SECTION 21 0500

COMMON WORK RESULTS FOR FIRE SUPPRESSION

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LANL MASTER SPECIFICATION SECTION

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| Rev. 0: New issue, adopting content aligned with commercial industry practice. |

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

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 specification 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.  This template is tailored to meet requirements contained in the LANL Engineering Standards Manual (ESM). To seek a variance from requirements of this section that are applicable, contact the Engineering Standards Manual Fire [POC](http://engstandards.lanl.gov/POCs.shtml#fire). Please contact POC with suggestions for improvement as well.

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

This template is 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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PART 1 GENERAL

1. SECTION INCLUDES

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Note that DOE-STD-1066 Appendices A and B are not applicable to the work specified herein. Consider the scope and purpose of DOE documents as applicable to commercial construction before editing such requirements in this section.

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1. Below ground pipe, fittings, and joints.
2. Above ground pipe, fittings and joints.
3. Inbuilding riser.
4. Pipe sleeves.
5. Pipe sleeve-seal systems.
6. Pipe hangers and supports.
7. Expansion loops.
8. Mechanical couplings.
9. RELATED SECTIONS
10. Section 01 4444, *Offsite Welding and Joining Requirements*
11. Section 01 6000, *Product Requirements*
12. Section 01 7700, *Closeout Procedures*
13. Section 07 8400, *Firestopping.*
14. Section 09 9100, *Painting.*
15. Section 21 0523, *General-Duty Valves for Water-Based Fire-Suppression Piping.*
16. Section 21 1200, *Fire-Suppression Standpipes: for Standpipe design.*
17. Section 21 1300, *Fire-Suppression Sprinkler Systems: for Sprinkler systems design.*
18. Section 33 1000, *Water Utilities:* for Site fire water distribution below grade.
19. REFERENCES
20. American Society of Mechanical Engineers (ASME)
	1. ASME BPVC-IX – *Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators*
	2. ASME B16.1 – *Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250*
	3. ASME B16.3 – *Malleable Iron Threaded Fittings: Classes 150 and 300*
	4. ASME B16.4 – *Gray Iron Threaded Fittings: Classes 125 and 250*
	5. ASME B16.5 – *Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard*
	6. ASME B16.9 – *Factory-Made Wrought Buttwelding Fittings*
	7. ASME B16.11 – *Forged Fittings, Socket-Welding and Threaded*
	8. ASME B16.25 – *Buttwelding Ends*
21. ASTM International
	1. ASTM A47/A47M – *Standard Specification for Ferritic Malleable Iron Castings*
	2. ASTM A53/A53M – *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless*
	3. ASTM A135/A135M – *Standard Specification for Electric-Resistance-Welded Steel Pipe*
	4. ASTM A234/A234M – *Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service*
	5. ASTM A269/A269M – *Standard Specification for Seamless and Welded Austenitic Stainless-Steel Tubing for General Service*
	6. ASTM A536 – *Standard Specification for Ductile Iron Castings*
	7. ASTM A795/A795M – *Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use*
	8. ASTM C592 – *Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type)*
	9. ASTM E814 – *Standard Test Method for Fire Tests of Penetration Firestop Systems*
22. American Welding Society (AWS)
	1. AWS D1.1/D1.1M – *Structural Welding Code - Steel*
23. American Water Works Association (AWWA)
	1. AWWA C105/A21.5 – *Polyethylene Encasement for Ductile-Iron Pipe Systems*
	2. AWWA C110/A21.10 – *Ductile-Iron and Gray-Iron Fittings*
	3. AWWA C111/A21.11 – *Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings*
	4. AWWA C151/A21.51 – *Ductile-Iron Pipe, Centrifugally Cast*
	5. AWWA C606 – *Grooved and Shouldered Joints*
24. FM Approvals
	1. FM (AG) – *FM Approval Guide*
25. ITS
	1. ITS (DIR) – *Directory of Listed Products*
26. National Fire Protection Association (NFPA)
	1. NFPA 13 – *Standard for the Installation of Sprinkler Systems*
	2. NFPA 14 – *Standard for the Installation of Standpipe and Hose Systems*
	3. NFPA 20 – *Standard for the Installation of Stationary Pumps for Fire Protection*
27. Underwriters Laboratories (UL) Inc.
	1. UL (DIR) – *Online Certifications Directory*
28. Warnock Hersey (WH) Mark
	1. *Warnock Hersey*
29. ACTION SUBMITTALS
30. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.
31. INFORMATIONAL SUBMITTALS
32. Operation and Maintenance Data: Include installation instructions and spare parts lists.
33. Maintenance Materials: Furnish the following:
34. Refer to Section 01 6000, *Product Requirements*, for additional provisions.
35. Extra Valve Stem Packings: [One; Two; or \_\_\_\_ ] for each type and size of valve.
36. QUALITY ASSURANCE
37. Fire Sprinkler subcontractors shall possess the following:
	1. A current New Mexico Certificate of Fitness, or equivalent from another state (as determined by the LANL Fire Marshal’s office).
	2. A qualifying individual holding a current New Mexico MS-12 qualifying party certificate, or equivalent from another state (as determined by the LANL Fire Marshal’s office). The qualifying party shall be on the company payroll, and not a sub-tier subcontractor.
	3. A minimum of one JS-12 Journeyman for every two unregistered Apprentices performing work on the project.
38. LANL fire sprinkler work crews shall possess the following:
	1. LANL Fire Marshal-approved shop drawings.
	2. One bound copy of the applicable edition of NFPA-13 and/or NFPA-14 and/or NFPA-20 shall remain on site and accessible while work is being performed.
	3. A minimum of one JS-12 Journeyman for every two unregistered Apprentices performing work on the project.
39. Comply with [FM (AG); UL (DIR); ITS (DIR) or Warnock Hersey; and \_\_\_\_\_\_\_] requirements.
40. Valves: Bear [FM (AG); UL (DIR); ITS (DIR) or Warnock Hersey; and \_\_\_\_\_\_\_] product listing label or marking. Provide manufacturer's name and pressure rating marked on valve body.
41. DELIVERY, STORAGE, AND HANDLING
42. Deliver and store valves in shipping containers, with labeling in place.
43. WARRANTY
44. See Section 01 7700, *Closeout Procedures* for additional warranty requirements.
45. Correct defective Work within a [five; or \_\_\_\_] year period after Date of Substantial Completion.

PART 2 PRODUCTS

1. GENERAL REQUIREMENTS
2. Fire Sprinkler System:
3. Comply with [NFPA 13](https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=13).
4. Refer to Section 21 1300, *Fire Suppression Sprinkler Systems*.
5. Standpipe and Hose System:
6. Comply with [NFPA 14](https://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NFPA%2014).
7. Refer to Section 21 1200, *Fire Suppression Standpipes*.
8. Combined Sprinkler, Standpipe, and Hose System:
9. Comply with [NFPA 13](https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=13) and [NFPA 14](https://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NFPA%2014).
10. Refer to Sections 21 1300, *Fire Suppression Sprinkler Systems* and 21 1200, *Fire Suppression Standpipes*.
11. Welding Materials and Procedures: Comply with [ASME BPVC-IX](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=ASME%20BPVC-IX) and Section 01 4444, *Offsite Welding and Joining Requirements*.
12. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

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1. BELOW GROUND PIPING
2. Ductile Iron Pipe: [AWWA C151/A21.51](https://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=AWWA%20C151/A21.51).
3. Fittings: [AWWA C110/A21.10](https://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=AWWA%20C110/A21.10), standard thickness.
4. Joints: [AWWA C111/A21.11](https://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=AWWA%20C111/A21.11), styrene-butadiene rubber (SBR) or vulcanized SBR gasket.
5. Mechanical Couplings: Shaped composition sealing gasket, steel bolts, nuts, and washers.
6. ABOVE GROUND PIPING
7. Steel Pipe: [ASTM A795 Schedule 10; ASTM A53 Schedule 40; ASTM A135/A135M Schedule 10; ASTM A795 Schedule 40], [black; galvanized].
8. Steel Fittings: [ASME B16.9, wrought steel, buttwelded; ASME B16.25, buttweld ends; ASTM A234/A234M, wrought carbon steel or alloy steel; ASME B16.5, steel flanges and fittings; ASME B16.11, forged steel socket welded and threaded].
9. Cast Iron Fittings: [ASME B16.1, flanges and flanged fittings; ASME B16.4, threaded fittings].
10. Malleable Iron Fittings: [ASME B16.3, threaded fittings; ASTM A47/A47M].
11. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
12. Ductile Iron Pipe: [AWWA C151/A21.51](https://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=AWWA%20C151/A21.51).
13. Fittings: [AWWA C110/A21.10](https://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=AWWA%20C110/A21.10), standard thickness.
14. Joints: [AWWA C111/A21.11](https://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=AWWA%20C111/A21.11), SBR or vulcanized SBR gasket.
15. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped composition sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

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1. IN BUILDING RISER
2. In Building Riser: UL-listed and/or FM-approved. Lead-free, one-piece 304 stainless steel construction with integral connections. Horizontal and vertical length to suit base-of-riser location and depth of tie-in to site water distribution. Wall thickness SCH 10 minimum for 6-inch and smaller pipe size, SCH 5 minimum for 8-inch and larger pipe size.
3. Manufacturers:
4. Ames.
5. Zurn.
6. \_\_\_\_\_\_\_\_\_\_
7. Connections:
8. Inlet: [push-on; flanged].
9. Outlet: [grooved; flanged].
10. PIPE SLEEVES
11. Vertical Piping:
12. Carbon steel SCH40. Sleeve Length: [1 inch; \_\_\_\_\_ inch] above finished floor.
13. Provide sealant for watertight joint.
14. Drilled Penetrations: Provide [1-1/2 inch; \_\_\_\_\_ inch] angle ring or square set in silicone adhesive around penetration.
15. Pipes Passing Through Above Grade Concrete and Masonry Walls:
16. Carbon steel flush with both sides of finished wall or core drill.
17. Pipes Passing Through Above Grade Framed Walls:
18. Provide pipe sleeves at fire wall penetrations if/as required by approved firestop assembly.
19. Provide clearance by means of neatly cut holes through frangible construction other than fire barriers.
20. Pipe Passing Through Below Grade Exterior Walls:
21. Zinc-coated or cast-iron pipe.
22. Provide annular space for modular linked rubber seal between sleeve and pipe.
23. Not required for wall hydrants for fire department connections or in drywall construction.
24. Clearances:
25. Observe NFPA 13 requirements for clearance at base-of-riser.
26. Provide clearances required to accommodate seismic design considerations***.***
27. Provide clearance required for firestopping at fire barrier penetrations.
28. PIPE SLEEVE-SEAL SYSTEMS

A. Modular Mechanical Seals:

1. Elastomer-based interlocking links to continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
2. Size and select seal component materials in accordance with service requirements.
3. PIPE HANGERS AND SUPPORTS
4. Hangers:
5. Adjustable Steel Clevis Hangers: MSS-SP-58 Type 1.
6. Adjustable Steel Band Hangers: MSS-SP-58 Type 7.
7. Trapeze Hangers.
8. Comply with NFPA 13 requirements for engineered pipe supports.
9. Vertical Support:
10. Steel Pipe Clamp: MSS-SP-58 Type 4.
11. Floor Support:
12. Pipe Saddle Support: MSS-SP-58 Type 36.
13. Pipe Stanchion Saddle: MSS-SP-58 Type 37.
14. Adjustable Pipe Saddle Support: MSS-SP-58 Type 38.
15. Seismic Bracing:
16. Comply with NFPA 13.
17. EXPANSION *[LOOPS; JOINTS; OR JOINTS AND LOOPS]* - HOSE AND BRAID
18. Manufacturers:
19. The Metraflex CompanyFire Loop
20. Flex-Weld, Inc
21. \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
22. Substitutions: [Alternate products may be accepted, follow Section 01 2500, *Substitution Procedures*; or Not permitted – No substitutions].
23. Provide flexible loops with two flexible sections of hose and braid, two 90-degree elbows, and 180-degree return with support bracket and air release or drain plug.
24. Provide flexible loops capable of movement in the x, y, and z planes. Flexible loops to impart no thrust loads to the building structure.
25. Flexible connectors: [Flanged; Grooved; or Threaded], braided type with wetted components of stainless steel, sized to match piping.
26. Maximum allowable working pressure: [300 psig; 175 psig; 150 psig; \_\_\_\_\_ psig] at [120 degrees Fahrenheit; \_\_\_\_\_ degrees Fahrenheit].
27. Accommodate the following:
	1. Axial Deflection in [Compression; Expansion; Compression and Expansion; or \_\_\_\_\_\_\_\_\_\_]: \_\_\_\_\_ inch.
	2. Lateral Movement: \_\_\_\_\_ inch.
	3. Angular Rotation: [15; or \_\_\_\_\_] degrees.
	4. Force developed by [1.5; or \_\_\_\_\_] times specified maximum allowable operating pressure.
28. End connections: Same as specified for pipe jointing.
29. End connections: Flanged [ductile iron; or \_\_\_\_\_]; complying with [ASME B16.1; or ASME B16.5] Class [125; 150; 300; or \_\_\_\_\_].
30. End connections: [Threaded; Welding; or \_\_\_\_]; complying with [ASME B16.11](https://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=ASME%20B16.11).
31. Provide necessary accessories including, but not limited to, [swivel joints; limit stops; internal guides; anti-torque device; internal flow liners; control rods; control cables; and \_\_\_\_\_].
32. MECHANICAL COUPLINGS
33. Manufacturers:
34. Anvil International.
35. Shurjoint Piping Products, Inc.
36. Tyco Fire Protection Products.
37. Victaulic.
38. \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
39. Substitutions: [ Alternate products may be accepted, follow Section 01 2500, *Substitution Procedures*; or Not permitted – No substitutions].
40. Rigid and Flexible Mechanical Couplings for Grooved Joints:
41. Dimensions and Testing: Comply with [AWWA C606](https://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=AWWA%20C606).
42. Minimum Working Pressure: [175 psig; 300 psig; \_\_\_ psig].
43. Housing Material: Fabricate of ductile iron complying with ASTM A536.
44. Housing Coating: Factory applied [ enamel; galvanize].
45. Gasket Material: EPDM suitable for operating temperature range from [minus 30 degrees Fahrenheit; \_\_\_\_\_\_\_\_ degrees Fahrenheit] to [230 degrees Fahrenheit; \_\_\_\_ degrees Fahrenheit].
46. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.
47. Provide stops for direct stab installation without field assembly.

PART 3 EXECUTION

1. PREPARATION
2. Ream pipe ends. Remove burrs.
3. Remove scale and foreign material, from inside and outside, before assembly.
4. Prepare piping connections to equipment with flanges or unions.
5. INSTALLATION
6. Install sprinkler system and service main piping, hangers, and supports in accordance with [NFPA 13](https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=13).
7. Install standpipe piping, hangers, and supports in accordance with [NFPA 14](https://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NFPA%2014).
8. Route piping in orderly manner, plumb and parallel to building structure.
9. Install piping to allow for bracing and movement without stressing pipe, joints, or connected equipment.
10. Slope piping and arrange systems to drain to the riser. Provide auxiliary drains where required. Use eccentric reducers to maintain top of pipe level.
11. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welds.
12. Painting of interior fire suppression systems is specified in Section 09 9100, *Painting*.
13. Painting of exterior fire suppression systems is specified in Section 09 9100, *Painting*.
14. Structural Considerations:
15. Do not penetrate building structural members unless indicated.
16. Locate flexible expansion loops at or near the building seismic joint.
17. Provide sleeves when penetrating [footings; floors; walls; partitions; and \_\_\_\_\_\_\_]. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
18. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
19. Aboveground piping:
	1. Pack solid using mineral fiber complying with [ASTM C592](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=ASTM%20C592).
	2. Fill space with an elastomer caulk to a depth of [0.50 inch; \_\_\_\_\_ inch] where penetrations occur between conditioned and unconditioned spaces.
20. All Rated Openings: Caulk tight with firestopping material complying with [ASTM E814](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=ASTM%20E814) in accordance with Section 07 8400, *Firestopping*, to prevent the spread of fire, smoke, and gases.
21. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
22. Manufactured Sleeve-Seal Systems:
23. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
24. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
25. Locate piping in center of sleeve or penetration.
26. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
27. Tighten bolting for a watertight seal.
28. Install in accordance with manufacturer's recommendations.
29. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.
30. Die-cut threaded joints with full-cut, standard taper pipe threads with non-toxic joint compound applied to male threads only.
31. CLEANING
32. Upon completion of work, clean all parts of the installation.
33. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

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 21 0500 Rev. 0 dated December 5, 2024.