SECTION 287210

LIFE SAFETY SYSTEMS FOR HIGH RISE BUILDINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, and coordinated system.

B. The fire alarm system shall comply with requirements of 2011 NFPA Standard 72 for Protected Premises Signaling Systems and all local codes and regulations. The system shall be electrically supervised and monitor the integrity of all conductors.

C. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded onto the Signaling Line Circuits.

D. The system shall be an active/interrogative type system where each transponder is repetitively scanned, causing a signal to be transmitted to the local fire alarm control panel/node indicating that the transponder and its associated initiating device and notification appliance circuit wiring is functional. Loss of this signal at the local FACP shall result in a trouble indication on both the FACP display and at the network display, as specified hereinafter for the particular input.

E. The system shall be arranged such that not less than 20 percent additional transponders may be inserted into any network communication loop.

F. The FACP and peripheral devices shall be manufactured by Notifier, Edwards or Siemens.

G. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site. To guide the final checkout and to ensure the systems integrity, the submitting company shall employ NICET Level IV minimum managers and engineers. Proof of NICET level training shall be included as part of submittal package and kept on site with personnel.

H. The installing company shall be UL listed for fire alarm installations. UL certificate shall accompany submittal package. The certification listing category shall be UUJJ and shall be indicated in the project submittal.

I. The Contractor shall make arrangements and pay all fees in connection with the testing of the Life Safety System. All system devices shall be tested for their correct operation, except non-restorable type heat detectors which shall be sample tested. All tests carried out shall meet the requirements of the local authority having jurisdiction.

1.2 SCOPE

A. A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance to the project specifications and drawings.

B. Basic Performance
   1. Each SLC loop shall be wired NFPA 72 Style 4 (Class A).

2. Initiation Device Circuits (IDC) shall be wired (NFPA Style B) as part of an addressable device connected by the SLC circuit.
3. Notification Appliance Circuits (NAC) shall be wired (NFPA Style Y) as part of an addressable device connected by the SLC circuit or a panel circuit.
4. NAC speaker circuits shall be arranged such that there is a minimum of one speaker circuit per floor of the building or smoke zone, which ever is greater.
5. 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.
6. Two-way telephone communication circuits shall be supervised for open and short circuit conditions. Phone circuits shall be wire (NFPA Style Y) and wired so that each vertical riser is a single circuit.

C. Basic System Functional Operation
1. As part of the fire alarm and voice communication system; when a fire alarm condition is detected and reported by one of the system initiating devices (except the smoke detectors located in air supply path of the stairwell and/or elevator shaft pressurization fans), the following functions shall immediately occur:
   a. FACP will sound and display the alarm condition showing the device address, location, zone information, time/date, and device type.
   b. The remote annunciator will sound and display the same information as shown on the FACP display unit.
   c. The speaker outputs for the floor of the alarm, floor above, floor below, elevator cabs and stairwells shall be activated for alarm evacuation message until silenced. All speakers shall sound the fire alerting tone followed by an evacuation message. When the message ends, the alerting tone shall resume. Other sequences for alarm evacuation messaging may be directed by drawings.
   d. All strobes on floors with activated speaker outputs shall flash in a synchronized pattern per floor.
   e. Operation of the fire alarm microphone must immediately override either the message or the fire alerting tone without moving any switches except the one on the microphone. The voice communication system shall also function as a public address communication system and shall operate on a selective and general basis from the Fire Alarm Control Panel.
   f. Release all magnetically held smoke doors.
   g. Provide signals to the mechanical controls including smoke dampers to shut down or reroute air-handling systems to prevent the recirculation of smoke and to start the stair and elevator shaft pressurization fans.
   h. Activate signals to the stairwell electric door locks as applicable.
   i. Provide a DACT (Digital Alarm Communicator Transmitter) and a signal via DACT for connection to a central station or local municipal fire department (connection and leased line, if required, shall be provided by building owner).
   j. Initiate a preprogrammed timing sequence.
   k. Additionally, actuation of a lobby elevator smoke detector shall cause immediate non-stop return of all automatic elevators served by that lobby to the primary discharge level; except that, when the alarm has been initiated on the primary discharge level, the elevators, shall be returned to the designated alternate discharge level per the requirements of ANSI ASME A17.1.
   l. Additionally, actuation of any elevator equipment room or shaft smoke detector shall cause immediate non-stop return of all automatic elevators served by that equipment room or shaft, to the primary discharge level per the requirements of ANSI ASME A17.1. Provide all required signals

from FACP to elevator controls for smoke detector in elevator machine room per the requirements of ANSI ASME A17.1.

m. Additionally, actuation of any smoke detector located in the air handling units and/or equipment rooms shall activate signals to the mechanical controls indicating the floor of occurrence.

n. The fire alerting tone shall be a low to high "slow whoop" from 200 Hz to 830 Hz lasting 2.5 seconds. Operation of the hand held microphone button shall override the alarm tone.

o. It shall be possible to silence the alarm signals by operating the signal silence switch. However, the activation of another zone shall repeat the entire alarm process, thus causing the signals to resound.

p. Each speaker circuit will have a manual selector switch. Operation of this switch will activate the speakers and fire lights associated with that circuit.

q. Silencing the alarm shall cause all speakers to silence. Firelights will continue to flash.

r. Fire pump normal power availability, fire pump phase reversal and fire pump run status shall be monitored. Loss of normal power, phase reversal shall annunciate as supervisory alarms and pump running shall annunciate as an alarm.

s. Provide a signal to activate the elevator shunt trip breaker upon activation of the heat detector in the elevator shaft.

2. As part of the fire alarm and voice communication system; actuation of any smoke detector located in the air supply path of the stairwell and/or elevator shaft pressurization fans shall cause the LCD display on the control panel module and audible alarm signal to sound at the central control station and prevent the subject pressurization fan from operating, thus preventing the induction of smoke into the area served by the subject fan.

3. Fire Department Communication System

a. Provide a two-way Voice Communication system between the Central Control, Emergency Phones and Emergency Phone Jacks. All wires between the Central Control and remote units shall be continuously supervised. Any fault which occurs shall be reported visually and audibly at the Central Control.

b. Removal of any phone from its normal hook position or the act of plugging a portable phone into a system jack shall cause its indicator LED to flash and an audible device to beep at the Central Control. Picking up the master phone and operation of the switch for the activated circuit shall silence the beeping signal, cause the LED for the active circuit to remain on steady and, connect the remote phone to the Central Control's master phone to provide direct and private communication between the remote phone and the master phone.

c. The fire department communication system shall be capable of handling single or simultaneous conversations with maximum of 10 phones connected into the system. The phone system circuits shall be so designed to prevent static, hum or other interference to clear, intelligible two-way conversation between maximum of 10 phones of the system.

d. The system shall indicate to the person attempting to use a remote phone, by a beeping busy signal, that the signal is being received at the Central Control and that the lines are intact. Two or more phones shall be capable of being connected into the active conversation at the discretion of the person at the Central Control.

e. At the discretion of the person at the Central Control, any remote phone shall be capable of broadcasting over any selected speaker circuits.

f. Replacement of all remote telephones or removal from their jacks and returning the related circuit acknowledge switch to normal shall restore the circuits to their normal supervised condition.

4. General Operation
   a. Power failures, opens, grounds or any disarrangement of the system wiring or components shall be indicated by a visual and audible trouble signal. The audible trouble signal may be silenced, however, the trouble LED shall remain lit until the system has been returned to normal operating condition.
5. Mechanical Controls
   a. Provide a separate panel with hand-off-auto switches for manual override of air handling units. The switches shall allow the person at the central control station to override the automatic operation of all air handling systems in the building individually. When the three position switch is in the “AUTO” position, the HVAC unit, fan or exhaust system shall run subject to the mechanical controls and life safety functions. When the three position switch is in the “ON” position, the HVAC unit, fan or exhaust system shall run, overriding the mechanical controls and life safety shutdowns. When the three position switch is in the “OFF” position, the HVAC unit, fans or exhaust system shall be turned off, overriding the mechanical controls and life safety controls. A green LED shall be illuminated whenever an HVAC unit, fan or exhaust system is running. An amber LED shall be illuminated whenever an HVAC unit, fan or exhaust system is off. The LED’s shall be labeled as such. Provide the wiring between each switch and its respective piece of mechanical equipment. Quantities of switches shall be confirmed with division 15 and cabinet size shall be as required by the quantities of switches.

1.3 SUBMITTALS

A. General
   1. Copies of all submittals shall be submitted to the Architect/Engineer for review prior to acceptance of system.
   2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality.

B. Shop Drawings
   1. Drawings shall include the following minimum requirements for submittal:
      a. Point-to-point wiring/conduit layout for all devices on 1/8” scale.
      b. Device placement showing all addresses and device ID.
      c. All panel and equipment terminations.
      d. All circuit voltage drop and current calculations spread sheets.
      e. All battery calculation spreadsheets.
      f. Legend reflecting device description, manufacturer, model number, and backbox requirement.
      g. Wiring legend reflecting wire function, type, and recommended manufacturer’s part number.
      h. Full sequence of operations.
      i. Power supply and amplifier calculations.
   2. Specification data sheets on each individual system component.

C. Data Sheets
   1. Submit simultaneously with the shop drawings, complete manufacturer’s technical data sheets showing product description, listings, and specs.

2. Copies of NICET II and IV certifications.
3. Copy of company UL listing certificate.

1.4 APPLICABLE STANDARDS AND SPECIFICATIONS

A. The specifications and standards listed below form a part of this specification. The system shall comply with the latest standards.
1. National Fire Protection Association (NFPA), 2000 Edition - USA:
No. 13 Sprinkler Systems
No. 13A Halon 1301 Extinguishing Systems
No. 17 Dry Chemical Extinguishing Systems
No. 17A Wet Chemical Extinguishing Systems
Clean Agent Extinguishing Systems
No. 70 National Electrical Code
Specifically Article 760
No. 72 1999 National Fire Alarm Code
No. 101 Life Safety Code
2. Standard Building Code, 2000 Edition
3. American National Standard A17.1-1980
4. Underwriter's Laboratories Fire Resistance Directory
5. Local and State Building Codes
6. ADA Public Law 101-336
7. All requirements of the Authority Having Jurisdiction (AHJ)

1.5 APPROVALS

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

FM Factory Mutual Systems
UL Underwriters Laboratories

1.6 SYSTEM FEATURES

A. The system shall include the following features as a minimum:
1. During an alarm condition, the LCD annunciator shall display the activated alarm until acknowledged. This shall allow determination of where the last alarm has taken place.
2. Ground fault detection in wiring on either plus or minus side.
3. Separate alarm and trouble shall be displayed on the LCD annunciator.
4. Resound feature.
5. Dead Front" design control panel with all LED alarm trouble and power on indicators and all switches located behind a locked tempered glass door.
6. Solid state construction.
7. All alarm initiating circuit wiring, signal circuit wiring, speaker circuit wiring and emergency phone circuit wiring shall be supervised.
8. Automatic transfer to standby batteries upon power failure.
9. Lightning and surge protection.

PART 2 - PRODUCTS

2.1 CONDUIT AND WIRE

A. All fire alarm wiring shall be installed in conduit. Conduit shall be installed as required by specification section 261000.

1. 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.
2. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
3. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes from the generator powered source.
4. Conduit and wire installations shall meet the survivability requirements of NFPA 72.

2.2 MAIN FIRE ALARM CONTROL PANEL

A. The FACP shall be completely microprocessor based.

B. System Capacity and General Operation:
1. Configure size of panel to operate number of SLC circuits in a fashion so that each circuit handles no greater than 70% load of capacity or a maximum of 5 floors per circuit.
2. The fire alarm control panel shall include a full-featured operator interface and backlit 80-character Liquid Crystal Display (LCD).
3. The system shall be fully field programmable from the display panel. Panels requiring the use of external keyboards for programming and changes are not acceptable.
4. The FACP shall provide the minimum following features:
   a. Drift compensation to extend detector accuracy over life.
   b. Detector sensitivity test, per NFPA 72, Chpt 7.
   c. Maintenance alert, to warn of excessive smoke detector dirt or dust accumulation.
   d. Multiple sensitivity levels for alarm, selected by detector.
   e. System status reports to display and printer. Provide printer.
   f. Alarm verification, with verification counters.
   g. Cross zoning with the capability of counting two detectors in alarm.
   h. Walk test.
   i. UL-1076 security monitor points.
   j. Control-by-time with holiday schedules.
   k. Day/night automatic adjustment of detector sensitivity.
   l. Device blink control for sleeping areas.
   m. Releasing capability.
   n. Pre-Alarm.
   o. Selectable sensitivity levels, three minimum.
   p. History Storage, with a minimum of 400 events.
   q. Point Enable/Disable.
   r. Point Read (status and level of obscuration).
   s. Output point for connection to any building EMS.

C. Signaling Line Circuits (SLC)
1. Each SLC interface shall provide power to communicate with 99 intelligent detectors (ionization, photoelectric or thermal) and 99 intelligent modules (monitor or control).
2. Each SLC circuit shall not exceed 70%, load capacity or cover more than 5 floors.

D. Serial Interface
1. The system shall include two serial EIA-232 interfaces. Each interface shall be a means of connecting UL Listed Electronic Data Processing (EDP) peripherals.
   a. One serial port shall support a serial printer.
   b. One serial port shall support a CRT/NRT device.

c. The system shall include an EIA-485 port for the serial connection of annunciators and remote LCD displays.

E. Voice Telephone Command Center (VTCC)

1. The Voice Telephone Command Center (VTCC) shall contain equipment required for all audio control, telephone system control, signaling and supervisory functions. This shall include:
   a. Tone generators.
   b. Digital voice units.
   c. Microphone for manual paging/all call.
   d. Main telephone handset.
   e. Speaker/phone circuit annunciation and control modules for manual activation of each individual speaker circuit and each individual microphone/annunciator circuit.
   f. Integral Digital Message Generator with a capacity of up to 60 seconds. The Digital Message Generator shall be capable of primary and secondary messages (30 seconds each). These messages shall be field programmable without the use of additional equipment.
   g. Built in alert tone generators with steady, slow whoop, high/low and chime tone field programmable.
   h. Provide list of evacuation pre-recorded messages and pre-alert tones to owner before ordering for selection.
   i. The Voice Control Panel shall have the ability to transmit up to 4 simultaneous evacuation message channels.
2. The one-way voice communications system shall be comprised of a local microphone, single channel audio controller/tone generator/digital message player and, if shown on the plans up to eight (8) remote microphone/annunciator panels.
3. Provide individual selector switches and indicator lights for each speaker circuit at the fire command center and at each remote microphone/annunciator.
4. Provide amplifiers. Size the amplifiers to accommodate each speaker being set at a one-watt tap with twenty watts reserve per floor.
5. Provide switch and LED modules for control of individual telephone circuits at the main fire alarm control panel and at any remote locations.

F. Field Charging Power Supply (FCPS): The FCPS is a device designed for use as either a remote 24-volt power supply or used to power Notification Appliances.

1. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24-volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries. Provide batteries to support 60-hour standby with ten minutes of alarm indication at the end of this period. Battery charger shall be capable of recharging all batteries to seventy percent capacity in twelve hours.
2. The Field Charging Power Supply shall have four outputs (two Style Y/Z and two style Y) shall be available for connection to the Notification devices.
3. Provide 20-watt spare capacity in each electrical room on each floor for tenant audible circuits. Locate in a junction box clearly labeled "tenant fire alarm audible circuits".
4. Provide 1ea. Field Charging Power Supply (DC) per floor to allow for tenant build-out expansion of NAC devices. At no time shall there exceed 70% load capacity of any FCPS on any of the common levels. Provide power capacity as follows:

Floor Size	Capacity
<25,000 gross sq. ft.	6 amps DC
25,001 to 35,000 gross sq. ft.	10 amps DC
35,001 gross sq. ft. and greater	consult engineer

5. Locate audible (where required) and visual power supplies adjacent to one another and in a location within each room approved by the engineer.
6. Provide battery capacity and amplifier capacity in the main fire control panel for addition of tenant devices described above.

G. Audio Amplifiers
1. The audio amplifiers will provide audio power (@ 25 Volts RMS) for distribution to the speaker circuits.
2. The amplifier shall include audio input and amplified output supervision; back up input, and automatic switchover to back up (if primary amplifier should fail).
3. Amplifiers shall be available in 30, 100, and 120-watt versions.
4. Provide amplifiers sized to accommodate each speaker being set at a one-watt tap with twenty watts reserve per floor.
5. Hardwired indicating appliance circuits (fire lights and speakers) shall be Style Y per NFPA 72. Provide one light circuit per floor and provide one speaker circuit per floor, one speaker circuit per stairwell and, one speaker circuit per elevator cab.
6. Hardwired telephone circuits shall be Style Y per NFPA 72. Provide one fire fighters telephone circuit per elevator, one per elevator lobby, one per stairwell and, one for the fire pump room.
7. Provide at least two on board relays to operate door holders etc.
8. Provide necessary modules to operate remote supervised relays for fan control, elevator control, etc.

2.3 SYSTEM COMPONENTS

A. Speakers
1. All speakers shall operate on 25 VRMS or with field selectable output taps from 0.25 to 2.0 Watts.
2. Speakers in corridors and public spaces shall produce a nominal sound output of 84 dBA at 10 feet (3m) when set at one watt as measured per UL Standard 1480.
3. Frequency response shall be a minimum of 400 HZ to 4000 HZ.
4. Provide mini-speaker in all guestroom bedrooms.
5. Provide mini-speaker in all ADA accessible and hearing impaired guestroom restrooms. All mini-speakers in ADA accessible and hearing impaired guestrooms shall include visual alarm.
6. The back of each speaker shall be sealed to protect the speaker cone from damage and dust.
7. Speakers shall be bone white in color.
8. Provide a unit cost to add 2 speakers per 25,000 s.f. This unit cost shall be applied to additional speakers that may be required at the request of the fire marshal during field inspections.

B. Strobe Lights
1. All Strobe Lights shall meet the requirements of the ADA, UL Standard 1971.
2. Strobe intensity and flash rate shall meet the requirements of UL 1971, ADA and NFPA 72.
3. Strobe unit shall mount to a four inch square electrical outlet box. The strobe light shall have a white lens with red “FIRE” imprinted on it. When the unit is combination speaker/strobe, the speaker portion shall comply with the requirements stated in A. above.
4. All strobes shall have selectable output intensities from 15 to 110 cd. The intensity selected shall meet NFPA 72 requirements for the layout shown on the drawings.
5. Strobe spacing shall be as follows:

a. Strobes shall be spaced a maximum of 100' apart in corridors and within 15' of the end of every corridor to comply with the requirements of NFPA 72.
b. Strobes in open areas shall be provided to comply with NFPA 72.
c. Provide strobes in public spaces such as restrooms, kitchens, breakrooms, cafeterias, conference rooms, training rooms and any other space where six or more people are likely to gather.

6. Provide a unit cost to add 5 strobes including required signal circuits per 25,000 s.f. This unit cost shall be applied to additional strobes that may be required at the request of the fire marshal during field inspections.

C. Manual Fire Alarm Stations
1. Manual fire alarm stations shall be dual-action, non-coded, 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. Units shall be master keyed with control equipment.
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. This shall be achieved with the pull lever remaining at a right angle to the station body until reset.
4. The station body shall be constructed so that chips and scratches will not expose metal.
5. Manual fire alarm stations shall be located as required by NFPA101 and the Standard Building Code.

D. Duct Smoke Detectors
1. Duct smoke detectors shall be addressable type with visual alarm and power indicators. Provide remote LED/test stations where duct detectors are mounted in non-visible areas such as above ceiling.
2. Each detector shall be installed upon the composite supply/return air ducts(s), with properly sized air sampling tubes where required. Provide smoke detectors in each return air path of any mechanical equipment that moves air in excess of 2000 CFM to meet the requirements of NFPA 72 and 90A. Provide smoke detectors in each supply and return air path of any mechanical equipment that moves air in excess of 15,000 CFM to meet the requirements of NFPA 72 and 90A. Confirm quantities of smoke detectors required for mechanical equipment with Division 23. Room detectors may be used to accomplish smoke detection in the supply/return air paths if the application permits.
3. Each duct detector shall be installed along with addressable control module as needed for fan shutdown and/or smoke control. Detectors zoned with other devices shall be capable of operating its control module even if all other devices on their circuit have gone into alarm.
4. Duct detectors shall be installed by the mechanical contractor and electrically connected to the fire alarm system by the electrical contractor.

E. Smoke Dampers
1. Smoke dampers shall be provided by Division 23.
2. Provide a smoke detector at each smoke damper location to meet the requirements of NFPA 72. Confirm quantities of smoke detectors required for smoke dampers with Division 23. Provide 120 volt power as required for operation of smoke dampers.

F. LCD Alphanumeric Display Remote Annunciator

1. The alphanumeric display annunciator shall be a supervised, backlit LCD display containing a minimum of eighty, (80) characters for alarm annunciation in clear English text. Annunciator shall be located as shown on the drawings or at the location selected by the local fire department.
2. The LCD annunciator shall display all alarm, supervisory, and trouble conditions from the FACP via the serial card.

G. FAN/HVAC Annunciator
1. Furnish and install in the Fire Control Room/Central Control Station a fan status annunciator and control panel. It shall contain one three position switch (Hand/Off/Auto) and one green and one amber LED indicator for each one of the building fans and HVAC units noted on the drawings and these specifications. When switched on, the fan or HVAC unit will run, overriding any shut down device and the green LED will be lit. When switched off, the fan or HVAC unit will turn off and the amber LED will be lit. The panel shall be constructed with white photo emulsion graphics applied to smoke plexiglass, protected by a layer of non-glare plexiglass and framed with anodized aluminum. The panel shall be provided with descriptive custom labels for each LED and switch, green “POWER ON” LED indicator and a power supply rated for continuous operation of all connected relays and LED’s. Provide relays at each point of control wiring back to the annunciator and control panel.
2. Surface mount the FAN/HVAC status and control panel in the fire control room. The 120 volt power shall be provided from the emergency circuits dedicated to the fire alarm control panel.
3. Provide relays at each point of control described below.
4. The logic, contact closures, switch inputs and status indicators for the FAN/HVAC status and control panel may be multiplexed via the Life Safety System if desired, however, all discrete operations shall function as specified.
5. Relays shall be mounted within 3’-0” of the device to be monitored. All wiring from the control panel to the relay shall be supervised.
6. Label each relay with name of the equipment controlled and function of each relay.
7. The following equipment shall be controlled:
   a. Stair Pressurization fans
   b. Pressure relief fans and louvers
   c. Atrium smoke exhaust fans
   d. Atrium supply air fans
   e. Parking deck supply air fans
   f. Parking deck exhaust fans
   g. Outside air fans
   h. Toilet exhaust fans
   i. Air handling fans
   j. Elevator pressurization fans (multiple fans serving a common shaft at a single location shall be controlled by a single switch, but have individual status LED’s).
   k. Packaged rooftop units
   l. Smoke dampers

2.4 SYSTEM COMPONENTS - ADDRESSABLE DEVICES

A. Addressable Devices - General
1. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel signaling line circuits.
2. Addressable photoelectric smoke and thermal detectors shall provide alarm and power/polling LEDs. LED(s) shall flash under normal conditions and LED(s) shall

be placed into steady illumination by the control panel, indicating an alarm condition.

3. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system.
4. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.
5. All field wiring is to be terminated on the detector base, not on the sensor head. Addressing of detectors shall be via integral decade switches built into sensor. Devices requiring separate addressing means will not be accepted.
6. Any additional equipment required to program devices are not acceptable.

B. 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.
2. Provide photoelectric smoke detector heads with sounder bases as required. Detectors shall be of the solid state photoelectric type utilizing a stable LED light source and a silicone photo diode as the receiving element to form a highly accurate means of smoke detection. Internal detector circuits shall be shielded against electrical interference and resistant to transients, noise and, RF interference. Detector shall be low profile. Detector shall have a dual purpose red LED that flashes continuously to show that the device is operating and, that comes on steady to show that the device is in alarm.
3. Nominal detector sensitivity shall be 1.4% per foot obscuration with a range of 1% to. 1.84%. Regardless of sensitivity settings, the detector's stability shall be unaffected by high air velocity. No radioactive materials shall be used.
4. Provide smoke detectors in elevator lobbies, at stairwell doors, in telephone rooms, electrical rooms, mechanical rooms, elevator pits, the top of the elevator shaft, adjacent to the fire alarm control panel, fire pump room, computer rooms as defined by NFPA 90, chiller plants, pump rooms, UPS rooms, guestrooms and elevator machine rooms.

C. Linear Beam Smoke Detector
1. Each beam shall be comprised of a solid state infrared (IR) transmitter, photodiode receiver and microprocessor based control module. Should IR output be attenuated below the desired alarm obscuration level as a result of smoke interference an alarm will be annunciated. Total obscuration of the beam is annunciated as a beam blockage trouble signal. All wiring from the control module to the transmitter and receiver heads is supervised.
2. The projected beam smoke detector system shall have an operating range of 10M. (33 ft.) to 100M. (330 ft.) and be listed for spacing the beam 30 ft. from a wall and 60 ft. on center. The transmitter and receiver optical elements shall be adjustable +/- 90 degrees horizontally and +/- 30 degrees vertically. The sensitivity shall be field selectable from 7% to 50% obscuration.

D. Intelligent Thermal Detectors
1. Thermal detectors shall be intelligent 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. It shall connect via two wires to the fire alarm control panel signaling line circuit.

E. Addressable Dry Contact Monitor Module
1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device such as flow, tamper, release systems, etc.) to one of the fire alarm control panel SLCs.
2. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
3. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.
4. Monitor module shall be provided for all sprinkler flow and tamper switches. Switches are furnished and installed by others and electrically connected to the fire alarm system by the electrical contractor. Verify quantities and coordinate installation of devices required with fire protection shop drawings.

F. Addressable Control Module:
1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay. Each relay shall have a red LED mounted on its cover to indicate if that relay has been activated.
2. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation, or as a dry contact (Form-C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

G. Door Holders
1. Provide door holders for wall mounting and for floor mounting. Door holders shall operate on twenty-four volt dc power and each holder shall not draw more than seventy Mili Amp of power. Coordinate quantities of door holders required with architect’s door schedule.

2.5 BATTERIES

A. The batteries shall be sealed, 12 volt nominal (two required).

B. The battery shall have sufficient capacity to power the fire alarm system for the time required in NFPA 72. This time shall be based on the type of system installed. At the end of this period the system shall be capable of operating all alarm notification appliances used for evacuation or to direct aid to the location of an emergency for 5 minutes upon a normal AC power failure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide all equipment, wiring, conduit and outlet boxes required for the erection of a complete and operating system in accordance with applicable local, state and national codes, the manufacturer's recommendations, these plans and specifications. Color code shall be used throughout.

3.2 TEST

A. The manufacturer's authorized representative shall provide supervision of final system panel connections, perform a complete functional test of the system and submit a written report to the contractor attesting to the proper operation of the system.

B. Testing and Proof of Compliance: Each owner shall submit a least one (1) in-building coverage test, as follows:
1. Acceptance testing prior to occupancy of any newly constructed building.
2. Whenever structural changes occur including additions to building that would materially change the original field performance tests.
3. Annually
4. When repairs of alterations are made to amplification systems, the performance test shall demonstrate that adequate radio coverage is available in all required areas of the building. At the conclusion of the testing, a report shall be submitted to the agency which shall verify compliance with Section 1.2.

C. Acceptance Test Procedure: When an in-building radio system is required, and upon completion of installation, it will be the building owner’s responsibility to have the radio system tested to ensure that two-way coverage on each floor of the building is a minimum of 95 percent.
1. Each floor of the building shall be divided into a grid of approximately forty (40) equal areas. A maximum of two (2) non-adjacent areas will be allowed to fail the test.
2. In the event that three (3) of the areas fail the test, in order to be more statistically accurate, the floor may be divided into forty (40) equal areas. A maximum of four (4) non-adjacent areas will be allowed to fail the test. After the forty (4) area test, if the system continues to fail, it will be the building owner’s responsibility to have the system altered to meet the 95 percent coverage requirement.
3. The test shall be conducted using a calibrated portable radio of the latest brand and model used by the agency talking through the agency’s radio communications system.
4. A test location approximately in the center of each grid area will be selected for the test, then the radio will be enabled to verify two-way communications to and from the outside of the building through the agency’s radio communication system. Once the test location has been selected, prospecting for a better spot within the grid areas will be permitted within 3’ in any direction of the original selected test location.

D. Isolation Testing: As part of the installation, a spectrum analyzer or other suitable test equipment shall be utilized to insure spurious oscillations are not being generated by the subject Bi-Directional Amplifier (BDA) due to coupling (lack of sufficient isolation) between the input and output antenna systems. This test will be conducted at time of installation and subsequent annual inspections.

E. System Settings: The gain and power values of all Bi-Directional Amplifiers (BDA’s) shall be measured. The test measurement results shall be recorded on as-built drawings and kept on file with the building owner so that the measurements can be verified each year during the annual tests. In the event that the measurement results become lost, the building owner will be required to rerun the acceptance test to re-establish the gain values.

F. Annual Test: When an in-building radio system is required, it shall be the building owner’s responsibility to have all active components of the system, such as Bi-Directional Amplifiers (BDA’s), power supplies and backup batteries tested to a minimum of once

every twelve (12) months. Bi-Directional Amplifiers (BDA's) shall be tested to ensure that the gain and power are the same as it was upon initial installation and acceptance. Backup batteries and power supplies shall be tested under load of a period of one (1) hour to verify that they will properly operate during an actual power outage. If within the one (1) hour test period, and in the opinion of the agency's representative, the battery exhibits symptoms of failure, the test shall be extended for additional one (1) hour periods until the integrity of the battery can be determined. All other active components shall be checked to determine that they are operating within the manufacturers specifications for the intended purpose.

G. Field Testing: Police and Fire Personnel shall at any time have the right to enter onto the property to conduct its own field-testing to be certain that the required level of radio coverage is present.

H. Minimum Qualifications of Personnel: The minimum of qualifications of the system engineer and integration organization shall include the following:
1. A valid Professional Engineering Certification
2. Certification of in-building system training issued by the manufacturer of the equipment being installed.

I. Other Code Compliance: The in-building system installation and components shall comply with all applicable local codes, including but not limited to, Federal Communications Rules (47 CFR 90.219), NEC, NFPA, IBC, IFC, TIA/EIA, etc.

3.3 FINAL INSPECTION

A. Upon completion of the installation, the electrical contractor shall provide to the architect, with a copy to the manufacturer's representative, a signed written statement attesting that all system equipment was installed in accordance with these specifications and in accordance with wiring diagrams, instructions and directions provided to the contractor by the manufacturer.

3.4 INSTRUCTION

A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components shall be provided and shall include one session for a period of 8 hours. Additional time that may be required for end-user training will be at added cost to owner.

3.5 GUARANTEE

A. All equipment and wiring shall be guaranteed against defects in materials and workmanship for a two year period from the start up and beneficial use of the system. Warranty service for the equipment shall be provided by the manufacturer's factory trained representative during normal working hours, Monday through Friday excluding holidays. Emergency service provided at times other than as stipulated above shall be available from the same source at additional cost to the owner.

3.6 INSPECTIONS

A. Upon satisfactory completion of the system test, the manufacturer's representative shall present for the owner's consideration, a proposal to provide semi-annual inspection and tests of the system.

END OF SECTION 287210

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