SECTION 21 1313

WET-PIPE SPRINKLER SYSTEMS

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LANL MASTER SPECIFICATION

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.  The specifications must also be edited to delete specification requirements for processes, items, or designs that are not included in the project -- and specifier’s notes such as these.  Additional tailoring requirements are contained in ESM [Chapter 1](http://engstandards.lanl.gov/ESM_Chapters.shtml#esm1) Section Z10 Att. F, Specifications.

To seek a variance from requirements in the specifications that are applicable, contact the Engineering Standards Manual Fire[POC](http://engstandards.lanl.gov/POCs.shtml#fire). Please contact the POC with suggestions for improvement as well.

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

This section was developed for ML-4 projects.  For ML-1 and 2 applications, additional requirements must be added for increased confidence in procurement or execution (and may be added for ML-3), and independent review is required; see ESM Chapter 1 Section Z10 Specifications and Quality sections. Also, for ML-1 (Safety Class) and ML-2 (Safety Significant) sprinkler systems and water supplies only, DOE has issued guidance in DOE-STD-1066; this guidance will exceed NFPA 13 requirements and some expectations in this section, and requirements will need to be added herein.

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As a minimum, include the following Sections in Specification:

01 2500 *Substitution Procedures*

01 3300 *Submittal Procedures*

01 3545 *Water Discharge Requirements*

01 4000 *Quality Requirements*

01 4444 *Offsite Welding and Joining Requirements*

01 4455 *Onsite Welding and Joining Requirements*

01 7700 *Closeout Procedures*

01 7839 *Project Record Documents*

Applicable Division 05 sections on Post-Installed Anchors

09 9100 *Painting*

22 0554 *Identification for Plumbing, HVAC, and Fire Piping and Equipment*

22 0816 *Disinfection of Potable Water Piping*

22 0813 *Testing Piping Systems*

28 4600 *Fire Detection and Alarm*

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1. GENERAL
	1. SECTION INCLUDES
		1. Scope of Work: Provide design, shop drawings, project record drawings (as-built), equipment, fabrication, labor, transportation and supervision necessary to install, flush, test and place into service a complete hydraulically designed automatic wet pipe sprinkler system.

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For existing fire sprinkler systems that are to be revised and/or extended, provide a detailed scope of work. Note the design parameters for the existing system including the design density and area for hydraulically designed systems or type of pipe schedule for older systems that were not hydraulically designed.

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* + 1. Components: The wet pipe fire sprinkler system shall consist of, but not be limited to, interconnecting piping, fittings, control valves, check valves, alarm valve with trim, fire department connection, sprinklers, hangers, bracing, Inspector's test stations, drains, sprinkler alarm and other devices for a complete installation in accordance with codes, standards and recommended practice referenced in this Section.
	1. LANL-PERFORMED WORK
		1. The LANL fire protection group (hereafter “ES-FP”) will coordinate with the Los Alamos Fire Department to provide Subcontractor with water supply test data for existing fire protection water supplies.
	2. DESIGN
		1. Subcontractor is responsible for performing hydraulic calculations for the sprinkler system in accordance with NFPA 13 that account for all flow and pressure requirements to the location of the flow test hydrant that was used to determine the static and residual pressures. Subcontractor is also responsible for determining the location and elevation of the static and residual test gauge relative to the riser reference point and providing this information on the sprinkler design plans per NFPA 13. Subcontractor shall coordinate with the LANL Fire Protection Division on any software QA criteria for the hydraulic software.
		2. [Design the system per the edition of NFPA 13 cited within the edition of the IBC currently adopted by LANL, or the most current edition of NFPA 13. Confirm the applicable code of record with LANL Fire Protection Group (ES-FP) prior to preparing design drawings.]

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[Modifications to existing systems involving less than 10 sprinklers may be designed per the Code of Record edition of NFPA 13. Modifications involving 10 or more sprinklers shall comply with the edition of NFPA 13 cited within the edition of the IBC currently adopted by LANL, or the current edition of NFPA 13. Confirm the applicable code of record with LANL Fire Protection Group (ES-FP) prior to preparing design drawings.]

* + - 1. At a minimum, design the system to protect an Ordinary Hazard Group II occupancy per NFPA 13, or as specified by ES-FP. [For office trailers, the design density may be reduced to Ordinary Hazard Group I with ES-FP concurrence].
			2. Regardless of the NFPA 13 occupancy or the response type of sprinkler selected, the minimum design area shall not be less than 1,500 ft2.
			3. A minimum 500 gpm hose stream allowance shall be provided. [For office trailers designed to Ordinary Hazard Group I criteria, the hose stream allowance may be reduced to 250 gpm with ES-FP concurrence.]
			4. Conform to extra or special hazard requirements where required or indicated.
			5. Conform to NFPA 13 for storage occupancies when storage height exceeds 12 feet and other special hazard occupancies.
			6. Design system to operate at 7500 feet altitude.
			7. Design the sprinkler system and provide required equipment and devices to be able to separate the sprinkler system into individual and distinct alarm zones. Provide a minimum of one zone per floor.

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The following seismic design requirement applies to fire protection sprinkler piping (FPSP) systems located in “commercial facilities.” They are based on 2015 IBC, ASCE 7-10, NFPA 13-16, & ESM Ch. 5 Sect. II, R10.

The IBC requirements are found in its Sect. 1613, which references ASCE 7. ASCE 7 para. 13.6.8.2 defers to NFPA 13 for the design & construction of FPSP, pipe hangers, and bracing. Other components of fire protection systems (e.g., pumps and control panels, etc.) are subject to the general requirements of ASCE 7.

Seismic design for fire sprinkler systems located in Hazard Category 1–3 nuclear facilities, facilities with biological hazards, or significant chemical or toxicological hazards shall be per ESM Chapter 5 Section III (in addition to the documents referred to in the first author note in this document).

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* + 1. Seismic Design: Design sprinkler system piping for protection against damage per NFPA 13 Section, “Protection of Piping Against Damage Where Subject to Earthquakes,” subject to the following modifications:
1. Within the Paragraph, “Horizontal Seismic Loads,” the horizontal force, Fpw, shall be determined based on the value of the seismic coefficient, Cp, being 0.52.
	1. For Work in TA-50/55, Cp = 0.42 may be used if desired.

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The following sprinkler location design requirements apply to sprinkler systems installed below exposed concrete single and double TEE ceiling/roof construction. They are based on FM Global Property Loss Prevention Data Sheet 2-0, *Installation Guidelines for Automatic Sprinklers,* and differ from NFPA 13. DOE directives and standards establish the expectation for DOE facilities to meet Highly-Protected Risk (HPR) criteria, and applying the FM Global criteria for concrete TEE construction is responsive to this expectation. Concrete TEEs are typically considered obstructed construction for the purposes of applying NFPA 13 and FM Global Loss Prevention Data Sheet 2-0, and often have very deep stems on 3 to 8 feet centers that have the potential to adversely affect sprinkler operating performance.
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* + 1. Sprinkler Location Design for Exposed Concrete TEE Construction: Design for pendent or upright sprinklers to be located in every channel formed by the obstructing exposed concrete TEE and position the centerline of the sprinkler’s thermal sensing element a minimum of 1 inch and a maximum of 12 inches vertically below the underside of the ceiling bay. When sprinkler spacing does not exceed 130 ft2, the following exceptions may be applied when the criteria are met:
			1. Concrete TEE members spaced up to 7.5 ft. on-center and extending no more than 21 inches from the underside of the ceiling bay: Locate the centerline of the sprinkler’s thermal sensing element on the horizontal plane no more than 6 inches vertically below the underside of the concrete TEE stem, and no more than 22 inches below the underside of the ceiling bay. The distance between sprinklers perpendicular to the concrete TEE stems shall not exceed 13 ft.
			2. Concrete TEE members extend more than 21 inches from the underside of the ceiling bay: Locate the centerline of the sprinkler’s thermal sensing element on a horizontal plane no more than 22 inches below the underside of the ceiling bay. The NFPA 13/FM Global Loss Prevention Data Sheet 2-0, *Installation Guidelines for Automatic Sprinklers,* criteria for structural obstructions must be met to allow development of the sprinkler discharge pattern. The distance between sprinklers perpendicular to the concrete TEE stems shall not exceed 13 ft.
	1. ACTION SUBMITTALS

All submittals must be approved by ES-FP prior to installation. Submit the following per project submittal procedures:

* + 1. Hydraulic Calculations prepared per NFPA 13. Submit hydraulic calculations with shop drawings.

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Where the static pressure is too low for the following margins, seek variance per ESM Ch. 1 Section Z10.

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* + - 1. Provide a minimum 10% or 10 psi, whichever is greater, safety factor between the calculated sprinkler flow and pressure demand and the design basis water supply curve. The calculated sprinkler demand shall include a minimum 500 gpm hose stream requirements per LANL ESM Chapter 2, [*Fire Protection*](https://engstandards.lanl.gov/ESM_Chapters.shtml#esm2), Section D4010 (*Para. 2.0O*). [For systems designed to Ordinary Hazard Group I criteria, the hose stream allowance may be reduced to 250 gpm with ES-FP concurrence.]
			2. Include in calculations elevation differences between point of water test and base of riser. Include graphical representation (N1.85) of design basis water supply curve and system demand.
			3. The following preliminary flow data is provided to Subcontractor for bidding purposes: static \_\_\_\_\_\_ psig, residual \_\_\_\_\_ psig, flow \_\_\_\_\_ gpm, hydrant number \_\_\_\_, hydrant elevation \_\_\_\_\_\_\_ feet.
			4. Base system design on actual flow information provided by LANL. Request actual flow data in a timely manner to maintain project schedules.
		1. Seismic Design Documents:
			1. Calculations that demonstrate compliance with 1.3.C, prepared per LANL AP-341-605 or ES-FP-approved equivalent.
			2. Drawings, prepared per the LANL [CAD Standards](https://engstandards.lanl.gov/cad-manual.shtml) that convey the design to the constructor.
			3. Test and Inspection Plan, prepared per LANL ESM Chapter 16, as necessary/applicable.
			4. Items 1-3 (above) shall be stamped and sealed by a PE licensed in the state of NM.
		2. Catalog Data with equipment and materials to be used for the sprinkler system highlighted.
		3. Certifications for welders per NFPA 13 if any fabricated piping is to be welded per Sections 01 4444 (offsite) and 01 4455 (onsite).
		4. Installation Instructions.
		5. Materials Part List (Bill of Materials) with manufacturer, model number, and quantity.
		6. Shop Drawings using a minimum scale of 1/8" = 1'0" for plans and 1/4" = 1'0" for details. Lettering shall be a minimum of 1/8-inch high.
			1. Show information required by NFPA 13 Section titled “Plans and Calculations”, including piping, sprinklers, hangers, flexible couplings, roof construction, electro-mechanical devices, occupancy of each area, and ceiling and roof heights. See Chapter 22 of NFPA 13 for guidance on information required to be included on plans and calculations.
			2. Base working plans on actual survey of existing conditions.
			3. Show all hydraulic reference points and outline or highlight the most demanding design areas.
			4. Indicate the zones of influence used for the seismic design calculations.
			5. Indicate ceiling/roof heights and slopes not shown on a full height cross section of the building.
			6. Provide means to forward flow test the backflow prevention assembly.
		7. Test Reports
		8. Operation and Maintenance Manual: Submit system description, system final inspection, and Subcontractor's *Material and Test Certificates for Aboveground and Underground Piping* per NFPA 13, in the completed system project record documents.
			1. Include in operation and maintenance manuals: Instructions, a brief description of type of system installed, routine maintenance work defined by step-by-step instructions, and recommended frequency of performance.
			2. Also, include in instructions possible malfunctions with diagnostic methods and suggested correction of each.
			3. Describe function of each component or subassembly.
			4. List recommended spare parts (manufacturer, model number, and quantity).
		9. Project Record Drawings (as-builts) on CDs and full-size prints reflecting as-built conditions showing Work completed under this Section.
			1. Base as-built drawings on actual configuration of the completed installation.
			2. Include notes on all special systems or devices such as dry pendent sprinklers, antifreeze loops and inspector's test stations.
			3. Provide revised hydraulic calculations demonstrating that piping and fittings that deviate from the approved design drawings have not exceeded the available water supply.
			4. Design agency shall provide electronic as-built drawings for fire suppression system in native format (e.g., AutoSPRINK, SprinkCAD) with all reference/background files included.
			5. Submit as-built plans to LANL Records per Section 01 7700, *Closeout Procedures* and Section 01 7839, *Project Record Documents*.
	1. QUALITY ASSURANCE
		1. Provide proof that installation firm has successfully performed at least ten projects of equivalent nature and scope of the Projects herein; and is licensed within the USA to engage in design, fabrication, and installation of automatic sprinkler systems for fire protection.
	2. DELIVERY, STORAGE, AND HANDLING
		1. Materials and Equipment: Protect materials and equipment from damage during shipping, storage and installation.
		2. Plugs and Cover Plates: Protect threaded ends, flanged openings with gasketed metal cover plates to prevent damage during shipment and to prevent foreign materials from entering pipe or fittings. Cap or plug drains, vents, small piping, and gauge connections.
		3. Store sprinklers at temperatures recommended by the manufacturer prior to and during installation.
1. PRODUCTS
	1. PRODUCT OPTIONS AND SUBSTITUTIONS
		1. Alternate products may be accepted; follow Section 01 2500, *Substitution Procedures.*
	2. MATERIALS
		1. Provide new fire protection materials and equipment, UL Listed and/or FM Approved, conforming to NFPA 13 requirements.
	3. PIPING AND FITTING MATERIALS
		1. Provide per NFPA 13, except that piping 2 inches and smaller shall be Schedule 40 minimum.
		2. Provide flange bolting per ASME B16.1 and B16.5 for ductile and steel flanges respectively.
	4. VALVES AND STRAINERS
		1. Provide Listed and/or Approved valves and strainers rated at 175 psi or greater working pressure.
		2. Check Valves: provide NPT threaded drainage taps.
		3. Strainers: Provide "Y" type strainers with cast iron body and 30-mesh stainless steel screen.
		4. Alarm Valve: Minimum acceptable size is 4 inches. Provide retard chamber, pressure switch, two (2) calibrated/verified listed and/or approved water pressure gauges, and all necessary valves and trim for listed and/or approved alarm valve operation. As an alternative to a retard chamber, provide a pressure switch with a built-in, adjustable, instantly recycling pneumatic retard.
			1. Provide bypass valve in trim per the listing and/or approval to test operation of pressure alarm switch, if so provided.
			2. Provide alarm line trim control valve per the listing and/or approval to permit isolation of the retard chamber and pressure switch for maintenance.
			3. Equip alarm valve with retard chamber and pressure alarm switch with one normally open contact and one normally closed contact, suitable for 24 VDC.
			4. Provide check valve in retard chamber drain line when retard chamber drain line ties into main riser drain, per the valve’s listing and/or approval.
	5. WATERFLOW MOTOR ALARM
		1. Provide mechanically operated, exterior-mounted, water-motor alarm assembly installed per NFPA 13. Include a body housing, impeller or Pelton wheel, drive shaft, striker assembly, gong, wall plate and related components necessary to complete operation. Provide minimum ¾” piping between the housing and the alarm check valve. Drain piping from the body housing shall be minimum 1” pipe and installed to drain to the exterior of the building. All piping and fittings shall be galvanized.
	6. inspector’s test connection
		1. Provide approved or listed Inspector’s test connection valve assembly at riser, or at the most remote location per NFPA 13.
		2. Inspectors test piped to the exterior of the building shall be located a maximum of 2 feet above grade and discharge onto a splash block.
	7. Main Drains
		1. Main drains shall discharge to the exterior of the building and be located a maximum of 2 feet above grade and discharge onto a splash block.
	8. pRESSURE GAUGES
		1. Provide 3-1/2” diameter, liquid-filled, listed/approved, calibrated/verified pressure gauges designed for use with water.
			1. Gauge Scale: Dial marking subdivision no finer than 1 percent of maximum scale reading and accurate to 3 percent or less. Provide minimum scale range twice the maximum working pressure (where possible).
	9. VALVE SUPERVISION (tamper switches)
		1. Equip valves that control water to automatic sprinklers with supervisory switches.
			1. Provide listed and/or approved valve supervisory switches with minimum single-pole, Form C (SPDT) contacts, housed in gasketed, weather-tight enclosure, suitable for 24 VDC.
			2. Supply supervisory device specifically designed to mount on, and operate reliably with the type of control valve being monitored.
			3. Adjust valve position switches to transmit a supervisory signal within two revolutions of valve operating hand wheel or crank (away from its full open position).
		2. Control valves in alarm lines, if provided, shall be electrically supervised. Provide alarm control valve with supervisory switch, Potter Electric part number PTS-C, or approved equivalent, suitable for 24 VDC.
	10. WATER FLOW SWITCHES
		1. Provide a Potter Model PS10A Pressure Switch, or approved equivalent, (suitable for 24 VDC) at the sprinkler riser to detect a water flow condition in the system.

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* + 1. Potter Electric Model VSR vane-type waterflow switch, or approved equivalent with retard (delay) feature.
		2. For waterflow alarm switches located at other than the system riser, provide Potter Electric Model VSR vane-type waterflow switches, or approved equivalent with retard feature.
			1. Use single pole Form C, suitable for 24 VDC.
			2. Adjust water flow switches to transmit an alarm within 90 seconds of opening the inspector’s test valve.
		3. Provide a minimum of one water flow switch for each sprinkler zone.
	1. SPRINKLERS AND ACCESSORIES
		1. Sprinklers shall be listed by a nationally recognized testing laboratory and be selected per their Listing and/or Approval, manufacturer’s instructions, and applicable NFPA requirements. Provide as follows:
			1. Upright Sprinklers: Brass upright type. Use in areas without suspended ceilings, and in above-ceiling and attic spaces, as required by the design.
			2. Pendent Sprinklers: Chrome plated, unless other finish is requested. Use below suspended ceilings. Provide semi-recessed escutcheons matching sprinkler finish.
			3. Sprinkler Guards: Provide where sprinklers are exposed to external damage, and in all mechanical, electrical, and utility spaces where installed less than 7 feet above the finished floor.
			4. Corrosion-Resistant Sprinklers: Provide in locations where chemicals, moisture, weather or other corrosive vapors exist. Stainless steel, polyester, or Teflon-coated sprinklers are preferred finish. Confirm selection of corrosion-resistant sprinklers with ES-FP.
			5. Concealed Sprinklers: Use listed/approved concealed type sprinklers in clean rooms, and where required by the design.
		2. Where indicated, provide other types of sprinklers per their Listing.
	2. WATER SHIELDS
		1. Provide in areas where there is no ceiling, and when multiple-level protection is required—e.g., at open-grating or open high-roofed areas.
			1. Provide compatible Listed/Approved water shields and/or intermediate level sprinklers per NFPA 13.
			2. Water shields shall not be considered/used as ‘heat collectors’ for sprinklers.
	3. FIRE DEPARTMENT CONNECTIONS
		1. Provide listed and/or approved fire department connections with 4-inch minimum outlet, two 2-1/2 inch minimum inlets, National Fire Standard threads, cast brass body, clapper in each inlet, plugs, and attached chains.
		2. Fire department connections shall be located on the fire department approach side of the building and be readily visible from the designated fire lanes and where they will remain unobstructed by equipment, landscaping, parking, or other features.
			1. When wall-mounted, locate pumper connections on blank masonry wall, or provide wall with one-hour fire barrier for 10 feet in all directions from pumper connection, and identify automatic sprinkler connection. Exemption: Office trailers.
			2. Identify fire department connection with NFPA 170 signage or escutcheon plate provided with fire department connection.
	4. Erosion Protection
		1. Provide concrete splash blocks or other approved methods at system exterior drains that do not discharge to a hard-covered surface to protect landscape from erosion due to water discharge from the drains.
	5. ANTIFREEZE Systems

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Provide a listed and/or approved backflow preventer (BFP) in the antifreeze loop when a BFP is not installed in the sprinkler riser supplied from a potable water system. Sprinkler systems supplied from a dedicated loop or tank (non-potable water) do not require backflow protection.

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* + 1. Install antifreeze systems per NFPA 13 and fill with a factory pre-mixed antifreeze solution that is listed for use in sprinkler systems. “TYCO LFP” or LANL-approved equivalent.
		2. Provide an approved sign in an approved location in the vicinity of the antifreeze system control valve that states the following information per NFPA 13:
		3. Antifreeze solution concentration
		4. Antifreeze solution manufacturer/type
		5. Antifreeze solution volume.
		6. Provide an approved sign at the system control riser indicating the presence and location of an antifreeze system.
	1. SPRINKLER RISER BACKFLOW PREVENTER

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Provide a listed and/or approved backflow preventer in a new system when the fire protection system is supplied from a potable water system. Backflow preventer shall be installed per its listed and/or approved configuration. Sprinkler systems supplied from a dedicated fire loop or tank (non-potable water) do not require backflow protection. Refer to Fire Protection Standard Drawings ST D4010-1 for riser detail with backflow preventer.
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* + 1. Manufacturers:
			1. FEBCO, Model LF880V.
			2. Wilkins, Model 475V.
		2. Reduced pressure type, vertical orientation, ductile iron body epoxy coated internal and external, with UL/FM outside stem and yoke (OS&Y) gate valves, flanged ends, test cocks for in-line field testing and relief valve air gap drain funnel. Provide BFPs listed as “Lead Free” construction by the manufacturer. Maximum water temperature range 33 to 140 degrees F, maximum rated working pressure 175 psi. Assembly shall be listed in the latest edition of *Approved Backflow Prevention Assemblies* by the University of Southern California Foundation for Cross Connection Control and Hydraulics Research. Size backflow preventer to match size of alarm check valve.
		3. Provide means to drain backflow discharge to outside the building or to a floor drain with sufficient capacity to contain the discharge. Size the discharge drain pipe the same nominal diameter as the backflow preventer. Cover drain pipe openings exterior to the building exterior with ¼-inch hardware cloth.
		4. Provide means downstream of all backflow prevention devices for full forward flow tests at system demand per NFPA 13. [For Ordinary Hazard and greater sprinkler designs, a test header and/or bypass around the fire department connection check valve will be required.]
			1. The test header connection shall be clearly and permanently marked “BACKFLOW TEST CONNECTION”.
			2. The test connection control valve shall be supervised in the closed position. Supervision by locking the valve in the closed position is acceptable.
			3. Provide means, such as an automatic ball drip valve to prevent accumulation of water at the test connection where subject to freezing temperatures. Route discharge to the exterior of the building.
	1. SPRINKLER SYSTEM AIR VENT
		1. Install an air vent, or means to vent air from the piping network, at an approved location at the high point of the system to allow air to be removed per NFPA 13.
		2. Automatic air vent manufacturers (where provided):
			1. Potter Electric Signal Company, Model PAV
			2. LANL-approved equivalent.

1. EXECUTION
	1. EXAMINATION
		1. Prior to installation, carefully inspect installed Work of other trades, whether pre-existing or part of this Project, and verify that such work is complete to the point where installation of sprinkler system may start.
		2. Notify the LANL Subcontract Technical Representative (STR) should conditions exist, not resulting from Work of this Project, that prohibits the installation from conforming to referenced codes, regulations, standards and approved design.
		3. Install materials and equipment that are free of moisture, scale, corrosion, dirt and other foreign materials.
	2. INSTALLATION
		1. General
			1. Install system per NFPA 13.
			2. Do not locate sprinklers closer than 12 inches to supply air registers.
			3. Conform to NFPA 13 requirements for “Temperature Ratings of Sprinklers Based on Distance from Heat Sources.”
			4. Visually examine pipe, fittings, valves, equipment and accessories to ensure they are clean and free of burrs, cracks and other imperfections before installation. Clean pipe interiors by flushing per NFPA 13.
			5. Verify dimensions in field.
			6. Drawings show only approximate building outlines and interior construction details as an aid in understanding the scope of Work. Investigate field conditions affecting the Work and arrange Work accordingly. Provide sprinklers, fittings, drain valves, piping, equipment, and accessories as required to accommodate field conditions. Indicate structural details that affect sprinkler system design on Drawings.
			7. Do not render inoperative any system without the prior approval of the LANL STR to permit them to initiate an impairment. Coordinate necessary shutdowns of existing systems by notifying the LANL STR a minimum of 7 working days before rendering such systems inoperative.
			8. Coordinate sprinkler piping, sprinklers and associated equipment with existing ceiling or roof materials, lighting, ductwork, conduit, piping, suspended equipment, structural and other building components.
			9. Dispose of equipment and materials associated with construction removed for completion of this Project as directed by the LANL STR.
			10. Provide access openings in areas where sprinkler system components are concealed.
		2. Piping
			1. Run piping parallel with building lines (i.e., along the axes of columns, beams, and girders). Arm-overs to pendent sprinklers are exempt from this requirement.
			2. Mark and identify sprinkler piping per Section 22 0554 *Identification for Plumbing, HVAC, and Fire Piping and Equipment*.
			3. Install piping above ceilings in areas with suspended ceilings. Install piping in exposed areas as high as possible. Install sprinkler piping a minimum of 7 feet 6 inches above finished floor. When minimum elevation requirement cannot be met, obtain approval from the LANL STR prior to installation.
				1. Mark piping installed less than 7 feet 6 inches above finished floor to identify it as a clearance hazard.
			4. [Install Inspector's Test piping at the hydraulically most remote point of automatic sprinkler system and discharge to the exterior of building OR install listed and/or approved Inspector’s Test connection valve assembly at the sprinkler system riser]. Also, install inspector’s test piping for each zone floor control assembly. Where possible, conceal test piping in wall and provide access panels for valve and sight glass and protect from freezing. Locate Inspector's Test in an easily accessible location approved by the LANL STR.
			5. Diamond core drill or sleeve concrete penetrations, then grout and seal with fire-resistive material, securely held in place. Use listed and/or approved through-penetration firestop systems for piping penetrating fire resistance rated construction.
		3. Hanging, Bracing, and Restraint of System Piping
			1. Install pipe hangers for pipe supports inside buildings per NFPA 13.
			2. Install seismic protection for the system piping, including sway bracing, as indicated and per the version of NFPA 13 utilized for this design. Include the required features identified therein that are applicable to the specific piping system.
			3. Install concrete anchors as indicated and per ESM Chapter 5–Structural sections and Section 05 0520 on post-installed anchors.
			4. Do not hang other piping, wiring or equipment from sprinkler pipe, hangers, or supports.
		4. Welding
			1. Shop-weld pipe and fittings using approved welding fittings. Comply with NFPA 13 for welding methods.
			2. Provide a blind flange or grooved cap at each end of welded headers.
			3. Comply with 01 4444 -- *Offsite Welding and Joining Requirements* and 01 4455 -- *Onsite Welding and Joining Requirements.*
		5. Alarm Valve: Set plumb and unobstructed. Provide minimum clear distances from walls to centerline of alarm valve as follows:
			1. Rear - 12 inches
			2. Sides ‑ 20 inches
			3. Front ‑ 36 inches
		6. System Riser: Install riser from underground so that no joint or fitting occurs within the bearing zone of foundation structures or occurs at least 5 feet from any foundation structure.
		7. Control Valves: Provide Listed and/or approved OS&Y fire protection control valves, installed so open or closed status can be readily seen from floor level.
			1. Install control valves on supply lines (outside protected area) into elevator shaft and elevator equipment room, computer rooms, and identified special protection areas. Control valves to be accessible from floor level. Provide control valves with supervisory tamper switches.
		8. Sprinklers and Accessories
			1. Provide upright sprinklers on exposed piping below ceiling. Pendent sprinklers may be used where necessary due to spacing, location and position requirements.
			2. Provide chrome plated pendent, recessed, or flush mounted sprinklers below finish ceilings. Route supply piping above ceiling.
			3. Align sprinklers below ceiling parallel to ceiling features and walls, and locate as close to center as possible in halls and corridors.
			4. Provide chrome-plated escutcheons where exposed piping passes through finished floors, walls, partitions and ceilings. Secure to pipe with set screws or spring clips.
			5. Protect sprinklers subject to mechanical injury with guards as follows:
2. Provide guards in mechanical equipment rooms, electrical equipment rooms, janitor's closets, and storage areas where distance from sprinkler deflector to finish floor is less than 15 feet.
3. In all other areas, provide guards where distance from sprinkler deflector to finish floor is less than 7 feet.
	* + 1. To prevent freezing, extend dry pendent sprinklers a minimum of 6 inches into heated area before connection to wet sprinkler piping.
			2. Provide spare sprinkler cabinet(s), complete with sprinklers of assorted temperature ratings of the type necessary and in use throughout the installation, at each main riser valve. Equip each cabinet per NFPA 13.
		1. Signs
			1. Install as required by NFPA 13, including information signs noting the locations of antifreeze loops, heat-trace systems, auxiliary drains; general information signs detailing the occupancy, building type, and other information; control valve signs indicating what portion of the system is isolated by the valve; etc.
			2. Provide post-indicator valves (PIVs) with a permanent weatherproof placard identifying the building or area protected by the sprinkler system for which the PIV controls the water supply.
			3. Provide a sign attached in the vicinity of control valves to antifreeze systems designating the type, concentration, manufacturer/brand and volume of antifreeze solution installed in the system.
			4. Provide a permanent, weatherproof sign noting “BACKFLOW TEST CONNECTION” located on the exterior of the building in the immediate vicinity of the backflow test connection valves.
			5. Provide fire department connections (FDCs) with a sign having raised or engraved letters at least 1 in. (25 mm) in height on plate or fitting reading service design—e.g., AUTOSPKR., OPEN SPKR., AND STANDPIPE. Provide supplementary signage indicating the portion of the building protected by the riser (where the specific riser supplied by the FDC does not protect the entire building).

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Edit “Painting” (*Para 3.2.J*) to clearly define the extent of painting of sprinkler system piping and appurtenances (e.g., which rooms). Painting need not be provided for factory-painted/-finished alarm check valves, backflow preventers, control valves and similar devices. Painting of piping may be warranted for the protection of the piping to mildly corrosive environments, where easy identification of the sprinkler system is desired from a facility operations perspective, or for cosmetic purposes when exposed (e.g., stairwells).

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* + 1. Painting: Paint unfinished sprinkler riser piping, unfinished fire department connection (FDC) piping, exposed sprinkler piping in stairwells, and sprinkler piping in all mechanical, electrical and telecommunications equipment rooms with two (2) coats of Fire Protection RED. Do not paint sprinklers, escutcheons or cover plates. Replace any sprinklers that are inadvertently painted. Comply with Section 09 9100, *Painting*.
		2. Unsupervised Water Supplies: Install approved water flow detection device on underground water supplies entering buildings when fire protection riser is more than 10 lineal feet from exterior of building.
		3. Water Supply Control Valve: Where not otherwise provided for, provide water supply control valve(s) conforming to the requirements of NFPA 24.
			1. Provide UL Listed and/or FM valves, with listed indicating post. Locate PIVs at minimum of 40 feet from building per NFPA 24 (or closer providing they are located outside the collapse area of the building’s walls). Fire hydrants and PIVs proposed to be located closer than 40 feet away from a building shall receive prior approval from ES-FP.
			2. Where a wall PIV is provided, the wall 10 feet in all directions of the valve shall be blank masonry or one-hour fire-resistance-rated construction. Exemption: Office trailers.
			3. Set PIVs so that the top of the post is 32 inches to 40 inches above the final grade.
			4. PIVs shall be protected against mechanical damage (e.g., install bollards).
		4. Air Vent(s): Manual air vent valve location(s) shall be accessible without use of a ladder. Automatic devices shall not be installed in areas with finished ceilings unless access panels are provided in ceilings for accessibility.
		5. Special Tools and Devices: Provide one complete set of special tools or special devices required for operation, testing and/or maintenance of equipment furnished under this Section.
	1. EQUIPMENT INSTALLATION
		1. Install devices or equipment not specifically covered by these Specifications per manufacturer's instructions.
	2. CONNECTIONS TO EXISTING SYSTEMS
		1. Final connection of new systems to existing underground piping systems will be made by LANL with materials furnished by Subcontractor.
		2. Final connection of new systems to other existing systems above grade shall be done by Subcontractor after contacting the LANL STR (who will implement LANL Fire Protection Impairment Procedure). Perform all final connections of this type with only one outage per existing system.
	3. STERILIZATION
		1. Sterilize sprinkler system underground piping upstream of alarm valve per Section 22 0816, *Disinfection of Potable Water Piping*.
		2. Do not sterilize sprinkler system downstream of alarm valve.
	4. EXISTING CONDITIONS
		1. Area Restoration: Restore areas disturbed by the fire protection system installation to the condition existing prior to start of construction.
		2. Field Inspection: Field inspect areas of sprinkler installation for potential interference with structure, ducts, cable trays, electrical or mechanical equipment, and other similar interferences. Carefully coordinate Work under this section with other Work.
	5. TESTING
		1. Hydrostatically test piping and attached appurtenances per Section 22 0813, *Testing Piping Systems*, and NFPA 13.
		2. Flush system with water per NFPA 13 and 24.
		3. Comply with the discharge requirements in Section 01 3545, *Water Discharge Requirements*.
		4. Notify LANL STR, ES-FP, and LANL Facility Operations Director (FOD) representative at least 5 working days in advance to witness all system tests.
	6. INSPECTION
		1. Inspect new fire protection system per NFPA 13 and 24, and in the presence of the LANL STR and ES-FP. Provide advance notice, as specified below, to the STR and ES-FP prior to any tests.
			1. Notify the LANL STR and ES-FP upon completion of installation of all materials and equipment. LANL STR will schedule inspection of installation within 5 working days after Subcontractor notification.
			2. Correct deficiencies noted during this inspection and correct prior to further testing.

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 Spec Section 21 1313 Rev. 9, dated August 1, 2019.