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Engineering Specification – Section 13850 (28 31 00)

FIRE DETECTION AND ALARM SYSTEM

SECTION 28 31 00 – FIRE DETECTION AND ALARM SYSTEM

INTELLIGENT FIRE ALARM DETECTION SYSTEM

THE A/E SHALL EDIT THE INFORMATION IN THIS DOCUMENT AND REMOVE SYSTEMS THAT DO NOT PERTAIN TO THE PROJECT WHERE INDICATED BY EDITOR NOTES. THE A/E SHALL VERIFY THAT SECTION TITLES REFERENCED IN THIS SECTION ARE CORRECT FOR THIS PROJECT'S SPECIFICATIONS; SECTION TITLES MAY HAVE CHANGED.

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Section 13800 – Building Automation and Control.
- B. Section 13900 (21 00 00) – Fire Suppression.
- C. Section (27 15 00) – (Fire Alarm Communications Horizontal Cabling).

1.2 SUMMARY

- A. This section of the specification includes the furnishing, installation, and connection of an intelligent reporting, microprocessor controlled, addressable, fire detection and emergency alarm communication system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panels, auxiliary control devices, annunciators, power supplies, and wiring as shown on the drawings and specified herein.
- B. The fire alarm shall comply with requirements of NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.
- C. The system shall be an active/interrogative type system where each addressable device is repetitively scanned, causing a signal to be transmitted to the main fire alarm control panel (FACP) indicating that the device and its associated circuit wiring is functional. Loss of this signal at the main FACP shall result in a trouble indication as specified hereinafter for the particular input.

SPECIFIER TO REMOVE PARAGRAPH BELOW IF A VOICE SYSTEM IS NOT A PROJECT REQUIREMENT.

- D. The facility shall have an emergency voice alarm communication system. Digitally stored message sequences shall notify the building occupants that a fire or life safety condition has been reported. Message generator(s) shall be capable of automatically distributing up to eight (8) simultaneous, unique messages to appropriate audio zones within the facility based on the type and location of the initiating event. The Fire Command Center (FCC) shall also support

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Emergency manual voice announcement capability for both system wide or selected audio zones, and shall include provisions for the system operator to override automatic messages system wide or in selected zones.

- E. The system shall be support additional, alternate Fire Command Centers, which shall be capable of simultaneous monitoring of all system events. Alternate Fire Command Centers shall also support an approved method of transferring the control functions to an alternate Fire Command Center when necessary. All Fire Command Centers shall be individually capable of assuming Audio Command functions such as Emergency Paging, audio zone control functions.
- F. Each designated zone shall transmit separate and different alarm, supervisory and trouble signals to the Fire Command Center (FCC) and designated personnel in other buildings at the site via a multiplex communication network.
- G. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994
- H. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.
- I. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final checkout and to ensure the systems integrity.
- J. System Programming:
 - 1. Ability to program the system via the local user interface.
 - 2. The system shall be capable of off-line/on-line programming by the manufacturers programming utility.
- K. Provide a cloud base connected life safety platform with the ability to remotely monitor the buildings fire system and capable of providing system diagnostics with full detail reports on annual test and inspections from a web based server or mobile device application. The software shall also expand to allow for future offerings and provide dedicated account access to facility users and service personal.
- L. The system shall automatically track NFPA 72 installation and testing requirements for all fire system devices to ensure that every device is functionally tested upon installation and then periodically as required by Code. A gateway/hub shall be utilized to retrieve the system information using its native protocol and/or bar codes without the need of additional tools and accessories.
- M. This section includes the minimum requirements for the following equipment:
 - 1. Main Fire Alarm Control Panel
 - 2. Signal Line Circuit Control Module
 - 3. Enclosures
 - 4. Digital Voice Command Center
 - 5. Power Supply
 - 6. Addressable Auxiliary Field Power Supply

7. Field Charging Power Supply
8. System Circuit Supervision
9. Audio Amplifiers
10. CLSS Checkpoint Hub Gateway
11. Digital Alarm Communicator Transmitter
12. Speaker Notification Devices
13. Audible/Visual Combination Devices
14. Programmable Electronic Sounders
15. Manual Fire Alarm Stations
16. Duct Smoke Detectors
17. Projected Beam Detectors
18. Waterflow Indicator
19. Sprinkler and Standpipe Valve Supervisory Switches
20. Annunciator Control Display
21. Network Node Communication
22. ONYXWorks Workstation
23. Network Control Display
24. Gateway and Webserver Communication
25. VESDA VEA Detector
26. Addressable Wireless Devices
27. Intelligent Photoelectric Smoke Detector
28. Intelligent Thermal Detectors
29. Self-testing Photoelectric Smoke Detector
30. Self-testing Thermal Detector
31. Self-testing Photo Thermal Detector
32. High Sensitivity Photo Smoke Detector
33. Multi-Criteria Smoke Detector
34. Low Frequency Sounder Base
35. Intelligent Duct Smoke Detector
36. CO Detector
37. Photoelectric Smoke and CO Detector
38. Batteries and External Charger

1.3 APPLICABLE STANDARDS AND SPECIFICATIONS

A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

B. National Fire Protection Association (NFPA) – USA

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|----------|---------------------------------------|
| No. 12 | Extinguishing Systems (low and high) |
| No. 12A | Halon 1301 Extinguishing Systems |
| No. 13 | Sprinkler Systems |
| No. 15 | Water Spray Systems |
| No. 16 | Foam / Water Deluge and Spray Systems |
| No. 17 | Dry Chemical Extinguishing Systems |
| No. 17A | Wet Chemical Extinguishing Systems |
| No. 2001 | Clean Agent Extinguishing Systems |
| No. 70 | National Electric Code |

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- No. 90A Air Conditioning Systems
- No. 92A Smoke Control Systems
- No. 92B Smoke Management Systems in Malls, Atria, Large Areas
- No. 72 National Fire Alarm Code
- No. 101 Life Safety Code

C. Underwriters Laboratories Inc. (UL) – USA

- No. 268 Smoke Detectors for Fire Protective Signaling Systems
- No. 864 Control Units for Fire Protective Signaling Systems
- No. 217 Smoke Detectors, Single and Multiple Station
- No. 228 Door Closers - Holders for Fire Protective Signaling Systems
- No. 268A Smoke Detectors for Duct Applications
- No. 521 Heat Detectors for Fire Protective Signaling Systems
- No. 464 Audible Signaling Appliances
- No. 38 Manually Actuated Signaling Boxes
- No. 1481 Power Supplies for Fire Protective Signaling Systems
- No. 346 Waterflow Indicators for Fire Protective Signaling Systems
- No. 1076 Control Units for Burglar Alarm Proprietary Protective Signaling Systems
- No. 1971 Visual Notification Appliances
- No. 2017 Standard for General-Purpose Signaling Devices and Systems

D. Local and State Building Codes.

E. Latest Adopted Edition of the International Building Code

F. Latest Adopted Edition of the International Fire Code

G. All requirements of the Authority Having Jurisdiction (AHJ)

1.4 APPROVALS

A. The system shall have proper listing and/or approval from the following nationally recognized agencies:

- UL Underwriters Laboratories, Inc.
- FM Factory Mutual
- NYFD New York Fire Department
- CSFM California State Fire Marshal

B. The system shall be listed by national agencies as suitable for extinguishing release applications.

C. The Fire Alarm Control Panel and all transponders shall meet the modular listing requirements of the ninth edition of UL Standard 864 (Control Units). Each subassembly, including all printed circuits, shall include the appropriate UL modular label. This includes all printed circuit board assemblies, power supplies, and enclosure parts. Systems that do not include modular labels may require return to the factory for system upgrades and are not acceptable.

1.5 SCOPE

- A. A new intelligent reporting, microprocessor-controlled fire detection system shall be installed in accordance to the project specifications and drawings.
- B. The system shall be designed such that each signaling line circuit (SLC) is limited to only 80% of its total capacity at initial installation.
- C. Basic Performance:

- 1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC).
- 2. Initiation Device Circuits (IDC) shall be wired Class B (NFPA Style A) as part of an addressable device connected by the SLC Circuit.
- 3. Notification Appliance Circuits (NAC) shall be wired Class B (NFPA Style Y)
- 4. On Style 6 or 7 (Class A) configurations a single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
- 5. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.
- 6. Speaker circuits may be controlled by NAC outputs built into the amplifiers, which shall function as addressable points on the Digital Audio Loop.
- 7. Notification Appliance Circuits (NAC) speaker circuits shall be arranged such that there is a minimum of one speaker circuit per floor of the building or smoke zone whichever is greater.
- 8. Audio amplifiers and tone generating equipment shall be electrically supervised for normal and abnormal conditions.
- 9. Notification Appliance Circuits (NAC) speaker circuits and control equipment shall be arranged such that loss of any one (1) speaker circuit will not cause the loss of any other speaker circuit in the system.
- 10. Speaker circuits shall be arranged such that there is a minimum of one speaker circuit per smoke zone.
- 11. Speaker circuits shall be electrically supervised for open and short circuit conditions. If a short circuit exists on a speaker circuit, it shall not be possible to activate that circuit.
- 12. Audio amplifiers and tone generating equipment shall be electrically supervised for abnormal conditions. Digital amplifiers shall provide built-in speaker circuits, field configurable as four Class B (Style Y), or two Class A (Style Z) circuits.
 - a. Speaker circuits shall be 25 VRMS Speaker circuits shall have 20% space capacity for future expansion or increased power output requirements.

D. Basic System Functional Operation

When a fire alarm condition is detected and reported by one of the systems initiating devices, the following functions shall immediately occur:

- 1. The System Alarm LED shall flash.
- 2. A local piezo electric signal in the control panel shall sound.

3. The touchscreen LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
4. Printing and history storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.
5. All system output programs assigned via control-by-event interlock programming to be activated by the particular point in alarm shall be executed, and the associated system outputs (notification appliances and/or relays) shall be activated.
6. The audio portion of the system shall sound the proper audio signal to the appropriate zones.

1.6 SYSTEM MAINTENANCE ANALYSIS AND REPORTING

- A. The software shall automatically report fire system events during usage and via Push Notifications when the App is not in the foreground on a mobile device. The software shall also record active events during test and inspection mode and capable of silencing alarm/trouble during the test period remotely.
- B. The software shall be capable of downloading and uploading such data to approved handheld devices via web portal or bar codes. Systems that rely solely on the use of bar codes shall not be considered as equal. No proprietary software of any kind shall be required for viewing reports online.
- C. The software shall have the capability to provide several services with open protocol to allow for future expansion. At minimum the software shall have the following functionalities;
 1. Check point access for commissioning.
 2. Detail commissioning reports.
 3. Facility Management.
 4. Service Site Management
 5. Check point remote access for service monitoring
 6. User Management
- D. The software shall be secure and encrypted with user authentication to meet cyber security requirements. Each user shall have a dedicated account with limitations based on designated clearances. Online access to the web-based reporting system shall run 24/7 with no downtime.
- E. Allow active control of fire system during test and inspection when connected to the buildings network for authentication. Off premise services shall only allow for monitoring and history of the system.
- F. Forwarding of event notifications and reports by utilizing a mobile device or PC.
- G. Full capability to monitor an unlimited number of buildings and shall display events customizable to the user.

1.7 SUBMITTALS

- A. General

1. Two copies of all submittals shall be submitted to the Architect/Engineer for review.
2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
3. All substitute equipment proposed as equal to the equipment specified herein, shall meet or exceed the following standards. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. Shop Drawings

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
3. Show annunciator layout, configurations, and terminations.

C. Manuals

1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.
2. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.
4. Approvals will be based on complete submissions of manuals together with shop drawings.

D. Software Modifications

1. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. 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.

E. Certifications

1. Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

1.8 GUARANTY

- A. All work performed, and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one-year period shall be included in the submittal bid.

1.9 POST CONTRACT MAINTENANCE

- A. Complete maintenance and repair service for the fire detection system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of one (1) years after expiration of the guaranty.
- B. As part of the bid/proposal, include a quote for a maintenance contract to provide all maintenance, tests, and repairs described below. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of One (1) year after expiration of the guaranty.
- C. Maintenance and testing shall be on a semiannual basis or as required by the AHJ. A preventive maintenance schedule shall be provided by the contractor describing the protocol for preventive maintenance. The schedule shall include:
 - 1. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, waterflow switches and all accessories of the fire alarm system.
 - 2. Each circuit in the fire alarm system shall be tested semiannually.
 - 3. Each smoke detector shall be tested in accordance with the requirements of NFPA 72 Chapter 7.

1.10 POST CONTRACT EXPANSIONS

- A. The contractor shall have the ability to provide parts and labor to expand the system specified, if so requested, for a period of three (3) years from the date of acceptance.
- B. As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent or addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable monitor modules and addressable modules equal in number to one tenth of the number required to meet this specification (list actual quantity of each type).
- C. The quotation shall include installation, test labor, and labor to reprogram the system for this 10% expansion. If additional FACP hardware is required, include the material and labor necessary to install this hardware.
- D. Do not include cost of conduit or wire or the cost to install conduit or wire.

- E. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

PART 2 - PRODUCTS

2.1 MANUFACTURES

- A. Basis of Design Product: Subject to compliance with requirements, provide product indicated on drawings as manufactured by NOTIFIER; a Honeywell company.

2.2 EQUIPMENT AND MATERIAL, GENERAL

- A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signaling (fire alarm) system. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system. The materials, equipment, and devices shall be tested to function with manufactures approved FACP via a cloud base life safety services system.
- B. The system shall fully comply with commissioning and test and inspect reports as outline in NFPA-72. System test shall automatically retrieve the fire systems connected devices utilizing a gateway. In applications where a gateway is not applicable the systems peripheral devices shall be entered manually and/or by using barcodes.
- C. All equipment and components shall be installed in strict compliance with each manufacturer's recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc. before beginning system installation. Refer to the riser/connection diagram for all specific system installation/termination/wiring data.
- D. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

2.3 CONDUIT AND WIRE

- A. Conduit
 1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
 2. Where possible, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross-sectional area where three or more cables are contained within a single conduit.
 3. Cable must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC Article 760.

4. Wiring for 24-volt control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
5. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
6. Conduit shall be 3/4-inch (19.1 mm) minimum.

B. System Wiring

1. All fire alarm system wiring must be new.
2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for initiating device circuits, signaling line circuits, and notification appliance circuits.
3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NFPA 70 (e.g., FPLR).
5. The system shall permit the use of IDC and NAC wiring in the same conduit with the multiplex communication loop.
6. All field wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, removal of any internal modules, or any open circuits in the field wiring; a trouble signal will be activated until the system and its associated field wiring are restored to normal condition.
7. All analog voice speaker and analog telephone circuits shall use twisted/shielded pair to eliminate cross talk.

C. Terminal Boxes, Junction Boxes

1. All boxes and cabinets shall be UL listed for their intended purpose.

D. Initiating circuits shall be arranged to serve like categories (manual, smoke, waterflow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

E. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold-water pipe or grounding rod.

2.4 MAIN FIRE ALARM CONTROL PANEL

- A. The main FACP Central Console shall be a NOTIFIER INSPIRE N16 Series Model and shall contain a microprocessor based Central Processing Unit (CPU). The FACP shall be a single scalable hardware platform without the need to replace the CPU for future expansion. The CPU

shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, control circuits, and notification appliance circuits, local and remote operator terminals, printers, annunciators, and other system-controlled devices.

- B. The FACP will be based on a licensing model to allow for future expansion. Licensable features shall include but not limited to additional general zones, logic zones, CLIP mode support and network display support. The FACP shall be backwards compatible to support previous Onyx series devices.
- C. The FACP shall be fully networkable to support traditional NOTI-Fire-Net standard and high speed networks.
- D. The main FACP shall include the capability to function as a network control display along with its main functions.
- E. Functionality of the FACP shall allow for the ability to annunciate and specify commands directly from the LED touchscreen without the need of a external programmer.
- F. In conjunction with intelligent Loop Control Modules and Loop Expander Modules, the main FACP shall perform the following functions:
 - 1. Supervise and monitor all intelligent addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions.
 - 2. Supervise all initiating signaling and notification circuits throughout the facility by way of connection to addressable monitor and control modules.
 - 3. Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed. In the event of CPU failure, all SLC loop modules shall fallback to degrade mode. Such degrade mode shall treat the corresponding SLC loop control modules and associated detection devices as conventional two-wire operation. Any activation of a detector in this mode shall automatically activate associated Notification Appliance Circuits.
 - 4. Visually and audibly annunciate any trouble, supervisory, security or alarm condition on operator's terminals, panel display, and annunciators.
 - 5. When a fire alarm condition is detected and reported by one of the systems initiating devices or appliances, the following functions shall immediately occur:
 - a. The system alarm LED shall flash.
 - b. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
 - c. The touchscreen LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
 - d. Printing and history storage equipment shall log and print the event information along with a time and date stamp.
 - e. All system outputs assigned via preprogrammed equations for a particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
 - f. When a trouble condition is detected and reported by one of the systems initiating devices or appliances, the following functions shall immediately occur:

- g. The system trouble LED shall flash.
 - h. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
 - i. The touchscreen LCD display shall indicate all information associated with the trouble condition, including the type of trouble point and its location within the protected premises.
 - j. Printing and history storage equipment shall log and print the event information along with a time and date stamp.
 - k. All system outputs assigned via preprogrammed equations for a particular point in trouble shall be executed, and the associated system outputs (trouble notification appliances and/or relays) shall be activated.
6. When a supervisory, security alarm or pre-alarm condition is detected by an initiating devices or appliance, the following functions shall immediately occur:
- a. The system trouble LED shall flash.
 - b. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
 - c. The touchscreen LCD display shall indicate all information associated with the supervisory condition, including the type of trouble point and its location within the protected premises.
 - d. Printing and history storage equipment shall log and print the event information along with a time and date stamp.
 - e. All system outputs assigned via preprogrammed equations for a particular point in trouble shall be executed, and the associated system outputs (notification appliances and/or relays) shall be activated.

G. Operator Control

- 1. Acknowledge
 - a. Activation of the control panel acknowledge selection in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, selection of acknowledge shall advance the LCD display to the next alarm or trouble condition. In addition, the FACP shall support Block Acknowledge to allow multiple trouble conditions to be acknowledged with a single depression of this switch.
 - b. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.
- 2. Signal Silence
 - a. Selection of the Signal Silence shall cause all programmed alarm notification appliances and relays to return to the normal condition. The selection of notification circuits and relays that are silence able by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.

3. Drill Switch
 - a. Selection of the Drill mode shall activate all programmed notification appliance circuits. The drill function shall latch until the panel is silenced or reset.
4. System Reset
 - a. Selection of the System Reset shall cause all electronically latched initiating devices to return to their normal condition. Initiating devices shall re-report if active. Active notification appliance circuits shall not silence upon Reset. Systems that de-activate and subsequently re-activate notification appliance circuits shall not be considered equal. All programmed Control-By-Event equations shall be re-evaluated after the reset sequence is complete if the initiating condition has cleared. Non-latching trouble conditions shall not clear and re-report upon reset.
5. Lamp Test
 - a. The Lamp Test switch shall activate all local system LEDs, light each segment of the liquid crystal display and display the panel software revision for service personal.
6. Scroll Display Keys
 - a. There shall be Scroll Display keys for FIRE ALARM, SECURITY, SUPERVISORY, TROUBLE, and OTHER EVENTS. Depression of the Scroll Display key shall display the next event in the selected queue allowing the operator to view events by type.
7. Print Screen
 - a. Depression of the PRINT SCREEN switch shall send the information currently displayed on the touchscreen LCD.

H. System Capacity and General Operations

1. The control panel shall be scalable up to 10 SLC modules without the need of replacing the CPU. Each SLC module shall support a maximum of 318 analog/addressable devices for a system capacity of 3180 points. The system shall be capable of up to 4500 annunciation points per system regardless of the number of addressable devices.
2. The Fire Alarm Control Panel shall include a full featured 10 inch 1024x600 resolution LCD with touch capability, including audible and visible feedback, backlit by a long life, solid-state LCD. It shall also include a full QWERTY-style keypad on the color, touchscreen display. The display shall have the ability to scroll events by type (i.e. Fire Alarm, Supervisory Alarm, Trouble, etc) using the touchscreen.
3. The touchscreen LCD shall be intuitive and allow for custom configuration of actional events to be program as a selectable icon on the screen.

4. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel.
5. The FACP shall be able to provide the following software and hardware features:
 - a. Pre-signal and Positive Alarm Sequence: The system shall provide means to cause alarm signals to only sound in specific areas with a delay of the alarm from 60 to up to 180 seconds after start of alarm processing. In addition, a Positive Alarm Sequence selection shall be available that allows a 15-second time period for acknowledging an alarm signal from a fire detection/initiating device. If the alarm is not acknowledged within 15 seconds, all local and remote outputs shall automatically activate immediately.
 - b. Smoke Detector Pre-alarm Indication at Control Panel: To obtain early warning of incipient or potential fire conditions, the system shall support a programmable option to determine system response to real-time detector sensing values above the programmed setting. Two levels of Pre-alarm indication shall be available at the control panel: alert and action.
 - c. Alert: It shall be possible to set individual smoke detectors for pre-programmed pre-alarm thresholds. If the individual threshold is reached, the pre-alarm condition shall be activated.
 - d. Action: If programmed for Action and the detector reaches a level exceeding the pre-programmed level, the control panel shall indicate an action condition. Sounder bases installed with either heat or smoke detectors shall automatically activate on action Pre-Alarm level, with general evacuation on Alarm level.
 - e. The system shall support a detector response time to meet world annunciation requirements of less than 3 seconds.
 - f. Device Blink Control: Means shall be provided to turn off detector/module LED strobes for special areas.
 - g. NFPA 72 Smoke Detector Sensitivity Test: The system shall provide an automatic smoke detector test function that meet the requirements of NFPA 72.
 - h. Programmable Trouble Reminder: The system shall provide means to automatically initiate a reminder that troubles exist in the system. The reminder will appear on the system display and (if enabled) will sound a piezo alarm.
 - i. On-line or Off-line programming: The system shall provide means to allow panel programming either through an off-line software utility program away from the panel or while connected and on-line. The system shall also support upload and download of programmed database and panel executive system program to a Personal Computer/laptop.
 - j. History Events: The panel shall be capable maintaining a history file up to the last 4000 events, each with a time and date stamp. History events shall include all

alarms, troubles, operator actions, and programming entries. The control panels shall also maintain up to a 1000 event Alarm History buffer, which consists of the 1000 most recent alarm events from the 4000-event history file.

- k. The system shall provide means for all SLC devices on any SLC loop to be auto programmed into the system by specific address. The system shall recognize specific device type ID's and associate that ID with the corresponding address of the device.
- l. Drill: The system shall support means to activate all silenceable fire output circuits in the event of a practice evacuation or "drill". If enabled for local control, the front panel switch shall be held for a minimum of 2 seconds prior to activating the drill function.
- m. Passwords and Users: The system shall support two password levels, master and user. Up to 9 user passwords shall be available, each of which may be assigned access to the programming change menus, the alter status menus, or both. Only the master password shall allow access to password change screens.
- n. Two Wire Detection: The system shall support standard two wire detection devices specifically from the following manufacture; System Sensor.
- o. Block Acknowledge: The system shall support a block Acknowledge for Trouble Conditions
- p. Sensitivity Adjust: The system shall provide Automatic Detector Sensitivity Adjust based on Occupancy schedules including a Holiday list of up to 15 days.
- q. Environmental Drift Control: The system shall provide means for setting Environmental Drift Compensation by device. When a detector accumulates dust in the chamber and reaches an unacceptable level but yet still below the allowed limit, the control panel shall indicate a maintenance alert warning. When the detector accumulates dust in the chamber above the allowed limit, the control panel shall indicate a maintenance urgent warning.
- r. Custom Action Messages: The system shall provide means to enter up to 100 custom action messages of up to 160 characters each. It shall be possible to assign any of the 100 messages to any point.
- s. Print Functions: The system shall provide means to obtain a variety of reports listing all event, alarm, trouble, supervisory, or security history. Additional reports shall be available for point activation for the last Walk Test performed, detector maintenance report containing the detector maintenance status of each installed addressable detector, all network parameters, all panel settings including broad cast time, event ordering, and block acknowledge, panel timer values for Auto Silence, Silence Inhibit, AC Fail Delay time and if enabled, Proprietary Reminder, and Remote Reminder timers, supervision settings for power supply and printers, all programmed logic equations, all custom action messages, all non-fire and output activations (if pre-programmed for logging) all active points filtered by alarms only, troubles only, supervisory alarms, prealarms, disabled points and activated

points, all installed points filtered by SLC points, logic zones, annunciators, releasing zones, special zones, and trouble zones.

- t. Local Mode: If communication is lost to the central processor the system shall provide added survivability through the intelligent loop control modules. Inputs from devices connected to the SLC and loop control modules shall activate outputs on the same loop when the inputs and outputs have been set with point programming to participate in local mode or when the type codes are of the same type: that is, an input with a fire alarm type code shall activate an output with a fire alarm type code.
- u. Resound based on type for security or supervisory: The system shall indicate a Security alarm when a monitor module point programmed with a security Type Code activates. If silenced alarms exist, a Security alarm will Resound the panel sounder. The system shall indicate a Supervisory alarm when a monitor module point programmed with a supervisory Type Code activates. If there are silenced alarms, a Supervisory alarm will Resound the panel sounder.
- v. Read status preview - enabled and disabled points: Prior to re-enabling points, the system shall inform the user that a disabled device is in the alarm state. This shall provide notice that the device must be reset before the device is enabled thereby avoiding activation of the notification circuits.
- w. Custom Graphics: When fitted with an LCD display, the panel shall permit uploading of a custom bit-mapped graphic to the display screen.
- x. Multi-Detector and Cooperating Detectors: The system shall provide means to link one detector to up to two detectors at other addresses on the same loop in cooperative multi-detector sensing. There shall be no requirement for sequential addresses on the detectors and the alarm event shall be a result or product of all cooperating detectors chamber readings.
- y. Tracking/Latching Duct (ion and photo): The system shall support both tracking and latching duct detectors either ion or photo types.
- z. One-Man Walk Test: The system shall provide both a basic and advanced walk test for testing the entire fire alarm system. The basic walk test shall allow a single operator to run audible tests on the panel. All logic equation automation shall be suspended during the test and while annunciators can be enabled for the test, all shall default to the disabled state. During an advanced walk test, field-supplied output point programming will react to input stimuli such as CBE and logic equations. When points are activated in advanced test mode, each initiating event shall latch the input. The advanced test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device and wiring operation/verification.
- aa. Multiple agent releasing zones: The system shall support up to 10 releasing zones to protect against 10 independent hazards. Releasing zones shall provide up to three cross-zone and four abort options to satisfy any local jurisdiction

requirements.

- bb. Alarm Verification, by device, with timer and tally: The system shall provide a user-defined global software timer function that can be set for a specific detector or indicating panel module input. The timer function shall delay an alarm signal for a user-specified time period and the control panel shall ignore the alarm verification timer if another alarm is detected during the verification period. It shall also be possible to set a maximum verification count between 0 and 20 with the "0" setting producing no alarm verification. When the counter exceeds the threshold value entered, a trouble shall be generated to the panel.

I. Central Processing Unit

1. The Central Processing Unit shall be the same component with the ability to expand to a larger system as required by the project without the need to be replaced.
2. The Central Processing Unit shall communicate with, monitor, and control all other modules within the control panel. Removal, disconnection or failure of any control panel module shall be detected and reported to the system display by the Central Processing Unit.
3. The Central Processing Unit shall contain and execute all control-by-event (including Boolean functions including but not limited to AND, OR, NOT, ANYx, and CROSSZONE) programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs shall be held in non-volatile programmable memory and shall not be lost with system primary and secondary power failure.
4. The Central Processing Unit shall also provide a real-time clock for time annotation, to the second, of all system events. The time-of-day and date shall not be lost if system primary and secondary power supplies fail.
5. The CPU shall be capable of being programmed on site without requiring the use of any external programming equipment. Systems that require the use of external programmers or change of EPROMs are not acceptable.
6. Consistent with UL864 standards, the CPU and associated equipment are to be protected so that voltage surges or line transients will not affect them.
7. Each peripheral device connected to the CPU shall be continuously scanned for proper operation. Data transmissions between the CPU and peripheral devices shall be reliable and error free. The transmission scheme used shall employ dual transmission or other equivalent error checking techniques.
8. The CPU shall provide an EIA-232 interface between the fire alarm control panel and the UL Listed Electronic Data Processing (EDP) peripherals.
9. The CPU shall provide two EIA-485 ports for the serial connection to annunciation and control subsystem components.
10. The EIA-232 serial output circuit shall be optically isolated to assure protection from earth ground.
11. The CPU shall provide one high-speed serial connection for support of network communication modules.
12. The CPU shall provide double pole relays for FIRE ALARM, SYSTEM TROUBLE, SUPERVISORY, and SECURITY. The SUPERVISORY and SECURITY relays shall provide selection for additional FIRE ALARM contacts.
13. The EIA-485 interface may be used for network connection to a proprietary-receiving unit.

14. An expandable power supply shall be standard to allow for future system modifications without the need to add additional hardware.

J. System Display

1. The system display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.
2. The display assembly shall contain, and display as required, custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.
3. The system display shall provide a 10 inch touchscreen LCD. The interactive touchscreen LCD shall indicate the status of the following system parameters: AC POWER, FIRE ALARM, PREALARM, SECURITY, SUPERVISORY, SYSTEM TROUBLE, OTHER EVENT, SIGNALS SILENCED, POINT DISABLED, and CPU FAILURE.
4. The system display shall provide a QWERTY style keypad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels with up to ten (one Master and nine User) passwords shall be accessible through the display interface assembly to prevent unauthorized system control or programming.
5. The system display shall include the following operator control selections: ACKNOWLEDGE, SIGNAL SILENCE, RESET, DRILL, and LAMP TEST. Additionally, the display interface shall allow scrolling of events by event type including, FIRE ALARM, SECURITY, SUPERVISORY, TROUBLE, and OTHER EVENTS. A PRINT SCREEN button shall be provided for printing the event currently displayed on the LCD.
6. The touchscreen LCD shall be intuitive and allow for custom configuration of actional events to be program as a selectable icon on the screen.

K. Loop (Signaling Line Circuit) Control Module

1. The Loop Control Module shall monitor and control a minimum of 318 intelligent addressable devices. This includes 159 intelligent detectors (Photoelectric, or Thermal) and 159 monitor or control modules.
2. The Loop Control Module shall contain its own microprocessor and shall be capable of operating in a local/degrade mode (any addressable device input shall be capable of activating any or all addressable device outputs) in the unlikely event of a failure in the main CPU.
3. The Loop Control Module shall provide power and communicate with all intelligent addressable detectors and modules on a single pair of wires. This SLC Loop shall be capable of operating as a NFPA Style 6 (Class B) circuit.
4. The SLC interface board shall be able to drive an NFPA Style 6 twisted unshielded circuit up to 12,500 feet in length. The SLC Interface shall also be capable of driving an NFPA Style 6, no twist, no shield circuit for limited distances determined by the manufacturer. In addition, SLC wiring shall meet the listing requirements for it to exit the building or structure. "T"-tapping shall be allowed in either case.
5. The SLC interface board shall receive analog or digital information from all intelligent detectors and shall process this information to determine whether normal, alarm, or trouble conditions exist for that particular device. Each SLC Loop shall be isolated and equipped to annunciate an Earth Fault condition. The SLC interface board software shall include software to automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in

each detector. The analog information may also be used for automatic detector testing and the automatic determination of detector maintenance requirements.

L. Enclosures

1. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
2. The back box and door shall be constructed of 0.060 steel with provisions for electrical conduit connections into the sides and top.
3. The door shall provide a key lock and include a transparent opening for viewing all indicators. For convenience, the door shall have the ability to be hinged on either the right or left-hand side.
4. The control unit shall be modular in structure for ease of installation, maintenance, and future expansion.
5. The FACP shall have a modular dress panel and door design with interchangeable door hinge locations.

SPECIFIER TO REMOVE THE DIGITAL VOICE COMMAND CENTER BELOW IF A VOICE SYSTEM IS NOT A PROJECT REQUIREMENT

M. Digital Voice Command Center

1. The Digital Voice Command Center located with the FACP, shall contain all equipment required for all audio control, signaling and supervisory functions. This shall include speaker zone indication and control, digital voice units, and master microphone
2. Function: The Voice Command Center equipment shall perform the following functions:
 - a. Operate as a supervised multi-channel emergency voice communication system. The system shall have the capability to support up to eight (8) simultaneous messages.
 - b. Operate as a two-way emergency telephone system control center.
 - c. Audibly and visually annunciate the active or trouble condition of every speaker circuit and emergency telephone circuit.
 - d. Audibly and visually annunciate any trouble condition for digital tone and voice units required for normal operation of the system.
 - e. Provide all-call Emergency Paging activities through activation of a single control switch.
 - f. As required, provide vectored paging control to specific audio zones via dedicated control switches.
 - g. Provide a factory recorded "library" of voice messages and tones in standard WAV. File format, which may be edited and saved on a PC running a current Windows® operating system.
 - h. Provide a software utility capable of off-line programming for the DVC operation and the audio message files. This utility shall support the creation of new programs as well as editing and saving existing program files. Uploading or downloading the shall DVC not inhibit the emergency operation of other nodes on the fire alarm network.

- i. Support an optional mode of operation with four analog audio outputs capable of being used with UL 864 fire-listed analog audio amplifiers and SCL controlled switching.
- j. The Digital Voice Command shall be modular in construction, and shall be capable of being field programmable without requiring the return of any components to the manufacturer and without requiring use of any external computers or other programming equipment.
- k. The Digital Voice Command and associated equipment shall be protected against unusually high voltage surges or line transients.

N. Power Supply

- 1. The Addressable Main Power Supply shall operate on 120/240 VAC, 50/60 Hz, and shall provide all necessary power for the FACP.
- 2. The Addressable Main Power Supply shall provide the required power to the CPU using a switching 24 VDC regulator and shall incorporate a battery charger for 24 hours of standby power using dual-rate charging techniques for fast battery recharge.
- 3. The Addressable Main Power Supply shall provide a battery charger for 24 hours of standby using dual-rate charging techniques for fast battery recharge. The supply shall be capable of charging batteries ranging in capacity from 7-200 amp-hours within a 48-hour period.
- 4. The Addressable Main Power Supply shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.
- 5. The Addressable Main Power Supply shall be power-limited per UL864 requirements.

O. Auxiliary Field Power Supply – Addressable

- 1. The auxiliary addressable power supply is a remote 24 VDC power supply used to power Notification Devices and field devices that require regulated 24VDC power. The power supply shall also include and charge backup batteries.
- 2. The addressable power supply for the fire alarm system shall provide up a minimum of 6.0 amps of 24-volt DC regulated power for Notification Appliance Circuit (NAC) power or 5 amps of 24-volt DC general power. The power supply shall have an additional .5 amp of 24 VDC auxiliary power for use within the same cabinet as the power supply. It shall include an integral charger designed to charge 7.0 - 25.0-amp hour batteries.
- 3. The addressable power supply shall provide four individually addressable Notification Appliance Circuits that may be configured as two Class "A" and two Class "B" or four Class "B" only circuits. All circuits shall be power-limited per UL 864 requirements.
- 4. The addressable power supply shall provide built-in synchronization for certain Notification Appliances on each circuit without the need for additional synchronization modules. The power supply's output circuits shall be individually selected for synchronization. A single addressable power supply shall be capable of supporting both synchronized and non-synchronized Notification Devices at the same time.
- 5. The addressable power supply shall operate on 120 or 240 VAC, 50/60 Hz.
- 6. The interface to the power supply from the Fire Alarm Control Panel (FACP) shall be via the Signaling Line Circuit (SLC) or other multiplexed means Power supplies that do not use an intelligent interface are not suitable substitutes. The required wiring from the FACP to the addressable power supply shall be a single unshielded twisted pair wire. Data on the SLC shall be transmitted between 24 VDC, 5 VDC and 0 VDC at approximately 3.33k baud.

7. The addressable power supply shall supervise for battery charging failure, AC power loss, power brownout, battery failure, NAC loss, and optional ground fault detection. In the event of a trouble condition, the addressable power supply shall report the incident and the applicable address to the FACP via the SLC.
8. The addressable power supply shall have an AC Power Loss Delay option. If this option is utilized and the addressable power supply experiences an AC power loss, reporting of the incident to the FACP will be delayed. A delay time of eight or sixteen hours shall be Dip-switch selected.
9. The addressable power supply shall have an option for Canadian Trouble Reporting and this option shall be Dip-switch selectable.
10. The addressable power supply mounts in either the FACP backbox or its own dedicated surface mounted backbox with cover.
11. Each of the power supply's four output circuits shall be DIP-switch selected for Notification Appliance Circuit or General Purpose 24 VDC power. Any output circuit shall be able to provide up to 2.5 amps of 24 VDC power.
12. The addressable power supply's output circuits shall be individually supervised when they are selected to be either a Notification Appliance Circuit when wired Class "A" or by the use of an end-of-line resistor. When the power supply's output circuit is selected as General 24VDC power, the circuit shall be individually supervised when an end-of-line relay is used.
13. When selected for Notification Appliance Circuits, the output circuits shall be individually DIP-switch selectable for Steady, March Time, Dual Stage or Temporal.
14. When selected as a Notification Appliance Circuit, the output circuits of the addressable power supply shall have the option to be coded by the use of a universal zone coder.
15. The addressable power supply shall interface and synchronize with other power supplies of the same type. The required wiring to interface multiple addressable power supplies shall be a single unshielded, twisted pair wire.
16. An individual or multiple interfaced addressable power supplies shall have the option to use an external charger for battery charging. Interfaced power supplies shall have the option to share backup battery power.

P. Field Charging Power Supply

The FCPS is a device designed for use as either a remote 24-volt power supply or used to power Notification Appliances.

1. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) or 10 amps of regulated 24-volt power. It shall include an integral charger designed to charge up to 33-amp hour batteries and to support 60-hour standby.
2. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (two Style Y or Z and two style Y) shall be available for connection to the Notification devices.
3. The FCPS shall include trouble history modes for diagnostic support. FCPS shall include individual NAC power and trouble LEDs for diagnostic efficiency.
4. The Field Charging Power Supply shall include the ability to delay the AC fail delay per NFPA requirements.
5. Self-Contained in compact, locking cabinet constructed of heavy gauge steel with a corrosion-resistant powder coat chip and scratch-resistant finish. Cabinet shall consist of 10 double knockouts and a removable door for ease of installation and wiring.

6. The FCPS shall be capable of utilizing a wide range of end of line supervision values (normal 2K- 27K ohms).
7. The FCPS shall be completely configurable via onboard dip switches, with no extra software required.
8. The FCPS include power limited circuitry, per 1995 UL standards.

Q. System Circuit Supervision

1. The FACP shall supervise all circuits to intelligent devices, transponders, annunciators and peripheral equipment and annunciate loss of communication with these devices. The CPU shall continuously scan above devices for proper system operation and upon loss of response from a device shall sound an audible trouble, indicate which device or devices are not responding and print the information in the history buffer and on the printer.
2. Transponders that lose communication with the CPU shall sound an audible trouble and light an LED indicating loss of communications.
3. Sprinkler system valves, standpipe control valves, PIV, and main gate valves shall be supervised for off-normal position.
4. All speaker and emergency phone circuits shall be supervised for opens and shorts. Each transponder speaker and emergency phone circuit shall have an individual ON/OFF indication (green LED).

R. Field Wiring Terminal Blocks

1. All wiring terminal blocks shall be the plug-in/removable type and shall be capable of terminating up to 12 AWG wire. Terminal blocks that are permanently fixed to the PC board are not acceptable.

SPECIFIER TO REMOVE AUDIO AMPLIFIERS BELOW IF A VOICE SYSTEM IS NOT A PROJECT REQUIREMENT

S. Audio Amplifiers

1. The Audio Amplifiers will provide Audio Power (@25 Volts RMS) for distribution to speaker circuits.
2. Multiple audio amplifiers may be mounted in a single enclosure, either to supply incremental audio power, or to function as an automatically switched backup amplifier(s).
3. The audio amplifier shall provide the following built-in controls:
 - a. Amplifier Address Selection Switches
 - b. Signal Silence of communication loss annunciation Reset
 - c. Level adjustment for background music
 - d. Enable/Disable for Earth Fault detection on DAP A
 - e. Switch for 2-wire/4-wire FFT riser
4. Adjustment of the correct audio level for the amplifier shall not require any special tools or test equipment.
5. Includes audio input and amplified output supervision, back up input, and automatic switch over function, (if primary amplifier should fail).
6. System shall be capable of backing up digital amplifiers.

7. One-to-one backup shall be provided by either a plug-in amplifier card or a designated backup amplifier of identical model as the primary amplifier.
8. One designated backup amplifier shall be capable of backing up multiple primary amplifiers mounted in the same or adjacent cabinets.
9. Multi-channel operation from a single amplifier shall be supported by the addition of an optional plug-in amplifier card.

T. Controls with associated LED Indicators

1. Speaker Switches/Indicators

- a. The speaker circuit control switches/indicators shall include visual indication of active and trouble status for each speaker circuit in the system.
- b. The speaker circuit control panel shall include switches to manually activate or deactivate each speaker circuit in the system.

U. Remote Transmissions

1. Provide local energy or polarity reversal or trip circuits as required.
2. The system shall be capable of operating a polarity reversal or local energy or fire alarm transmitter for automatically transmitting fire information to the fire department.
3. Provide capability and equipment for transmission of zone alarm and trouble signals to remote operator's terminals, system printers and annunciators.
4. Transmitters shall be compatible with the systems and equipment they are connected to such as timing, operation and other required features.

V. System Expansion

1. Design the main FACP and required components so that the system can be expanded in the future (to include the addition of twenty percent more circuits or zones) without disruption or replacement of the existing control panel. This shall include hardware capacity, software capacity and cabinet space.

W. Field Programming

1. The system shall be programmable, configurable and expandable in the field without the need for special tools, laptop computers, or other electronic interface equipment. There shall be no firmware changes required to field modify the system time, point information, equations, or annunciator programming/information.
2. It shall be possible to program through the standard FACP keyboard all system functions.
3. All field defined programs shall be stored in non-volatile memory.
4. Two levels of password protection shall be provided in addition to a key-lock cabinet. One level shall be used for status level changes such as point/zone disable or manual on/off commands (Building Manager). A second (higher-level) shall be used for actual change of the life safety program (installer). These passwords shall be five (5) digits at a minimum. Upon entry of an invalid password for the third time within a one-minute time period an encrypted number shall be displayed. This number can be used as a reference for determining a forgotten password.
5. The system programming shall be "backed" up via an upload/download program and stored on compatible removable media. A system back-up disk shall be completed and

given in duplicate to the building owner and/or operator upon completion of the final inspection. The program that performs this function shall be "non-proprietary", in that, it shall be possible to forward it to the building owner/operator upon his or her request.

6. The installer's field programming and hardware shall be functionally tested on a computer against known parameters/norms which are established by the FACP manufacturer. A software program shall test Input-to-Output correlations, device Type ID associations, point associations, time equations, etc. This test shall be performed on an IBM-compatible PC with a verification software package. A report shall be generated of the test results and two copies turned in to the engineer(s) on record.

X. Specific System Operations

1. Smoke Detector Sensitivity Adjust: Means shall be provided for adjusting the sensitivity of any or all analog intelligent smoke detectors in the system from the system keypad or from the keyboard of the video terminal. Sensitivity range shall be within the allowed UL window.
2. Alarm Verification: Each of the Intelligent Addressable Smoke Detectors in the system may be independently selected and enabled to be an alarm verified detector. The alarm verification function shall be programmable from 5 to 50 seconds and each detector shall be able to be selected for verification during the field programming of the system or any time after system turn-on. Alarm verification shall not require any additional hardware to be added to the control panel. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.

Y. System Point Operations

1. Any addressable device in the system shall have the capability to be enabled or disabled through the system keypad or video terminal.
2. System output points shall be capable of being turned on or off from the system keypad or the video terminal.
3. Point Read: The system shall be able to display the following point status diagnostic functions without the need for peripheral equipment. Each point shall be annunciated for the parameters listed:
 - a. Device Status.
 - b. Device Type.
 - c. Custom Device Label.
 - d. Software Zone Label.
 - e. Device Zone Assignments.
 - f. Analog Detector Sensitivity.
 - g. All Program Parameters.
4. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system statuses:
5. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 4000 system events. Each of these events will be stored, with time and date stamp, until an operator requests that the contents be either displayed or printed. The contents of the history buffer may be manually reviewed; one event at a time, and the actual number of activations may also be

displayed and or printed. History events shall include all alarms, troubles, operator actions, and programming entries.

6. The history buffer shall use non-volatile memory. Systems which use volatile memory for history storage are not acceptable.
7. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent system detector and shall analyze the detector responses over a period of time.
8. If any intelligent detector in the system responds with a reading that is below or above normal limits, then the system will enter the trouble mode, and the particular Intelligent Detector will be annunciated on the system display and printed on the optional system printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
9. The system shall include the ability (programmable) to indicate a "pre-alarm" condition. This will be used to alert maintenance personal when a detector is at 80% of its alarm threshold in a 60 second period.

2.5 CLOUD BASED REPORTING AND MONITORING REQUIREMENTS

- A. All equipment, components and software shall be new and meet manufacturers current model. The materials, equipment, and devices shall be tested to function with manufactures approved FACP via a cloud base life safety services system.
- B. The system shall fully comply with commissioning and test and inspect reports as outline in NFPA-72. System test shall automatically retrieve the fire systems connected devices utilizing a gateway. In applications where a gateway is not applicable the systems peripheral devices shall be entered manually and/or by using barcodes.
- C. CONNECTED LIFE SAFETY SERVICES SOFTWARE PLATFORM
 1. The software shall meet all the requirements outline in the System Maintenance and Analysis Reporting section of this specification.
 - a. System shall be compatible with IOS and Android mobile functionality and have web-based access with Windows and MAC based platforms without the need to install software on a dedicated network server.
 - b. Functions through the mobile App and Web access should have all the following features:
 - 1) Device count per building
 - 2) Event log on App and Web access
 - 3) Control and reporting via Mobile App
 - 4) Automatic data input
 - 5) Automatic report generation
 2. The system shall support an IP based gateway to enable the panel or local Noti-Fire-Net to be connected to an ONYXWorks workstation via the Inter-net or Intranet. This gateway shall also support the ability to integrate the system to an interactive firefighter's display.
 3. Webserver: The system shall support a webserver allowing remote connection via the Internet or Intranet. Authorized users will have the ability to view panel/network history,

event status and device properties. The webserver shall also support sending event information via email or text to up to 50 registered users, the webserver shall be available from the fire alarm control panel manufacturer.

4. Web Portal Interface: The system shall be capable of being interfaced with a web portal to integrate with Inspection and Service Manager utilities. The web portal and inspection and service manager utilities shall be available from the fire alarm control panel manufacturer.

D. CLSS CHECKPOINT HUB GATEWAY

1. Provide a CheckPoint gateway for connection to a NOTIFIER fire system panel, serving as an interface between the FACP, Cloud and peripheral devices. The CheckPoint Hub shall be capable of reading the connected device system data base from a single or network of panels and shall transmit the data to the Connected Life Safety Services (CLSS) cloud.
2. Equipment standard features shall allow Blue Tooth mobile pairing for gateway configuration and control capability.
3. Connection to NOTIFIER INSPIRE N16 series fire system panels utilizing Universal Protocol Ports via RJ45.
4. Provide Nominal Voltage consumption of 12V to 32V DC from the FACP or an external power supply.
5. The CLSS gateway shall allow for alarm transmission to a central station via IP and or GSM.
6. The system shall support the ability for installation and or test and inspection personnel to generate automated commissioning reports or test and inspection reports via the Connected Life Safety Service (CLSS) platform enabling reports to be provided to the appropriate stakeholders immediately after completion of the system commission or test and inspection.
7. The CLSS platform shall support the ability to automatically capture every addressable device connected to the system ensuring that each addressable device is accounted for and properly tested. CLSS shall also support importing any non addressable devices associated with the system to ensure all system devices are accounted for and properly tested.
8. For self-testing devices CLSS shall identify any issues associated the integrity of the ability for the smoke detector to properly detect smoke such as a dust cap not being removed or someone tampering with the detector by obstructing the smoke detector chamber.

REMOVE PARAGRAPH BELOW IF INTERFACE TO A NOTIFIER ONYX SYSTEM VIA A GATEWAY IS NOT REQUIRED

E. DIGITAL ALARM COMMUNICATION TRANSMITTER

1. The CLSS gateway shall include an interface to allow for cell communication, per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events.
2. Communication via cellular shall be concluded by utilizing AT&T or Verizon communication services.

3. The CLSS Gateway shall be completely field programmable utilizing the CLSS mobile app.
4. Communication shall include vital system status such as:
 - a. Independent Zone (Alarm, trouble, non-alarm, supervisory)
 - b. Independent Addressable Device Status
 - c. AC (Mains) Power Loss
 - d. Low Battery and Earth Fault
 - e. System Off Normal
 - f. 12 and 24 Hour Test Signal
 - g. Abnormal Test Signal (per UL requirements)
 - h. EIA-485 Communications Failure
 - i. Phone Line Failure
5. It shall support independent zone/point reporting when used in the Contact ID format. In this format the communicator shall support transmission of up to 2,040 points. This enables the central station to have exact details concerning the origin of the fire or response emergency.

2.6 SYSTEM COMPONENTS

SPECIFIER TO REVIEW AND EDIT NOTIFICATION AND INITIATING DEVICES BELOW THAT ARE NOT REQUIRED FOR THE PROJECT

- A. Speakers: Notifier-System Sensor PN SPRL or SPRL Series
 1. All speakers/audibles shall operate on 25 VRMS or with field selectable output taps from 0.5 to 2.0 Watts.
 2. Speakers/audibles in corridors and public spaces shall produce a nominal sound output of 84 dBA at 10 feet (3m).
 3. Frequency response shall be a minimum of 400 HZ to 4000 HZ. Capable of producing 520 HZ low Frequency for hearing impaired, etc.
 4. The back of each speaker shall be sealed to protect the speaker cone from damage and dust.
- B. Audible/Visual Combination Devices
 1. Shall meet the applicable requirements of Section A listed above for audibility.
 2. Shall meet the requirements of Section D listed below for visibility.
 3. Visuals shall be installed at a height no less than 90 inches from the floor and no less than 6 inches below the finished ceiling when the greater of the two cannot be achieved as required per NFPA-72
- C. Programmable Electronic Sounders
 1. Electronic sounders shall operate on 24 VDC nominal.
 2. Electronic sounders shall be field programmable without the use of special tools, at a sound level of at least 90 dBA measured at 10 feet from the device.

3. Shall be flush or surface mounted as shown on plans.
- D. Strobe lights, such as the Notifier-System Sensor PN SRLseries, shall meet the requirements of the ADA, UL Standard 1971, be fully synchronized, and shall meet the following criteria:
1. The maximum pulse duration shall be 2/10 of one second
 2. Strobe intensity shall meet the requirements of UL 1971.
 3. The flash rate shall meet the requirements of UL 1971.
- E. Manual Fire Alarm Stations
1. Manual fire alarm stations shall be non-code, non-breakglass type, equipped with key lock so that they may be tested without operating the handle.
 2. Stations must be designed such that after an actual activation, they cannot be restored to normal except by key reset.
 3. An operated station shall automatically condition itself so as to be visually detected, as operated, at a minimum distance of 100 feet (30.5 m) front or side.
 4. Manual stations shall be constructed of high impact Lexan, with operating instructions provided on the cover. The word FIRE shall appear on the manual station in letters one half inch (12.7 mm) in size or larger.
 5. Manual Fire Alarm station shall be located within 5ft of each exit door and mounted between 42-48 inches from the finish floor as required per NFPA-72 and ADA requirements.
 6. Add additional manual fire alarm stations when the distance between stations exceed 200ft.
- F. Duct Smoke Detectors
1. Duct smoke detectors shall be a 24 VDC type with visual alarm and power indicators, and a reset switch. Each detector shall be installed upon the composite supply/return air ducts(s), with properly sized air sampling tubes.
- G. Projected Beam Detectors
1. The projected beam type shall 24 VDC device.
 2. The detector shall be listed to UL 268
 3. The detector shall operate in either a short range (16' - 100') or long range (100' - 330') mode.
 4. The temperature range of the device shall be -22 degrees F to 131 degrees F.
 5. The detector shall feature a bank of four alignment LEDs on both the receiver and the transmitter that are used to ensure proper alignment of unit without special tools.
 6. Beam detectors shall feature automatic gain control which will compensate for gradual signal deterioration from dirt accumulation on lenses.
 7. The unit shall be both ceiling and wall mountable.
 8. The detector shall have the ability to be tested using calibrated test filters or magnet activated remote test station.
- H. Waterflow Indicator

1. Waterflow Switches shall be an integral, mechanical, non-coded, non-accumulative retard type.
2. Waterflow Switches shall have an alarm transmission delay time which is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30-45 seconds.
3. All waterflow switches shall come from a single manufacturer and series.
4. Waterflow switches shall be provided and connected under this section but installed by the mechanical contractor.
5. Where possible, locate waterflow switches a minimum of one (1) foot from a fitting which changes the direction of the flow and a minimum of three (3) feet from a valve.

I. Sprinkler and Standpipe Valve Supervisory Switches

1. Each sprinkler system water supply control valve riser, zone control valve, and standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.
2. PIV (post indicator valve) or main gate valves shall be equipped with a supervisory switch.
3. The switch shall be mounted so as not to interfere with the normal operation of the valve and adjusted to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.
4. The supervisory switch shall be contained in a weatherproof aluminum housing, which shall provide a 3/4-inch (19 mm) conduit entrance and incorporate the necessary facilities for attachment to the valves.
5. The switch housing shall be finished in red baked enamel.
6. The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.
7. Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.
 - a. This unit shall provide for each zone: alarm indications, using a red alarm and yellow trouble long-life LEDs and control switches for the control of fire alarm control panel functions. The annunciator will also have an ON-LINE LED, local piezo electric signal, local acknowledge/lamp test switch, and custom slide-in zone/function identification labels.
 - b. Switches shall be available for remote annunciation and control of output points in the system, system acknowledge, telephone zone select, speaker select, global signal silence, and global system reset within the confines of all applicable standards.

J. Annunciator Control Display

1. The annunciator shall provide the FACP or NCD with remote, serially connected annunciators. Arrays of LED's indicate, at a remote location the status of the system. Common system functions such as silence, system reset and local annunciator controls are controlled through switches on the annunciators keypad.
2. The annunciator communicates to the FACP via a two-wire serial interface. Power is provided by the FACP via 24 VDC power and is inherently supervised
3. The LCD annunciator shall display all alarm and trouble conditions in the system.
4. An audible indication of alarm shall be integral to the alphanumeric display.

5. The display shall be UL listed for fire alarm application.
6. It shall be possible to connect up to 32 LCD displays and be capable of wiring distances up to 6,000 feet from the control panel.
7. The annunciator shall connect to a separate, dedicated "terminal mode" EIA-485 interface. This is a two-wire loop connection and shall be capable of distances to 6,000 feet. Each terminal mode LCD display shall mimic the main control panel.
8. Up to 160 annunciators can be supported by the FACP., additionally it shall allow up to 10 annunciators to be configure as routers with each router supporting an additional 15 annunciators.
9. The LED annunciator shall offer an interface to a graphic style annunciator and provide each of the features listed above.

SPECIFIER TO REMOVE NETWORK NODE BELOW IF PANEL NETWORKING IS NOT A PROJECT REQUIREMENT. SPECIFIER TO CHOOSE BETWEEN STANDARD AND HIGHSPEED NETWORK.

2.7 NETWORK NODE

A. Standard Network Communication

1. The network architecture shall be based on a Local Area Network (LAN), a firmware package that utilizes a peer-to-peer, inherently regenerative communication format and protocol. The protocol shall be based on ARCNET or equivalent. The network shall use a deterministic token-passing method. Collision detection and recovery type protocols are not acceptable substitutes due to life safety requirements. In addition, there shall be no master, polling computer, central file computer, display controller or other central element (weak link) in the network which, on failure, may cause complete loss of network communications or cause major degradation of network capability. There shall be no cascading of CPUs or master/slave relationships at the network level to facilitate network communications. Failure of any node shall not cause failure or communication degradation of any other node or change the network communication protocol among surviving nodes located within distance limitations. Each node/panel shall communicate on the network at a baud rate of not less than 312 KBPS (kilo bits per second). A node may be an intelligent Fire Alarm Control Panel (FACP), ONYXWorks Workstation (ONYXWorks), Embedded Gateway, Network Control Annunciator (NCA), BACnet Gateway, Modbus Gateway, or Network Web Server (NWS). The network shall be capable of expansion to at least 103 nodes.
2. Each network node address shall be capable of storing Event equations. The event equations shall be used to activate outputs on one network node from inputs on other network nodes.
3. The network shall be capable of communicating via wire or fiber optic medium. A wire network shall include a fail-safe means of isolating the nodes in the unlikely event of complete power loss to a node.
4. A network repeater shall be available to increase the twisted-pair distance capability in 3,000 ft. increments. As an option, a repeater shall be available for fiber optics that increases the wire distance in 8 dB increments. A mix (hybrid) fiber/wire network repeater shall also be supported. Systems that have distance limitations, and have no available means to regenerate signals are not suitable substitutes.

B. High Speed Network Communication

1. The high-speed network (HS-NCM) architecture shall be based on a Local Area Network (LAN), a firmware package that utilizes a peer-to-peer, inherently regenerative communication format and protocol. The network shall use a deterministic token-passing method. Collision detection and recovery type protocols are not acceptable substitutes due to life safety requirements. In addition, there shall be no master, polling computer, central file computer, display controller or other central element (weak link) in the network which, on failure, may cause complete loss of network communications or cause major degradation of network capability. There shall be no cascading of CPUs or master/slave relationships at the network level to facilitate network communications. Failure of any node shall not cause failure or communication degradation of any other node or change the network communication protocol among surviving nodes located within distance limitations. Each node/panel shall communicate on the network at a baud rate of not less than 3Mbps on wire or 100Mbps on fiber. A node may be an intelligent NOTIFIER INSPIRE N16 Series Fire Alarm Control Panel (FACP), ONYXWorks Workstation (ONYXWorks), Embedded Gateway, Network Control Annunciator (NCA), BACnet Gateway, Modbus Gateway, Digital Voice Command Center (DVC) or Network Web Server (NWS).
2. The network shall be capable of expansion to at least 200 nodes.
3. Network upload/download shall support broadcast and point to point operation.
4. Each network node address shall be capable of storing Event equations. The event equations shall be used to activate outputs on one network node from inputs on other network nodes.
5. The Network shall utilize an IP based Ethernet technology adapted for long range use on wire media using VDSL technology.
6. The Network shall be compatible with multimode and single mode fiber optic media without the use of external converters.
7. The Network shall be fully capable of Style 7 operation.
8. The network shall be capable of communicating via wire (14-18AWG) or fiber optic medium. A wire network shall include a fail-safe means of isolating the nodes in the unlikely event of complete power loss to a node.
9. The high speed (HS-NCM) shall function as a network repeater to increase the twisted-pair distance capability in 3,000 ft. increments. As an option, a HS-NCM shall be available for fiber optics that increases the fiber optic distance in dB increments stated in section 2.3.A.13. A mix (hybrid) fiber/wire network HS-NCM's shall also be supported. Systems that have distance limitations and have no available means to regenerate signals are not suitable substitutes.

SPECIFIER TO REMOVE THE ONYXWorks WORKSTATION BELOW IF A DEDICATED WORKSTATION IS NOT A PROJECT REQUIREMENT.

C. ONYXWorks Workstation

1. The ONYXWorks workstation shall utilize a Microsoft® operating system. Each workstation shall be capable of graphically annunciating and controlling all network activity. Network display devices that are only capable of displaying a subset of network points shall not be suitable substitutes.

2. The ONYXWorks workstation shall be an industrial grade computer with the following minimum requirements: Intel® Dual Core processor, operating at a minimum of 2.16 GHz, 3.2 GB of RAM, 64 MB Video RAM, two 160 GB hard disks, mouse, DVD-ROM/CD-RW, 3PCI / 1 ISA expansion slots, sound card, 300-watt power supply, and SVGA graphics with a screen resolution of 1024 x 768. The ONYXWorks workstation shall include a 19-inch wide-screen LCD monitor.
3. The ONYXWorks workstation shall be capable of storing over 100,000 network events in a history file. Events shall be stored on hard disk and shall be capable of back-up storage to a tape drive. The history buffer allows the operator to view events in a chronological order. A filter shall be available for displaying chronological events by operator, date, time, fire alarms, troubles (including security, supervisory and system/device), disabled points/zones, system programming, operator response and operator log in/log out. The ability to print history files shall also be available.
4. The ONYXWorks workstation shall use a Windows® dialog box technology to address, interrogate, control, and/or modify intelligent points on each fire alarm node. This shall include, and not be limited to: Activating outputs, enabling or disabling points, adding or removing intelligent points, viewing intelligent detector sensitivity levels and modifying point information (custom messages, detector type, verification, day/night selection etc.).
5. The ONYXWorks workstation shall include the ability to display system information in a graphical (floor plan) format. Each view, created using standard Windows® bitmap files, shall include icons created for intelligent devices. These icons shall blink and change to the appropriate programmed icon when an event occurs. When the device has been acknowledged, the icon shall become steady. Once the point has returned to normal, the normal icon is displayed. In addition to the graphical representation of the device, the user shall be able to link pictures, documents, and sound files to the device. The ONYXWorks workstation shall also provide the ability to auto-vector to the floor plan (screen) of the device that is active. By selecting a device in the graphic presentation, the operator of the ONYXWORKS shall have the ability to log onto the corresponding node and interrogate the associated intelligent point.
6. The ONYXWorks workstation shall have the ability to provide the following information through a Windows® pull down menu: An Event Counter that contains the number of new and total events on the network. The information that is displayed shall consist of Fire Alarms, Pre-Alarms, Security Alarms, Supervisory Alarms, and Troubles. Detailed Event window that contains all Off-Normal events, both unacknowledged and acknowledged that are present in the system.
7. The ONYXWorks workstation shall have the option, from a Windows® pull down menu, to connect to a third-party paging service that allows the ONYXWorks workstation to automatically send text-based messages regarding system status to a typical text pager.
8. The ONYXWorks workstation shall be UL-Listed for fire protection (UL864) and burglary (UL1076).
9. The ONYXWorks workstation shall meet FCC regulations (Part 15, subpart J) regardless of its connection means to the network.
10. The ONYXWorks workstation shall have a flexible way of assigning operator passwords. There shall be an unlimited number of possible operators, each with specific levels of control. Each operator shall have his/her own password. Operator password and control selection shall be available to a high level "administrator" who shall have complete control over levels of control.
11. The ONYXWorks workstation shall include an industry-standard EIA-232 port for a UL864 listed printer.

SPECIFIER TO REMOVE NETWORK CONTROL DISPLAY IF A NETWORK REMOTE ANNUNCIATOR IS NOT A PROJECT REQUIREMENT.

D. Network Control Display

1. A Network Control Display (NCD) shall be provided to display all intelligent system points. The NCD shall be capable of displaying information for all events on a fully utilized network of at least 300,000 points. Network display devices that are capable of displaying only a subset of network points shall not be suitable substitutes.
2. The NCD screen shall have a resolution of 1024x600 with touch capability, including audible and visible feedback, backlit by a long life, solid-state LCD. It shall also include a full QWERTY-style keypad on the color, touchscreen display. Additionally, the network display shall have the ability to scroll events by type (i.e. Fire Alarm, Supervisory Alarm, Trouble, etc) using the touchscreen.
3. The NCD shall have the ability to display up to 3,000 events in order of priority and time of occurrence. Counters shall be provided to indicate the total number of events by type.
4. The NCD shall mount in any of the network node fire alarm control panels. Optionally, the network display may mount in a backbox designed for this use. The NCD shall connect to the network over either a wire or fiber interface.
 - a. The NCD shall include touchscreen buttons for system-wide control of Acknowledge, Signal Silence, System Reset, Drill, and local Lamp Test.
 - b. The NCD shall include indication on the touchscreen of Fire Alarm, Trouble, Supervisory, Signals Silenced, Disabled Points, and other (non-fire) events. The NCD will also include LEDs to indicate primary power status and any off-normal event.
 - c. The NCD shall include a Master username and password and up to 49 additional usernames and passwords. Each password shall be up to 16 alpha-numeric characters in length.

2.8 SYSTEM COMPONENTS – ADDRESSABLE DEVICES

A. Addressable Devices – General

1. Addressable devices shall provide an address-setting means using rotary decimal switches. Addressable devices that require the address be programmed using a programming utility are not an allowable substitute.
2. Addressable devices shall use simple to install and maintain decade (numbered 0 to 15) type address switches. Devices which use a binary address or special tools for setting the device address, such as a dip switch are not an allowable substitute.
3. Detectors shall be Analog and Addressable and shall connect to the fire alarm control panel's Signaling Line Circuits.
4. Addressable smoke and thermal detectors shall provide dual (2) status LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the flashing mode operation of the detector LEDs can be programmed off via the fire control panel program.

5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity can be automatically adjusted by the panel on a time-of-day basis.
6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.
7. The detectors shall be ceiling-mount and shall include a separate twist-lock base which includes a tamper proof feature.
8. The following bases and auxiliary functions shall be available:
 - a. Sounder base rated at 85 DBA minimum,
 - b. Form-C Relay base rated 30VDC, 2.0A
 - c. Isolator base
 - d. Where required a Low Frequency 520 HZ
9. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
10. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (example: Duct, PHOTO, THERMAL).
11. Self-testing initiating devices shall be capable of providing both a functional test and smoke entry test using a self-test function. The detector shall transmit a wireless beacon activated only during self-test mode designed to communicate with the CLSS app to prove successful completion of a visual inspection.

SPECIFIER TO REVIEW AND EDIT ADDRESSABLE DETECTION SYSTEMS THAT ARE NOT A PROJECT REQUIREMENT

B. Addressable Vesda VEA Detector

1. An early warning addressable ASD smoke detection system, the VESDA-E VEA shall be installed throughout the areas nominated on the drawings.
2. The ASD shall be capable of connection to the NOTIFIER INSPIRE N16 series Fire Alarm Control Panels via a Signaling Line Circuit (SLC) using the communications protocol native to the system, without the use of any additional hardware. Addressable monitoring modules shall be utilized where direct SLC connectivity is possible.
3. The ASD system shall incorporate addressable microbore sampling tubes and pinpoint locations from where the smoke events are reported.
4. The system will consist of a central housing with 40 microbore sampling tubes that are routed to the protected area with capacity to expand up to 120 microbore sampling tubes.
5. Each sampling point shall be identified in accordance with Codes or Standards. The spacing and location of the sample ports shall be in compliance with NFPA-72 standard detection requirements.
6. The system shall support maximum microbore tube length of 100m (328ft) per tube, however shorter tube lengths may be used as per the manufacturer's guidelines.
7. The system shall incorporate end to end tube integrity and sample point integrity monitoring

8. The system shall incorporate centralized smoke test and maintenance facilities to ensure the proper operation of the smoke sensor module and other system components.
9. The system shall be powered from a regulated supply of nominally 24V DC.
10. The FACP shall be capable of monitoring and annunciating up to four smoke event thresholds on the ASD and several trouble conditions.
11. The detector shall have four output levels for the global detector alarm corresponding to Alert, Action, Fire 1 and Fire 2. The detector program sensitivity for Fire-1 shall base on the desire obscuration level below:

ADJUST SENSITIVITY BELOW TO MEET PROJECT REQUIREMENTS. ONLY SELECT ONE SENSITIVITY LEVEL

High = 1.6% obs/m (0.5% obs/ft),

Enhanced = 4% obs/m (1.3% obs/ft)

Standard = 8% obs/m (2.5% obs/ft)

12. The detector shall have a test port per detection chamber to facilitate centralized smoke test under user control.

C. Addressable Manual Fire Alarm Box (manual station)

1. Addressable manual fire alarm boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
3. Manual fire alarm boxes shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.

D. Addressable Wireless Devices

1. The system shall be capable of supporting intelligent addressable wireless detectors, modules, pull stations and AV devices with similar capabilities as wired addressable intelligent devices.
2. Intelligent wireless devices shall utilize a gateway device to communicate with the intelligent fire alarm control panel, so that the wireless devices report to the panel using the established SLC protocol.
3. Wireless devices shall be capable of co-existing on the same panel with wired devices, and shall be capable of participating in common control-by-event programming sequences.
4. Wireless devices (excepting the gateway) shall operate on batteries recommended by the manufacturer, and shall be UL tested and listed for 2 years of system operation on one set of batteries.
5. Intelligent wireless devices shall use a UL approved Class A mesh communication protocol to provide redundant supervised wireless communication links.

6. Wireless AV systems shall offer synchronization within a single mesh network.
7. Available Wireless devices shall include:
 - a. Intelligent wireless smoke detector (photoelectric technology)
 - b. Intelligent wireless smoke/heat combo detector
 - c. Intelligent wireless fixed temperature heat detector, 135 degrees F.
 - d. Intelligent wireless rate of rise heat detector, 135 degrees F.
 - e. Wireless monitor module
 - f. Wireless relay module
 - g. Wireless synchronization module
 - h. Wireless AV base for use with wired AV devices
 - i. Wireless pull station
 - j. Wireless gateway
8. A program that supports qualification of potential wireless applications, configuration and installation, and diagnostics shall be available. This program shall be installed on a Windows® PC, and shall be capable of communicating with wireless devices by use of a USB adapter that plugs into the computer.

E. Intelligent Photoelectric Smoke Detector

1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

F. Intelligent Thermal Detectors

1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit Fixed Temperature. 195 degrees where required. It shall connect via two wires to the fire alarm control panel signaling line circuit.

G. Self-Testing Photo Smoke Detector

1. Smoke detectors shall be intelligent addressable devices using photoelectric (light-scattering) principal to measure smoke density. It shall connect via two wires to the fire alarm control panel signaling line circuit.
2. The detector shall comply with UL268 7th edition; operating at 24-28V dc, nominal.
3. The self-test sensor shall generate a controlled amount of smoke into the chamber which will test the optics in response to a real smoke simulation.
4. The detector shall also measure the dilution of smoke within a set time frame to determine if there is masking that will prevent smoke from entering the chamber.
5. An alarm condition shall be generated upon smoke entering the chamber.
6. A trouble condition shall be generated if the testing chamber reveals its being blocked.

H. Self-Testing Thermal Detector

1. Thermal detectors shall be intelligent addressable devices rated at 135°F (57.2°C) Fixed Temperature. It shall connect via two wires to the fire alarm control panel signaling line circuit.
2. The detector shall comply with UL521 7th edition; operating at 24-28V dc, nominal.

3. The self-test sensor shall generate energy into an internal thermistor to allow register heat to be identified.
4. The detector shall also measure the cooling of the heating element after it's cycle has been completed.
5. An alarm condition shall be generated upon the introduction of heat from the thermistor.
6. A trouble condition shall be generated if the thermistor does not detect heat.

I. Self-Testing Photo Thermal Detector

1. Photo Thermal detectors shall be intelligent addressable devices using photoelectric (light-scattering) principal to measure smoke density and rated at 135°F (57.2°C) Fixed Temperature. It shall connect via two wires to the fire alarm control panel signaling line circuit.
2. The detector shall comply with UL268 and UL521 7th edition; operating at 24-28V dc, nominal.
3. The self-test sensor shall generate a controlled amount of smoke into the chamber which will test the optics in response to a real smoke simulation and shall generate energy into an internal thermistor to allow register heat to be identified.
4. The detector shall also measure the dilution of smoke within a set time frame to determine if there is masking that will prevent smoke from entering the chamber.
5. The detector shall also measure the cooling of the heating element after its cycle has been completed.
6. An alarm condition shall be generated upon smoke entering the chamber. and heat from the thermistor.
7. A trouble condition shall be generated if the testing chamber reveals its being blocked, or if the thermistor does not detect heat.

J. High Sensitivity Photo Smoke Detector

1. The intelligent high sensitivity photoelectric smoke detector shall include a smoke-sensing chamber and patented optic block designed to amplify signals from smoke.
2. The intelligent LED photo detector shall have nine sensitivity levels and be sensitive to a minimum obscuration of 0.02 percent per foot.
3. The detector shall be listed to meet UL 268 7TH edition requirements and UL268A for duct applications.
4. The intelligent laser photo detector shall support standard, relay, isolator and sounder detector bases.
5. The laser photo detector shall not require other cleaning requirements than those listed in NFPA 72. Replacement, refurbishment or specialized cleaning of the detector head shall not be required.

K. Multi-Criteria Smoke Detectors

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire alarm control unit.
3. Automatically adjusts its sensitivity by means of drift compensation and smoothing algorithms. The detector shall send trouble alarm if it is incapable of compensating for existing conditions.
4. Test button tests all sensors in the detector.

5. An operator at fire alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present sensitivity selected.
 - d. Sensor range (normal, dirty, etc.).
6. Sensors: The detector shall be comprised of four sensing elements including a smoke sensor, a carbon monoxide sensor, an infrared sensor, and a heat sensor.
7. Smoke sensor shall be photoelectric type as described in "System Smoke Detectors" Article.
8. Carbon monoxide sensor shall be as described in "Carbon Monoxide Detectors" Article.
9. Heat sensor shall be as described in "Heat Detectors" Article.
10. Each sensor shall be separately listed according to requirements for its detector type.

SPECIFIER TO REMOVE LOW FREQUENCY SOUNDER BASE BELOW IF SOUNDER BASES ON SMOKE AND HEAT DETECTORS IS NOT A PROJECT REQUIREMENT.

L. Low Frequency Sounder Base

1. Low frequency sounder base shall be listed to UL 268 and UL 464. The low frequency sounder shall have an option to switch between a temporal three-pattern, temporal four-pattern, non-temporal (continuous) or march time pattern.
2. The low frequency sounder base shall offer two volume levels. The alarm current shall not exceed 140 mA at 16 VDC and operate between 10% and 93% relative humidity.
3. The low frequency sounder base shall have the ability to synchronize with notification devices without the use of added accessories. A manual locking feature shall be available to prevent removal of the attached sensor head.

M. Intelligent Duct Smoke Detector

1. The smoke detector housing shall accommodate intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.
2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

N. Addressable Control Module

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances.
2. The control module NAC may be wired for Style Z or Style Y (Class A/B) with a current rating of 2 Amps for Style Z and 3 Amps for Style Y. For speaker applications the module is rated for 50 watts at 25 or 70.7.
3. Audio/visual power shall be provided by a separate supervised power circuit from the main fire alarm control panel or from a supervised UL listed remote power supply.

4. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.
5. For multiple circuit control a module shall be available that provides 6 Style B or 3 Style D control circuits.

O. Addressable Relay Module

1. Addressable Relay Modules shall be available for HVAC control and other building functions. The module shall provide two form C relays rated at up to 3 Amps resistive and up to 2.0 Amps inductive. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to ensure that 100% of all auxiliary devices energize at the same time on the same pair of wires.
2. For multiple relay control a module shall be available that provides 6 programmable Form-C relays.

P. Addressable Releasing Control Module

1. An addressable FlashScan releasing module shall be available to supervise and control compatible releasing agent solenoids.
2. The module shall operate on a redundant protocol for added protection.
3. The module shall be configurable for Style Z or Style Y (Class A/B) and support one 24 volt or two 12-volt solenoids.

Q. Isolator Module

1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or Class B branch. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building.
2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
3. The isolator module shall not require address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
4. The isolator module shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

R. Serially Connected Annunciator Requirements

1. The annunciator shall communicate to the fire alarm control panel via an EIA 485 (multi-drop) two-wire communications loop. The system shall support two 6,000 ft. EIA-485 wire runs. Up to 32 annunciators, each configured up to 96 points, may be connected to the connection, for a system capacity of 3,072 points of annunciation.
2. An EIA-485 repeater shall be available to extend the EIA-485 wire distance in 3,000 ft. increments. An optional version shall allow the EIA-485 circuit to be transmitted over Fiber optics. The repeater shall be UL864 approved.

3. Each annunciator shall provide up to 96 alarm and 97 trouble indications using a long-life programmable color LED's. Up to 96 control switches shall also be available for the control of Fire Alarm Control Panel functions. The annunciator will also have an "ON-LINE" LED, local piezo sounder, local acknowledge and lamp test switch, and custom zone/function identification labels.
4. The annunciator may be field configured to operate as a "Fan Control Annunciator". When configured as "Fan Control," the annunciator may be used to manually control fan or damper operation and can be set to override automatic commands to all fans/dampers programmed to the annunciator.
5. Annunciator switches may be programmed for System control such as, Global Acknowledge, Global Signal Silence, Global System Reset, and on/off control of any control point in the system.
6. An optional module shall be available to utilize annunciator points to drive EIA-485 driven relays. This shall extend the system point capacity by 3,072 remote contacts.
7. The LED annunciator shall offer an interface to a graphic style annunciator and provide each of the features listed above.

S. CO Detectors

1. The detector shall have the ability to detect Carbon Monoxide gases in compliance with UL 2075.
2. The detector shall automatically include drift compensation of CO cell.
3. Provide a 24 Volt with Integral Sounder base connected to the SLC Addressable Circuit. Sounder shall be capable of providing a Temp 4 pattern for CO Alarm indication.
4. The sounder bases shall synchronize with it's native system.

T. Photoelectric CO detectors

1. The detector shall have dual functionality to detect Carbon Monoxide gases in compliance with UL 2075 use photoelectric principle to measure smoke density in accordance with UL268 7TH edition.
2. The detector shall automatically include drift compensation of CO cell.
3. Provide a 24 Volt with Integral Sounder base connected to the SLC Addressable Circuit. Sounder shall be capable of providing a Temp 4 pattern for CO Alarm indication and a Temp 3 for Fire conditions.
4. The sounder bases shall synchronize with its native system.

2.9 BATTERIES AND EXTERNAL CHARGER

A. Battery

1. Shall be 12 volt, Gell-Cell type.
2. Battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.
3. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.

B. External Battery Charger

1. Shall be completely automatic, with constant potential charger maintaining the battery fully charged under all service conditions. Charger shall operate from a 120/240-volt 50/60 hertz source.
2. Shall be rated for fully charging a completely discharged battery within 48 hours while simultaneously supplying any loads connected to the battery.
3. Shall have protection to prevent discharge through the charger.
4. Shall have protection for overloads and short circuits on both AC and DC sides.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
- B. All conduit, junction boxes, conduit supports, and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
- C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
- D. Manual Pull Stations shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches, nor more than 48 inches above the finished floor.

3.2 TYPICAL OPERATION

- A. Actuation of any manual station, smoke detector heat detector or water flow switch shall cause the following operations to occur unless otherwise specified:
 1. Activate all programmed speaker circuits.
 2. Actuate all strobe units until the panel is reset.
 3. Light the associated indicators corresponding to active speaker circuits.
 4. Release all magnetic door holders to doors to adjacent zones on the floor from that the alarm was initiated.
 5. Return all elevators to the primary or alternate floor of egress.
 6. A smoke detector in any elevator lobby shall, in addition to the above functions, return all elevators to the primary or alternate floor of egress.
 7. Smoke detectors in the elevator machine room or top of hoistway shall return all elevators in to the primary or alternate floor. Smoke detectors or heat detectors installed to shut down elevator power shall do so in accordance with ANSI A17.1 requirements and be coordinated with the electrical contractor.
 8. Duct type smoke detectors shall, in addition to the above functions shut down the ventilation system or close associated control dampers as appropriate.

9. Activation of any sprinkler system low pressure switch or valve tamper switch shall cause a system supervisory alarm indication.

3.3 TEST AND INSPECTION REPORT

- A. Only a factory-authorized service representative trained shall be allowed to test and inspect components, assemblies, and equipment installations, including connections.
- B. All test and inspection shall be completed by using the CLSS platform.
- C. Perform the following tests and inspections via the mobile app:
 1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Documentation" chapter in NFPA 72.
 - b. Comply with the "Visual Inspection" table in the "Inspection" section of the "Inspection, Testing, and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
 2. Verification shall take place carrying out an automated self-testing process (without need of manual intervention or a smoke/ heat pole). The detectors shall be able to carry out the following;
 - a. Functional test on heat or smoke
 - b. Smoke entry test for smoke alarms
 - c. Determine that the dust cover is in place during construction.
 - d. Determine that the dust cover has been removed when the building becomes ready for occupation.
 - e. Provide an automated summary report of above points.
 3. The system will register real events from all initiating devices not in test mode after each test. Upon an alarm condition during the self-test process the system will be overwritten and initiate an alarm at the FACP.
 4. System Testing: Comply with the "Testing" table in the "Testing" section of the "Inspection, Testing, and Maintenance" chapter in NFPA 72.
 5. During inspection the software shall automatically comply and generate "Fire Alarm System Record of Completion" in the "Documentation" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing, and Maintenance" chapter in NFPA 72.
- D. Annual Test and Inspection: One year after date of Substantial Completion, test fire alarm system complying with visual and testing inspection requirements in NFPA 72. A report shall be automatically be generated from the mobile app upon completion and provide to applicable parties.

3.4 SYSTEM TEST

- A. Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.
- B. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
- C. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
- D. Verify activation of all flow switches.
- E. Open initiating device circuits and verify that the trouble signal actuates.
- F. Open signaling line circuits and verify that the trouble signal actuates.
- G. Open and short notification appliance circuits and verify that trouble signal actuates.
- H. Ground initiating device circuits and verify response of trouble signals.
- I. Ground signaling line circuits and verify response of trouble signals.
- J. Ground notification appliance circuits and verify response of trouble signals.
- K. Check presence and audibility of tone at all alarm notification devices.
- L. Check installation, supervision, and operation of all intelligent smoke detectors during a walk test.
- M. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
- N. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.5 FINAL INSPECTION

- A. At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.

3.6 INSTRUCTION

- A. Provide instruction as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

- B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

END OF SECTION