

## SECTION 283111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Fire-alarm control unit.
  - 2. Manual fire-alarm boxes.
  - 3. System smoke detectors.
  - 4. Heat detectors.
  - 5. Notification appliances.
  - 6. Firefighters' two-way telephone communication service.
  - 7. Magnetic door holders.
  - 8. Remote annunciator.
  - 9. Addressable interface device.
  - 10. System printer.

## 1.3 DEFINITIONS

- A. LED: Light-emitting diode.
- B. NICET: National Institute for Certification in Engineering Technologies.

## 1.4 SYSTEM DESCRIPTION

- A. System is a new noncoded, UL-certified addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.
- B. Work involves the extension and/or reconfiguration of the existing building **<Insert Make/Model of existing fire alarm system>** fire alarm system dedicated to fire-alarm service only. The fire alarm contractor's work shall include system reprogramming, modification of graphic interfaces, and updating of system as-built drawings.
- C. [Bethesda campus only. ]The fire alarm system shall receive a low level audio input signal from the mass evacuation system and retransmit the signal over all notification circuits.

## 1.5 PERFORMANCE REQUIREMENTS

- A. Voice Evacuation: In order to ensure the ability to use the system for emergency notification in situations other than fire, the fire-alarm shall utilize voice evacuation.
- B. Any new fire alarm system shall be compatible with the base/campus fire alarm reporting system.
  - 1. For the Bethesda Campus the new system shall be compatible with the Simplex reporting loop. The only acceptable manufacturers for are either Simplex or Siemens.
  - 2. For the Poolesville Campus the new system shall be compatible with the Simplex reporting loop. The only acceptable manufacturer is Simplex.
  - 3. For the Rocky Mountain Laboratory Campus the new system shall be manufactured by Notifier and shall be capable of being monitored by the Notifier panel in the Security Building. The only acceptable manufacturer is Notifier.
- C. Duct smoke detectors shall be omitted from all HVAC systems outside of the Clinical Center Complex.
- D. Detectors shall not be installed in elevator shafts.
- E. Notification appliances shall not be installed in elevator cabs or stairwells.
- F. The fire alarm control panel shall be located at the building entrance or in the Fire Command Center (if provided). If the main building entrance cannot accommodate the FACP, audio controller, battery cabinets and amplifier panels, then a remote annunciator and audio controller shall be located at the main building entrance with the FACP and other components located in an electrical closet.
- G. Battery backup is required on all fire alarm systems. Battery capacity shall be based on 72 hours of standby operation followed by 30 minutes of alarm operation. For facilities with emergency generators (this includes all buildings on the Rocky Mountain Laboratory Campus) the standby period of operation may be decreased to 24 hours.
- H. Wiring
  - 1. All signaling line circuits (SLC) shall meet Style 6 requirements.
  - 2. All panel-to-panel communication (SLC) circuits shall meet Style 7 requirements.
  - 3. All initiating device circuits (IDC) shall meet Style D requirements.
  - 4. All notification appliance circuits (NAC) shall meet Style Z requirements.
  - 5. All fire alarm wiring shall be solid copper sized in accordance with the manufacturer's recommendations.
  - 6. The fire alarm wire for 120 V AC circuits shall be #12 AWG, solid copper, TFN insulation.

## 1.6 SUBMITTALS

### A. General Submittal Requirements:

1. Submittals shall be approved by the NIH Division of the Fire Marshal.
2. Shop Drawings shall be prepared by persons with the following qualifications:
  - a. Trained and certified by manufacturer in fire-alarm system design.
  - b. NICET-certified fire-alarm technician, Level III minimum.

### B. Product Data: For each type of product indicated.

### C. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, riser diagram(s), details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
2. Include voltage drop calculations for notification appliance circuits.
3. Include battery-size calculations.
4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
5. For work in the Clinical Center Complex only, include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
6. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
7. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

### D. Qualification Data: For qualified Installer.

### E. Field quality-control reports.

### F. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
  - a. Frequency of testing of installed components.
  - b. Frequency of inspection of installed components.

- c. Requirements and recommendations related to results of maintenance.
  - d. Manufacturer's user training manuals.
- 5. Manufacturer's required maintenance related to system warranty requirements.
  - 6. Abbreviated operating instructions for mounting at fire-alarm control unit.
- G. Software and Firmware Operational Documentation:
- 1. Software operating and upgrade manuals.
  - 2. Program Software Backup: On magnetic media or compact disk, complete with data files.
  - 3. Device address list.
  - 4. Printout of software application and graphic screens.

## 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm [Level II] [Level III] [Level IV] technician.
- C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 1.8 PROJECT CONDITIONS

- A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by NIH or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
  - 1. Notify NIH no fewer than 14 days in advance of proposed interruption of fire-alarm service.
  - 2. Do not proceed with interruption of fire-alarm service without NIH's written permission.

## 1.9 SEQUENCING AND SCHEDULING

- A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As 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 the building.
- B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

### 1.10 SOFTWARE SERVICE AGREEMENT

- A. Comply with UL 864.
- B. Technical Support: Beginning with Substantial Completion, provide software support for **[two]** **<Insert number>** years.
- C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within **[two]** **<Insert number>** years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
  - 1. Provide **[30]** **<Insert number>** days' notice to NIH to allow scheduling and access to system and to allow NIH to upgrade computer equipment if necessary.

### 1.11 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Lamps for Remote Indicating Lamp Units: Quantity equal to **[10]** **<Insert number>** percent of amount installed, but no fewer than 1 unit.
  - 2. Lamps for Strobe Units: Quantity equal to **[10]** **<Insert number>** percent of amount installed, but no fewer than 1 unit.
  - 3. Smoke Detectors, Fire Detectors: Quantity equal to **[10]** **<Insert number>** percent of amount of each type installed, but no fewer than 1 unit of each type.
  - 4. Detector Bases: Quantity equal to **[2]** **<Insert number>** percent of amount of each type installed, but no fewer than 1 unit of each type.
  - 5. Keys and Tools: One extra set for access to locked and tamperproofed components.
  - 6. Audible and Visual Notification Appliances: **[One]** **<Insert number>** of each type installed.
  - 7. Fuses: **[Two]** **<Insert number>** of each type installed in the system.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Equipment installed on an existing fire alarm system shall be the current make and model recommended by the manufacturer for that fire alarm system.
- B. For new fire alarm systems the system installed shall be compatible with the campus central station reporting system.
  - 1. For the Bethesda Campus the new system shall be compatible with the Simplex reporting loop. The only acceptable manufacturers for are either Simplex or Siemens.
  - 2. For the Poolesville Campus the new system shall be compatible with the Simplex reporting loop. The only acceptable manufacturer is Simplex.

3. For the Rocky Mountain Laboratory Campus the new system shall be manufactured by Notifier and shall be capable of being monitored by the Notifier panel in the Security Building. The only acceptable manufacturer is Notifier.

## 2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices[ **and systems**]:
  1. Manual stations.
  2. Heat detectors.
  3. Smoke detectors.
  4. Duct smoke detectors.
  5. Automatic sprinkler system water flow.
  6. Fire-extinguishing system operation.
  7. **<Insert alarm-initiating devices and systems>**.
- B. Fire-alarm signal shall initiate the following actions:
  1. Continuously operate alarm notification appliances **<throughout the building> <in the affected zones>**.
  2. Identify alarm at fire-alarm control unit[ **and remote annunciators**].
  3. Transmit an alarm signal to the campus fire alarm reporting system.
  4. Unlock electric door locks in designated egress paths.
  5. Release fire and smoke doors held open by magnetic door holders.
  6. Activate voice/alarm communication system **<throughout the building> <in the affected zones>**.
  7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
  8. Activate smoke-control system (smoke management) at firefighter smoke-control system panel.
  9. Activate stairwell pressurization systems.
  10. Close smoke dampers in air ducts of designated air-conditioning duct systems.
  11. Elevator machine room heat detector alarms shall shunt trip power to the elevator controllers in that room.
  12. Recall elevators to primary or alternate recall floors.
  13. Record events in the system memory.
  14. Record events by the system printer.
  15. **<Insert signal-initiating actions>**.
- C. Supervisory signal initiation shall be by one or more of the following devices and actions:
  1. Valve supervisory switch.
  2. Low-air-pressure switch of a dry-pipe or preaction sprinkler system.
  3. Fire pump running.
  4. Fire pump loss of power.
  5. Fire pump power phase reversal.
  6. **<Insert supervisory signal-initiating devices and actions>**.
- D. System trouble signal initiation shall 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 primary power at fire-alarm control unit.
  4. Ground or a single break in fire-alarm control unit internal circuits.
  5. Abnormal ac voltage at fire-alarm control unit.
  6. Break in standby battery circuitry.
  7. Failure of battery charging.
  8. Abnormal position of any switch at fire-alarm control unit or annunciator.
  9. **<Insert trouble signal-initiating devices and actions>.**
- E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit[ **and remote annunciators**]. Record the event on system printer. After a time delay of 200 seconds, transmit the supervisor and trouble conditions to the campus fire alarm reporting system if still active.

### 2.3 FIRE-ALARM CONTROL UNIT

- A. General Requirements for Fire-Alarm Control Unit:
1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.
    - a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
    - b. Include a real-time clock for time annotation of events on the event recorder and printer.
  2. Addressable initiation devices that communicate device identity and status.
    - a. Smoke sensors shall additionally communicate sensitivity setting[ **and allow for adjustment of sensitivity at fire-alarm control unit**].
    - b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
  3. Addressable control circuits for operation of mechanical equipment.
  4. If the main fire alarm control panel is required to have a backup control unit, the backup control unit must be separated from the primary control unit by 2 hour fire-rated construction.
- B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.
1. Annunciator and Display: Liquid-crystal type, 3 line(s) of 80 characters, minimum.
  2. Keypad: Arranged to permit entry and execution of programming, display, and control commands[ **and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters**].

- C. Stairwell Pressurization: Provide an output signal using an addressable relay to start the stairwell pressurization system. Signal shall remain on until alarm conditions are cleared and fire-alarm system is reset. Signal shall not stop in response to alarm acknowledge or signal silence commands.
1. Pressurization starts when any alarm is received at fire-alarm control unit from a smoke detector outside a door to the given stairwell.
- D. Notification Appliance Circuit: Operation shall sound in a **<Insert pattern>**.
- E. Elevator Recall:
1. Smoke detectors at the following locations shall initiate automatic elevator recall to the primary floor level.[ **Alarm-initiating devices, except those listed, shall not start elevator recall.**]
    - a. Elevator lobby detectors except the lobby detector on the designated floor.
    - b. Smoke detector in elevator machine room.
  2. Elevator lobby detectors located on the designated recall floors shall be programmed to move the cars to the alternate recall floor.
  3. System shall lock in the first recall function (i.e., a subsequent activation of the primary floor lobby detector shall not move the elevator(s) to the secondary floor).
  4. Activation of a heat detector in an elevator machine room shall shut down elevators associated with the location without time delay.
- F. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke barrier walls shall **[be] [not be]** connected to fire-alarm system.
- G. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.
- H. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.
- I. Voice/Alarm Signaling Service: Central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators provided **[in a separate cabinet located in the fire command center] [as a special module that is part of fire-alarm control unit]**.
1. All new fire alarm systems on the Bethesda campus shall utilize a voice evacuation system.
    - a. The prerecorded voice evacuation sequence for all buildings on the Bethesda Campus is the standard Montgomery County voice message.



- b. Notification appliance circuits for voice evacuation systems shall be zoned on a floor by floor basis.
      - c. Selector switches shall be provided to select each zone or any combination of zones to deliver manual voice messages to the building.
      - d. A separate exterior speaker circuit shall be provided. This circuit shall only be activated through an input from the campus mass evacuation system or by the building fire alarm audio controller.
    2. The notification patterns for Poolesville and RML shall meet NFPA 72 for systems not employing voice evacuation.
    3. Status Annunciator: Indicate the status of various voice/alarm speaker zones and the status of firefighters' two-way telephone communication zones.
  - J. Preamplifiers, amplifiers, and tone generators shall automatically transfer to backup units, on primary equipment failure.
  - K. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. All 120 V AC primary operating power for the fire alarm system shall be obtained from the line side of the building incoming power source ahead of all building services and disconnect switches. An independently fused safety switch with provisions for the cover and operating handle to be locked in the "power on" position shall be provided. This fused safety switch shall be located adjacent to the main electrical distribution panel. This enclosure shall be painted red and shall be labeled by a letter designation.
  - L. Initiating devices, notification appliances, signaling lines, trouble signals, **[supervisory signals]** shall be powered by 24-V dc source.
    1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.
  - M. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
    1. Batteries: **[Sealed lead calcium] [Sealed, valve-regulated, recombinant lead acid] [Vented, wet-cell pocket, plate nickel cadmium].**
  - N. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.
- 2.4 CONDUIT
- A. All fire alarm wiring shall be installed in 19.05 mm (0.75 inch) minimum conduit or electrical metallic tubing (EMT). All fire alarm wiring in damp locations (fire pump and valve rooms, at flow, and tamper switches) shall be installed in liquid-tight flexible metal conduit and liquidtight device boxes. Flexible metal conduit is limited to 1.83 m (6 ft) and shall be secured per *National Electrical Code*®. All fire alarm wiring installed underground shall comply with NFPA 70®.

- B. All concealed fire alarm conduit and conduit located in stairwells, storage rooms, mechanical rooms, garages, and utility rooms shall be painted red enamel. All other exposed fire alarm conduit (outside the stairwells) shall be painted to match the existing adjacent wall surface, and red enamel bands 0.10 m (4 in.) wide shall be painted at 3.0 m (10 ft) intervals. This painting requirement also applies to the pull boxes, junction boxes, mounting boxes, and extensions. Red enamel bands shall not be painted on the pull boxes, junction boxes, mounting boxes, and extensions.

## 2.5 MANUAL FIRE-ALARM BOXES

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

## 2.6 SYSTEM SMOKE DETECTORS

- A. General Requirements for System Smoke Detectors:
  - 1. Comply with UL 268; operating at 24-V dc, nominal.
  - 2. Detectors shall be [**four**] [**two**]-wire type.
  - 3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
  - 4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
  - 5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
  - 6. Integral Visual-Indicating Light: LED type indicating detector has operated[ **and power-on status**].
  - 7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
    - a. Provide multiple levels of detection sensitivity for each sensor.
- B. Photoelectric Smoke Detectors:
  - 1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.

2. 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 average value.
  - d. Present sensitivity selected.
  - e. Sensor range (normal, dirty, etc.).

C. Ionization Smoke Detector:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. 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 average value.
  - d. Present sensitivity selected.
  - e. Sensor range (normal, dirty, etc.).

D. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. 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 average value.
  - d. Present sensitivity selected.
  - e. Sensor range (normal, dirty, etc.).
3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

## 2.7 HEAT DETECTORS

- A. General Requirements for Heat Detectors: Comply with UL 521.
- B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 57 deg C (135 deg F) or a rate of rise that exceeds 8 deg C (15 deg F) per minute unless otherwise indicated.

1. Mounting: [**Adapter plate for outlet box 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.
- C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of [**88 deg C (190 deg F)**] <Insert temperature>.
1. Mounting: [**Adapter plate for outlet box 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.

## 2.8 NOTIFICATION APPLIANCES

- A. General Requirements for Notification Appliances: Retain subparagraph below where applicable.
1. Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.
  2. All audible devices shall have adjustable sound levels.
  3. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.
- B. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 25-mm (1-inch) high letters on the lens.
1. Rated Light Output:
    - a. 15, 30, 75, 110, or 177 cd as necessary to meet NFPA 72 requirements.
    - b. 15/30/75/110 cd, selectable in the field.
  2. Mounting: Wall mounted unless otherwise indicated.
  3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
  4. Flashing shall be in a temporal pattern, synchronized with other units.
  5. Strobe Leads: Factory connected to screw terminals.
  6. Mounting Faceplate: Factory finished, [**red**] [**white**].
- C. Voice/Tone Notification Appliances:
1. Voice notification appliances shall operate on a 75 V RMS signal.
  2. Adjustable Units: Adjustable from ¼ W to 2 W.
  3. Mounting: [**Flush**] [**semirecessed**] [**or**] [**surface mounted and bidirectional**]. Devices located outdoors or exposed to the elements shall weatherproof and be mounted on suitable backboxes

4. Matching Transformers: Tap range matched to acoustical environment of speaker location.

## 2.9 FIREFIGHTERS' TWO-WAY TELEPHONE COMMUNICATION SERVICE

- A. Dedicated, two-way, supervised, telephone voice communication links between fire-alarm control unit[, **the fire command center,**] and remote firefighters' telephone stations. Supervised telephone lines shall be connected to talk circuits by controls in a control module. Provide the following:
  1. Common-talk type for firefighter use only.
  2. Controls to disconnect phones from talk circuits if too many phones are in use simultaneously.
  3. Audible Pulse and Tone Generator, and High-Intensity Lamp: When a remote telephone is activated, it causes audible signal to sound and high-intensity lamp to flash.
  4. Selector panel controls shall provide for simultaneous operation of up to six telephones in selected zones. Indicate ground faults and open or shorted telephone lines on the panel front by individual LEDs.
  5. Display: [**Graphic**] [**Liquid-crystal digital**] to indicate location of caller.
  6. Remote Telephone Cabinet: Flush- or surface-mounted cabinet as indicated, factory-standard red finish, with handset.
    - a. Install one-piece handset to cabinet with vandal-resistant armored cord. Silk-screened or engraved label on cabinet door, designating[ "**Fire Warden Phone**" or] "Fire Emergency Phone."
    - b. With "break-glass" type door access lock.
  7. Remote Telephone Jack Stations: Single-gang, stainless-steel-plate mounted plug, engraved[ "**Fire Warden Phone**" or] "Fire Emergency Phone."
  8. Handsets: <Insert number> [**push-to-talk-type**] sets[ **with noise-canceling microphone**] stored in a cabinet [**adjacent to fire-alarm control unit**] [**in the fire command center**].

## 2.10 MAGNETIC DOOR HOLDERS

- A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.
  1. Electromagnet: Requires no more than 3 W to develop 111-N (25-lbf) holding force.
  2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
  3. Rating: 24-V ac or dc.
  4. Rating: 120-V ac.
- B. Material and Finish: Match door hardware.

## 2.11 REMOTE ANNUNCIATOR

- A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, 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 shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

## 2.12 ADDRESSABLE INTERFACE DEVICE

- A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.
- B. Integral Relay: Capable of providing a direct signal [**to elevator controller to initiate elevator recall**] [**to circuit-breaker shunt trip for power shutdown**] <Insert functions>.

## 2.13 BASE/CAMPUS FIRE ALARM REPORTING LOOP

- A. Provide all equipment and cabling necessary to interface between the building fire alarm system and the base/campus fire alarm reporting loop.

## 2.14 DEVICE GUARDS

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

## PART 3 - EXECUTION

### 3.1 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72 for installation of fire-alarm equipment.
- B. Equipment Mounting: Install fire-alarm control unit on concrete base with tops of cabinets not more than 1830 mm (72 in.) above the finished floor. Comply with requirements for concrete base specified in Division 03 Section "[**Cast-in-Place Concrete**] [**Miscellaneous Cast-in-Place Concrete**]."
  - 1. Install seismic bracing. Comply with requirements in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 450-mm (18-in.) centers around the full perimeter of concrete base.
  3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
  4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  5. Install anchor bolts to elevations required for proper attachment to supported equipment.
- C. Equipment Mounting: Install fire-alarm control unit on finished floor with tops of cabinets not more than 1830 mm (72 in.) above the finished floor.
1. Comply with requirements for seismic-restraint devices specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
  2. Comply with requirements for seismic-restraint devices specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- D. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.
1. Connect new equipment to existing control panel in existing part of the building.
  2. Connect new equipment to existing monitoring equipment at the supervising station.
  3. Expand, modify, and supplement existing **[control]** **[monitoring]** equipment as necessary to extend existing **[control]** **[monitoring]** functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.
- E. Smoke- or Heat-Detector Spacing:
1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
  2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing. Locate elevator machine room sprinklers within **.61 m (2 ft)** of each sprinkler in the elevator machine room.
  3. Smooth ceiling spacing shall not exceed **[9 m (30 ft)] <Insert distance>**.
  4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A **[or Appendix B]** in NFPA 72.
  5. HVAC: Locate detectors not closer than **[1 m (3 ft)] [1.5 m (5 ft)]** from air-supply diffuser or return-air opening.
  6. Lighting Fixtures: Locate detectors not closer than 300 mm (12 in.) from any part of a lighting fixture.
- F. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.
- G. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.
- H. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

- I. Audible Alarm-Indicating Devices: Install with top edge 2.29 m (90 in.) above finished floor and not more than 150-mm (6-in.) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.
- J. Visible Alarm-Indicating Devices: Install with bottom edge between 2.03 m (80 in.) and 2.44 m (96 inches) above finished floor.
- K. Combination audible/visible devices shall be installed in accordance with the requirements for visible devices.
- L. Device Location-Indicating Lights: Locate in public space near the device they monitor.
- M. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 1830 mm (72 in.) above the finished floor.
- N. Annunciator: Install with top of panel not more than 1830 mm (72 in.) above the finished floor.

### 3.2 CONNECTIONS

- A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 08 Section "Door Hardware." Connect hardware and devices to fire-alarm system.
  - 1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.
- B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 1 m (3 ft.) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
  - 1. Alarm-initiating connection to smoke-control system (smoke management) at firefighter smoke-control system panel.
  - 2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
  - 3. Smoke dampers in air ducts of designated air-conditioning duct systems.
  - 4. Alarm-initiating connection to elevator recall system and components.
  - 5. Supervisory connections at valve supervisory switches.
  - 6. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
  - 7. At elevator shunt trip breaker.
  - 8. Supervisory connections at fire-pump controller for: pump running, power failure and phase-reversal conditions.
  - 9. Supervisory connections at fire-pump engine control panel for diesel fire pumps.
  - 10. **<Insert connections>**.

### 3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."



- B. Install framed instructions in a location visible from fire-alarm control unit.

### 3.4 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

### 3.5 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by the Project Officer or representative. The final system acceptance test shall be witnessed by the NIH Division of the Fire Marshal.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections before requesting a final acceptance test.
- C. Perform preliminary tests and inspections and deliver as-built drawings to the NIH Division of the Fire Marshal before requesting a final acceptance test.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
  - 1. Visual Inspection: Conduct visual inspection prior to requesting final acceptance testing.
    - a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
    - b. Comply with "Visual Inspection Frequencies" 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. Final Acceptance System Testing shall be performed under the direction and observation of the NIH Division of the Fire Marshal, however all work shall be performed by the Contractor. Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
  - 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
  - 4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
  - 5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
  - 6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm

Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

- E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- F. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.

### 3.6 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train] [Train]** NIH's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 283111