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Engineering Specification – Section 13850 (28 31 00)

FIRE DETECTION AND ALARM SYSTEM

Intelligent Fire Alarm Detection System

[REV A 11/11/2022]

1 Table of Contents

PART 1 - GENERAL	3
1.1 RELATED SECTIONS	3
1.2 SUMMARY	3
1.3 APPLICABLE STANDARDS AND SPECIFICATIONS	5
1.4 APPROVALS	6
1.5 SCOPE	6
1.6 SYSTEM MAINTENANCE ANALYSIS AND REPORTING	8
1.7 SUBMITTALS	8
1.8 GUARANTY	9
1.9 POST CONTRACT MAINTENANCE	10
1.10 POST CONTRACT EXPANSIONS	10
PART 2 - PRODUCTS	11
2.1 MANUFACTURER	11
2.2 EQUIPMENT AND MATERIAL, GENERAL	11
2.3 CONDUIT AND WIRE	11
2.4 MAIN FIRE ALARM CONTROL UNIT	12
2.5 CLOUD BASED REPORTING AND MONITORING REQUIREMENTS	28
2.6 SYSTEM COMPONENTS	30
2.7 NETWORK NODE	33
2.8 SYSTEM COMPONENTS – ADDRESSABLE DEVICES	35
2.9 PC BASED GRAPHICAL FACILITIES MONITORING SYSTEM	43
2.10 BATTERIES AND EXTERNAL CHARGER	48
PART 3 - EXECUTION	49
3.1 INSTALLATION	49
A. 3.2 TYPICAL OPERATION	49
B. 3.3 TEST AND INSPECTION REPORT	49
C. 3.4 SYSTEM TEST	50
D. 3.5 FINAL INSPECTION	51
E. 3.6 INSTRUCTION	51

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 Fire Alarm Control Unit 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 Unit (FACU) indicating that the device and its associated circuit wiring is functional. Loss of this signal at the main FACU 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 (EVACS). 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)

Intelligent Fire Alarm Detection System

[REV A 11/11/2022]

shall also support 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 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 where necessary.
- 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 comply with the UL listing.
- I. The installing company shall employ NICET (minimum Level II Fire Alarm Systems) 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:
 - Main Fire Alarm Control Unit
 - Signal Line Circuit Control Module
 - Enclosures
 - Digital Voice Command Center
 - Addressable Main Power Supply

- Auxiliary Addressable Power Supply
- Power Supply Expander
- System Circuit Supervision
- Audio Amplifiers
- CLSS Gateway
- Digital Alarm Communicator Transmitter
- Speaker Notification Devices
- Audible/Visual Combination Devices
- Manual Fire Alarm Stations
- Projected Beam Detectors
- Waterflow Indicator
- Annunciator Control Display
- Network Node Communication
- ONYX Works Workstation
- Network Control Display
- Gateway Communication
- Addressable Wireless Devices
- Intelligent Photoelectric Smoke Detectors
- Intelligent Thermal Detectors
- Self-testing Photoelectric Smoke Detectors
- Self-testing Thermal Detectors
- Self-testing Photo Thermal Detectors
- High Sensitivity Photo Smoke Detectors
- Multi-Criteria Smoke Detectors
- Low Frequency Sounder Base
- Intelligent Duct Smoke Detectors
- CO Detectors
- Photoelectric Smoke and CO Detectors
- 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
 - No. 13 Sprinkler Systems
 - No. 70 National Electric Code
 - No. 90A Air Conditioning Systems
 - 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 Fire Alarm Control Unit and all transponders shall meet the modular listing requirements of the tenth 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 Class <A, B or X> Signaling Line Circuits (SLC).
2. Initiation Device Circuits (IDC) shall be wired Class <A or B> as part of an addressable device connected by the SLC Circuit.
3. Notification Appliance Circuits (NAC) shall be wired Class <A or B>
4. On 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 FACU 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, two or four Class A circuits where necessary
 - a. Speaker circuits shall be <25 or 70V> 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 shall flash on display.
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 Unit 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 FACU 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 MANUFACTURER

- 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 FACU 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 Unit, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACU 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 Unit 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 Unit 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 UNIT

- A. The main FACU Central Console shall be a NOTIFIER INSPIRE N16 Series Model and shall contain a microprocessor based Central Processing Unit (CPU). 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 FACU 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 FACU shall be backwards compatible to support previous Onyx series devices.
- C. The FACU shall be fully networkable to support traditional NOTI-Fire-Net standard and high speed networks.
- D. The main FACU shall include the capability to function as a master network controller along with its main functions.
- E. Functionality of the FACU 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 Signaling Loop Modules the main FACU 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 local mode. Such local 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.

Visually and audibly annunciate any trouble, supervisory, security or fire or CO (Carbon Monoxide) alarm condition on operator's terminals, panel display, and annunciators.
 - 4. 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 shall flash on the display.
 - 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 shall flash on the display.

- 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 shall flash on the display.
 - 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 indicators 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 FACU shall support Block Acknowledge to allow multiple trouble conditions to be acknowledged with a single tap on the touchscreen button
- b. Tapping on the Acknowledge button shall also silence all remote annunciator piezo sounders.

2. Signal Silence

- a. Tapping of the Signal Silence button shall cause all programmed alarm notification appliances and relays to return to the normal condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACU software shall include silence inhibit and auto-silence timers.

3. Drill Switch

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

Tapping the System Reset button 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

Tapping the Lamp Test button shall activate all local system LED's as well as illuminate the LCD display.

6. About Screen

The system shall provide an "About Screen" that offers panel software and hardware version as well as provide a means to upgrade the software for service personnel.

7. Scrolling

a. Provide a programmable Alert bar such that Tapping on an active events category in the Alert Bar shall vector the display to those categorized events including but not limited to, Fire Alarm, Supervisory, Trouble, CO Alarm and Disable. Tapping on the display and dragging in a upward or downward motion shall scroll through active events

8. Printing

a. When connected to a supported printer the panel shall print live events. History may also be exported to USB drive.

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 SLM module shall support a maximum of 318 analog/addressable devices for a system capacity of 3,180 points. The system shall be capable of up to 2,400 annunciation points per system regardless of the number of addressable devices.
2. The Fire Alarm Control Unit shall include a full featured high definition 10 inch color 1024x600 resolution LCD with capacitive touch display, including audible and visible feedback, adjustable brightness solid-state LCD. It shall also include a graphical 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 actionable events to be program as a selectable icon on the screen.
4. The touchscreen LCD 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
5. The panel display may be converted to a Network control display through licensing
6. The touchscreen LCD shall include indication of Fire Alarm, CO Alarm, Trouble, Supervisory, Signals Silenced, Disabled Points, and other (non-fire) events. The LCD will also include LEDs to indicate primary power status and any off-normal event
7. 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 Unit.
8. The FACU shall be able to provide the following software and hardware features:
 - a. Pre-signal and Alarm Delay: 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, an Alarm Delay 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: Provide a means to enable or disable detector/module LED indicators 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 a Fire Alarm or CO Alarm or supervisory event or 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 or Remote 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 online or remotely connected to the panel via a secured gateway. The system shall also support upload and download of programmed database to a Personal Computer/cloud.
- j. History Events: The panel shall be capable maintaining a history file up to the last 10,000 events, each with a time and date stamp and shall allow to scroll through all stored events. History events shall include all alarms, troubles, operator actions, and programming entries. The control panels shall be able to export the history to a USB drive.
- 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 silence able 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 5 access levels System Operator, Building Maintenance User, Technician User, Admin User, Master User. and up to 50 usernames and passwords. Each role has default permissions that can be customized. 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 manufacturer; System Sensor.
- o. Block Acknowledge: The system shall support a block Acknowledge for Trouble and Disable conditions

- p. Service mode: Panel shall support a Service Mode in which state, the panel can be accessed remotely for programming, testing and control. Service mode shall have a time out feature that can be customized. While in Service Mode the panel shall display a trouble condition.
- q. Magnet test – Panel shall support A/V magnet test with compatible A/V appliances which allows to test individual A/V appliances on the NAC circuit by applying the magnet to appliance shortly without activating the entire circuit minimizing disruptions during testing and inspection
- r. Sensitivity Adjust: The system shall provide Automatic Detector Sensitivity Adjust based on Occupancy schedules including a Holiday list of up to 15 days.
- s. 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.
- t. 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.
- u. Custom Action Button: Panel will support up to 32 programmable custom action buttons on the LCD touchscreen display to enable/disable or control panel outputs without the use of additional hardware
- v. Print Functions: When connected to a supported printer the panel shall print live events. History may also be exported to USB drive
- w. 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.
- x. 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.

- y. 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.
- z. Custom Wallpaper: The panel display shall permit uploading of a custom background wallpaper.
- aa. 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.
- bb. Tracking/Latching Ductdetector : The system shall support both tracking and latching duct detectors photo types.
- cc. 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.
5. Consistent with UL864 standards, the CPU and associated equipment are to be protected so that voltage surges or line transients will not affect them.
6. 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.

7. The CPU shall provide three EIA-485 ports for the serial connection to annunciation and control subsystem components.
8. The EIA-232 serial output circuit shall be optically isolated to assure protection from earth ground.
9. The CPU shall provide one high-speed serial connection for support of network communication modules.
10. The CPU shall provide a trouble relay.
11. The EIA-232 interface may be used for network connection to a proprietary-receiving unit.
12. An expandable power supply shall be allowed for future system modifications.

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 operational parameters.
2. The display assembly shall contain, and display as required, custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.
The system display shall provide a full featured high definition 10 inch color LCD with touch capability display, including audible and visible feedback, adjustable brightness solid-state LCD. It shall also include a graphical QWERTY-style keypad when needed 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. The display 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 any off normal conditions.
3. The system display shall provide a graphical QWERTY style keypad when needed with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Five access levels System Operator, Building Maintenance User, Technician User, Admin User, Master User. Up to 50 usernames and passwords shall be accessible through the display interface to prevent unauthorized system control or programming.
4. 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 active events including,
5. FIRE ALARM, CO ALARM, SECURITY, SUPERVISORY, TROUBLE, DISABLE and OTHER EVENTS. 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/ 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 Class A, B or X circuit.
4. The SLC interface board shall be able to drive a twisted unshielded circuit up to 12,500 feet in length. The SLC Interface shall also be capable of driving an NFPA Class A, 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 and dress plates can be installed and removed without requiring any specialized tools.
4. The control unit shall be modular in structure for ease of installation, maintenance, and future expansion.
5. The FACU 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 FACU, 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. Addressable Main Power Supply

- 1. The Addressable Main Power Supply shall be universal input and shall accept either 120/240 VAC, 50/60 Hz, without any modifications and shall provide all necessary power for the FACU.
- 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 7-100 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.
- 6. Up to three addressable main power supplies may be added within the same FACU to expand power capacity

7. Each addressable main power supply shall provide a minimum of 4 programmable Notification appliance circuits (NAC)
8. Power distribution of Each addressable main power supply can be customizable to provide system power, NAC, power, Auxillary power and battery charging

O. Auxiliary Addressable Power Supply

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 Unit (FACU) 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 FACU 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 FACU 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 FACU 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 FACU 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. Power Supply Expander

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

1. The PSE shall offer up to 6.0 amps or 10 amps of regulated 24volt power. It shall include an integral charger designed to charge up to 33-amp hour batteries.
2. The Power Supply Expanders shall have two or three fully isolated input triggers configurable, pairing any input with any output. The input trigger shall be a Notification Appliance Circuit (from the Fire Alarm Control Unit) or a control module. Five or Seven outputs shall be available for connection to the Notification devices Class B or Class A (without losing any output using converter card)
3. UL-Listed NAC synchronization using System Sensor, Wheelock, Gentex or AMSECO appliances. Sync signal maybe triggered from FACU NAC or remote sync outputs allowing cascading or daisy chain multiple power supplies.
4. The PSE shall include trouble history modes for diagnostic support. PSE shall include individual NAC power and trouble LEDs for diagnostic efficiency.
5. The Power Supply Expanders shall include the ability to delay the AC fail delay per NFPA requirements.
6. 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.
7. The PSE shall be capable of utilizing a wide range of end of line supervision values (normal 2K- 27K ohms).
8. The PSE shall be completely configurable via onboard dip switches, with no extra software required.

Q. System Circuit Supervision

1. The FACU 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

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 & 70V 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. Audio Message Generator (Prerecorded Voice)/Speaker Control:

1. Each initiating zone or intelligent device shall interface with an emergency voice communication system capable of transmitting a prerecorded voice message to all speakers in the building.

2. Actuation of any alarm initiating device shall cause a prerecorded message to sound over the speakers. The message shall be repeated four (4) times. Pre- and post-message tones shall be supported.
3. A built-in microphone shall be provided to allow paging through speaker circuits.
4. System paging from emergency telephone circuits shall be supported.
5. The audio message generator shall have the following indicators and controls to allow for proper operator understanding and control:
 - Lamp Test
 - Trouble
 - Off-Line Trouble
 - Microphone Trouble
 - Phone Trouble
 - Busy/Wait
 - Page Inhibited
 - Post Announcement Tone
6. Emergency Two-Way Telephone Control Switches/Indicators:
 - The emergency telephone circuit control panel shall include visual indication of active and trouble status for each telephone circuit in the system.
 - The telephone circuit control panel shall include switches to manually activate or deactivate each telephone circuit in the system.

U. 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.

V. 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.

W. System Expansion

1. Design the main FACU 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.

X. Field Programming

1. The system shall be programmable, configurable and expandable in the field using the programming utility provided by the manufacturer .
2. All field defined programs shall be stored in non-volatile memory.
3. Five levels of password protection shall be provided in addition to a key-lock cabinet. Building Maintenance User, Technician User, Admin User, Master User and up to 50 usernames and passwords. Each role has default permissions that can be customized. Only the master password shall allow access to password change screens.
4. The system shall enforce the change from factory default password and it shall be a minimum of Eight (8) characters with a maximum of 16
 5. The system programming shall be "backed" up via an upload/download program and stored on compatible removable media and also provide means to backup the file to the cloud.
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 FACU 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 windows-compatible PC with a verification software package. A system generated report of the test results shall be provided to the engineer(s) on record.

Y. 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 FACU 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.

Z. System Point Operations

1. Any addressable device in the system shall have the capability to be enabled or disabled through the system display.
2. System output points shall be capable of being turned on or off from the system display
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 History Recording and Reporting: The Fire Alarm Control Unit shall contain a history buffer that will be capable of storing up to 10000 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.
 5. The history buffer shall use non-volatile memory. Systems which use volatile memory for history storage are not acceptable.
 6. Automatic Detector Maintenance Alert: The Fire Alarm Control Unit shall automatically interrogate each intelligent system detector and shall analyze the detector responses over a period of time.
 7. 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.
 8. 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 manufacturer's current model. The materials, equipment, and devices shall be tested to function with manufacture's approved FACU via a cloud-based life safety services system.
- B. The system shall fully comply with commissioning and test and inspect reports as outlined 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 imported from the panel programming file, 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
 - 6) Cause & Effect testing
 - 7) Ability to change panel device labels
2. The system shall support an IP based gateway to enable the panel or local Noti-Fire-Net to be connected to an ONYX-Works workstation via the Inter-net or Intranet. This gateway shall also support the ability to integrate the system to an interactive firefighter's display.
- D. Permanently installed Fixed Gateway: The system shall be capable of being interfaced with a fixed gateway to integrate with 3rd Party Service Management Software.
- E. CLSS Gateway:
- 1. Provide a CLSS gateway for connection to a NOTIFIER fire system panel, serving as an interface between the FACU, Cloud and peripheral devices. The CLSS gateway 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 NUP
 - 4. Provide Nominal Voltage consumption of 12V to 32V DC from the FACU or an external power supply.
 - 5. The CLSS gateway shall allow for alarm transmission to a central station via IP and CELLULAR (LTE).
 - 6. The system shall support the ability to generate automated commissioning reports or test and inspection reports for installation or test & inspection personnel via the Connected Life Safety Service (CLSS) platform. The reports should be stored in cloud, enabling appropriate stakeholders to retrieve test and inspect report immediately after completion of the system commissioning or test and inspection.
 - 7. Inspection report shall indicate the method in which the device disposition was captured. Either by event received from a connected gateway, barcode scan, or manual user entry,
 - 8. 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.

9. For self-testing devices CLSS shall identify any issues associated with the integrity or 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.
10. The CLSS Gateway shall support the ability to send events from a single Notifier N16 panel or a network of up to 16 panels using standard BACnet communications protocol
11. The CLSS Gateway shall support the ability to send events from single Notifier N16 panel or a network of up to 10 panels using standard MODbus communications protocol

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

F. 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. Diagnostic information such as cell signal strength, connection method, and connection status of the communicator should be available to users via the website and mobile app.
4. Communication shall include vital system status such as:
 - 1 Independent Zone (Alarm, trouble, non-alarm, supervisory)
 - 2 Independent Addressable Device Status
 - 3 AC (Mains) Power Loss
 - 4 Low Battery and Earth Fault
 - 5 System Off Normal
 - 6 6, 12 or 24 Hour Test Signal
 - 7 Abnormal Test Signal (per UL requirements)
 - 8 Communications Failure between panel and gateway
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 3180 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 70VRMS 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.

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 80 dBA measured at 10 feet from the device & low frequency 520Hz sounders shall provide sound level at least 75 dBA measured at the pillow per NFPA 72
3. Shall be flush or surface mounted as shown on plans.

D. Strobe lights, such as the Notifier-System Sensor PN SRL series, 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 20 milliseconds.
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-break glass 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 exceeds 200ft.

F. Intelligent Duct Smoke Detector

The smoke detector housing shall accommodate an intelligent photoelectric detector that provides continuous analog monitoring and alarm verification from the panel. 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. The Intelligent Duct Smoke Detector shall support the installation of addressable Photoelectric detector capable or being tested remotely. The Intelligent Duct Detector housing shall be model # DNR(W) and the remote test capable photoelectric smoke detector shall be NOTIFIER model # FSP-951R.

G. Projected Beam Detectors

1. The projected beam type shall 24 VDC device.
2. The detector shall be listed to UL 268A
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 Monitoring

1. The FACU shall be capable of monitoring any 3rd party water flow devices and annunciating with unique indication for alarm or supervisory condition
2. The FACU addressable monitoring point shall monitor normally open contacts and display status
3. Need to add points around monitoring for opens/shorts, ground faults

I. LED Annunciator Control Display

1. The annunciator shall provide the FACU or NCD with local or remote, serially connected annunciators. Arrays of LED's indicate, at the panel or at the remote location the status of the system.
2. The annunciator shall provide 60 RGB LEDs allowing for multiple programmable color indications
3. The annunciator shall provide 30 capacitive touch programmable control points.

4. The annunciator communicates to the FACU via a two-wire serial interface. Power is provided by the FACU via 24 VDC power and is inherently supervised
5. Up to 80 annunciators can be supported by the FACU., it shall allow up to 10 annunciators to be configured as routers with each router supporting an additional 15 annunciators

J. Remote LCD annunciator

1. The 5inch capacitive full color touchscreen LCD annunciator shall display all system events.
2. An audible indication of alarm shall be integral to the display.
3. The display shall be UL listed for fire alarm application.
4. It shall be possible to connect up to 10 LCD displays and be capable of wiring distances up to 6,000 feet from the control panel.
5. Each LCD display shall mimic the main control panel.

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 (kilobits per second). A node may be an intelligent Fire Alarm Control Unit (FACU), ONYX Workstation (ONYX Works), Gateways (Modbus protocol, BACnet protocol etc), , Network Control Display (NCD), 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 Unit (FACU), ONYX Works Workstation (ONYX Works), Gateways (Modbus protocol, BACnet protocol etc), Network Control Display (NCD), Digital Voice Command Center (DVC) or
The network shall be capable of expansion to at least 200 nodes using high speed network cards.
2. Network shall allow upload/download of configuration data to panels on the network on site or remotely via a secured gateway
3. 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.
4. The high-speed Network shall utilize an IP based Ethernet technology adapted for long range use on wire media using VDSL technology.
5. The Network shall be compatible with multimode and single mode fiber optic media without the use of external converters.
6. The Network shall be fully capable of Class X operation.
7. 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.
8. 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 NETWORK CONTROL DISPLAY IF A NETWORK REMOTE ANNUNCIATOR IS NOT A PROJECT REQUIREMENT.

C. 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 include a full featured high definition 10-inch color 1024x600 resolution LCD with capacitive touch display, including audible and visible feedback, adjustable brightness solid-state LCD. It shall also include a graphical 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 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 be capable of up to 2000 Boolean logic equations and up to 32 customizable soft key control buttons
5. The NCD shall mount in any of the network node Fire Alarm Control Units. 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 of Fire Alarm, CO 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. 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 Unit'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 via the fire control panel program.
5. The Fire Alarm Control Unit 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 FACU, 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 mounted 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 Db(high) and 75 Db (low)
 - b. Form-C Relay base
 - 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).

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

1. Detector Sensitivity Level

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)

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

B. 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.

C. 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 Unit, 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.

D. 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.

E. Intelligent Thermal Detectors

1. The intelligent thermal detectors shall be NOTIFIER FST- series addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. A high heat thermal detector rated at 190 degrees Fahrenheit shall also be available. The thermal detectors shall connect via two wires to the fire alarm control panel signaling line circuit.

F. 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 Unit signaling line circuit.
2. The detector shall comply with UL268 7th edition; operating at 24Vdc, 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 it is being blocked.

G. 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 Unit signaling line circuit.
2. The detector shall comply with UL521 and operating at 24VDC, 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.

H. 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 Unit signaling line circuit.

Intelligent Fire Alarm Detection System

2. The detector shall comply with UL268 7th edition and UL521; operating at 24VDC, 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.

I. 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 requirements and UL268A for duct applications.
4. The intelligent High sensitivity photo detector shall support standard, relay, isolator and sounder detector bases.
5. The High sensitivity 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.

J. 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. 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. Categories of multicriteria detector should offer the following variants for different applications:
 - Fire / CO
 - PTIR (Photo, Thermal, Infrared)

- Photo/Thermal
- Photo/CO
- Each sensor shall be separately listed according to requirements for its detector type (Except IR).

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

K. 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.

L. 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 FACU, 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.

M. Addressable Control Module

1. Addressable control modules shall provide supervised monitoring of wiring to load devices that require an external power supply to operate, such as horns, strobes, or bells. It shall be capable of Class B (Style Y) and Class A (Style Z) supervision. Upon command from the control panel, the control module shall be able to disconnect the supervision and connect the external power supply across the load device. The disconnection of the supervision shall provide verification to the panel that the control relay state changed. The external power supply shall always be relay isolated from the communication loop. The control module shall transmit full analog measurement of the supervised wiring back to the panel and can be used to detect impedance changes or other special test functions.
2. The modules shall provide address-setting means on the module using rotary switches. Because of the possibility of installation error, systems that use binary jumpers or DIP switches to set the module address are not acceptable. The modules shall also store an internal identifying code that the control panel shall use to identify the type of detector. Systems that require a special programmer to set the module address (including temporary connection at the panel) are labor intensive and not acceptable. Each module occupies any one-off at least 99 possible addresses on the signaling line circuit (SLC) loop. It responds to regular polls from the system and reports its type and status. The module shall have an LED that is controlled by the panel to indicate module status.

Coded signals, transmitted from the panel, can cause the LED to blink, latch on, or latch off. Refer to the control panel technical documentation for module LED status operation.

3. The module shall mount in a standard 4-inch square, 2-1/8" deep electrical box, surface mounted backbox listed, or compatible duct smoke detector housing. The notification appliance circuit (NAC) shall wire in a Class B (Style Y) or Class A (Style Z) fashion. Each control module shall support up to 1 amp of inductive or 2 amps of resistive audible/visual signals. Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised, UL listed remote power supply. The module shall use SEMS screws for easy wiring. Wiring terminals shall be easily accessible for troubleshooting while installed.

N. Addressable Relay Module

1. Addressable relay modules shall allow a compatible control panel to switch discrete contacts by code command. The relay module shall provide two isolated sets of Form-C contacts, which operate as a double pole double throw switch. The module shall allow the control panel to switch these contacts on command. The module shall not provide supervision for the notification appliance circuit (NAC). Module shall have both normally open and normally closed connections available for field wiring.
2. The modules shall provide address-setting means on the module using rotary switches. Because of the possibility of installation error, systems that use binary jumpers or dipswitches to set the module address are not acceptable. The modules shall also store an internal identifying code that the control panel shall use to identify the type of module. Systems that require a special programmer to set the module address (including temporary connection at the panel) are labor intensive and not acceptable. Each module occupies any one of at least 99 possible addresses on the SLC loop. It responds to regular polls from the system and reports its type and status. The module shall have an LED that is controlled by the panel to indicate module status. Coded signals, transmitted from the panel, can cause the LED to blink, latch on, or latch off.
3. The module shall mount in a standard 4-inch square, 2-1/8" deep electrical box or to a surface mounted backbox. The relay module contact ratings shall support up to 1 amp/30 VDC of inductive load or 2 amps/30VDC (coded) of resistive load (up to 3 amps in non-coded applications). The relay coil shall be magnetically latched to minimize wiring connection requirements and to ensure that 100% of all auxiliary relays may be energized simultaneously on the same pair of wires. The module will use SEMS screws for easy wiring. Wiring terminals shall be easily accessible for troubleshooting while installed.

O. Addressable Releasing Control Module

1. An addressable Flash-Scan 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 Class <A or B> and support one 24 volt or two 12-volt solenoids.

P. Isolator Module

1. Isolator modules shall automatically isolate wire-to-wire short circuits on a signaling line circuit (SLC) loop. 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.
2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section of the SLC loop.
3. The isolator module shall not require any address-setting, and its operations shall be fully automatic. It shall not be necessary to replace or reset an isolator module after its normal operation. The module shall have an LED that is controlled by the panel to indicate module status.
4. Coded signals, transmitted from the panel, can cause the LED to blink, latch on, or latch off. Refer to the control panel technical documentation for module LED status operation.
5. The module shall mount in a standard 4-inch square, 2-1/8" deep electrical box, in a surface mounted backbox, or in the Fire Alarm Control Unit. The module shall use SEMS screws for easy wiring. Wiring terminals shall be easily accessible for troubleshooting while installed.
6. Meets Agency Standards:
 - ANSI/ UL 864- Control Units and Accessories for Fire Alarm Systems
 - ULC S527- Control Units for Fire Alarm Systems
 - FM- ANSI/NFPA 72- National Fire Alarm Code.

Q. Serially Connected Annunciator Requirements

1. The annunciator shall communicate to the Fire Alarm Control Unit via an EIA 485 (multidrop) 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 Unit functions. The annunciator will also have an "ONLINE" 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.

R. 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. If sounder base is used with the CO Detector, it should be capable of producing Temp 4 pattern for CO Alarm indication.
4. The sounder bases shall synchronize with it's native system.

S. 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.

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

2.9 PC BASED GRAPHICAL FACILITIES MONITORING SYSTEM

A. Scope

1. The PC based graphical facilities monitoring system shall include, but not be limited to, optional touch screen or LCD wide screen monitor, one or more PC based graphical workstations, all input/output devices, network communications media, control equipment, auxiliary control devices, power supplies,
2. and wire / fiber optic media as shown on the drawings and specified herein.
3. A supervised interface to NOTIFIER Fire Alarm Control Units and NOTI-FIRE-NET shall be made available.
4. The system shall employ an advanced technology network to monitor and control various fire, security and other facility information over a network.
5. The system shall include an interface to digital alarm communicator receivers for wide area network monitoring.
6. The system shall include a device that allows remote viewing of the ONYX Works system via the Internet or an intranet.
7. The system shall include a redundant interface for NOTI-FIRE-NET network for survivability.
8. The system shall allow a mixture of different technologies and manufacturers' equipment to operate on the same network and provide the operator with a consistent look and operation for all monitored equipment.

9. The system shall support a variety of topologies and media and shall provide an industry standard open architecture transport layer protocol.
10. Using standard RS-232 ports on existing and future monitoring and control systems used by the facility, the system shall connect to and interpret status change data transmitted from the ports and provide graphic annunciation, control, history logging and reporting as specified herein.
11. The system shall be electrically supervised and monitor the integrity of all conductors.
12. The system shall provide E-Mail functions capability to send system information via an email server to an email account.
13. The system shall utilize Boolean logic for automatic event response.
14. The system shall have the facility to page directly from the workstation to any DVC installed on the network.

B. Workstation Performance

1. The network will interface and report the individually monitored system's status via a user-friendly Graphical User Interface (GUI) based software workstation.
2. The software shall operate under Microsoft® Windows® 10 , 64bit OS
3. The GUI based software must be capable of graphically representing each facility being monitored with floor plans and icons depicting the actual locations of the various systems; and / or sensors' locations as well as view the system events in text mode.
4. The software shall use a 1920 pixels X 1080 pixels GUI display capable of showing a large primary floor plan display, a key map representative of a larger view of the primary display and its relationship to the facility being monitored, the current operator, number of fire, supervisory, pre-alarms, troubles, and security events within the network as well as outstanding events and acknowledged events.
5. The software shall have the capacity of at least 1,000 screens / floor plans or as dictated by hard drive space and installed VIDEO and RAM memory for efficient operation.
6. The software shall have the ability to float and dock windows to support dual monitors' display.
7. The workstation shall have the ability to support graphic printing of all data including graphical floor plans, system activity, history, and guidance text. A Windows® compatible printer shall be supported for the graphics and report printer options.
8. The workstation software shall permit automatic navigation to the screen containing an icon that represents the system or sensor in the event of an off-normal condition.
9. The system/sensor icon shall indicate the type of off-normal condition, flash, and change to the color associated with the off-normal condition (e.g., RED for ALARM and YELLOW for TROUBLE).
10. The software shall allow the attachment of text (TXT) files, sound (WAV) files, image (BMP) files, and video (AVI) files to each system or sensor icon allowing additional information to be provided to the system operator for responding to the off-normal condition. The software must have the ability for an attachment for each major event type per device.
11. The software shall allow the importation of externally developed floor plans in Drawing Exchange Format (DXF), Windows Metafile (WMF), JPEG (JPG), Graphics Interchange Format (GIF) and Bitmap (BMP) format.
12. The software shall provide automatic navigation to the screen containing the icon of any system or sensor when an event is initially annunciated. In addition, operator navigation

to screens containing outstanding events shall be accomplished by “clicking on” the event from either the acknowledged or unacknowledged event.

13. History Manager:

- The software shall contain a History Manager, which shall record all system events with a time and date stamp as well as the current system operator’s name.
- The system shall provide the ability to store all off-normal events experienced by the various sub-systems that are monitored by the system.
- All events shall be recorded with a time and date stamp and the system operator shall be provided with the ability to log a pre-defined response or a custom comment for each off-normal event and have that comment stored in the history file with the time, date, and operator name.
- Provide the ability to conduct searches and generate subsequent reports, based on all events for a single system / device address, a specific node, a specific type of off-normal condition and date range (mm/dd/yy to mm/dd/yy) or combinations of these search parameters. The number of entries in the history file that match the determined search criteria will be displayed.
- The History Manager shall automatically back-up the history file at 2,500,000 events.
- It shall be possible to pre-select data fields for reporting and then saving the report as a template. It shall also be possible to schedule the pre-defined report to print at a designated time.
- The History Manager shall provide the operator the ability to select the number of days or number of months to back-up history.

14. Alarm Monitoring:

- The system shall provide for continuous monitoring of all off-normal conditions regardless of the current activity displayed on the screen.
- If an operator is viewing the history of a sub-system and an alarm condition should occur, the system shall automatically navigate to the graphic screen showing the area where the off-normal event is occurring.
- The system shall prioritize all off-normal events as defined by National Fire Alarm Code® 72 into the following categories: fire alarms, troubles, supervisory alarms, pre-alarms and security alarms.
- The system shall display a running count of all events by type in an alarm summary window. The alarm summary window shall include at least five counters, defaulted to Alarm, Pre-Alarm, Trouble, Security, and Supervisory events.
- The system shall show a running list of all unacknowledged events and acknowledged events and allow the system operator to acknowledge an event by “double-clicking” on that event in the Unacknowledged Events box. The Unacknowledged and Acknowledged Events boxes shall contain an abbreviated description of the off-normal condition.
- The details of the condition may be viewed by selecting event in the unacknowledged events box.
- The system shall allow the attachment of user-definable text files, image files, video files, and sound files to each device / system monitored (for every event state) in order to facilitate the operators and response personnel’s response to the off-normal condition.
- The system shall record all events to the system’s hard drive. A minimum of 2,500,000 events may be stored.

15. Reports & Logs:
 - The system shall provide for the ability to generate reports based on system history.
 - The system shall allow the system operator to enter custom comments up to 255 characters for each event and have those comments recorded in the system's history file
16. Boolean Logic
 - An automated event response application shall be provided to automatically perform actions across the entire system based on network activity.
 - event response application shall allow event responses (actions) based on predefined user conditions using simplified Boolean logic.
 - Actions shall be configured to be executed immediately or timed as required.
17. Control Aspects of System Software
 - The system shall have the ability to monitor and control the following NOTIFIER® Fire Alarm Panels using NOTI-FIRE-NET Network, ONYX® & N16 series control panels.
 - The system shall have the ability to monitor and control the NOTIFIER N16 Fire Alarm Panel
 - using a PC Network Card (NFN Gateway) installed in the workstation.
 - The Gateway interfaces shall have the ability to be constructed in a redundant configuration with either two NFN Gateway computers monitoring the same nodes, or by having multiple Embedded Gateways on the same network, monitored by multiple workstation clients.
 - The system shall provide an NFN Gateway interface for direct connections to the Notifier Network containing the following panels: AFP-1010, AM2020, AFP-200, and the AFP-300/400, ONYX® series and N16 control panels. The NFN Gateway and the Embedded Gateway will:
 - i. Serves as a bridge between an ONYX Works® Workstation and a NFN network, and it uses that Workstation as the primary reporting station for the NFN network
 - ii. Translates a NFN network's panel and device data into data that can be interpreted by the ONYX Works® Workstation software application
 - iii. Monitors NFN networks using ARCNET network architecture.
 - iv. The workstation shall provide configuration utilities for monitoring and control profiles. These profiles shall be user definable for distribution of monitoring and control allowances for operators per workstation.
 - v. *Under no condition shall any sub-system be required to rely on the network for any data processing required to perform its particular function. Each individual sub-system shall be in effect "stand-alone" as to insure its continued operation should a disruption in communication with the system be experienced.*
 - The software shall be password protected and provide for the definition of security profiles for operator access control.
 - The software shall contain provision for defining monitoring profiles of pre-selected Nodes for monitoring. This shall include provision for status types within the selected NODES.
 - The software shall support sending real-time off-normal event notifications to designate email addresses.
 - The software shall support live voice paging for mass notification to NOTIFIER voice evacuation system over Internet Protocol (IP).

- The PC based graphical facilities monitoring system shall include a Configuration Tool that provides the following features:
 - i Allows operators the ability to create and edit graphics
 - ii Set up Gateway Connections and define their nodes
 - iii Set system operating mode
 - iv Add and edit objects on screens
 - v Configure colors and sounds for the status classes

C. Workstation Specification

1. The system shall be an ONYXWorks® Fire Systems Command Interface.
2. The system shall operate on no less than an IBM compatible UL listed Intel Quad Core processor operating at 2.4 GHz on the Microsoft® Windows® 10 64 bit OS platform.
3. The workstation shall be an industrial grade computer listed for UL Standards 864 (Control Units for Fire-Protective Signaling Systems) under category UUKL (Smoke Control Equipment). The workstation shall be capable of annunciation and control of all fire detection and smoke control points.
4. The workstation shall have no less than 16 Gigabytes of RAM, Solid-State Hard Drive with no less than 240 Gigabytes of storage space, a minimum of 64 megabytes of video RAM, internal supervisory CPU watchdog board with audible annunciator, 100 Base-T Ethernet NIC card, a 104 key keyboard, and a mouse type pointing device with a center wheel.
5. The workstation shall come equipped with all necessary gateway modules to allow connection to the network(s) it monitors as standard equipment. All workstations shall support Ethernet communications when multiple workstations are required.
6. The workstation shall support dual SVGA monitors and be supplied with a 22” or 42” flat screen LCD monitor with integrated speakers or an optional touch screen monitor.
7. The computer shall be capable of networking to additional computers and these computers shall be capable of operating as workstations and/or gateways for local area or wide area networks.
8. Alarm annunciation shall appear on all workstations and may be silenced at each local workstation.
9. Only one workstation and operator shall be in command of the system for global alarm acknowledgement at any time.

D. Printer

1. Support one or more Windows® compatible printers to be located and connected each workstation for graphics and report printing.
2. Support one model PRN-7, 80-column dot matrix tractor feed industrial grade printer for event and date-stamped printouts of off-normal events and status changes per workstation.

E. Notifier® Monitoring Network

1. The NOTIFIER® monitoring network shall consist of a network based on proven peer-to-peer technology and support standard NCM cards and High Speed NCM cards.
2. The network consisting of the standard NCM cards shall have the ability to use multi-mode fiber optic cable, wire (twisted pair copper media in a style 4 or style 7 configuration), or

combination wire/fiber communications with support of up to 103 nodes with a data communications rate of 312,500 BPS.

3. Wire networks shall support 12 AWG, 1 Pair Shielded to 24 AWG, 4 Pair Unshielded following the manufacturer's guidelines.
4. Fiber optic networks shall support 62.5/125µm cable (8dB limit) or 50/125µm cable (4.2dB limit), Wire to fiber conversions cards.
5. The network consisting of the High Speed NCM cards shall have the ability to use fiber optic cable (both multi-mode and single mode), wire (twisted pair copper media in a style 4 or style 7 configuration), or combination wire/fiber communications with support of up to 200 nodes with a data communications rate of 12MB (wire) or 100MB (fiber).
 - a) Wire networks shall support 12 AWG, 1 Pair Shielded to 24 AWG, 4 Pair Unshielded following the manufacturer's guidelines.
 - b) Fiber optic networks shall support 62.5/125µm cable (10dB limit), 50/125µm cable (6.5dB limit), or 9/125 µm cable (30dB limit).
 - c) Wire to fiber conversions cards.

2.10 BATTERIES AND EXTERNAL CHARGER

Battery

- a) Shall be 12 volt, Gel-Cell type.
- b) Battery shall have sufficient capacity to power the fire alarm system for not less than <four/twenty-four> hours plus <five/fifteen> minutes of alarm upon a normal AC power failure.
- c) The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.

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

Intelligent Fire Alarm Detection System

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 hoist-way shall return all elevators in to the <primary/ 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 FACU.
 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 FACU.
- D. Open initiating device circuits and verify that the trouble signal actuates.
- E. Open signaling line circuits and verify that the trouble signal actuates.
- F. Open and short notification appliance circuits and verify that trouble signal actuates.
- G. Ground initiating & Signaling device circuits and verify response of trouble signals.
- H. Ground notification appliance circuits and verify response of trouble signals.

- I. Check presence and audibility of tone at all alarm notification devices.
- J. Check installation, supervision, & operation of intelligent smoke detectors during a walk test.
- K. 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 FACU and the correct activation of the control points.
- L. 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

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