SECTION 28 4600

FIRE DETECTION AND ALARM

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LANL MASTER SPECIFICATION SECTION

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| Rev. 5 Summary of Changes: Added clarifications and editorial changes. Updated Articles in Part 1 with changes to Related Sections, References, Submittals, Design, Quality Assurance, and added Definitions and Acronyms. Updated Part 2 with approved parts and components for Fire Alarm systems. Updated Part 3 to align with commercial industry and LANL practices for execution. Updated Appendix by replacing Deliverables for Fire Alarm System with Master Equipment List Reference. |

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

This template must be edited for each Fire Alarm project, new systems or modifications to existing systems.  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 in 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 specifications 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.

Seismic: To edit this section for job-specific seismic requirements, refer to author notes that indicate “Seismic,” and the document, *Seismic Spec-Editing for Electrical/Fire Alarm Components* (“Guide,” posted under References on the [LANL Master Specifications](https://engstandards.lanl.gov/specs.shtml) page) for guidance on properly editing this section.

NOTE: Scope of work in this section should match the scope of work in the drawing package including codes and standards references.  
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1. GENERAL
2. SECTION INCLUDES
3. Circuits from protected premises to supervising station, including raceways.
4. Replacement and removal of existing fire alarm system components, wiring, and raceways indicated.
5. Maintenance of fire alarm system under subcontract for specified warranty period.
6. Provide an addressable fire alarm system consisting of, but not limited to, the following components:

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Edit subparagraphs below to match project fire alarm system requirements. Supplement list for devices or equipment not listed. Specific details of the required system can be provided as necessary. Modify description for modifications of existing systems.

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1. Fire Alarm Control Units (FACU)
2. Notification Appliance Power Panels (NAPP)
3. Raceways and Wiring
4. Manual Fire Alarm Pull Stations and Abort Switches
5. Smoke Detectors (Photoelectric)
6. Air Sampling Smoke Detection
7. Heat Detectors:
8. Rate of Rise
9. Fixed
10. Flame Detectors
11. Monitoring of Sprinkler System Supervisory and Alarm Signals
12. Notification Appliances:
13. Horn Strobes
14. Strobes
15. Horns
16. Speakers/Speaker Strobes
17. Emergency Control Functions Interfaces:
18. Air Handling System/Fan/Air Conditioner Shutdown Relays
19. Elevator Recall/Shunt/Indicator Relays
20. Door Release
21. Secondary Power Batteries
22. Conduit and Communication Cable to Building’s Telecommunications Room
23. Key Box Supervisory and Trouble Switches
24. Manual Transfer Switch for FACU or NAPP Branch Circuit.
25. LED Annunciator or Switch Card (Disable Buttons)
26. Digital Alarm Communicator Transmitter (DACT)
27. Carbon Monoxide Detection
28. RELATED SECTIONS
29. Section 01 2500, *Substitution Procedures*
30. Section 01 3300, *Submittal Procedures*
31. Section 01 4216, *Definitions*
32. Section 01 4000, *Quality Requirements – Non-Nuclear*
33. Section 01 6000, *Product Requirements*
34. Section 01 7700, *Closeout Procedures*
35. Section 01 7823, *Operation and Maintenance Data*
36. Section 01 7839, *Project Record Documents*
37. Section 01 8734, *Seismic Qualification of Nonstructural Components (IBC)*
38. Section 09 9100, *Painting*
39. Section 02 4115, *Electrical Demolition*
40. Section 07 8400, *Firestopping*
41. Section 08 3323, *Overhead Coiling Doors*
42. Section 08 7100, *Door Hardware*
43. Section 21 1200, *Fire Suppression Standpipes*
44. Section 21 1300, *Fire-Suppression Sprinkler Systems*
45. Section 21 2200, *Clean-Agent Fire-Extinguishing Systems*
46. Section 21 3000, *Fire Pumps*
47. Section 22 0535, *Electric Heat Tracing Systems*
48. Section 23 3300, *Air Duct Accessories*
49. Section 26 0533, *Raceways and Boxes for Electrical Systems*
50. Section 26 0548.16, *Seismic Controls for Electrical Systems*
51. Section 26 2933, *Controllers for Fire Pump Drivers*
52. Section 26 2726, *Wiring Devices*
53. Section 27 1000, *Structured Cabling*
54. Section 27 3000, *Voice Communications*
55. DEFINITIONS AND ACRONYMS
    1. For definitions and acronyms, refer to [COE Glossary of Terms](https://engstandards.lanl.gov/_assets/GLOS-COE-1.pdf). definitions exist for the following terms: AHJ, FDAR, LBO, STR, Subcontractor among others.
    2. AFF – Above finished floor
    3. AHJ – Authority having Jurisdiction
    4. DACT – Digital Alarm Communicator Transmitter
    5. DTMF – Dual-Tone, Multi-Frequency
    6. DSS – Designated Seismic Systems
    7. ECF – Emergency Two-Way Communication Systems
    8. EMT – Electrical Metallic Tubing
    9. EOC – Emergency Operations Console
    10. EWFD – Early Warning Fire Detection
    11. FACU – Fire Alarm Control Units
    12. FOD – Facility Operations Director/Facility Operations Directorate
    13. FDAR – Facility Design Authority Representative
    14. FMC – Flexible Metal Conduit
    15. FPO – Fire Protection Office
    16. IDC – Initiating Device Circuits
    17. IFC – Issue for Construction
    18. IMC – Intermediate Metal Conduit
    19. LBO – LANL Building Official
    20. MTS – Manual Transfer Switch
    21. NAC – Notification Appliance Circuits
    22. NAPP – Notification Appliance Power Panels
    23. PE – Project Engineer
    24. PVC – Polyvinyl Chloride
    25. RMC – Rigid Metal Conduit
    26. RTRC – Reinforced Thermosetting Resin Conduit
    27. SFD – Standard Fire Detection
    28. SLC – Signaling Line Circuits
    29. SPD – Surge Protection Devices
    30. STR – Subcontract Technical Representative
    31. UPS – Uninterruptible Power Supply
    32. UV/IR – Ultraviolet/Infrared
    33. VEWFD – Very Early Warning Fire Detection
56. REFERENCES
57. ABA – Architectural Barriers Act Standards
58. ADA – Americans with Disability Act Standards for Accessible Design
59. ASCE 7 – Minimum Design Loads and Associated Criteria for Buildings and Other Structures
60. ASME A17.1 – Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices
61. DOE-STD-1066 – Fire Protection
62. IBC – International Building Code
63. IEBC – International Existing Building Code
64. IFC – International Fire Code
65. NFPA 70 - National Electrical Code
66. NFPA 72 – National Fire Alarm and Signaling Code
67. NFPA 76 – Standard for the Fire Protection of Telecommunications Facilities
68. NFPA 90A – Standard for the Installation of Air-Conditioning and Ventilation Systems
69. NFPA 101 – Life Safety Code
70. NECA 305 – Standard for Fire Alarm System Job Practices
71. UL 268 – Smoke Detectors for Fire Alarm Systems
72. UL 464 – Audible Signaling Devices for Fire Alarm and Signaling Devices, Including Accessories
73. UL 497B – Protectors for Data Communication and Fire-Alarm Circuits
74. UL 1424 – Cables for Power-Limited Fire-Alarm Circuits
75. UL 1449 – Surge Protective Devices
76. UL 1480 – Speakers for Fire Alarm and Signaling Systems, Including Accessories
77. UL 1484 – Residential Gas Detectors
78. UL 1971 – Signaling Devices for the Deaf and Hard of Hearing
79. UL 2034 – Single and Multiple Station Carbon Monoxide Alarms
80. UL 2075 – Gas and Vapor Detectors and Sensors
81. [Other references related to project scope.]
82. DESIGN

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Edit system design description to match the project fire alarm system requirements. Include details to supplement the shop drawings, as required. The example list should not be considered comprehensive for any specific project. Projects in high explosives areas or per NEC Article 500 hazardous locations will require additional specialized equipment and system characteristics not included in this section.

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1. System Design:
2. Pathways: Survivability Level [1; 2; 3].
3. System circuits configured as follows:
4. Signaling Line Circuits or Network Circuits between FACUs/Transponders Class X
5. Signaling Line Circuits (SLC) Class B
6. Initiating Device Circuits (IDC) Class B
7. Notification Appliance Circuits (NAC) Class B
8. Emergency Two-Way Communication Class B
9. Emergency Control Function Circuits Class D.
10. SLC zones configured as Separate Circuits or a Hybrid Class A Isolator Loops with Class B Branches.
11. SLCs shall not exceed 80% total device capacity.
12. Calculations: Use the UL max current draw for notification appliances.
13. NACs: Provide end-of-line voltages 10% greater than the minimum device operating voltage, starting with the panel cut-off voltage at the terminals. Current draw not exceeding 80% of maximum capacity with the starting voltage at 20.4 VDC.
14. Batteries: Sized for 24 hours of standby and 10 minutes (minimum) of alarm, and 15 minutes (minimum) for Voice Evacuation Systems, fully loaded SLCs, and 10% of indicator lights and other auxiliary features active. De-rating factor: 50%.
15. The FACU LED Annunciator/Switch Card pre-defined disable groups shall correspond to an individual Control Relay for disabling emergency control functions independently, and a separate group for all notification appliances (except for any sprinkler system waterflow audible alarms).
16. Provide dedicated Surge Protection Devices (SPD) on the Primary Power Circuit, and all Fire Alarm and Control Circuits (IDC, NAC, SLC, etc.) that extend beyond or enter a building.
17. Provide a Remote LED Alarm Indicator for: Duct Smoke Detectors located outside, above a ceiling, or 10 feet AFF, when the Duct Smoke Detector is in a separate space other than the associated Control Relay.
18. QUALITY ASSURANCE
19. Qualifications of Subcontractor producing Shop Drawings:
20. Be qualified to design Fire Alarm Systems based on the following:
21. Have successfully designed at least 20 Fire Alarm Systems of equivalent nature and scope to the system described in this section.
22. Utilize a qualified Fire Alarm System Technician who is NICET III or IV Certified, or a Registered Fire Protection Engineer in the state of NM, employed by the installer.
23. Be a Manufacturer Factory-Certified Representative for the specified Fire Alarm System.
24. Qualifications of Subcontractor installing the Fire Alarm System:
25. Have successfully installed and field-tested at least 20 Fire Alarm Systems of equivalent nature and scope to the system described in this section and providing maintenance service as a regular part of their business.
26. Installer/Programmer Personnel: Provide services of a Journeyman Electrician for raceways or a Low-Voltage Electrician for wiring, and a minimum of five years of experience installing Fire Alarm Systems.
27. Be factory trained in the theory, operation, installation, and troubleshooting of the specified fire alarm system.
28. ACTION SUBMITTALS
29. Provide the following submittals per 01 3300, *Submittal Procedures*.
30. Certifications
31. Within 30 days after Notice to Proceed, qualifications of the fire alarm installing firm.
32. Within 30 days after Notice to Proceed, qualifications of the fire alarm system technician.
33. [Designated Seismic System: Special Certification from Manufacturer per ASCE 7, Section 13.2.2].
34. FACU Program: Provide Programming file for Fire Alarm System minimum 10 working days prior to Pre-Final Test. Note: FPO will provide a copy of the programming file for Fire Alarm Modification Projects, upon request during Title III.
35. Test Plan: Submit test plan for the final acceptance tests, 10 working days prior to Pre-Final Test.
36. DELEGATED DESIGN SUBMITTALS
37. Provide the following submittals per 01 3300, *Submittal Procedures*.
    1. Submit delegated design submittals for review at least 30 days prior to scheduled start of fire alarm system installation. Installation shall not proceed without 100% IFC Shop Drawing approval by LANL (Fire Protection Office, and the FDAR or LBO, appropriately for the work type).
    2. Mark the first package as a 60% Shop Drawing Design, followed by 90%, then 100%. A design without comments may proceed to the 100% design with the concurrence of the LANL Fire Protection Office. Address comments with additional design review percent.
    3. Draft submittals (i.e., 60%, 90% & 100%) shall be marked with the appropriate alphabet, starting with A for the initial. Final IFC package shall be marked with a numerical revision, starting with 0. Subsequent revisions shall be marked with the next sequential revision number.
    4. Shop drawings shall follow the [LANL CAD Standards](https://engstandards.lanl.gov/cad-manual.shtml).
38. Catalog Data for all equipment and devices including Installation Instructions.
39. Design Package: Submit all information required for plan review and permitting by FPO/AHJ, including but not limited to floor plans, riser diagrams, and description of operation:
40. Copy (if any) of the List of Data required by FPO/AHJ.
41. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A.14.6.2.4, and complete listing of software required.
42. System zone boundaries and interfaces to fire safety systems as indicated in NFPA 72.
43. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
44. Circuit layouts; number, size, and type of raceways and conductors
45. Provide calculations as a sheet in the design package drawings which includes
46. System Battery Load
47. Voltage Drop calculations for notification appliances
48. Provide settings for each fire alarm device on the plans and risers including addresses:
49. Candela
50. Loudness
51. Wattage
52. Voltage – 25 VRMS or 70 VRMS
53. Provide location of and conductor pathway to electrical panels, telecommunication boards, and other equipment supplying primary or secondary power.
54. Provide location and type of all interfaced systems for monitoring or emergency control functions.
55. Provide installation specific wiring and termination details for monitoring module and control relays/modules at the monitored or controlled equipment.
56. Provide elevation drawings.
57. Provide a sheet with the Materials and Parts List.
58. List of all devices on each signaling line circuit with a Points/Address List with Descriptions on the Riser Diagram.
59. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations, if applicable.
60. Air-Sampling Smoke Detection Systems (VESDA): Include air-sampling pipe network layout with sampling ports identified; include calculations demonstrating compliance with specified requirements.
61. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
62. Detailed drawing of graphic annunciator(s).

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Seismic: See Guide discussed in first author’s note for editing guidance.

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1. Required seismic design documentation:
2. Include dimensioned representations or plans and elevations that identify the weight and the location of the center of gravity.
3. Indicate field anchorage or mounting provisions to hold the component in place and resist forces derived from the criteria specified in [Section 01 8734, *Seismic Qualification of Nonstructural Components (IBC)*;Section 26 0548.16, *Seismic Controls for Electrical Systems*].
4. Identify anchors and other mounting devices.
5. Include information on the size, type, and spacing of factory-installed mounting brackets, holes, and other mounting provisions.
6. Supporting calculations for seismic design.
7. INFORMATIONAL SUBMITTALS
8. Provide the following submittals per 01 3300, *Submittal Procedures*.
9. Operation & Maintenance Manual

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Operations and Maintenance Manual Submittals are be based on new projects or major modifications to the Fire Alarm System.

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1. Follow the requirements of Section 01 7823, *Operation and Maintenance Data*.
2. Submit project-specific operating and maintenance instruction manuals upon successful completion of the Final Acceptance Test.
3. Provide in an electronic format shall consist of all items combined into one PDF file.
4. Submit operating and instruction manuals that include the as-built calculations and drawings.
5. Provide complete, step-by-step recommended and required testing instructions with frequency, methods, and troubleshooting information for all devices and equipment.
6. Maintenance instructions shall provide the following information:
7. Instructions for replacing any components of the system, including internal parts.
8. A list of recommended spare parts.
9. Instructions and schedule for periodic cleaning and adjustment of equipment meeting NFPA 72.
10. A list of all equipment with the address and telephone number of the manufacturer and local supplier.
11. Test Reports

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An installer’s preliminary test report is required when additional assurance is needed that the system is ready for LANL pre-final and final testing with the fire alarm system reporting to the LANL supervising station at the Emergency Operations Console (EOC). This is not intended to require a report for LANL pre-testing of the fire alarm system and it’s reporting to the EOC, which precedes the final acceptance test. A statement of compliance can also be required. Neither are appropriate for system modifications, which often require final acceptance test immediately after tie-in to the existing system. Test plans and final test reports are required by the IBC/IFC and NFPA 72 for all work.

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1. [Installer’s Preliminary Test Report: Submit report of the installing subcontractor’s preliminary tests in accordance with NFPA 72 and indicating system status and corrective actions required ten working days before Pre-Final Test.]
2. [Statement of Compliance per IFC Section 901.2.1 and NFPA 72 Section 7.5.2.]
3. Final Test Report: After final acceptance test, submit test reports.
4. Provide Project Record Documents upon completing Final Acceptance Test
5. FACU Program file
6. Provide the electronic As-Built drawing files in “.pdf”
7. Provide Record of Completion and associated documentation for the completed system according to NFPA 72.
8. Final CAD As-Built Drawing Package
9. Submit all CAD files (including .dwg, .xref, etc.) in a .zip folder to [FireCAD@lanl.gov](mailto:%20FireCAD@lanl.gov) upon completing Final Acceptance Test.
10. Warranty
11. See Section 01 7700, *Closeout Procedures*, for additional warranty requirements.
12. Warrant all equipment and wiring for mechanical and electrical defects for not less than one year (365 days) from the date of final acceptance test.
13. PRODUCTS

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Seismic: If Project specification package includes Section 26 0548.16, and this section includes devices that differ from those in Section 26 0548.16, then these products (i.e., the devices that differ) must be included in PART 2. And, if/when what’s been described is applicable, use the same terminology for these devices in PART 3 herein to identify the type of devices required for each application.

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1. GENERAL
2. Provide materials and equipment that are new and unused, free of defects, specifically designed for the use intended, and are listed for use with the FACU.
3. Provide products suitable for operation at an elevation of 7,500 feet.
4. Where two or more products serving the same function are provided, they shall be exact duplicates produced by one manufacturer. (*Note:* *Use of different models or options of products to achieve a system design requirement is not included in this requirement, e.g., weather-proof, conventional devices in exterior locations; or notification appliances with atypical output ratings that are better options for achieving design criteria).*

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Seismic: See Guide for editing guidance. If either paragraph below apply and there are too many systems/components to list here, then list them in an appendix to this section, and then add a reference to that appendix below.

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1. SEISMIC PERFORMANCE REQUIREMENTS
2. The raceways, or boxes, 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)*] \*\*\*OR\*\*\* as represented by the seismic forces derived from the criteria indicated [on the drawings] [in Section 26 0548.16, *Seismic Controls for Electrical Systems*].
3. The raceway, or boxes, are Designated Seismic Systems (DSS) and, as such, shall remain in place and be fully operational following the design basis earthquake [per Section 01 8734, *Seismic Qualification of Nonstructural Components (IBC)*] \*\*\*OR\*\*\* as represented by the seismic forces derived from the criteria indicated [on the drawings] [in Section 26 0548.16, *Seismic Controls for Electrical Systems*].
4. MANUFACTURERS
5. Fire Alarm Control Units and Accessories
6. The FACU shall incorporate all control electronics and necessary components in a [Surface] [Flush] [Semi-Flush] mounted cabinet. [Design and install the FACU to meet ABA requirements, Section 307.] The cabinet with the operating controls and zone/supervisory indicators shall be located behind locked door with viewing window.
7. Provide sealed lead-acid batteries. Provide battery calculations when submitting the battery size.
8. Battery boxes, if required, shall be UL Listed for the purpose.
9. The system program shall meet the requirements of this project, applicable codes and standards, and satisfy the LANL Fire Protection Office.
10. Manufacturers:
    1. Edwards Signaling Technologies (EST)
    2. Honeywell Security & Fire Solutions/Notifier
11. Initiating Devices and Notification Appliances
12. Same manufacturer as control units.
13. Provide initiating devices and notification appliances made by the same manufacturer, where possible.
14. Manufacturers:
    1. Honeywell Security & Fire Solutions/Notifier
    2. Edwards Signaling Technologies (EST)
    3. System Sensor
    4. Wheelock
    5. Kiddie
    6. Fike
    7. Xtralis
15. Substitutions
16. For substitutions, see Section 01 2500, *Substitution Procedures*.
17. For substitution of FACUs, submit product data showing equivalent features and compliance with Subcontract Documents.
18. For substitution of initiating devices and notification appliances, submit product data showing features and compliance with Subcontract Documents.
19. FIRE ALARM SYSTEM
20. Fire Alarm System: Provide [a new; modifications and extensions to the existing] Fire Alarm system:
21. Provide all components necessary, regardless of whether shown in Subcontract Documents or not.
22. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
23. [ADA/ABA Standards in reference to Protruding Objects.]
24. [DOE-STD-1066; or \_\_\_\_\_\_\_].
25. Subcontract Documents (drawings and specifications).
26. NFPA 101 and IBC.
27. NFPA 72; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
28. Evacuation Alarm: [Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to; or Single smoke zone;] general evacuation of entire premises.
29. Voice Notification: Provide emergency voice/alarm communications[ with multichannel capability; \_\_\_\_\_\_; or None - N/A]; [digital].
30. Program notification zones and voice messages as directed by FPO/AHJ.
31. Hearing Impaired Occupants: Provide visible notification devices in all public areas and in dwelling units.
32. Combined Systems: Do not combine fire alarm system with other non-fire systems.
33. FACU Spare Capacity
34. Initiating Device Circuits: Minimum 20 percent spare capacity of device count.
35. Notification Appliance Circuits: End of line voltage shall be greater than 17.6 VDC and have a 20 percent current capacity.
36. Speaker Amplifiers: Minimum 20 percent spare capacity of wattage.
37. Fire Alarm Control Units: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.
38. Power Sources – Primary and Secondary:
39. Primary: Dedicated branch circuits of the facility power distribution system.
40. Secondary Capacity: Provide batteries as represented in Article [1.5] *Design*, paragraph [1.5.7] on *Batteries*.
41. Each Computer System: Provide uninterruptible power supply (UPS).
42. Seismic Qualification: Refer to Article [2.2] *Seismic Performance Requirements*. Include Special Certification from Manufacturer if Fire Detection and Alarm is a DSS.
43. EXISTING COMPONENTS
44. Fire Alarm System – Full Replacement: Remove existing system completely after new system is fully operational and tested.
45. Fire Alarm System - Modifications: Remove existing components indicated and incorporate remaining components into new system, under warranty as if they were new; do not take existing portions of system out of service until new portions are fully operational, tested, and connected to existing system.
46. Clearly label components that are "Not in Service."
47. Remove unused existing components and materials from site and dispose of properly after coordination with FPO or LANL STR.
48. Remove abandoned cables and raceways. Tag raceways that are for future use.
49. FIRE SAFETY SYSTEMS INTERFACES
50. Supervision: Provide supervisory signals in accordance with NFPA 72.
51. Alarm: Provide alarm initiation in accordance with NFPA 72.
52. Elevators: Provide alarm initiation in accordance with NFPA 72 and ASME A17.1
53. HVAC: Provide alarm initiation in accordance with NFPA 72 and NFPA 90A.
54. Doors:Provide alarm initiation in accordance with NFPA 72 and NFPA 101.
55. FACU COMPONENTS
56. For the Master List of Equipment approved by LANL, refer to Appendix A
57. Addressable Fire Alarm Control Unit (FACU)
58. Basis of Design: Edwards Signaling Technologies; EST 4

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1. Basis of Design: Honeywell Security & Fire Solutions; Notifier Series; NFS2-640
2. Power Supply
3. The power supply shall be a high efficiency switch mode type with line monitoring. The automatic battery charger shall have low battery discharge protection. The power supply shall provide internal power and 24 VDC for notification appliance circuits. All outputs shall be power limited.
4. Digital Alarm Communicator Transmitter (DACT)
5. The FACU shall have a Digital Alarm Communicator Transmitter (DACT).
6. The DACT shall support dual telephone lines, “Contact ID” communications format, and configured for Dual-Tone, Multi-Frequency (DTMF).
7. The DACT shall be listed for “Central Station Fire Service” and for “Proprietary Station Fire Service” and shall be of the same manufacturer as the control panel.
8. FACU Panel Modules/Components
9. Provide an SLC Loop Controller for SLC for up to [250; 500; 318 more] Devices.
10. For retrofit applications, provide an Initiating Device Circuit Module for existing Two-Wire, Normally Open Circuit Devices or Notification Devices:
11. FACU Cabinets
12. For smaller applications, the [Single Chassis; Two-Teir] Cabinet shall be installed.
13. For larger applications, the [Two Chassis; Three-Tier] Cabinet shall be installed.
14. An approved equal based on the application.
15. High-Contrast, Alphanumeric Display and LED Indicators
16. Control Display Module (Disable Switch Card)
17. Graphic User Interface Computer Work Stations
18. Remote Annunciator Panel
19. Isolator Modules
20. Provide an Isolation Module for SLC configurations extending beyond a single zone as described in NFPA 72.
21. Synchronization Modules
22. Provide a Synchronization Output Module for NACs connected to a 24 VDC Riser.
23. Required for EST4 FACUs
24. Addressable Heat Detectors
25. The detector shall be temperature-rated at 135 degrees F (fixed temperature or rate-of-rise).
26. For applications requiring other than 135 degrees F, consult the LANL Fire Protection Office.
27. Addressable Photoelectric Detectors
28. Photoelectric Smoke Detectors shall be ceiling mounted or be suitable for wall mount applications where applicable.
29. Flame Detection
30. Listed for UV/IR capabilities
31. Carbon Monoxide Detectors
32. Gas Detectors: UL 2075 listed and responsive to the sensitivity limits of UL 2034.
33. Combination Smoke/Carbon Monoxide Detectors
34. Combination Detectors, UL 1484 or UL 2075 listed.
35. Detector Mounting Bases
36. Standard bases suitable for mounting on 3-1/2 inch or 4 inch octagon box, or a 4 inch square box. The base shall contain no electronics and support all detector types. Removal of the detector shall not affect communications with other detectors.
37. Duct Smoke Detector
38. Provide duct housing assemblies for mounting an intelligent analog photoelectric detector along with a standard relay. Protect the measuring chamber from damage and insects. Provide an air exhaust tube and an air sampling inlet tube that extends into the duct air stream. Provide drilling templates and gaskets to facilitate locating and mounting the housing.
39. Provide duct detectors that are suitable for the air velocity and differential pressures measured for each air handling unit.
40. Beam Detectors
41. Addressable Manual Pull Stations
42. Provide Addressable Double-Action, Non-Coded Manual Pull Stations.
43. The fire alarm station shall be of Lexan or metal construction with an internal toggle switch. Provide a key locked feature. Finish the station in red with white PULL IN CASE OF FIRE lettering. The Manual Pull Station shall be suitable for mounting on 2-1/2 inch deep 1-gang boxes and 1-1/2 inch deep 4 inch square boxes with 1 foot gang covers.
44. Provide the appropriate back boxes and mounting plates for flush-mounting or surface mounting (depending on the building construction).
45. Addressable Control Relay Modules
46. Provide enhanced voltage and current ratings as appropriate for the application.
47. Addressable Monitor Modules
48. Provide Intelligent Single-Input or Dual-Input Modules as required to the addressable analog loop. Each input shall provide a supervised Class B Initiating Device Circuit.
49. Notification Appliances
50. Provide NRTL-listed 24 VDC audible, visual, and audible-visual combination-type electronic three-pulse temporal pattern horn sounder, strobe, and combination notification appliances.
51. Horns and Horn-Strobes shall be UL 464 listed. For voice alarm systems, speakers shall be UL 1480 listed. Horns and speakers shall be in a red housing.
52. Strobes and Horn-Strobes shall be UL 1971 listed. Strobes shall have a xenon bulb or LED enclosed in a clear Lexan lens, and FIRE, in white lettering on a red trim plate or device housing.
53. Horns, Strobes, and Horn-Strobes shall mount to a 4 inch x 2-1/8 inch deep electrical box with single device cover. Provide weatherproof wall boxes for outdoor mounting.
54. Voice Evacuation Systems
55. Releasing
56. Notification Appliance Power Panels (NAPP)
57. Area of Refuge Emergency Two-Way Communication Systems (ECS)
58. Door Release
59. Refer to Section 08 7100, *Door Hardware* for door hardware requirements.
60. Air-Sampling Smoke Detection Systems
61. [Design and provide; Provide; or \_\_\_\_\_\_\_\_\_\_] smoke detection system suitable for application and coverage area indicated, consisting of smoke detector unit with aspirator/fan that continuously draws air into sensing chamber through connected sampling pipe network and associated sampling ports.
62. Comply with NFPA 72 and list and label as complying with UL 268.
63. Comply with applicable requirements of NFPA 76 for [Very Early Warning Fire Detection (VEWFD); Early Warning Fire Detection (EWFD); Standard Fire Detection (SFD); or \_\_\_\_\_\_\_\_].
64. Use manufacturer's recommended sampling pipe and fittings; plenum rated; identified in accordance with NFPA 72.
65. Design using manufacturer's product-specific design software or based on manufacturer's pre-engineered design suitable for the application.
66. Xtralis: VESDA Aspirating Smoke Detection.
67. RACEWAYS
68. Refer to Section 26 0533, *Raceway and Boxes for Electrical Systems*, for raceway systems.
69. All interior fire alarm raceways for power-limited circuits shall be red EMT, unless otherwise approved. Note: Fittings, conduit bodies, junction boxes, and device boxes are not required to be red.
70. Minimum raceway size shall be ¾ inch, unless otherwise approved.
71. All EMT raceway fittings shall be compression type.
72. One-half (1/2) inch FMC up to 6 feet in length is allowed in between addressable modules and controlled and monitored devices.
73. Provide IMC or RMC for exposed outdoor raceways, when subject to damage.
74. Provide PVC, tape-wrapped IMC, RTRC, or tape-wrapped RMC for underground work. Note: Must be installed per manufacturer recommendations.
75. Raceways for 120 VAC circuits shall be unpainted galvanized.
76. If red exterior fire alarm raceway is not readily available, it is permitted to instead apply outdoor rated UV resistant “Fire Alarm” labels at 10 feet intervals.
77. JUNCTION BOXES AND BACKBOXES
78. Refer to Section 26 0533, *Raceway and Boxes for Electrical Systems*, for junction boxes.
79. WIRING
80. New wiring shall be provided unless re-use of existing has been approved.
81. Color Code fire alarm wiring as follows:

|  |  |
| --- | --- |
| Black, Red, or Blue | 120 VAC (Ungrounded Conductor – Match Existing) |
| White | 120 VAC Neutral Wire (Grounded Conductor) |
| Green | Equipment Grounding Conductor |
| Blue (-) / Yellow (+) | Negative/Positive Connection for Notification Appliance Circuits |
| Gray (-) / Violet (+) | Negative/Positive Conventional Alarm IDC |
| Black (-) / Red (+) | Negative/Positive Auxiliary Circuit Connections |
| Black (-) / Red (+) T/S | Negative/Positive for SLC or Speaker Circuit |

1. Refer to manufacturer specifications for telephone wire color configuration (four-pair wire method) for both DACT lines.
2. Conductors**:** Minimum Requirements:
3. Interior/Dry Locations: Red-jacketed FPL[R] cable [shielded; non-shielded] with No. 16 AWG (minimum) twisted-pair conductors for SLC and listed per UL 1424.
4. Minimum No. 14 AWG THHN/THWN-2 for NAC, AUX, and IDC.
5. Low voltage binary signal conductors shall be type TFN/AWM, No. 16 AWG minimum, and solid copper conductor. For sizes larger than No. 16 AWG, use THHN/THWN-2.
6. Other low voltage conductors shall be type TFN/AWM, No. 16 AWG (minimum), solid copper conductor. For sizes larger than No. 16 AWG, use THHN/THWN-2.
7. Exterior/Wet Locations: Red or Black-jacketed FPL/PLTC cable, No. 16 AWG (minimum), twisted-pair conductors for SLC, and listed for WET locations per UL 1424.
8. West Penn Catalog #AQ225 for SLC, or an approved equal.
9. Minimum No. 14 AWG unshielded for NAC, AUX, and IDC.
10. Low voltage binary signal conductors: TFN/AWM, No. 16 AWG minimum, and solid copper conductor.
11. Power conductors: Type THHN/THWN-2, No. 12 AWG, thermoplastic insulation, and single solid copper conductor.
12. TEST EQUIPMENT
13. Provide any special test equipment manufactured by the fire alarm equipment manufacturer for maintenance, testing, or troubleshooting.
14. All test equipment shall be calibrated and provided with a calibration certificate.
15. SURGE PROTECTION DEVICES (SPD)
16. Provide a UL 1449 listed 120 VAC surge protective device for the main FACU, sub-FACUs, and each Notification Appliance Power Supply (NAPP) that have a 120 VAC supply circuit.
17. Device shall be capable of absorbing a maximum single pulse of at least 6,500A.
18. Manufacturer: DITEK-120SRD
19. Provide UL 497B listed surge protective devices for each analog and 24 VDC initiating device signaling circuits, 24 VDC control circuits, and 24 VDC notification appliances entering/leaving each building that is monitored by the FACU.
20. Devices shall be capable of absorbing a peak 8x20 microsecond current of not less than 10,000A for 24 VDC initiating devices & control circuits and 10,000A for analog initiating devices, at least 10 times.
21. Devices for notification appliances shall be capable of absorbing a peak 8x20 microsecond current of 5000A and a 2000A occurrence at least 50 times.
22. Protective device for notification appliances shall have a series resistance not exceeding 0.2 ohms per pair and shall be capable of carrying a continuous current of 5A.
23. Clamping voltage shall not exceed 30 volts for initiating devices control circuits, and 43 volts for notification appliances.
24. Capacitance shall not exceed 50 pf for analog initiating devices.
25. Provide matching receptacle for plug-in surge protective devices.
26. Manufacturer: DITEK-DTK-2MHLP Series
27. Provide a UL 497B listed four-wire surge protective device for each FACU RS‑232 & RS-485 circuits entering/leaving each building monitored by the FACU.
28. Device shall be capable of absorbing a peak 8x20 microsecond current of 10,000A at least 10 times.
29. Clamping voltage shall not exceed 20 volts for RS-232 applications and 8 volts for RS-485 applications.
30. Line-to-line and line-to-ground capacitance for RS‑485: 50 pf maximum.
31. MANUAL TRANSFER SWITCH
32. Manufacturers:
33. Reliance Pro/Tran Signa C20A1N
34. Reliance Model Easy/Tran CSR201
35. PANEL RECEPTACLES
36. 125-volt NEMA-5-15R duplex receptacle. Refer to Section 26 2726, *Wiring Devices*.
37. EXECUTION

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Seismic: If Project specification package includes Section 26 0548.16, and this section includes requirements associated with installation, testing, and inspection of mounting and/or anchorage devices that differ from those in Section 26 0548.16, then the differing requirements must be included in PART 3 herein. \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

1. FIELD CONDITIONS
2. Installation shall not proceed without 100% design package approval by the Fire Protection Office.
3. Prior to installation, carefully inspect the installed work of other trades, whether pre-existing or part of this project and verify that such work is complete to the point where the installation of the fire alarm system may properly commence.
4. Notify the [LANL STR; LANL PE] if conditions exist, not resulting from work of this project, that prohibit the installation from conforming to applicable codes, regulations, standards, and the original, approved design.
5. Coordinate installation of fire alarm system with work of other trades.
6. Coordinate installation of ceiling mounted fire alarm devices and associated equipment with existing ceiling or roof materials, lighting, ductwork, raceways, piping, suspended equipment, structural and other building components.
7. Verify dimensions in the field to lay out work in the most direct and expeditious manner and avoid interference.
8. Locate notification appliances away from obstructions and notify the [LANL STR; LANL PE] of possible obstruction by other trades, equipment, or furnishings.
9. Protect fire alarm equipment with suitable coverings until completion of project.
10. Coordinate necessary shutdowns of existing systems by notifying the [LANL STR; LANL PE] a minimum of seven working days before rendering such systems inoperative. Do not render inoperative any system without the prior approval of the [LANL STR; LANL PE].
11. INSTALLATION
12. Install in accordance with NFPA 72, NFPA 70, Subcontract Documents, and this section.
13. Coordinate necessary shutdowns of existing systems by notifying the [LANL STR; LANL PE] a minimum of seven working days before rendering such systems inoperative.
14. Do not render inoperative any system without the prior approval of the [LANL STR; LANL PE]. The [LANL STR; LANL PE] will submit Form 1821 - Utility Outage Form.

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Seismic: If some of the components in the FACU are exempt, then Sections 26 0529 and 26 0548.16—or 01 8734—are applicable. Regarding the applicability of Section 260548.16 or 01 8734, see Seismic guide for editing guidance.

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1. Follow Section 26 0529, *Hangers and Supports for Electrical Systems*[, and] [Section 26 0548.16, *Seismic Controls for Electrical Systems]* for anchorage requirements. [The anchorage requirements for the components in Section 01 8734, *Seismic Qualification of Nonstructural Components (IBC)*, shall be in accordance with that Section.].
2. Install fire alarm devices to be serviceable, unless unfeasible due to required installation location (e.g., above-ceiling smoke detectors).
3. Install Monitor Modules, Control Relays, and Remote Alarm Indicators:
4. Between 60 inches and 72 inches AFF.
5. If the Control Circuit is not Class A, Style D, then it shall be within 3 feet (nominal) of the monitored equipment or emergency control function, unless approved otherwise by FPO.
6. All fire alarm equipment requiring servicing or maintenance shall have a minimum clear working space of 36 inches by 36 inches, or as wide as the equipment, centered on the equipment. The clear height of the working space shall be 72 inches, or the height of the equipment if more than 72 inches. The clear working space shall be in a routinely accessible location as approved by the LANL Fire Protection Office.
7. POWER
8. Install 120 VAC manual transfer switch (MTS) in FACU/NAPP branch circuit before the power SPD.
9. Install MTS so that it is readily accessible above or adjacent to the FACU/NAPP. The transfer switch shall be located before the AC surge suppressor.
10. Install a 125-volt NEMA-5-15R duplex receptacle below each FACU/NAPP. Provide dedicated circuit from a panel that does not power the FACU/NAPP. Refer to Section 26 2726, *Wiring Devices*.
11. FACU AND NAPP INSTALLATION
12. Install FACU or NAPP following manufacturer’s written instructions, NFPA 72, and NFPA 70.
13. Locate the FACU in the main building lobby or entry vestibule, if a conditioned space. Coordinate location of FACU with the LANL Fire Protection Office.
14. Unless otherwise approved, install FACU or NAPP with top of cabinet trim 66 inches AFF.
15. Mount FACU or NAPP cabinet plumb and rigid without distortion of the box.
16. Mount flush cabinets uniformly flush with wall surfaces.
17. Install filler plates in unused spaces in FACU or NAPP.
18. Train conductors in cabinet gutters neatly in groups; bundle and wrap with cable ties after completion of testing.
19. Tighten electrical connectors and terminals, including grounding connections, according to the manufacturer’s published torque‑tightening values (typically marked on the equipment). Where manufacturer values cannot be located, contact the manufacturer for guidance.
20. WIRING INSTALLATION
21. Install all fire alarm system and power wiring in raceways.
22. Do not install AC current-carrying conductors in the same raceway with the DC or digital fire alarm detection and signaling conductors.
23. Underground raceways shall be swabbed prior to installing respective conductors.
24. Do not pull wire or cable until the raceway system is complete between pull points.
25. Bundle conductors in panels and boxes into groups by service and destination.
26. Run electronic cable continuous between device termination points. No splicing is permitted without prior approval from the Fire Protection Office.
27. Where splicing is approved:
28. Provide “Wago” Splicing Connectors or Terminal Blocks/Strips.
29. Wire nuts shall not be used.
30. Adhere to the manufacturer requirements/limitations for T-taps. Make no T-taps in notification appliance circuits. T-taps shall only be made on device terminals or on terminal strips that are acceptable to the Fire Protection Office. Wire nuts are not approved and shall not be used.
31. Make allowances in conductor length at panels and other enclosures to permit forming the conductors neatly within the enclosures. Where wiring troughs are not provided with the enclosures, neatly cable and adequately support the wiring.
32. Plan for additional wires required during pulls, such as ground conductors for SPDs.
33. Ring out and identify power and control conductors before terminal connections are made.
34. Check polarity and phasing and make changes as required before making terminal connections.
35. Test conductors for continuity and presence of shorts and unintentional grounds.
36. Utilize Fire Alarm Terminal Cabinets (FATC) where needed, with approval from FPO.
37. JUNCTION BOX AND RACEWAY INSTALLATION
38. Refer to Section 26 0533, *Raceway and Boxes for Electrical Systems*, for junction box and raceway installation requirements.
39. SURGE PROTECTIVE DEVICE INSTALLATION
40. Install a 120 VAC SPD for the FACU, NAPP, and any other AC power supplies.
41. Install an SPD for each dedicated IDC, NAC, data, and SLC entering/extending beyond each building.
42. SPDs shall be installed between 44 inches and 72 inches AFF.
43. Install FACU 120VAC SPDs in one or more metal enclosures near the protected Fire Alarm Control Unit.
44. Provide separate or divided enclosures for 120 VAC Power and Low Voltage Device SPDs.
45. Install a single-point ground bar in the 120 VAC SPD Enclosure:
46. Bond the Ground Bar to the enclosure and the power circuit equipment-grounding conductor.
47. Connect each SPD to the Ground Bar with a separate 12 AWG solid, green-insulated ground wire.
48. 12 AWG Ground Wire shall be routed back to the FACU or Fire Auxiliary Power Supply in a raceway.
49. Install SPDs in accordance with manufacturer’s instructions, keeping leads and ground conductors as short and straight as possible.
50. Provide matching receptacle for plug-in surge protective devices.
51. IDENTIFICATION
52. Follow Section 26 0553, *Identification for Electrical Systems*, for all system components.
53. For field labelling purposes, FACU is the required acronym.
54. Provide pressure-sensitive, vinyl labels with red lettering of 3/4 inch (minimum) on a white background, unless otherwise noted below.
55. Inside the FACU and NAPP, all devices shall be labeled, and all zone locations shall be clearly identified.
56. Label each conductor at each terminal point:
57. Use wire markers specified in Section 26 0553, *Identification for Electrical Systems*.
58. On wire markers indicate the type of fire alarm circuit. SLC circuits shall be identified by the loop number indicated on the riser diagram (e.g. SLC-1, etc..).
59. NAC circuits shall be identified by the source and circuit number indicated on the riser diagram (e.g., NAPP1-1, FACU1-2, etc.).
60. Auxiliary system circuits shall be identified by component ID of the interfaced system and the prefix FA (e.g., FA BAS-PNL-001, FA HVA‑001, etc.).
61. Label fire alarm and branch circuit junction boxes and conduit bodies with FIRE ALARM on a 2-1/4 inches x ½ inch (minimum size) label.
62. Label junction boxes containing terminal blocks with FIRE ALARM – TERMINAL BLOCK on a 2-1/4 inches x ½ inch (minimum size) label.
63. Label all devices with address/zone information as shown on the drawings.
64. Label device settings on adjustable devices (Candela, Temperature, Delay Time, Wattage, Alarm Thresholds, etc.).
65. Provide red markings and a locking mechanism on branch circuit breakers and other disconnecting means.
66. Identify fire alarm equipment on electrical panel schedules and terminal cabinet schedules (“Fire Alarm”, “Emergency Communication System”).
67. Label the MTS with the electrical panel and circuit number of the feeding branch circuit, and “For Fire Alarm Panel Use Only. [For Use with Non-Bonded Portable Generator” on a 2-1/4 inch x ½ inch (minimum size) label. Keep only if using existing type, when using the CSR201.]
68. Remove abandoned cables and conduits. Tag conduits that are for future use.

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Painting is at the direction of the FOD (based on aesthetics, environmental conditions, etc.) If not required by FOD, delete the following article and any other references to painting in this document.

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1. PAINTING
2. For painting, refer to 09 9100, *Painting*.
3. Exposed Surfaces: Paint/patch and clean exposed walls that were affected by the installation/demolition, with an approved matching paint.
4. Refinishing: Thoroughly clean and touch up shop-primed or finish-painted surfaces damaged in installation with an approved matching paint.
5. EQUIPMENT INSTALLATION
6. Install devices or equipment not specifically covered by this section in accordance with manufacturer's instructions.
7. CONNECTION TO LANL PROPRIETARY SUPERVISING STATION
8. Install 6 inches x 6 inches x 4 inches electrical enclosure adjacent to the FACU with a raceway to the appropriate factory knockout.
9. Install a 1 inch raceway, with a measuring pull tape, from the electrical enclosure to the backboard located in the main telecom room.
10. Install three (3) red GFE Category 6A cables in the raceway.
11. Route two (2) Cat 6A cables to the building’s telephone terminal board.
12. Route the third Cat 6A cable to the nearest open network switch in the building. Coordinate with the LANL Telecommunication Services Group (NIE-TS) to ensure proper location.
13. CLEANING
14. Blow out junction boxes and fire alarm equipment not hermetically sealed with clear, dry, oil-free (15 psig maximum) air to remove dust prior to energizing.
15. FIELD QUALITY CONTROL

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Note: Testing and commissioning of fire alarm systems is a three-step process at LANL. First the installing Subcontractor performs quality control inspections and testing, and any required corrections. A Statement of Compliance and/or a Preliminary Test Report (if required) is to be provided to LANL, along with revised drawings and the current FACU program.

Next a LANL-supported, pre-final test is performed to verify correct DACT signals reporting to the LANL supervising station at the EOC. Changes made after the pre-final test will require sufficient time to make changes to LANL supervising station account.

Finally, the LANL-supported final acceptance test is performed.

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1. The Subcontractor’s Qualified Fire Alarm Technician or Installer shall ensure the completeness and correctness of the installation by performing the following quality assurance check:
2. Field-verify and red-line installation/design drawings of fire alarm layout, raceway and wiring plans, and point-to-point field-wiring diagrams.
3. Verify correct labeling of fire alarm system conductors.
4. Verify correct conductor sizes.
5. Update calculations to reflect field changes.
6. Verify audible alarm in all spaces meets design sound pressure levels.
7. Test all devices for proper supervision and alarm operation.
8. Test all emergency interfaces with for proper operation in all modes.
9. Perform preliminary inspection and testing of the fire alarm system.
10. Prepare test plan and report.
11. Prepare as-built (record) drawings.
12. PRE-FINAL AND FINAL ACCEPTANCE TESTS
13. Coordinate date of pre-final and final acceptance tests with installer, [LANL STR; LANL PE], LANL Fire Protection Office representative, and sub-tier Subcontractors for HVAC, Sprinklers, Elevator Controls, and all other interfaced systems.
14. Requests for pre-final or final acceptance tests shall not be made before approval of the 100% design documentation.
15. Notify [LANL STR; LANL PE] at a minimum of 10 working days in advance of LANL-supported pre-final and final acceptance tests. For large projects, notification shall be based on a timeline approved by the LANL Fire Protection Office.
16. The following shall be provided with the request for LANL-supported pre-final and final acceptance test:
17. Revised versions of the FACU Program, Centration Station Reports, or Input/Output Matrix.
18. Marked-up (red-lined) shop drawings and point-to-point wiring diagrams.
19. Approved final test plan.
20. [Statement of Compliance].
21. [The Installer’s Preliminary Test Report, indicating the status of the fire alarm system and any corrective actions required.]
22. Perform pre-final and final acceptance tests on the completed fire alarm system:
23. Perform final tests in the presence of authorized representatives of [LANL STR; LANL PE], Fire Protection Office, and Facility Operations Director (FOD).
24. Follow the approved test plan and comply with NFPA 72 requirements.
25. Perform end-to-end, integrated testing for the entire system.
26. LANL will perform 24-hour discharge test on the FACU/NAPP batteries.
27. Startup and Commissioning Group will measure air velocity and pressure differentials in ducts.
28. LANL will perform tests on connections made by other LANL groups.
29. Telecommunication Services Group (NIE-TS) will perform the acceptance test of the telephone lines from the modular plug connectors.
30. Re-verify the complete fire alarm raceway and wiring system in the presence of a LANL Fire Protection Office representative, upon request.
31. Correct deficiencies discovered in the final acceptance test and re-test fire alarm system until satisfactory test results are obtained.
32. SIGNAGE
33. For FACUs located other than inside the entry vestibule, furnish and install a permanently mounted placard in or adjacent to the fire alarm control cabinet that can withstand the environmental conditions at the panel.
34. Provide the following information typewritten or engraved on the placard:
35. Location of Fire Alarm Control Unit.

END OF MAIN SECTION [; APPENDICES FOLLOW]

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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 28 4600 Rev. 5, dated December 10, 2024.

Appendix A – Master Equipment List Reference

*List of equipment approved by LANL FPO/AHJ. For equipment not listed, seek approval from the FPO/AHJ.*

|  |  |  |
| --- | --- | --- |
| **POWER SUPPLIES** | | |
| **FACU COMPABILITY** | **PART NUMBER** | **DESCRIPTION** |
| Edwards | EST 4-PPS/M | - |
| Notifier | ACPS-610 | - |
|  | | |
| **DIGITAL ALARM COMMUNICATOR TRANSMITTER (DACT)** | | |
| **FACU COMPABILITY** | **PART NUMBER** | **DESCRIPTION** |
| Edwards | 3-MODCOM | - |
| Notifier | UDACT-2 | - |
|  | | |
| **FACU PANEL MODULES/COMPONENTS** | | |
| **FACU COMPABILITY** | **PART NUMBER** | **DESCRIPTION** |
| **Edwards** | 3-SSDC2 | Single Signature Driver Controller |
| 3-SDDC2 | Dual Signature Driver Controller |
| **Notifier** | LEM-320 | Loop Expander Module |
|  | | |
| **FACU PANEL MODULES/COMPONENTS** | | |
| **FACU COMPABILITY** | **PART NUMBER** | **DESCRIPTION** |
| **Edwards** | 3-IDC8/4 | Initiating Device Circuit Module |
| **Notifier** | XP10-M(A) | Ten-Input Monitor Module |
|  | | |
| **FACU CABINETS** | | |
| **FACU COMPABILITY** | **PART NUMBER** | **DESCRIPTION** |
| **Edwards** | 3-CAB7B | Single Chassis Backbox, Black |
| 4-CAB16DR | Single Chassis Door Assembly, Red |
| 3-CAB14B | Two Chassis Backbox, Black |
| 4-CAB24DR | Two Chassis Door Assembly, Red |
| **Notifier** | CAB-4 “B” | Two-Tier Backbox, Black |
| DR-B4R | Two-Tier Door Assembly, Red |
| CAB-4-“C” | Three-Tier Backbox, Black |
| DR-C4R | Three-Tier Door Assembly, Red |
|  | | |
| **FACU DISPLAYS** | | |
| **FACU COMPABILITY** | **PART NUMBER** | **DESCRIPTION** |
| **Edwards** | 4-LCDLE | Color LCD Display |
| **Notifier** | KDM-R2 | LCD Display |
|  |  |  |
| **CONTROL DISPLAY MODULE (DISABLE SWITCH CARD)** | | |
| **FACU COMPABILITY** | **PART NUMBER** | **DESCRIPTION** |
| **Edwards** | 4-24L12S | 24 Indicator, 12 Control Display Module |
| **Notifier** | ACM-24AT | 24-Programable Buttons, Annunciator Control Module |
|  | | |
| **GRAPHIC USER INTERFACE COMPUTER WORKSTATION** | | |
| **FACU COMPABILITY** | **PART NUMBER** | **DESCRIPTION** |
| **Edwards** | FW-UL6SWW10 | Fireworks – Server Workstation |
| FW-CGS | Fireworks - Software |
| **Notifier** | OW-SWKIT-US-3 | ONYXWorks |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **REMOTE ANNUNCIATOR PANEL** | | | | | | | |
| **FACU COMPABILITY** | | | **PART NUMBER** | | | **DESCRIPTION** | |
| **Edwards** | | | 4-2ANN | | | Color Touch Screen Annunciator | |
| 4-2ANNMT | | | 4-2ANN Backbox | |
| **Notifier** | | | LCD2-80 | | | LCD Annunciator | |
| ABF-1DB(C) | | | LCD2-80 – Semi-Flush Box with Door and Keylock | |
|  | | | | | | | |
| **ISOLATOR MODULES** | | | | | | | |
| **FACU COMPABILITY** | | | **PART NUMBER** | | | **DESCRIPTION** | |
| **Edwards** | | | SIGA-IM2 | | | Fault Isolator Module | |
| SIGA-SB4 | | | Standard Detector Isolator Base | |
| **Notifier** | | | ISO-X-(A) | | | Fault Isolator Module | |
| SMB500 | | | ISO-X-(A) Surface Mount Backbox | |
| B22BI-WH | | | Standard Detector Isolator Base | |
|  | | |  | | |  | |
| **SYNCHRONIZATION MODULES** | | | | | | | |
| **FACU COMPABILITY** | | | **PART NUMBER** | | | **DESCRIPTION** | |
| **Edwards** | | | SIGA-CC1S | | | Synchronization Output Module | |
|  | | |  | | |  | |
| **ADDRESSABLE HEAT DETECTORS** | | | | | | | |
| **FACU COMPABILITY** | | | **PART NUMBER** | | | **DESCRIPTION** | |
| **Edwards** | | | SIGA-HFD | | | Fixed Temperature | |
| SIGA-HRD | | | Rate-of-Rise | |
| EST 302 Series | | | Hazardous Locations | |
| **Notifier** | | | FST-951 | | | Fixed Temperature | |
| FST-951R | | | Rate-of-Rise | |
| Thermotech EPM Series | | | Hazardous Locations | |
| **Conventional** | | | Fike 60-1029 | | | Rate-of-Rise/Fixed Temperature | |
| System Sensor Series 100 | | | Rate-of-Rise/Fixed Temperature | |
|  | | | | | | | |
| **ADDRESSABLE PHOTOELECTRIC DETECTORS** | | | | | | | |
| **FACU COMPABILITY** | | | **PART NUMBER** | | | **DESCRIPTION** | |
| **Edwards** | | | SIGA-OSD | | | - | |
| **Notifier** | | | FSP-951 | | | - | |
| **Conventional** | | | System Sensor 2W-B | | | - | |
| Fike 63-1024 | | | - | |
| 30-3013 | | | Hazardous Location | |
|  | | | | | | | |
| **FLAME DETECTION** | | | | | | | |
| **FACU COMPABILITY** | | | **PART NUMBER** | | | **DESCRIPTION** | |
| **Notifier** | | | Fire Sentry Series | | | - | |
|  | | |  | | |  | |
| **CARBON MONOXIDE DETECTORS** | | | | | | | |
| **FACU COMPABILITY** | | | **PART NUMBER** | | | **DESCRIPTION** | |
| **Edwards** | | | SIGA-COD | | | - | |
| **Notifier** | | | FSCO-951 | | | - | |
|  | | | | | | | | |
| **COMBINATION SMOKE/CARBON MONOXIDE DETECTORS** | | | | | | | | |
| **FACU COMPABILITY** | **PART NUMBER** | | | **DESCRIPTION** | | | | |
| **Edwards** | SIGA-OSCD | | | - | | | | |
| **Notifier** | FPC-951(A) | | | Standard Detector Isolator Base | | | | |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **DETECTOR MOUNTING BASES** | | | | | | | | | |
| **FACU COMPABILITY** | | | **PART NUMBER** | | | | **DESCRIPTION** | | |
| **Edwards** | | | SIGA-SB4 | | | | - | | |
| **Notifier** | | | B300-6 | | | | Low Profile Base | | |
|  | | | | | | | | | |
| **DUCT SMOKE DETECTOR** | | | | | | | | | |
| **FACU COMPABILITY** | | | **PART NUMBER** | | | | **DESCRIPTION** | | |
| **Edwards** | | | SIGA-SDH | | | | With SIGA-OSD | | |
| SIGA-DDOS | | | | - | | |
| SIGA-LED | | | | Remote Alarm LED | | |
| SD-T Series | | | | Sampling Tubes | | |
| **Notifier** | | | DNR(A) | | | | With FSP-951R | | |
| DNRW | | | | With FSP-951R | | |
| RA100Z | | | | Remote Alarm LED | | |
| DST Series | | | | Sampling Tubes | | |
| **Conventional** | | | Fike 63-029 | | | | - | | |
| System Sensor InnovairFlex | | | | - | | |
|  | | | | | | | | | |
| **BEAM DETECTORS** | | | | | | | | | |
| **FACU COMPABILITY** | | | **PART NUMBER** | | | | **DESCRIPTION** | | |
| **Edwards** | | | EST EC3000 | | | | - | | |
| **Notifier** | | | FS-OSI-RI | | | | Beam Detector | | |
|  | | |  | | | |  | | |
| **ADDRESSABLE MANUAL PULL STATIONS** | | | | | | | | | |
| **FACU COMPABILITY** | | | **PART NUMBER** | | | | **DESCRIPTION** | | |
| **Edwards** | | | SIGA-278 | | | | Pull Stations | | |
| 276B- RSB | | | | Backboxes | | |
| 278A-REL | | | | Releasing Pull Station | | |
| RELA-ABT | | | | Releasing Abort Switch | | |
| EST MPSR2 Series | | | | Hazardous Locations | | |
| FIKE 10-2963 | | | | Hazardous Locations | | |
| **Notifier** | | | NBG-12LX | | | | Pull Stations | | |
| SB-10 | | | | Backboxes | | |
| NBG-12LRAA | | | | Pull Station & Abort Switch | | |
| FIKE 10-2963 | | | | Hazardous Locations | | |
|  | | | | | | | | | | |
| **ADDRESSABLE CONTROL RELAY MODULES** | | | | | | | | | | |
| **FACU COMPABILITY** | | | | | | | **PART NUMBER** | **DESCRIPTION** | | |
| **Edwards** | | | | | | | SIGA-CR | - | | |
| SIGA-CRH | - | | |
| **Notifier** | | | | | | | FRM-1 | - | | |
|  | | | | | | | | | | |
| **ADDRESSABLE MONITOR MODULES** | | | | | | | | | | |
| **FACU COMPABILITY** | | | | **PART NUMBER** | | | | **DESCRIPTION** | | |
| **Edwards** | | | | SIGA-CT1 | | | | Single-Input Module | | |
| SIGA-CT2 | | | | Dual-Input Module | | |
| SIGA-UM | | | | Class A Configurations | | |
| SIGA-REL | | | | Releasing Control Module | | |
| **Notifier** | | | | FMM-1 | | | | FlashScan Monitor Module | | |
| FDM-1 | | | | FlashScan Dual Monitor Module | | |
| FCM-1-REL | | | | Releasing Control Module | | |
|  | | | | | | | | | | |
| **NOTIFICATION APPLIANCES** | | | | | | | | | | |
| **FACU COMPABILITY** | | | **PART NUMBER** | | | | | **DESCRIPTION** | | |
| **Edwards** | | | EST Genisis Series | | | | |  | | |
| WHEELOCK Eluxa Series | | | | | - | | |
| System Sensor LED Series | | | | | - | | |
| Protocol Dependent, Selection on Approval | | | | | Hazardous Location Strobe | | |
| Hazardous Location Horn Strobe | | |
| **Notifier** | | | WHEELOCK Eluxa Series | | | | |  | | |
| System Sensor LED Series | | | | |  | | |
| Protocol Dependent, Selection on Approval | | | | | Hazardous Location Strobe | | |
| Hazardous Location Horn Strobe | | |
|  | | | | | | | | | | |
| **VOICE EVACUATION SYSTEMS** | | | | | | | | | | |
| **FACU COMPABILITY** | | | **PART NUMBER** | | | | | **DESCRIPTION** | | |
| **Edwards** | | | EST Genesis Series | | | | | With approved Backbox | | |
| **Notifier** | | | System Sensor SpectrAlert Series | | | | | With approved Backbox | | |
| System Sensor SpectreAlert Series | | | | | With approved Backbox | | |
|  | | | | | | | | | | |
| **RELEASING** | | | | | | | | | | |
| **FACU COMPABILITY** | | | **PART NUMBER** | | | | | **DESCRIPTION** | | |
| **Edwards/Notifier** | | | WHEELOCK Eluxa Series | | | | | Horns | | |
| WHEELOCK Eluxa Series | | | | | Strobes with Clear, Amber, Red, or Blue Lenses | | |
| WHEELOCK ELSBB-R | | | | | Backbox | | |
|  | | | | | | | | | | |
| **NOTIFICATION APPLIANCE POWER PANEL (NAPP)** | | | | | | | | | | |
| **FACU COMPABILITY** | | | **PART NUMBER** | | | | | **DESCRIPTION** | | |
| Edwards | | | BPS-10A | | | | | - | | |
| Notifier | | | ACPS-610 | | | | | - | | |
|  | | | | | | | | | | |
| **AREA OF REFUGE EMERGENCY TWO-WAY COMMUNICATION SYSTEMS (ECS)** | | | | | | | | | | |
| **COMPONENTS** | | | **PART NUMBER** | | | | | | **DESCRIPTION** | |
| **Central Control Point** | | | RATH SmartRescue Base Stations | | | | | | 2500-205 | |
| 2500-210 | |
| **Remote Call Stations** | | | RATH 2100-986 | | | | | |  | |
| ALPHAREFUGE RCB2100 Series Callbox | | | | | |  | |
| **Power Supply** | | | RATH 2500-PWR24U | | | | | | Contacts for Power Failure Supervision | |
| AlphaRefuge PWR2410A | | | | | | If Central Control Point is not Remote Powered | |
|  | | | | | | | | | | |
| **DOOR RELEASE** | | | | | | | | | | |
| **FACU COMPABILITY** | | | **PART NUMBER** | | | | | | **DESCRIPTION** | |
| **Edwards** | | | EST Electromagnetic Door Holders | | | | | | - | |

END OF SECTION