

## SECTION 284621.11 - ADDRESSABLE FIRE-ALARM SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Addressable fire-alarm system.
2. Fire-alarm control unit (FACU).
3. Manual fire-alarm boxes.
4. System smoke detectors.
5. Non-system combination smoke and carbon monoxide detectors
6. Carbon monoxide detectors.
7. Heat detectors.
8. Multicriteria and multisensor fire detectors.
9. Fire-alarm remote annunciators.
10. Fire-alarm addressable interface devices.
11. Digital alarm communicator transmitters (DACTs).

##### B. Related Requirements:

1. Section 087100 "Door Hardware" for magnetic door holders that release in response to fire-alarm outputs.
2. Section 260519 "Low-Voltage Electrical Power Conductors and Cables" or Section 260523 "Control Voltage Electrical Power Cables" for cables and conductors for fire-alarm systems.
3. Section 284700 "Mass Notification" for mass notification features that are required in addition to fire-alarm system and equipment requirements specified in this Section.

#### 1.2 DEFINITIONS

A. DACT: Digital alarm communicator transmitter.

B. FACU: Fire-alarm control unit.

C. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:

1. Control Voltage: Listed and labeled for use in remote-control, signaling, and power-limited circuits supplied by a Class 2 or Class 3 power supply having rated output not greater than 150 V and 5 A, allowing use of alternate wiring methods complying with NFPA 70, Article 725.
2. Low Voltage: Listed and labeled for use in circuits supplied by a Class 1 or other power supply having rated output not greater than 1000 V, requiring use of wiring methods complying with NFPA 70, Article 300, Part I.

### 1.3 SEQUENCING AND SCHEDULING

- A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. When new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service, and label existing fire-alarm equipment "NOT IN SERVICE" until removed from building.
- B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

### 1.4 ACTION SUBMITTALS

- A. Approved Permit Submittal: Submittals must be approved by authorities having jurisdiction prior to submitting them to Architect.
- B. Product Data: For each type of product, including furnished options and accessories.
  - 1. Include construction details, material descriptions, dimensions, profiles, and finishes.
  - 2. Include rated capacities, operating characteristics, and electrical characteristics.
- C. Shop Drawings: For fire-alarm system.
  - 1. Comply with recommendations and requirements in "Documentation" section of "Fundamentals" chapter in NFPA 72.
  - 2. Include plans, elevations, sections, and details, including details of attachments to other Work.
  - 3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
  - 4. Annunciator panel details as required by authorities having jurisdiction.
  - 5. Detail assembly and support requirements.
  - 6. Include voltage drop calculations for notification-appliance circuits.
  - 7. Include battery-size calculations.
  - 8. Include input/output matrix.
  - 9. Include written statement from manufacturer that equipment and components have been tested as a system and comply with requirements in this Section and in NFPA 72.
  - 10. Include performance parameters and installation details for each detector.
  - 11. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
  - 12. Provide control wiring diagrams for fire-alarm interface to HVAC; coordinate location of duct smoke detectors and access to them.
    - a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
    - b. Show field wiring and equipment required for HVAC unit shutdown on alarm and override by firefighters' smoke-evacuation system.
    - c. Locate detectors in accordance with manufacturer's written instructions.

13. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
  14. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.
- D. Delegated Design Submittal: For notification appliances and smoke and heat detectors, in addition to submittals listed above, indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.
1. Drawings showing location of each notification appliance and smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of device.
  2. Design Calculations: Calculate requirements for selecting spacing and sensitivity of detection, complying with NFPA 72. Calculate spacing and intensities for strobe signals and sound-pressure levels for audible appliances.
  3. Indicate audible appliances required to produce square wave signal per NFPA 72.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Certificates:
1. Seismic Performance Certificates: For FACU, accessories, and components, from manufacturer. Include the following information:
    - a. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - b. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
    - c. Detailed description of equipment anchorage devices on which certification is based and their installation requirements.
- B. Field quality-control reports.
- C. Qualification Statements: For Installer.
- D. Sample Warranty: Submittal must include line item pricing for replacement parts and labor.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following and deliver copies to authorities having jurisdiction:
    - a. Comply with "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.

- b. Provide "Fire-Alarm and Emergency Communications System Record of Completion Documents" in accordance with "Completion Documents" Article in "Documentation" section of "Fundamentals" chapter in NFPA 72.
- c. Complete wiring diagrams showing connections between devices and equipment. Each conductor must be numbered at every junction point with indication of origination and termination points.
- d. Riser diagram.
- e. Device addresses.
- f. Air-sampling system sample port locations and modeling program report showing layout meets performance criteria.
- g. Record copy of site-specific software.
- h. Provide "Inspection and Testing Form" in accordance with "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:
  - 1) Equipment tested.
  - 2) Frequency of testing of installed components.
  - 3) Frequency of inspection of installed components.
  - 4) Requirements and recommendations related to results of maintenance.
  - 5) Manufacturer's user training manuals.
- i. Manufacturer's required maintenance related to system warranty requirements.
- j. Abbreviated operating instructions for mounting at FACU and each annunciator unit.

B. Software and Firmware Operational Documentation:

- 1. Software operating and upgrade manuals.
- 2. Program Software Backup: On USB media and approved online or cloud solution.
- 3. Device address list.
- 4. Printout of software application and graphic screens.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

- 1. Personnel must be trained and certified by manufacturer for installation of units required for this Project.
- 2. Installation must be by personnel certified by NICET as fire-alarm technician Level III or above .
- 3. Obtain certification by NRTL in accordance with NFPA 72.
- 4. Licensed or certified by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 ADDRESSABLE FIRE-ALARM SYSTEM

A. Description:

1. Noncoded, UL-certified addressable system, with multiplexed signal transmission.
- B. Performance Criteria:
1. Regulatory Requirements:
    - a. Fire-Alarm Components, Devices, and Accessories: Listed and labeled by a NRTL in accordance with NFPA 70 for use with selected fire-alarm system and marked for intended location and application.
  2. General Characteristics:
    - a. Automatic sensitivity control of certain smoke detectors.
    - b. Fire-alarm signal initiation must be by one or more of the following devices and systems:
      - 1) Manual stations.
      - 2) Heat detectors.
      - 3) Smoke detectors (not including detectors inside dwellings).
      - 4) Duct smoke detectors.
      - 5) Carbon monoxide detectors.
      - 6) Automatic sprinkler system water flow.
      - 7) Fire standpipe system.
      - 8) Fire pump running.
    - c. Fire-alarm signal must initiate the following actions:
      - 1) Continuously operate alarm notification appliances.
      - 2) Identify alarm and specific initiating device at FACU and remote annunciators.
      - 3) Transmit alarm signal to remote alarm receiving station.
      - 4) Switch HVAC equipment controls to fire-alarm mode.
      - 5) Activate smoke-control system (smoke management) at firefighters' smoke-control system panel where indicated on drawing.
      - 6) Activate stairwell and elevator-shaft pressurization systems.
      - 7) Close smoke dampers in air ducts of designated air-conditioning duct systems.
      - 8) Recall elevators to primary or alternate recall floors.
      - 9) Record events in system memory.
    - d. Supervisory signal initiation must be by one or more of the following devices and actions:
      - 1) Valve supervisory switch.
    - e. System trouble signal initiation must be by one or more of the following devices and actions:
      - 1) Open circuits, shorts, and grounds in designated circuits.
      - 2) Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.

- 3) Loss of communication with addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
- 4) Loss of primary power at FACU.
- 5) Ground or single break in internal circuits of FACU.
- 6) Abnormal ac voltage at FACU.
- 7) Break in standby battery circuitry.
- 8) Failure of battery charging.
- 9) Abnormal position of switch at FACU or annunciator.
- 10) Fire-pump power failure, including a dead-phase or phase-reversal condition.

f. System Trouble and Supervisory Signal Actions:

- 1) Initiate notification appliances.
- 2) Identify specific device initiating event at FACU and remote annunciators.
- 3) Transmit system status to building management system.

g. Device Guards:

- 1) Description: Welded wire mesh of size and shape for manual station, smoke detector, gong, or other device requiring protection.
  - a) Factory fabricated and furnished by device manufacturer.
  - b) Finish: Paint of color to match protected device.

h. Document Storage Box:

- 1) Description: Enclosure to accommodate standard 8-1/2-by-11 inch (216-by-279 mm) manuals and loose document records. Legend sheet will be permanently attached to door for system required documentation, key contacts, and system information. Provide two key ring holders with location to mount standard business cards for key contact personnel.
- 2) Material and Finish: 18-gauge cold-rolled steel; four mounting holes.
- 3) Color: Red powder-coat epoxy finish.
- 4) Labeling: Permanently screened with 1 inch (25 mm) high lettering "SYSTEM RECORD DOCUMENTS" with white indelible ink.
- 5) Security: Locked with 3/4 inch (19 mm) barrel lock. Provide solid 12 inch (304 mm) stainless steel piano hinge.

## 2.2 FIRE-ALARM CONTROL UNIT (FACU)

- A. Description: Field-programmable, microprocessor-based, modular, power-limited design with electronic modules.
- B. Performance Criteria:
  1. Regulatory Requirements: Comply with NFPA 72 and UL 864.
  2. General Characteristics:

- a. System software and programs must be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining information through failure of primary and secondary power supplies.
- b. Include real-time clock for time annotation of events on event recorder and printer.
- c. Provide communication between FACU and remote circuit interface panels, annunciators, and displays.
- d. FACU must be listed for connection to central-station signaling system service.
- e. Provide nonvolatile memory for system database, logic, and operating system and event history. System must require no manual input to initialize in the event of complete power down condition. FACU must provide minimum 500-event history log.
- f. Addressable Initiation Device Circuits: FACU must indicate which communication zones have been silenced and must provide selective silencing of alarm notification appliance by building communication zone.
  - 1) Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: FACU must be listed for releasing service.
- g. Fire-Alarm Annunciator: Arranged for interface between human operator at FACU and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and programming and control menu.
  - 1) Annunciator and Display: LCD, 80 characters, minimum.
  - 2) Keypad: Arranged to permit entry and execution of programming, display, and control commands.
- h. Stairwell and Elevator Shaft Pressurization: Provide output signal using addressable relay to start stairwell and elevator shaft pressurization system. Signal must remain on until alarm conditions are cleared and fire-alarm system is reset. Signal must not stop in response to alarm acknowledge or signal silence commands.
  - 1) Pressurization starts when alarm is received at FACU.
  - 2) Alarm signals from smoke detectors at pressurization air supplies have higher priority than other alarm signals that start system.
- i. Smoke-Alarm Verification:
  - 1) Initiate audible and visible indication of "alarm-verification" signal at FACU.
  - 2) Activate approved "alarm-verification" sequence at FACU and detector.
  - 3) Record events by system printer.
  - 4) Sound general alarm if alarm is verified.
  - 5) Cancel FACU indication and system reset if alarm is not verified.
- j. Notification-Appliance Circuit:
  - 1) Audible appliances must sound in three-pulse temporal pattern, as defined in NFPA 72.

- 2) Where notification appliances provide signals to sleeping areas, alarm signal must be 520 Hz square wave with intensity 15 dB above average ambient sound level or 5 dB above maximum sound level, or at least 75 dB(A-weighted), whichever is greater, measured at pillow.
  - 3) Visual alarm appliances must flash in synchronization where multiple appliances are in same field of view, as defined in NFPA 72.
- k. Elevator Recall: Initiate by one of the following alarm-initiating devices:
- 1) Elevator lobby detectors except lobby detector on designated floor.
  - 2) Smoke detectors in elevator machine room.
  - 3) Smoke detectors in elevator hoistway.
- l. Elevator controller must be programmed to move cars to alternate recall floor if lobby detectors located on designated recall floors are activated.
- 1) Water-flow switch associated with sprinkler in elevator pit may have delay to allow elevators to move to designated floor.
- m. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to remote alarm station.
- n. Status Annunciator: Indicate status of various voice/alarm speaker zones and status of firefighters' two-way telephone communication zones.
- o. Preamplifiers, amplifiers, and tone generators must automatically transfer to backup units, on primary equipment failure.
- p. Printout of Events: On receipt of signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble) and date and time of occurrence. Differentiate alarm signals from other printed indications. Also, print system reset event, including same information for device, location, date, and time. Commands initiate printing of list of existing alarm, supervisory, and trouble conditions in system and historical log of events.
- q. Primary Power: 24 V(dc) obtained from 120 V(ac) service and power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, and supervisory signals supervisory and DACT and digital alarm radio transmitters must be powered by 24 V(dc) source.
- r. Alarm current draw of entire fire-alarm system must not exceed 80 percent of power-supply module rating.
- s. Secondary Power: 24 V(dc) supply system with batteries, automatic battery charger, and automatic transfer switch.
- t. Batteries: Sealed lead calcium.
- C. Accessories:
1. Instructions: Computer printout or typewritten instruction card mounted behind plastic or glass cover in stainless steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe functional operation of system under normal, alarm, and trouble conditions.
  2. Preaction System Functionality:

- a. Initiate Presignal Alarm: This function must cause audible and visual alarm and indication to be provided at FACU. Activation of initiation device connected as part of preaction system must be annunciated at FACU only, without activation of general evacuation alarm.

## 2.3 MANUAL FIRE-ALARM BOXES

- A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes must be finished in red with molded, raised-letter operating instructions in contrasting color; must show visible indication of operation; and must be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
  1. Single-action mechanism, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to FACU.
  2. Station Reset: Key- or wrench-operated switch.
  3. Indoor Protective Shield: Factory-fabricated, clear plastic enclosure hinged at top to permit lifting for access to initiate alarm. Lifting cover actuates integral battery-powered audible horn intended to discourage false-alarm operation.

## 2.4 SYSTEM SMOKE DETECTORS

- A. Photoelectric Smoke Detectors:
  1. Performance Criteria:
    - a. Regulatory Requirements:
      - 1) NFPA 72.
      - 2) UL 268.
    - b. General Characteristics:
      - 1) Detectors must be four-wire type.
      - 2) Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
      - 3) Base Mounting: Detector and associated electronic components must be mounted in twist-lock module that connects to fixed base. Provide terminals in fixed base for connection to building wiring.
      - 4) Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
      - 5) Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
      - 6) Detector address must be accessible from FACU and must be able to identify detector's location within system and its sensitivity setting.
      - 7) Operator at FACU, having designated access level, must be able to manually access the following for each detector:
        - a) Primary status.
        - b) Device type.
        - c) Present average value.

- d) Present sensitivity selected.
  - e) Sensor range (normal, dirty, etc.).
- 8) Detector must have functional humidity range within 10 to 90 percent relative humidity.

## 2.5 NON-SYSTEM COMBINATION SMOKE AND CARBON MONOXIDE DETECTORS

### A. Single-Station Smoke Detectors:

1. Comply with UL 217; suitable for NFPA 101, residential occupancies; operating at 120-V ac with 9-V dc battery as the secondary power source. Provide with "low" or "missing" battery chirping-sound device.
2. Audible Notification Appliance: Piezoelectric sounder rated at 90 dBA at **10 feet (3 m)** according to UL 464.
3. Visible Notification Appliance: 177-cd strobe for hearing and visual impaired dwellings.
4. Test Switch: Push to test; simulates smoke at rated obscuration.
5. Tandem Connection: Allow tandem connection of number of indicated detectors within dwelling unit; alarm on one detector shall actuate notification on all connected detectors.
6. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
7. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
8. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
9. Smoke sensors shall be ionization type; carbon monoxide (CO) sensor shall be electrochemical.

## 2.6 CARBON MONOXIDE DETECTORS

### A. Description: Carbon monoxide detector listed for connection to fire-alarm system.

### B. Performance Criteria:

1. Regulatory Requirements:
  - a. NFPA 72
  - b. NFPA 720.
  - c. UL 2075.
2. General Characteristics:
  - a. Mounting: Adapter plate for outlet box mounting.
  - b. Testable by introducing test carbon monoxide into sensing cell.
  - c. Detector must provide alarm contacts and trouble contacts.
  - d. Detector must send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
  - e. Locate, mount, and wire in accordance with manufacturer's written instructions.

- f. Provide means for addressable connection to fire-alarm system.
- g. Test button simulates alarm condition.

## 2.7 HEAT DETECTORS

### A. Combination-Type Heat Detectors:

#### 1. Performance Criteria:

##### a. Regulatory Requirements:

- 1) NFPA 72.
- 2) UL 521.

##### b. General Characteristics:

- 1) Temperature sensors must test for and communicate sensitivity range of device.

- c. Actuated by fixed temperature of **135 deg F (57 deg C)** or rate of rise that exceeds **15 deg F (8 deg C)** per minute unless otherwise indicated.
- d. Mounting: Adapter plate for outlet box mounting and Twist-lock base interchangeable with smoke-detector bases.
- e. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
- f. Detector must have functional humidity range of 10 to 90 percent relative humidity.

## 2.8 MULTICRITERIA AND MULTISENSOR FIRE DETECTORS

### A. Description: Fire-sensing detectors using multiple means of detection.

### B. Performance Criteria:

#### 1. Regulatory Requirements:

- a. NFPA 72.

#### 2. General Characteristics:

- a. Mounting: Adapter plate for outlet box mounting and Twist-lock base interchangeable with smoke-detector bases.
- b. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
- c. Automatically adjusts its sensitivity by means of drift compensation and smoothing algorithms. Detector must send trouble alarm if it is incapable of compensating for existing conditions.
- d. Test button tests sensors in detector.
- e. Operator at FACU, having designated access level, must be able to manually access the following for each detector:

- 1) Primary status.
  - 2) Device type.
  - 3) Present sensitivity selected.
  - 4) Sensor range (normal, dirty, etc.).
- f. Detector must have functional humidity range within 10 to 90 percent relative humidity.
- g. Comply with UL and FM Global requirements.
- h. Sensors (Multisensor Type): Detector must be comprised of four sensing elements including smoke sensor, carbon monoxide sensor, infrared sensor, and heat sensor.
- 1) Smoke sensor must be photoelectric type as described in "System Smoke Detectors" Article.
  - 2) Carbon monoxide sensor must be as described in "Carbon Monoxide Detectors" Article.
  - 3) Heat sensor must be as described in "Heat Detectors" Article.
  - 4) Each sensor must be separately listed in accordance with requirements for its detector type.

## 2.9 FIRE-ALARM REMOTE ANNUNCIATORS

### A. Performance Criteria:

1. Regulatory Requirements:
  - a. NFPA 72.
2. General Characteristics:
  - a. Annunciator functions must match those of FACU for alarm, supervisory, and trouble indications. Manual switching functions must match those of FACU, including acknowledging, silencing, resetting, and testing.
    - 1) Mounting: Flush Surface cabinet, NEMA 250, Type 1.
  - b. Display Type and Functional Performance: Alphanumeric display and LED indicating lights must match those of FACU. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

## 2.10 FIRE-ALARM ADDRESSABLE INTERFACE DEVICES

### A. Performance Criteria:

1. Regulatory Requirements:
  - a. NFPA 72.
2. General Characteristics:
  - a. Include address-setting means on module.

- b. Store internal identifying code for control panel use to identify module type.
- c. Listed for controlling HVAC fan motor controllers.
- d. Monitor Module: Microelectronic module providing system address for alarm-initiating devices for wired applications with normally open contacts.
- e. Integral Relay: Capable of providing direct signal to elevator controller to initiate elevator recall.
  - 1) Allow control panel to switch relay contacts on command.
  - 2) Have minimum of two normally open and two normally closed contacts available for field wiring.
- f. Control Module:
  - 1) Operate notification devices.
  - 2) Operate solenoids for use in sprinkler service.

## 2.11 DIGITAL ALARM COMMUNICATOR TRANSMITTERS (DACTs)

### A. Performance Criteria:

- 1. Regulatory Requirements:
  - a. NFPA 72.
- 2. General Characteristics:
  - a. DACT must be acceptable to remote central station and must be listed for fire-alarm use.
  - b. Functional Performance: Unit must receive alarm, supervisory, or trouble signal from FACU and automatically capture [**one**] [**two**] telephone line(s) and dial preset number for remote central station. When contact is made with central station(s), signals must be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter must initiate local trouble signal and transmit signal indicating loss of telephone line to remote alarm receiving station over remaining line. Transmitter must automatically report telephone service restoration to central station. If service is lost on both telephone lines, transmitter must initiate local trouble signal.
  - c. Local functions and display at DACT must include the following:
    - 1) Verification that both telephone lines are available.
    - 2) Programming device.
    - 3) LED display.
    - 4) Manual test report function and manual transmission clear indication.
    - 5) Communications failure with central station or FACU.
  - d. Digital data transmission must include the following:
    - 1) Address of alarm-initiating device.
    - 2) Address of supervisory signal.
    - 3) Address of trouble-initiating device.

- 4) Loss of ac supply or loss of power.
  - 5) Low battery.
  - 6) Abnormal test signal.
  - 7) Communication bus failure.
  - 8) IP Line Failure.
- e. Secondary Power: Integral rechargeable battery and automatic charger.
  - f. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
  - 1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.
- B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Preinstallation Testing: Perform verification of functionality of installed components of existing system prior to starting work. Document equipment or components not functioning as designed.
- B. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service in accordance with requirements indicated:
  - 1. Notify Construction Manager and Owner no fewer than seven days in advance of proposed interruption of fire-alarm service.
  - 2. Do not proceed with interruption of fire-alarm service without Construction Manager's and Owner's written permission.
- C. Protection of In-Place Conditions: Protect devices during construction unless devices are placed in service to protect facility during construction.

#### 3.3 INSTALLATION OF EQUIPMENT

- A. Comply with NECA 305, NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install electrical wiring to

comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

1. Devices placed in service before other trades have completed cleanup must be replaced.
  2. Devices installed, but not yet placed, in service must be protected from construction dust, debris, dirt, moisture, and damage in accordance with manufacturer's written storage instructions.
- B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections. (If applicable, see drawings)
1. Connect new equipment to existing control panel in existing part of building.
  2. Connect new equipment to existing monitoring equipment at supervising station.
  3. Expand, modify, and supplement existing control monitoring equipment as necessary to extend existing control monitoring functions to new points. New components must be capable of merging with existing configuration without degrading performance of either system.
- C. Equipment Floor and Wall Mounting: Install FACU on finished floor.
- D. Install wall-mounted equipment, with tops of cabinets not more than **78 inch (1980 mm)** above finished floor.
- E. Manual Fire-Alarm Boxes:
1. Install manual fire-alarm box in normal path of egress within **60 inch (1520 mm)** of exit doorway.
  2. Mount manual fire-alarm box on background of contrasting color.
  3. Operable part of manual fire-alarm box must be between **42 and 48 inch (1060 and 1220 mm)** above floor level. Devices must be mounted at same height unless otherwise indicated.
- F. Smoke- and Heat-Detector Spacing:
1. Comply with "Smoke-Sensing Fire Detectors" section in "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
  2. Comply with "Heat-Sensing Fire Detectors" section in "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
  3. Smoke detectors installed on smooth ceiling spacing must not exceed **30 ft. (9 m)**.
  4. Heat detectors installed on smooth ceiling spacing must not exceed their listed spacing.
  5. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas must be determined in accordance with Annex A or Annex B in NFPA 72.
  6. Smoke detectors shall be provided in all equipment, compactor, and laundry rooms.
  7. Smoke detectors shall be provided in the elevator machine room, elevator lobbies, at the top of the elevator hoist and the top of staircase shaft smoke vents.
  8. Heat detectors shall be provided in boiler rooms only.
  9. Lighting Fixtures: Locate detectors not closer than **12 inch (300 mm)** from lighting fixture and not directly above pendant mounted or indirect lighting.
- G. Non-System Combination Smoke and Carbon Monoxide Detectors Inside Dwellings

1. Where more than one combination smoke and carbon monoxide detector are installed within a dwelling or suite, they shall be interconnected to operate all the alarms within the respective unit when any of the detectors are activated.
  2. Detectors inside a dwelling shall be install in the following areas:
    - a. All bedrooms.
    - b. All halls within 15 feet of the bedroom doors.
    - c. All living rooms.
    - d. All dwellings dedicated for hearing and visual impaired must be provided with strobe lights in accordance with the Uniform Federal Accessibility Standards (UFAS) or the American with Disabilities Act (ADA), 2010 Standards for Accessible Design.
- H. Install cover on each smoke detector that is not placed in service during construction. Cover must remain in place except during system testing. Remove cover prior to system turnover.
- I. Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location. Do not install smoke detectors in sprinklered elevator shafts.
- J. Remote Status and Alarm Indicators: Install in visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.
- K. Audible Alarm-Indicating Devices: Install not less than **6 inch (150 mm)** below ceiling. Install bells and horns on flush-mounted back boxes with device-operating mechanism concealed behind grille. Install devices at same height unless otherwise indicated.
- L. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least **6 inch (150 mm)** below ceiling. Install devices at same height unless otherwise indicated.
- M. Device Location-Indicating Lights: Locate in public space near device they monitor.
- 3.4 ELECTRICAL CONNECTIONS
- A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
  - B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
  - C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.
  - D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
    1. Nameplate must be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."

### 3.5 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.
- B. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."
- C. Install nameplate for each control connection, indicating field control panel designation and I/O control designation feeding connection.

### 3.6 CONNECTIONS

- A. Make addressable connections with supervised interface device to the following devices and systems. Install interface device less than **36 inch (910 mm)** from device controlled. Make addressable confirmation connection when such feedback is available at device or system being controlled.
  - 1. Alarm-initiating connection to smoke-control system (smoke management) at firefighters' smoke-control system panel.
  - 2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
  - 3. Alarm-initiating connection to elevator recall system and components.
  - 4. Supervisory connections at valve supervisory switches.
  - 5. Data communication circuits for connection to building management system.
  - 6. Supervisory connections at fire-pump power failure including dead-phase or phase-reversal condition.
  - 7. Supervisory connections at fire-pump engine control panel.
  - 8. Sprinkler system water flow switch.

### 3.7 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."
- B. Install framed instructions in location visible from FACU.

### 3.8 GROUNDING

- A. Ground FACU and associated circuits in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Ground shielded cables at control panel location only. Insulate shield at device location.

### 3.9 FIELD QUALITY CONTROL

- A. Field tests must be witnessed by authorities having jurisdiction.
- B. Administrant for Tests and Inspections:

1. Owner will engage qualified testing agency to administer and perform tests and inspections.
  2. Engage qualified testing agency to administer and perform tests and inspections.
- C. Tests and Inspections:
1. Visual Inspection: Conduct visual inspection prior to testing.
    - a. Inspection must be based on completed record Drawings and system documentation that is required by "Completion Documents, Preparation" table in "Documentation" section of "Fundamentals" chapter in NFPA 72.
    - b. Comply with "Visual Inspection Frequencies" table in "Inspection" section of "Inspection, Testing and Maintenance" chapter in NFPA 72; retain "Initial/Reacceptance" column and list only installed components.
  2. System Testing: Comply with "Test Methods" table in "Testing" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
- D. Reacceptance Testing: Perform reacceptance testing to verify proper operation of added or replaced devices and appliances.
- E. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.
- G. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- H. 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. Use forms developed for initial tests and inspections.

END OF SECTION 284621.11