



SECTION 28 46 21 - FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Division 01 General Requirements
 - 2. Division 07 Thermal and Moisture Protection (Penetration Firestopping)
 - 3. Division 08 Openings, Section (Door Hardware)
 - 4. Division 21 Fire Suppression (Agent or pre-action/foam)
 - 5. Division 23 Heating Ventilating and Air Conditioning Monitoring & Control (HVAC).
 - 6. Division 26 Electrical (Common Work Results for Electrical)
 - 7. Division 28 Electronic Safety and Security

1.2 SUMMARY

- A. Section Includes:
 - 1. This specification describes an addressable Fire Detection and alarm signaling system. The control panel shall be intelligent device addressable, analog detecting, low voltage and modular, with digital communication techniques, in full compliance with all applicable codes and standards. The features and capacities described in this specification are required as a minimum for this project and shall be furnished by the successful contractor.
 - 2. The system shall include all required hardware, raceways, interconnecting wiring and software to accomplish the requirements of this specification and the contract drawings, whether or not specifically itemized herein.
 - 3. All equipment furnished shall be new and the latest state-of-the-art products of a single manufacturer, engaged in the manufacturing and sale of analog fire detection devices for over ten years.
 - 4. The system as specified shall be supplied, installed, tested and approved by the local Authority Having Jurisdiction, and turned over to the owner in an operational condition.
 - 5. In the interest of job coordination and responsibilities, the installing contractor shall contract with a single supplier for fire alarm equipment, engineering, programming, inspection and tests.
 - 6. The system specified shall be that of Cerberus® PRO Fire Safety which meets the project requirements. Other systems shall be submitted 10 days prior to bid date for approval by the Engineer. All system approved shall meet all the requirements spelled out in this specification. System approval shall be in writing by the Engineer and a copy shall be submitted with the system submittals.
 - 7. The system shall support approved smart-infrastructure integration (SII) and be capable of bi-directional data exchange with other building systems where required.

1.3 DEFINITIONS

- A. ASME: American Society of Mechanical Engineers.
- B. Broadcast Media: The speakers, radio, cell phone, and other media that will carry the selected message to the selected audience.
- C. FACP: Fire alarm control panel.
- D. NAC: Notification Appliance Circuit. A circuit used to monitor and activate notification appliances or devices.
- E. FM: FM Global (Factory Mutual).
- F. Furnish: To supply the stated equipment or materials.
- G. Install: To set in position and connect or adjust for use.
- H. LED: Light-emitting diode.
- I. NFPA: National Fire Protection Association. Definitions in NFPA 72 apply to fire alarm terms used in this Section.
- J. NICET: National Institute for Certification in Engineering Technologies.
- K. Provide: To furnish and install the stated equipment or materials.
- L. UL: Underwriters Laboratories.
- M. AHJ: Authority Having Jurisdiction. Local authority (such as a fire marshal), presiding over the occupancy of the building(s).
- N. Cerberus DMS: Cerberus Danger Management Station
- O. VESDA: Very Early Smoke-Detection Apparatus.
- P. ASSD: Air Sampling Smoke Detection
- Q. VEWFD: Very Early Warning Fire Detection
- R. ISOTECHTM: devices with built-in isolation
- S. NRTL: National Recognized Testing Lab (UL, ULC, FM, ETL etc.)

1.4 SYSTEM DESCRIPTION

- A. Basic Cerberus® PRO Fire Safety – The system shall be a complete, electrically supervised fire detection and notification system, with a microprocessor-based operating system having the following capabilities, features, and capacities:
 - 1. The local system shall provide status indicators and control switches for all of the following functions:

- a. Audible and visual notification alarm circuit zone control.
- b. Status indicators for sprinkler system water-flow and valve supervisory devices.
- c. Any additional status or control functions as indicated on the drawings, including but not limited to; emergency generator functions, fire pump functions, door unlocking and security with bypass capabilities.

1.5 PERFORMANCE REQUIREMENTS

- A. General Performance: System devices shown shall comply with NFPA 72 and all contract documents and specification requirements.
- B. The system shall have Class B (former Style 4) circuits for each floor. The system shall operate in the alarm mode upon actuation of any alarm initiating device. The system shall remain in the alarm mode until all initiating device(s) are reset and the fire alarm control panel is manually reset and restored to normal.
- C. The system shall be capable of the following configurations. Both configurations are permitted on the same network.
 1. The system shall support up to 252 addressable devices, which may be divided in any ratio on one, two, three, or four separate, isolated Class B circuits.
 2. The system shall support two loops of 252 addressable devices, each of which may be divided in any ratio on one, two, three, or four separate, isolated Class B circuits.
- D. The system shall support H-series devices and Cerberus® PRO series devices
- E. The system shall support X-Series I/O modules & X-Series manual pull stations with built-in isolation capability with ISOtechnology™.
- F. The system shall have an optional digital alarm communication transmitter.
- G. The system shall provide an off-normal warning prior to reset for all active devices.
- H. The system shall be capable of remote monitoring via Cerberus Remote, a proprietary software system that provides a graphical representation of the fire alarm control panel at a remote PC when connected via Ethernet to the system. The display will show the exact state of the panel, including blinking LEDs, and with menu buttons for control.
- I. The system shall be capable of being configured via a PC Tool.
- J. The system shall provide the following functions and operating features:
 1. The FACP and auxiliary power panels shall provide power, annunciation, supervision and control for the system.
 2. Provide Class B (formerly style 4) initiating device circuits.
 3. Provide Class B (formerly style 4) notification appliance circuits. Arrange circuits to allow individual, selective, and all-call voice and visual notification by zone. Notification Appliance circuits shall be zoned to correspond with the building fire barriers and other building features.

4. NACs shall be synchronized throughout the entire building.
 5. Provide electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control panel.
- K. The system shall provide a field test function where one person can test the complete system or a specific area while maintaining full operational function of other areas not being tested. Alarms, supervisory signals, trouble signals shall be logged in system history during the walk-test.
- L. Alarm functions shall override trouble or supervisory functions. Supervisory functions shall override trouble functions.
- M. Fire alarm signal initiation shall be by one or more of the following devices:
1. Manual pull station
 2. Heat detector
 3. Addressable area smoke detectors
 4. Addressable Multi-criteria, dual optical smoke detectors
 5. Addressable Multi-criteria smoke detectors with built-in Carbon Monoxide (CO) sensor
 6. Standard Addressable Duct smoke detector
 7. Specialized Duct Smoke detector
 8. Projected beam detector
 9. Automatic sprinkler system water flow switch.
- N. Activation of any system fire, supervisory, trouble, or status initiating device shall cause the following actions and indications at all network Person Machine Interfaces using an LCD display with multiple detail screens.
1. Fire Alarm Condition:
 - a. Sound an audible alarm and display a custom message defining the building in alarm and the specific alarm point initiating the alarm on an LCD display.
 - b. Log into the system history archives all activity pertaining to the alarm condition.
 - c. Sound the ANSI 117-1 signal with synchronized audible notification appliances and synchronized strobes throughout the facility.
 - d. Audible signals shall be silenced from the fire alarm control panel by an alarm silence switch. Visual signals shall be programmable to flash until system reset or alarm silencing, as required.
 - e. A signal dedicated to sprinkler system water flow alarm shall not be silenced while the sprinkler system is flowing at a rate of flow equal to a single head.
 - f. Activation of any smoke detector in a single elevator lobby or an elevator equipment room shall, in addition to the actions described, cause the recall of that bank of elevators to the 1st floor and the lockout of controls. In the event of recall initiation by a detector in the first-floor lobby, the recall shall be to the alternate floor as determined by the AHJ.
 - g. Where indicated on drawings heat detectors in elevator shaft and machine rooms shall activate an elevator power shunt trip breaker. The heat detectors shall be rated at a temperature below the ratings of the sprinkler

- heads in respective locations to ensure that the power shall be shut off before activation of sprinkler system.
- h. System operated duct detectors as per local requirements shall accomplish HVAC shut down.
- i. Door closure devices shall operate by floor or by local requirements.
- 2. Supervisory Condition:
 - a. Display the origin of the supervisory condition report at the local fire alarm control panel LCD display.
 - b. Activate supervisory audible and dedicated visual signal.
 - c. Audible signals shall be silenced from the control panel by the supervisory acknowledge switch.
 - d. Record within system history the initiating device and time of occurrence of the event.
- 3. Trouble Condition
 - a. Display at the local fire alarm control panel LCD display, the origin of the trouble condition report.
 - b. Activate trouble audible and visual signals at the control panel and as indicated on the drawings.
 - c. Audible signals shall be silenced from the fire alarm control panel by a trouble acknowledge switch.
 - d. Trouble conditions that have been restored to normal shall be automatically removed from the trouble display queue and not require operator intervention. This feature shall be software selectable and shall not preclude the logging of trouble events to the historical file.
 - e. Trouble reports for primary system power failure to the master control shall be automatically delayed for a period of time equal to 25% of the system standby battery capacity to eliminate spurious reports as a result of power fluctuations.
 - f. Record within system history, the occurrence of the event, the time of occurrence and the device initiating the event.
- O. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories. Complete manufacturer's catalog data including supervisory power usage, alarm power usage, physical dimensions, and finish and mounting requirements.
- B. Power calculations. Battery capacity calculations. Battery size shall be a minimum of 125% of the calculated requirement. Provide the following supporting information:
 - 1. Supervisory power requirements for all equipment.
 - 2. Alarm power requirements for all equipment.
 - 3. Power supply rating justification showing power requirements for each of the system power supplies. Power supplies shall be sized to furnish the total connected load in a worst-case condition plus 25% spare capacity.

4. Voltage drop calculations for wiring runs demonstrating worst-case condition.
 5. NAC circuit design shall incorporate a 20% spare capacity for future expansion.
- C. Submit manufacturer's requirements for testing Signaling Line Circuits and device addresses prior to connecting to control panel. At a minimum the following tests shall be required; device address, the usage (Alarm, Supervisory etc.), environmental compensation, temperature ratings for thermal detectors and smoke detector sensitivities. This requirement shall need approval before any wiring is connected to the control panel.
- D. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 2. Wiring Diagrams: For power, signal, and control wiring.
 3. Complete drawings covering the following shall be submitted by the contractor for the proposed system:
 - a. Floor plans in a CAD compatible format at a scale of 1/8" = 1'-0" showing all equipment and raceways, marked for size, conductor count with type and size, showing the percentage of allowable National Electric Code fill used.
 - b. Provide a fire alarm system function matrix as referenced by NFPA 72, Figure A-7-5.2.2 (9). Matrix shall illustrate alarm input/out events in association with initiation devices. Matrix summary shall include system supervisory and trouble output functions. Include any and all departures, exceptions, variances or substitutions from these specifications and/or drawings at time of bid.
 4. Installation drawings shop drawings, and as-built drawings shall be prepared by an individual experienced with the work specified herein.
 5. Incomplete submittals shall be returned without review, unless with prior approval of the Engineer.
- E. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
1. Light fixtures.
 2. HVAC registers
 3. Fire protection equipment interfaces
 4. Special suppression system interfaces
- F. Qualification Data: For qualified Installer, Applicator, manufacturer, fabricator, professional engineer, testing agency, and factory-authorized service representative.
- G. Source quality-control reports.
- H. Field quality-control reports.
- I. Operation and Maintenance Data: For all fire alarm equipment, to include in operation and maintenance manuals.

J. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: The publications listed below form a part of this publication to the extent referenced. The publications are referenced in the text by the basic designation only. The latest version of each listed publication shall be used as a guide unless the authority having jurisdiction has adopted an earlier version.

1. FM Global (Factory Mutual (FM)):FM Approval Guide
2. National Fire Protection Association (NFPA)
 - a. NFPA 70 National Electrical Code
 - b. NFPA 72 National Fire Alarm Code
 - c. NFPA 90A Standard for The Installation of Air Conditioning and Ventilating Systems
 - d. NFPA 101 Life Safety Code
 - e. NFPA 720 Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment
3. Underwriters' Laboratories, Inc. (UL) equipment standards, Latest Edition
 - a. UL Fire Protection Equipment Directory
 - b. UL Electrical Construction Materials Directory
 - c. UL 38 – Manually Actuated Signaling Boxes for Use with Fire Protection Signaling Systems
 - d. UL 228 – Door Holding Devices
 - e. UL 268 - Smoke Detectors for Fire Protective Signaling Systems
 - f. UL 268A - Smoke Detectors for Duct Application
 - g. UL 464 - Audible Signal Appliances
 - h. UL 497A – Secondary Protectors for Communications Circuits
 - i. UL 521 - Heat Detectors for Fire Protective Signaling Systems
 - j. UL 864 - Control Units for Fire Protective Signaling Systems
 - k. UL 1283 – Electromagnetic Interference Filters
 - l. UL 1449 - Transient Voltage Surge Suppressors
 - m. UL 1971 - Signaling Devices for the Hearing Impaired
 - n. UL 2075 – Gas and Vapor Detectors and Sensors
 - o. UL 2572 – Mass Notification Systems
4. International Code Council
 - a. International Building Code
 - b. International Fire Code.
5. State and Local Building Codes as adopted and/or amended by The Authority Having Jurisdiction, ADA, and/or State and local equivalency standards as adopted by The Authority Having Jurisdiction.
6. California State Fire Marshal

7. The manufacturer shall have a minimum of 15 years production experience in the manufacture and design of high sensitivity air sampling-type smoke detection systems.
8. ISO 9002

B. Supplier Qualifications

1. The manufacturer of the supplied products must utilize multi-channel product distribution on a national basis to be considered for this bid. The manufacturer must have factory branches as well as independent distributors to allow the end user with the ability to utilize factory trained and authorized competitive service providers after system installation and commissioning.
2. Provide the services of a factory trained and certified representative or technician, experienced in the installation and operation of the type of system provided. The representative shall be licensed in the State if required by law.
3. The technician shall supervise installation, software documentation, adjustment, preliminary testing, final testing and certification of the system. The technician shall provide the required instruction to the owner's personnel in the system operation and maintenance.
4. The suppliers shall furnish evidence they have an experienced service organization, which carries a stock of spare and repair parts for the system being furnished.
5. The equipment supplier shall be authorized and trained by the manufacturer to calculate, design, install, test, and maintain the air sampling system and shall be able to produce a certificate stating such upon request.

C. Installer Qualifications:

1. Before commencing work, submit data showing that the manufacturer has successfully installed fire alarm systems of the same scope, type and design as specified.
2. The contractor shall submit copies of all required Licenses and Bonds as required in the State having jurisdiction.
3. The manufacturer representative shall employ on staff a minimum of one NICET certified designer, technician and/or a professional engineer, registered in the State of the installation, as required by the AHJ.
4. Contractors unable to comply with the provisions of Qualification of Installers shall present proof of engaging the services of a subcontractor qualified to furnish the required services.

D. Testing Agency Qualifications: Qualified for testing indicated.

E. Source Limitations for fire alarm equipment: Obtain fire alarm equipment from single source.

F. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.

2. Smoke-Developed Index: 50 or less.
3. Combustion Characteristics: ASTM E 136.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Pre-installation Conference: Conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, and shelf life if applicable.
- B. Store materials inside, under cover, above ground, and kept dry and protected from physical damage until ready for use. Remove from site and discard wet or damaged materials.

1.9 PROJECT CONDITIONS

- A. Installed products or materials shall be free from any damage including, but not limited to, physical insult, dirt and debris, moisture, and mold damage.
- B. Environmental Limitations: Do not deliver or install products or materials until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire alarm equipment that fail(s) in materials or workmanship within specified warranty period.
 1. Warranty Period: 2 year from date of Substantial Completion.

1.11 SERVICE AGREEMENT

- A. Technical Support: Beginning with Substantial Completion, provide software support for 1 year.
- B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
 1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements.

1. Siemens

2.2 CONTROL PANEL

- A. The fire alarm control panel shall be microprocessor based using multiple microprocessors throughout the system providing rapid processing of smoke detector and other initiation device information to control system output functions.
- B. There shall be a watchdog circuit, which shall verify the system processors and the software program. Problems with either the processors or the system program the panel shall activate a trouble signal, and reset the panel.
- C. The system modules shall communicate with an RS 485 network communications protocol. All module wiring shall be to terminal blocks.
- D. The Cerberus® PRO Fire Safety FC and FV922 system shall be capable of the following configurations. Both configurations are permitted on the same network.
1. The system shall support up to 252 addressable devices, which may be divided in any ratio on one, two, three, or four separate, isolated Class B circuits.
 2. The system shall support two loops of 252 addressable devices, each of which may be divided in any ratio on one, two, three, or four separate, isolated Class B circuits.
- E. The Cerberus® PRO Fire Safety FC and FV924 system shall be capable of supporting the following configurations. Both configurations are permitted on the same network.
1. The system shall support up to 504 addressable devices, which includes a second SLC configuration and each may be divided in any ratio on one, two, three, or four separate, isolated Class B circuits.
 2. The system shall support 504 addressable devices, each of which includes a second SLC configuration and each may be divided in any ratio on one, or two separate, isolated Class A circuits.
- F. The system shall be capable of supporting unshielded wiring applications.
- G. The system shall be compliant with the requirements of NFPA 720 as a Carbon Monoxide Detection Control Unit and shall meet the UL 2075 listing requirements. All inputs from CO sensors shall be indicated visually and audibly at the control panel. CO sensor inputs shall be distinct and descriptively annunciated from other signals.
- H. System Components:
1. The System Periphery board shall be capable of 252 intelligent devices distributed between one, two, three, or four Class B SLC circuits. Any trouble on one circuit shall not affect the other circuit. This module controls the signaling from the

initiation devices reporting alarms and troubles to the control panel. This module shall also provide the signaling to the field devices for the controlling the output of specific initiation devices. The on-board microprocessor provides the periphery board with the ability to function even if the main microprocessor fails. LEDs on the board shall provide annunciation for the following: Power, Gnd. Fault, Alarm, Trouble. This board is integral to the system. The board shall be model number FCI2016-U1.

2. The system periphery board shall be capable of supporting two system drivers of 252 intelligent devices distributed between one, two, three, or four Class B SLC circuits for each driver, for a total panel capacity of 504 addressable devices. Any trouble on one circuit shall not affect the other circuit. This module controls the signaling from the initiation devices reporting alarms and troubles to the control panel. This module shall also provide the signaling to the field devices for the controlling the output of specific initiation devices. The on-board microprocessor provides the periphery board with the ability to function even if the main microprocessor fails. LEDs on the board shall provide annunciation for the following: Power, Gnd. Fault, Alarm, and Trouble. This board is integral to the system. The board shall be model number FCI2017-U1.
3. The Signal Line Circuits (SLC) shall be tested for opens, shorts and communications with all addressable devices installed before connection to the control panel. Systems without this capability shall have a test panel installed for initial testing to eliminate any possible damage short term or long term to the control panel. After initial testing replace the test panel and proceed with complete testing.
4. The standard Operator Interface shall have the ability to view events, acknowledge, silence, and reset the system and any networked Cerberus® PRO Fire Safety control panels, when configured as a global PMI. The standard operator interface can acknowledge, silence, and reset all panels via Global PMI.
5. The LED Operator Interface shall have the ability to view events, acknowledge, silence, and reset the system and any networked Cerberus® PRO Fire Safety control panels, when configured as a global PMI. Additionally, the operator interface provides twelve multicolored configurable LEDs for annunciating system status
6. The System Periphery Board shall contain 2 Class B NAC circuits rated at 3 amps each with power-limited outputs. The zones shall be isolated and independently supervised. There shall be at least 6 unique codes/signals for each circuit based on system logic. These signals shall be Temporal Code 3 (Evacuation), Steady, Temporal Code 4 (for CO alarms), March Time 120ppm, March Time 60ppm, and March Time 30ppm. The card shall have the following LEDs to provide trouble shooting and annunciation, Power, Gnd. Fault, Zone Activation or Trouble. This functionality shall be integral to the system. The card shall be model number FCI2016-U1/FCI2017-U1.
7. The control panel shall be equipped with four Form C relays for alarm, trouble, supervisory, and programmable output. The system shall provide the mounting of all system cards, field wiring, and panel's inter-card wiring. All power limited field wiring shall be separated from all non-power limited internal wiring. The card shall be model number FCI2016-U1/FCI2017-U1.

- I. System response time from alarm to output shall comply with UL requirements.

- J. All system cards and modules shall have Flash memory for downloading the latest module firmware.
- K. Passwords:
 - 1. Technician Level Password - There shall be a 8-character password that a user must enter into the control panel in order to perform such maintenance- and control-related functions at the panel as:
 - a. Arming and disarming devices.
 - b. Activating, deactivating or modifying detector ASD and sensitivity settings.
 - c. Activating and deactivating the History Log function, and deleting obsolete entries.
 - d. Changing the system time and date.
 - 2. Maintenance Level Password - There shall be a 8-character password that a user must enter into the control panel in order to access the panel's reporting functions and walktest functions.
 - 3. Acknowledge Silenceable Reset Access - There shall be a key required to open a locked cabinet that a system user must use in order to acknowledge events, turn silenceable audibles and visuals on and off, and perform panel resets.
- L. Software Modifications: The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made. Systems that require the use of external programmers or change of EPROMs are not acceptable.
- M. Logic: The fire alarm system shall support generic functions that deal with binary states (True/False, high/low), and produce desired outputs from one or more binary inputs (for example, alarm outputs from detector or manual station inputs). AND, OR, NOT, Any N, Latches, Start Timer, Delay Timer, Restart Timer are generic functions. Generic functions can be used as inputs to other function. The system shall support 500 logic functions.
- N. History: The system shall store 10,000 events in history. Trouble warnings will occur when the History buffer is full.
- O. Reports:
 - 1. The system shall have the ability to provide configuration, status, queue and history reports.
 - 2. Configuration reports shall provide the following information:
 - a. Custom Messages
 - b. Database Information
 - c. Entity Type
 - d. Zone usage
 - e. Device Category
 - f. Firmware revision
 - 3. Status reports shall provide the following information:
 - a. Disarmed cards and devices
 - b. ASD settings
 - c. Sensitivity in %/foot

- d. Alarm threshold in %/foot
- e. Temperature in degrees F.
- f. Walktest
- 4. Queue reports shall provide the following information:
 - a. Alarm events with custom message and event time
 - b. Mass notification events with custom message and event time
 - c. Gas alarm events with custom message and event time
 - d. Supervisory events with custom message and event time
 - e. Trouble events with custom message and event time
 - f. Status events with custom message and event time
 - g. Information events
- 5. History reports shall provide Address, History Type, Description, Time & Date and Custom Message. The following event types shall be reported:
 - a. Alarm events
 - b. Gas alarm events
 - c. Supervisory events
 - d. Status changes
 - e. Alarm verification
 - f. Output activation from logic
 - g. System Reset
 - h. Event Acknowledgements
 - i. Block Acknowledgements
 - j. Audible Silence System Flag Changes
 - k. Sensitivity Changes
 - l. Arm / Disarm Commands
 - m. Arm / Disarm By Logic
 - n. Manual Output Overrides
 - o. Output Overrides By Logic
 - p. Time Changes
 - q. Menu Logins
 - r. ASD Changes
 - s. Walktest
 - t. Device Input to Logic Activations/Deactivations

2.3 POWER SUPPLY

- A. The system Power Supply shall be a 170 Watt, 6.5-amp that provides 24VDC power for system operation. The power supply shall be filtered and regulated. The power supply provides power for all system operation, including signaling line circuits, notification appliance circuits, auxiliary power, battery charger, and all optional modules. The power supply shall be rated for 120/240VAC 50/60Hz. The module shall be model number FP2011-U1
- B. The system Power Supply FP2012-U1 shall be a 300 Watt, 11.5-amp that provides 24VDC power for system operation. The power supply provides power for all system operation, including signaling line circuits, notification appliance circuits, auxiliary power, battery charger, and all optional modules. The power supply shall be rated for 120/240VAC 50/60Hz. The module shall be model number FP2012-U1.
- C. For applications requiring greater than 300W of power, the Model FP2013-U1 power supply can optionally power a Model FV922 or FV924 system. Model FP2013-U1

consists of two (2) power supply units and one (1) interconnection cable, in order to balance the power from Model FP2013-U1. Consequently, this power-supply configuration can provide up to 600W at 24VDC.

- D. The battery charger shall be able to charge the system batteries up to 100AH. Battery charging shall be microprocessor controlled and programmed to select battery sizes.
- E. Transfer from AC to battery power shall be instantaneous when AC voltage drops to a point where it is not sufficient for normal operation.

2.4 REMOTE POWER SUPPLY FOR NON-VOICE NOTIFICATION APPLIANCES

- A. The PAD-5 power supply unit shall be used with a Siemens Cerberus® PRO System. It shall be an addressable NAC distributed controller to provide power to visual strobe circuits or supply auxiliary power to such items as Door holder circuits.
- B. The PAD-5 shall communicate on the SLC loop to the Siemens Cerberus® PRO Control Panel. It shall provide status monitoring, device level fault indications and individual NAC control using a single address on the SLC. The PAD-5 unit shall provide a constant 24VDC nominal output voltage to each NAC-independent of voltage fluctuations on the primary or secondary power source.
- C. The PAD-5 shall be a self-contained unit with 24VDC power supply and batteries housed in its own locked enclosure. Enclosure shall be made of 16 GA cold rolled steel, lockable and having the same key as the other control enclosures. Shall have 2 sizes (1 unit and a 2 unit) and colors (red and black).
- D. The power supply shall be UL 864 listed and available in 6A and 9A models and 120 or 240VAC.
- E. The power supply be able to support up to 18AH batteries in a single unit and 35AH in a 2-unit enclosure. Shall be able to support up to 100AH batteries in a separate enclosure.
- F. The power supply shall have four independent 3 amp rated NAC circuits, expandable to a total of eight (8) Class B or four (4) Class A circuits or a mixture of each with an expansion CLSA card.
- G. The power supply shall have the ability to add one of two types of expansion cards which take one additional address on the SLC:
 - 1. CLSA expansion card provides additional NAC circuits and can be configured with two (2) Class B or one (1) Class A releasing circuits with on board service disconnect switches.
 - 2. CDC Conventional Zone Module is an expansion card that provides for four (4) Class A or B conventional detection zone input circuit or shorting device (non-alarm) input circuits
- H. The power supply shall be a class X isolating device residing on the SLC loop.
- I. Each NAC output can be configured as an Aux Power output or a non-alarm closure input circuit.

- J. Complete status monitoring to the individual circuit level at the main FACP and on-board LED status and diagnostic indicators.
- K. The PAD-5 is fully configurable through the Siemens Fire Safety system configuration tool.
- L. Output Circuits can be configured individually as Steady On, Temp 3, Temp 4, March Time 30, 60 or 120PPM.
- M. All NAC circuits have synchronized strobe outputs, any combination of PAD-5 Main Boards and Expansion cards up to 32 can be synchronized on the same XDLC loop.
- N. A dedicated Bell Follower circuit can be used to achieve synchronization across multiple SLC loops.
- O. Shall be able to accept a range of End of the Line (EOL) resistor values (2.2K to 24K Ω) without having to program or configure unit.

2.5 SYSTEM ENCLOSURE

- A. Provide the enclosure as specified. Provide the color to comply with local AHJ requirements.
- B. Provide two-height-unit backbox as part of the Cerberus® PRO Fire Safety intelligent non-voice-communication system hardware for use with 2HU system enclosures. Specifically, each backbox is used to fasten with a 2HU outer door.
- C. Provide Black cabinet enclosure.

2.6 REMOTE ANNUNCIATOR

- A. LCD Annunciator Panel: Provide FT2014/FT2015 LCD remote annunciator(s) as indicated on the drawings. The remote annunciator shall provide visual indication of all system status changes including alarm, supervisory, trouble, and system status. Display shall include text descriptions as programmed at the main panel for all device status and system status. The FT2015 remote annunciator shall provide key-lock switch protected functionality including reset, signal silence/un-silence, and acknowledge. The FT2014/FT2015 shall be available in both red and black housings.
- B. LED annunciator panel: Provide Siemens model FT2008 (16-zone), or FT2009 (32-zone) LED annunciator as indicated on the drawings. Each LED annunciator shall provide the LED indicators for each zone including alarm, supervisory, and trouble per zone. System status LEDs shall also be provided indicating Reset, Audibles On, Silenced, Acknowledge, Ground Fault, System Fault, and Power. Key-switch lock protected buttons shall provide system control for Reset, Silence/Un-silence, Acknowledge, and Lamp Test. Both versions of the LED annunciator shall be available with red and black housings.

2.7 DIGITAL COMMUNICATOR

- A. The Multi-Point Digital Alarm Communicator FCA2015-U1 shall be UL864 listed to provide point identification of alarm, supervisory, security and trouble events to a Central or Remote Receiving Station. The DACT shall support the following:

1. Ademco Contact ID or SIA protocol
2. Ademco Contact ID selection shall provide the ability to transmit events for up to 999 individual zones
3. SIA selection shall provide the ability to transmit events for up to 10000 individual points
4. Programming of accounts and phone numbers
5. Cellular connectivity.
6. Line fault monitoring.
7. Automatic 24-hour test
8. The DACT supports configurable alarm, alarm restoral, trouble, trouble restoral, supervisory, supervisory restoral, and reset events.
9. The DACT supports Ademco Contact ID alarm event codes for general alarm, smoke detector alarm, waterflow alarm, duct alarm, and manual alarm events.
10. Optionally, the DACT can be programmed to report events by event queue only.

2.8 INTELLIGENT INITIATING DEVICES

A. General

1. All initiation devices shall be insensitive to initiating loop polarity. Specifically, the devices shall be insensitive to plus/minus voltage connections. Except when built-in isolation with ISOtechnology™ is used, polarity sensitivity is required for the devices configured in isolation mode. (~~Add ISOtechnology requirement statement here~~)

B. Smoke Detectors –Advanced Addressable OOH-Series

1. The detectors shall be guaranteed in writing not to false alarm when configured by the factory trained certified technician. The detectors must provide at least 19 different environmental algorithms that allow the detector to provide superior false alarm immunity without the need for additional alarm verification delays.
2. The detectors shall have a tri-color LED to streamline system maintenance/inspection by plainly indicating detector status as follows: green for normal operation, amber for maintenance required, red for alarm.
3. Detectors shall utilize state of the art forward/backward light scattering technology, with improved detection for smoldering and flaming fire signatures. The detectors shall replace the need for ionization detectors due to improved response characteristics to flaming fires.
4. When required, the detectors shall incorporate an addressable Carbon Monoxide (CO) sensor. The CO sensor of the OOH941 The CO sensor of the OOH941 has a 10-year lifetime from the date of installation. The CO sensor shall be selectable as an input to the multi-criteria fire detector algorithm and as an independent life-safety CO gas detector (in compliance with NFPA 720).
5. Detectors shall provide pre-alarm signal at 0.2% obs/ft. and a full alarm at 1.0% obs/ft. to meet the performance requirements of NFPA 76 - National Fire Protection Association Standard 76, Fire Protection of Telecommunications Facilities as a Very Early Warning Fire Detector (VEWFD).
6. The forward/backward light scattering technology shall provide improved immunity to spurious activation (deceptive phenomena). The detectors shall have a “No False Alarm Guarantee”.

7. The detectors shall be RoHS-compliant: it shall meet standards for Reduction of Hazardous Substances (RoHS) by reduction in lead content and other restricted substances.
8. The multi-criteria detector with CO input shall be UL 2075 compliant as a gas and vapor detector.
9. The multi-criteria fire detectors shall be an intelligent digital photoelectric detector with a programmable heat detector. Detectors shall be listed for use as open area protective coverage, in-duct installation and sampling assembly installation and shall be insensitive to air velocity changes. The detectors' communications shall allow the detectors to provide alarm input to the system and alarm output from the system within four (4) seconds. So as to minimize the effort required by the installing and maintenance technician to appropriately configure the detector to ensure optimal system design, the detectors shall be programmable as application specific. Application settings shall be selected in software for a minimum of 19 environmental fire profiles unique to the devices installed location.
10. The detectors shall be designed to eliminate the possibility of false indications caused by dust, moisture, RFI/EMI, chemical fumes and air movement while factoring in conditions of ambient temperature rise, obscuration rate changes and hot/cold smoke phenomenon into the alarm decision to give the earliest possible real alarm condition report.
11. The detectors shall be capable of being field programmed for simultaneous and /or independent functionality, depending on the application. For example, the detectors shall be capable of utilizing the optical, heat, and/or CO sensors together for enhanced fire detection (multi-criteria) and simultaneously provide independent outputs for CO gas life-safety, smoke, and heat detection. Any combination of the sensors is possible.
12. The detectors shall be UL listed for operation in a 95% relative humidity (RH) environment.
13. The detectors shall be designed to eliminate calibration errors associated with field cleaning of the chamber.
14. The detectors shall support the use of a relay, or LED remote indicator without requiring an additional software address. Low profile, white case shall not exceed 2.5 inches of extension below the finish ceiling.
15. The detectors shall support the use of an ambient temperature warning signal at the panel. This temperature shall be user-configurable for the set temperature of the warning and the event type generated by the warning. This event can be used to trigger system logic.
16. The multi-criteria detector with CO sensor shall support the use of an ambient Carbon Monoxide (CO) warning signal at the panel. This ambient CO level shall be user-configurable in parts per million (PPM) for the set threshold of the warning and event type generated by the warning. This event can be used to trigger system logic. .
17. CO sensor shall have a 10-year lifetime.
18. For the detectors where required, there shall be available a locking kit and detector guard to prevent unauthorized detector removal.
19. UL Listed as "direct in-duct" mounting.
20. Detectors shall include optional built-in short circuit isolation, ISOtechnology.
21. Available models:
 - a. OOH941. Multi-Criteria incorporating 2 Optical sensors and 2 Thermal sensors with an operating temperature range of 32°F to 120°F (0°C to

49°F). Nineteen selectable profiles. Polarity insensitive installation wiring. Three color LED.

- b. OOH941. Multi-Criteria incorporating 2 Optical sensors, 2 Thermal sensors, and Carbon Monoxide sensing technologies with an operating temperature range of 32°F to 120°F (0°C to 49°C). Twenty-Five selectable profiles. Polarity insensitive installation wiring. Three color LED. CO sensor may be programmed as part of the multi-criteria, or may be an independent CO detector.

C. Smoke Detectors – Standard Addressable Detectors:

- 1. The smoke detectors must provide at least 3 environmental parameter sets to assist in device sensitivity configuration.
- 2. The detectors shall have a tri-color LED to streamline system maintenance/inspection by plainly indicating detector status as follows: green for normal operation, amber for maintenance required, red for alarm.
- 3. The detector shall be RoHS-compliant: it shall meet standards for Reduction of Hazardous Substances (RoHS) by reduction in lead content and other restricted substances.
- 4. The detectors shall be UL listed for operation in a 95% relative humidity (RH) environment.
- 5. The detectors shall be designed to eliminate calibration errors associated with field cleaning of the chamber.
- 6. The detectors shall support the use of a relay, or LED remote indicator without requiring an additional software address. Low profile, white case shall not exceed 2.5 inches of extension below the finish ceiling.
- 7. For the detectors where required, there shall be available a locking kit and detector guard to prevent unauthorized detector removal.
- 8. Detectors shall include optional built-in short circuit isolation, ISOtechnology.
- 9. Available models:
 - a. OH921. Multi-Criteria incorporating 1 Optical sensor and 1 Thermal sensor with an operating temperature range of 32°F to 100°F (0°C to 38°C). Available in four parameter sets. Polarity insensitive installation wiring. Three color LED.
 - b. OP921. Photoelectric Smoke detector with an operating temperature range of 32°F to 120°F (0°C to 49°C). Available in three parameter sets. Polarity insensitive installation wiring. Three color LED.

D. Heat Detectors – Addressable

- 1. Thermal Detectors shall be rated at 135°F (57°C) fixed temperature and 15°F (8.3°C) degrees per minute rate of rise. Detectors shall be constructed to compensate for the thermal lag inherent in conventional type detectors due to the thermal mass, and alarm at the set point of 135°F (57°C). The choice of alarm reporting as a fixed temperature detector or a combination of fixed and rate of rise shall be made in system software and be changeable at any time without the necessity of hardware replacement.
- 2. The detectors furnished shall have a listed spacing for coverage up to 2,500 square feet and shall be installed according to the requirements of NFPA 72 for open area coverage. The thermal detector shall be model number HI921.
- 3. Detectors shall include optional built-in short circuit isolation, ISOtechnology.

4. Model HI921 heat detector shall have the following temperature settings:
 - a. Fixed temperature at 135°F (57°C), 145°F (63°C), 155°F (68°C), 165°F (74°C), 174°F (79°C)
 - b. Rate of Rise at 15°F/ min (8.3°C) at 135°F (57°C)
 - c. Rate of Rise at 15°F/ min (8.3°C) at 174°F (79°C)
 - d. Low temperature warning at 40°F (4.4°C)

E. Duct Smoke Detectors – Addressable

1. For duct detector applications, the smoke detector shall be an intelligent digital photoelectric detector. Detectors shall be listed for use as open area protective coverage, in duct installation and sampling assembly installation and shall be insensitive to air velocity changes.
2. The detector communications shall allow the detector to provide alarm input to the system and alarm output from the system within four (4) seconds. The detector shall be mounted in a duct detector housing listed for that purpose. The duct detector shall support the use of a remote test switch, relay or LED remote indicator. The duct detector shall be supplied with the appropriate sampling tubes to fit the installation.
3. Where duct detectors are exposed to the weather a weatherproof enclosure shall be available. A NEMA-3R and NEMA-4X option shall be available. The duct housing cover shall include a test port for functional testing of the detector without cover removal. The duct housing shall include a cover removal switch capable of indicating cover removal status to the fire alarm control panel.
4. The intelligent duct detector shall have a model number from the FDBZ-Series. Where required there shall be available a duct housing with an on-board relay. Also, where required, there shall be a standalone housing available with its own power supply and test/reset switch that does not require connection to a fire alarm control panel. It shall be model FBZ492-PR.
5. Duct smoke detector housing shall allow use in duct systems with air velocity ranging from 100 to 4,000ft/min (0.51 to 20m/s), within temperature ranges of 32°F to 120°F (0°C to 49°C) per minute, and with relative humidity ranging from 0 to 95%.
6. Detectors shall include optional built-in short circuit isolation, ISOtechnology.
7. Duct Housings and Accessories:
 - a. FDBZ492-Global Air Duct Housing for Conventional and Addressable Detectors
 - b. FDBZ492-HR Global Air Duct Housing for Addressable P2 Detectors with Relay Application
 - c. FDBZ492-R Global Air Duct Housing for Conventional Detectors with Relay Application
 - d. FDBZ492-RP Global Air Duct Housing for Conventional Detectors with Relay Application and Built-in Power Source
 - e. FDBZ-WP Weather-Proof housing to accommodate all versions of Global Air Duct Housings
 - f. FDBZ-RTL Remote Test Lamp for Conventional Detectors

F. Detector Bases – Addressable

1. Detector bases shall be low profile twist lock type with screw clamp terminals and self-wiping contacts. Bases shall be installed on an industry standard, 4" square or octagonal electrical outlet box.
2. Multi-Criteria Fire Detector Model OOH941 shall be listed as providing CO detection in duct application.
3. The model number for the standard base shall be DB-11 - 6in version.
4. The model number for the standard base shall be DB-11E - 4in version.

G. Manual Pull Stations – Addressable

1. Provide addressable manual stations where shown on the drawings, to be flush or surface mounted as required. Manual stations shall contain the intelligence for reporting address, identity, alarm and trouble to the fire alarm control panel. The manual station communications shall allow the station to provide alarm input to the system and alarm output from the system within less than four (4) seconds.
2. The manual station shall be equipped with terminal strip and pressure style screw terminals for the connection of field wiring. Surface mounted stations where indicated on the drawings shall be mounted using a manufacturer's prescribed matching red enamel outlet box.
3. The double action pull station shall be model number XMS-D. It shall provide built-in isolation capability with ISOtechnology™. The operator display shall indicate which specific device has detected a wiring fault on the data communication line.
4. Where required, there shall also be available pull stations with break glass, capable of explosion proof installation, capable of weatherproof installation, reset key operation, and metal housings.
5. Pull stations shall include optional built-in short circuit isolation, ISOtechnology.

H. Addressable Interface Devices

1. Addressable Interface Devices shall be provided to monitor inputs (contacts) and control outputs (relays) to and from the fire alarm system and associated devices. These interface devices shall be able to monitor single or dual contacts. An address will be provided for each contact. Where remote supervised relay is required the interface shall be equipped with a SPDT relay rated for 4 amps resistive and 3.5 amps inductive. The addressable interface modules shall be model FDCIO Series, XTRI Series, ILED-X series, TSM-1X or HCP series.
2. Where needed, a Conventional Zone Module shall connect to the Signal Line Circuit, which will allow the use of conventional initiation devices. This module shall have the ability to support up to 15 conventional smoke detectors and an unlimited number of contact devices. The module shall be model HZM.
3. Model XTRI Series shall provide input and outputs as needed by specific model number. The device shall also provide built-in isolation capability with ISOtechnology™. The operator display shall indicate which specific device has detected a loop short on the data communication line.
4. Model FDCIO422 device shall provide built-in isolation capability with ISOtechnology™. The addressable input/output module shall be insensitive to polarity except when built in isolation ISOtechnology™ is used in which case polarity sensitivity is required for the devices configured in isolation mode. Additionally, the FDCIO422 shall have the capability for up to 4 separate inputs (Class B) or 2 separate Class A inputs and 4 separate outputs (Class B).

5. Model ILED-X addressable remote LED alarm indicators shall provide a visual notification for remote or concealed initiating devices. The device shall also provide built-in isolation capability with ISOtechnology™.
6. Model TSM-1X addressable remote test switch shall provide an addressable normally open (N.O.) momentary switch with a tricolor light-emitting diode (LED) indicator. The LED indicator shall provide visual notification of the status of the tested device. The device shall also provide built-in isolation capability with ISOtechnology™.
7. Model HCP addressable control point shall provide remote, independent control of a single device.
8. Monitoring applications include (but not limited to):
 - a. Water-flow switches
 - b. Tamper switches
 - c. PIV switches
 - d. Damper position – All 3 states on one input
 - e. Conventional devices (e.g., Smoke detectors, beam detectors, flame detectors, etc.)
 - f. Duct Detectors
9. Control applications include (but not limited to):
 - a. Notification appliance circuits (NAC)
 - b. Telephone zones
 - c. Speaker zones.
 - d. Damper position
 - e. Solenoids for sprinklers
10. Where applicable, all interface devices shall meet NFPA 72 Class X requirements for survivability.

2.9 DEVICE PROGRAMMING UNIT

- A. Device Programming Unit: The programming tool shall program the intelligent devices with addresses. The unit shall test the device to respond to its address. Dipswitches and rotary switches shall not be acceptable. The programmer shall be model DPU with carrying case.

2.10 ADVANCED FIRE ALARM NOTIFICATION APPLIANCES (LED BASED)

- A. Series SLHW, SLSW, SLHSW Wall Horns, Strobes, and Horn/Strobes
 1. The notification appliances shall be Siemens SLHS Audible Strobe appliances with LED strobe, SLSW Visual Strobe appliances with LED strobe, and SLHW Audible appliances for wall-mount applications
 2. SLSW and SLHSW Strobes and horn/strobes shall be listed for UL Standard 1971 (Emergency Devices for the Hearing Impaired) for Indoor Fire Protection Service.
 3. The SLHW and SLHSW Audibles shall be UL Listed under Standard 464 (Fire Protective Signaling).
 4. All Series shall meet the requirements of FCC Part 15 and ICES-003.
 5. The SLHSW Audible Strobe and SLSW Strobe appliances shall produce a flash rate of one (1) flash per second over the Regulated Voltage Range and shall incorporate a Light Emitting Diode (LED) as the light source with a rugged Lexan® lens.
 6. The appliances shall be of low current design.

7. The LED strobe flash duration shall be 20ms. Where Multi-Candela appliances are specified, the strobe intensity shall have 4 field selectable settings at 15, 30, 75, and 110 candela for wall mount applications.
8. The selector switch for selecting the candela shall be tamper resistant.
9. Appliances with candela settings shall show the candela selection in a visible location at all times when installed.
10. The audible shall have a minimum of two (2) field selectable settings for dBA levels and shall have a choice of continuous or temporal (Code 3) audible outputs.
11. The SLHSW Audible Strobe, SLSW Strobe, and SLHW Audible mounting options shall include LED backboxes, single-gang backbox and to 4" square with adapter kit.
12. All notification appliances shall be backwards compatible with Siemens' legacy notification appliances.
13. The SLHSW, SLSW and SLHW wall models shall have a low profile measuring 4.53in (115mm) H x 2.76in (70mm) W x 1.27in (32mm) D.
14. Synchronization is possible when using the DSC sync modules, Cerberus® PRO Modular panel, FC901, FC922-924, FV922-924, or PAD SERIES power supply with built-in sync protocol
15. The strobes shall not drift out of synchronization at any time during operation. If the sync protocol fails to operate, the strobe shall revert to a non-synchronized flash rate and still maintain (1) flash per second over its Regulated Voltage Range.
16. The appliance shall also be designed so that the audible signal may be silenced while maintaining strobe activation

B. Series SLHC, SLSC, SLHSC Ceiling Horns, Strobes, and Horn/Strobes

1. The notification appliances shall be Siemens SLHS Audible Strobe appliances with LED strobe, SLSC Visual Strobe appliances with LED strobe, and SLHC Audible appliances for ceiling-mount applications
2. SLSC and SLHSC Strobes and horn/strobes shall be listed for UL Standard 1971 (Emergency Devices for the Hearing Impaired) for Indoor Fire Protection Service.
3. The SLHC and SLHSC Audibles shall be UL Listed under Standard 464 (Fire Protective Signaling).
4. All Series shall meet the requirements of FCC Part 15 and ICES-003.
5. The SLHSC Audible Strobe and SLSC Strobe appliances shall produce a flash rate of one (1) flash per second over the Regulated Voltage Range and shall incorporate a Light Emitting Diode (LED) as the light source with a rugged Lexan® lens.
6. The appliances shall be of low current design.
7. The LED strobe flash duration shall be 20ms. Where Multi-Candela appliances are specified, the strobe intensity shall have 4 field selectable settings at 15, 30, 75, and 95 candela for ceiling mount applications.
8. The selector switch for selecting the candela shall be tamper resistant.
9. Appliances with candela settings shall show the candela selection in a visible location at all times when installed.
10. The audible shall have a minimum of two (2) field selectable settings for dBA levels and shall have a choice of continuous or temporal (Code 3) audible outputs.
11. The SLHSC Audible Strobe, SLSC Strobe, and SLHC Audible mounting options shall include LED Ceiling backboxes, 4in square, 1-1/2in (38mm) or 2-1/8in (54mm) deep and 4in Octagonal, 1-1/2in (38mm) or 2-1/8in (54mm).
12. All notification appliances shall be backwards compatible with Siemens' legacy notification appliances.

13. The SLHSC, SLSC and SLHC ceiling models shall have a low profile measuring 6.26in (159mm) Diameter with 1.5in (38mm) D.
14. Synchronization is possible when using the DSC sync modules, Cerberus® PRO Modular panel, FC901, FC922-924, FV922-924, or PAD SERIES power supply with built-in sync protocol
15. The strobes shall not drift out of synchronization at any time during operation. If the sync protocol fails to operate, the strobe shall revert to a non-synchronized flash rate and still maintain (1) flash per second over its Regulated Voltage Range.
16. The appliance shall also be designed so that the audible signal may be silenced while maintaining strobe activation

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Perform work in accordance with the requirements of NFPA 70, NFPA 72 and NECA 1-2006, Standard of Good Workmanship in Electrical Contracting.
- B. Fasten equipment to structural members of building or metal supports attached to structure, or to concrete surfaces.
- C. In the event that limited energy cable installation is allowed, all cable runs shall be run at right angles to building walls, supported from structure at intervals not exceeding 3ft (1m) and where installed in environmental air plenums, be rated for such use and tied/supported by components listed for environmental air plenums installation.
- D. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.
- E. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- F. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.
- G. Provide primary power for each panel from normal/ emergency panels as indicated on the Electrical Power Plans. Power shall be 120 VAC service, transformed through a two-winding, isolation type transformer and rectified to low voltage DC for operation of all circuits and devices.

3.3 BOXES, ENCLOSURES AND WIRING DEVICES

- A. Boxes shall be installed plumb and firmly in position.
- B. Extension rings with blank covers shall be installed on junction boxes where required.
- C. Junction boxes served by concealed conduit shall be flush mounted.
- D. Upon initial installation, all wiring outlets, junction, pull and outlet boxes shall have dust covers installed. Dust covers shall not be removed until wiring installation when permanent dust covers or devices are installed.
- E. "Fire alarm system" decal or silk-screened label shall be applied to all junction box covers.

3.4 CONDUCTORS

- A. Each conductor shall be identified as shown on the drawings at each with wire markers at terminal points. Attach permanent wire markers within 2in (50mm) of the wire termination. Marker legends shall be visible.
- B. All wiring shall be supplied and installed in compliance with the requirements of the National Electric Code, NFPA 70, Article 760, and that of the manufacturer.
- C. Wiring for strobe and audible circuits shall be a minimum 14 AWG, signal line circuits minimum 18 AWG twisted.
- D. All splices shall be made using solder-less connectors. All connectors shall be installed in conformance with the manufacturer recommendations.
- E. Crimp-on type spade lugs shall be used for terminations of stranded conductors to binder screw or stud type terminals. Spade lugs shall have upset legs and insulation sleeves sized for the conductors.
- F. The installation contractor shall submit for approval prior to installation of wire, a proposed color code for system conductors to allow rapid identification of circuit types.
- G. Wiring within sub panels shall be arranged and routed to allow accessibility to equipment for adjustment and maintenance.

3.5 DEVICES

- A. Relays and other devices to be mounted in auxiliary panels are to be securely fastened to avoid false indications and failures due to shock or vibration.
- B. Wiring within panels shall be arranged and routed to allow accessibility to equipment for adjustment and maintenance.
- C. All devices and appliances shall be mounted to or in an approved electrical box.

3.6 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- B. Permanently label or mark each conductor at both ends with permanent alphanumeric wire markers.
- C. A consistent color code for fire alarm system conductors throughout the installation.

3.7 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Testing General:
 - 1. All Alarm Initiating Devices shall be observed and logged for correct zone and sensitivity. These devices and their bases shall be tagged with adhesive tags located in an area not visible when installed, showing the initials of the installing technician and date.
 - 2. Wiring runs shall be tested for continuity, short circuits and grounds before system is energized. Resistance, current and voltage readings shall be made as work progresses.
 - 3. The acceptance inspector shall be notified before the start of the required tests. All items found at variance with the drawings or this specification during testing or inspection by the acceptance inspector shall be corrected.
 - 4. Test reports shall be delivered to the acceptance inspector as completed.
 - 5. All test equipment, instruments, tools and labor required to conduct the system tests shall be made available by the installing contractor. The following equipment shall be a minimum for conducting the tests:
 - a. Ladders and scaffolds as required to access all installed equipment.
 - b. Multi-meter for reading voltage, current and resistance.
 - c. Two-way radios and flashlights.
 - d. A manufacturer recommended device for measuring air flow through air duct smoke detector sampling assemblies.
 - e. Decibel meter.
 - f. In addition to the testing specified to be performed by the installing contractor, the installation shall be subject to test by the acceptance inspector.

3.8 ACCEPTANCE TESTING

- A. A written acceptance test procedure (ATP) for testing the fire alarm system components and installation will be prepared by the engineer in accordance with NFPA 72 and this specification. The contractor shall be responsible for the performance of the ATP, demonstrating the function of the system and verifying the correct operation of all system components, circuits, and programming.
- B. A program matrix shall be prepared by the installing contractor referencing each alarm input to every output function affected as a result of an alarm condition on that input.

- C. The installing contractor prior to the ATP shall prepare a complete listing of all device labels for alphanumeric annunciator displays.
- D. Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests shall be witnessed by the owner and test results recorded for use at the final acceptance test.
- E. Preliminary Testing: Conduct preliminary tests to ensure that all devices and circuits are functioning properly. After preliminary testing is complete, provide a letter certifying that the installation is complete and fully operable. The letter shall state that each initiating and indicating device was tested in place and functioned properly. The letter shall also state that all panel functions were tested and operated properly. The Contractor and an authorized representative from each supplier of equipment shall be in attendance at the preliminary testing to make necessary adjustments.
- F. Final Acceptance Test: Notify the owner in writing when the system is ready for final acceptance testing. Submit request for test at least 14 calendar days prior to the test date. A final acceptance test will not be scheduled until megger test results, the loop resistance test results, and the submittals required in Part 1 are provided to the owner. Test the system in accordance with the procedures outlined in NFPA 72.
 - 1. Verify that the control unit is in the normal condition as detailed in the manufacturer's operating and maintenance manual.
 - 2. Test each initiating and indicating device and circuit for proper operation and response. Disconnect the confirmation feature for smoke detectors during tests to minimize the amount of smoke or test gas needed to activate the detector.
 - 3. Test the system for all specified functions in accordance with the contract drawings and specifications and the manufacturer's operating and maintenance manual.
 - 4. Visually inspect all wiring.
 - 5. Verify that all software control and data files have been entered or programmed into the FACP.
 - 6. Verify that Shop Drawings reflecting as-built conditions are accurate.
 - 7. Measure the current in circuits to assure that there is the calculated spare capacity for the circuits.
 - 8. Measure voltage readings for circuits to assure that voltage drop is not excessive.
 - 9. Measure the voltage drop at the most remote appliance on each notification appliance circuit.
- G. The acceptance inspector shall use the system record drawings in combination with the documents specified in this specification during the testing procedure to verify operation as programmed. In conducting the ATP, the acceptance inspector shall request demonstration of any or all input and output functions. The items tested shall include but not be limited to the following:
 - 1. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:
 - a. Open, shorted and grounded signal line circuits.
 - b. Open, shorted and grounded notification circuits.
 - c. Primary power or battery disconnected.

2. System notification appliances shall be demonstrated as follows:
 - a. All alarm notification appliances actuate as programmed
 - b. Audibility and visibility at required levels.
3. System indications shall be demonstrated as follows:
 - a. Correct message display for each alarm input at the control display.
 - b. Correct history logging for all system activity.
4. System off-site reporting functions shall be demonstrated as follows:
 - a. Correct zone transmitted for each alarm input
 - b. Trouble signals received for disconnect
5. Secondary power capabilities shall be demonstrated as follows:
 - a. System primary power shall be disconnected for a period of time as specified herein. At the end of that period, an alarm condition shall be created and the system shall perform as specified for a period as specified.
 - b. System primary power shall be restored for forty-eight hours and system-charging current shall be normal trickle charge for a fully charged battery bank.
 - c. System battery voltages and charging currents shall be checked at the fire alarm control panel.

3.9 DOCUMENTATION

- A. System documentation shall be furnished to the owner and shall include but not be limited to the following:
 1. System record drawings and wiring details including one set of reproducible drawings, and a CD ROM with copies of the record drawings in DXF format for use in a CAD drafting program.
 2. System operation, installation and maintenance manuals.
 3. System matrix showing interaction of all input signals with output commands.
 4. Documentation of system voltage, current and resistance readings taken during the installation, testing and ATP phases of the system installation.
 5. System program showing system functions, controls and labeling of equipment and devices.
 6. All applicable NFPA 72 commissioning reports.

3.10 PROTECTION

- A. Remove and replace devices and panel components that are wet, moisture damaged, or mold damaged.

3.11 DEMONSTRATION

- A. Instructor: Include in the project the services of an instructor, who shall have received specific training from the manufacturer for the training of other persons regarding the inspection, testing and maintenance of the system provided. The instructor shall train the employees designated by the owner, in the care, adjustment, maintenance, and operation of the fire alarm system.
- B. Training sessions shall cover all aspects of system performance, including system architecture, signaling line circuit configurations, sensor and other initiating device types,

locations, and addresses, fire alarm control panel function key operation, and other functions as designated by the owner.

- C. Required Instruction Time: Provide 4 hours of instruction after final acceptance of the system. The instruction shall be given during regular working hours on such dates and times as are selected by the owner. The instruction may be divided into two or more periods at the discretion of the owner. One training session shall be videotaped by the contractor. Videotapes shall be delivered to the owner.
- D. Provide a typeset printed or typewritten instruction card mounted behind a Lexan plastic or glass cover in a stainless steel or aluminum frame. Install the frame in a conspicuous location observable from the FACP. The card shall show those steps to be taken by an operator when a signal is received as well as the functional operation of the system under all conditions, normal, alarm, supervisory and trouble. The instructions shall be approved by the owner.
- E. Comprehensive system troubleshooting training shall be provided for a single individual designated by the owner. This session shall be separate and distinct from the above-described sessions.
- F. All training sessions shall be conducted following final system certification and acceptance. Three additional training sessions shall be provided for all security personnel on all shifts six months after final system certification.
- G. All training sessions shall be conducted by an authorized fire alarm system distributor representative, who has received specific training from the manufacturer for the training of other persons regarding the inspection, testing, and maintenance of the system provided.

END OF SECTION 28 46 21