

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 is existing, but modifications to unit and programming are required as part of this project.
 - 2. Transponders.
 - 3. Manual fire-alarm boxes.
 - 4. System smoke detectors.
 - 5. Heat detectors.
 - 6. Notification appliances.
 - 7. Magnetic door holders.
 - 8. Addressable interface device.

1.3 DEFINITIONS

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

1.4 SYSTEM DESCRIPTION

- A. Noncoded addressable system, with automatic sensitivity control of certain smoke detectors and multiplexed signal transmission, dedicated to fire-alarm service only.
 - 1. Interface with existing fire alarm system.

1.5 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

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1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, 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. System riser diagram with all device types and cable and wire types and sizes.
 - 6. Wiring Diagrams: Power, signal and control wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Show wiring color code.
 - 7. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
 - 8. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.
- C. General Submittal Requirements:
 - 1. 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.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field quality-control reports.

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1.8 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," deliver copies to authorities having jurisdiction and 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.
 7. Copy of NFPA 25.
- B. 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.

1.9 MAINTENANCE MATERIAL SUBMITTALS

- 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 percent of amount installed, but no fewer than 1 unit.
 2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
 3. Smoke Detectors, Fire Detectors, Addressable Interface Devices: Quantity equal to 10 percent of amount of each type installed, but no fewer than 1 unit of each type.
 4. Detector Bases: Quantity equal to 2 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: Three of each type installed.
 7. Fuses: Two of each type installed in the system.

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1.10 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel licenses by the City and/or State.
- B. 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.
- C. Manufacturer Qualifications: Source must be an authorized distributor of the specified manufacturer and authorized to sell in project area.

1.11 PROJECT CONDITIONS

- A. 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 according to requirements indicated:
 - 1. Notify Architect 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 Architect's and Owner's written permission.

1.12 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.

1.13 ALLOWANCE

- A. Furnish, install, wire (with 50 ft. of approved wiring and conduit), terminate and program the following:
 - 1. Smoke Detector with Base: Quantity equal to 5 percent of units installed, but not less than two units.
 - 2. Combination Audio/Visual Notification Appliance: Quantity equal to 5 percent of units installed, but not less than five units.
 - 3. Visual Notification Appliance: Quantity equal to 5 percent of units installed, but not less than ten units.
 - 4. Manual Fire Alarm Box: Quantity equal to 5 percent of units installed, but not less than two units.
 - 5. Addressable Interface Devices: Quantity equal to 5 percent of units installed, but not less than ten units.
 - 6. Speaker: Quantity equal to 5 percent of units installed, but not less than ten units.
- B. If units are not utilized before substantial completion of Project, then at the Owner's option, either turn units over to Owner or provide credit to Owner for deletion of material and labor.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide SimplexGrinnell LP; a Tyco International company or comparable product by one of the following:

1. SimplexGrinnell LP; a Tyco International company; 4100U, existing control panel.

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. Verified automatic alarm operation of smoke detectors.
6. Automatic sprinkler system water flow.
7. Heat detectors in elevator shaft and pit.
8. Fire-extinguishing system operation.
9. Fire standpipe system.

- B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.
2. Identify alarm at fire-alarm control unit.
3. Transmit an alarm signal to the remote alarm receiving station.
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.
7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
8. Close smoke dampers in air ducts/HVAC units of designated air-conditioning duct systems serving zone where alarm was initiated.
9. Recall elevators to primary or alternate recall floors.
10. Activate emergency lighting control in assembly spaces.
11. Activate emergency shutoffs for gas, fuel and power supplies for equipment under kitchen hoods. Provide additional contactors and relays and pushbuttons to control and monitor hoods, valves, makeup fans and equipment.
12. Record events in the system memory.
13. Open smoke dampers in elevator shafts under smoke detector alarm condition in elevator lobbies.

- C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. Elevator shunt-trip supervision.

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- 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.
- E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit.

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.
 3. Addressable control circuits for operation of mechanical equipment.
- 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, 2 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. Circuits:
1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class A.
 - a. Notification Appliance Circuits: Style Z.
 - b. Signaling Line Circuits: Style 6.

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2. Serial Interfaces: One RS-232 port per annunciator.
- D. Smoke-Alarm Verification:
1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
 2. Activate an NRTL-listed and -approved "alarm-verification" sequence at fire-alarm control unit and detector.
 3. Sound general alarm if the alarm is verified.
 4. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.
- E. Notification Appliance Circuit: Operation shall sound in a temporal pattern, comply with ANSI S3.41.
- F. Elevator Recall:
1. Smoke detectors at the following locations shall initiate automatic elevator recall with signal sent to elevator controller. Alarm-initiating devices, except those listed, shall not start elevator recall.
 - a. Elevator lobby detectors other than at the designated floor.
 - b. Smoke detector in elevator machine room.
 - c. Smoke detectors in elevator hoistway.
 2. Elevator lobby detectors located on the designated recall floors shall be programmed to move the cars to the alternate recall floor.
 3. A field-mounted relay actuated by the smoke detector or the fire alarm control unit signals the elevator controller and operates building notification appliances and annunciator.
 4. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.
- G. Elevator Controls: Heat detector operation shuts down elevator power by operating a shunt trip in a circuit breaker feeding the elevator.
1. A field-mounted relay actuated by the heat detector or the fire alarm control unit closes the shunt trip circuit and operates building notification appliances and annunciator.
- H. HVAC Controls: Auto/off switch located in FACP allows for manual control of each air distribution unit 2,000 cfm and over in size.
- I. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke barrier walls shall be connected to fire-alarm system.
- J. 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.
- K. Voice/Alarm Signaling Service: Central emergency communication system with redundant microphones in a separate cabinet as a special module that is part of fire-alarm control unit.

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1. Indicated number of alarm channels for automatic, simultaneous transmission of different announcements to different zones or for manual transmission of announcements by use of the central-control microphone. Amplifiers shall comply with UL 1711 and be listed by an NRTL.
 - a. Allow the application of and evacuation signal to indicated number of zones and, at same time, allow voice paging to the other zones selectively or in any combination.
 - b. Programmable tone and message sequence selection.
 - c. Standard digitally recorded messages for "Evacuation" and "All Clear."
 - d. Generate tones to be sequenced with audio messages of type recommended by NFPA 72 and that are compatible with tone patterns of notification appliance circuits of fire-alarm control unit.
 2. Status Annunciator: Indicate the status of various voice/alarm speaker zones and the status of firefighters' two-way telephone communication zones.
 3. Preamplifiers, amplifiers, and tone generators shall automatically transfer to backup units, on primary equipment failure.
- L. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory 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.
 2. Power supply shall be from a circuit breaker with locking clip located in an emergency panelboard located as close to main service as possible.
- M. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
1. Batteries: Sealed, valve-regulated lead acid. Sized based upon all strobes set at 95 cd.
 2. Battery and Charger Capacity: Comply with NFPA 72. Minimum 60 hours of standby, followed by 10 minutes of alarm.
 3. Loads Not Served by Battery: Magnetic door handlers and smoke dampers.
- N. Surge Protection:
1. Install surge protection normal AC power for the FACP and its accessories. Comply with Section 264313 "Transient-Voltage Suppression for Low-Voltage Electrical Power Circuits" for auxiliary panel suppressors.
 2. Install surge protectors recommended by FACP manufacturer. Install on all system wiring external to the building housing the FACP.
- O. 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.

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- P. Smoke Damper Supervision: Visible signal indication at fire alarm control unit to reflect open and closed position of dampers associated with smoke control system only. Provide multiple local addressable interface devices for each damper for control open and close and monitoring open and close independently. Provide appropriate UL relays and contactors for interface.

2.4 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. Single-action mechanism, breaking-glass or plastic-rod type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
 - 2. Station Reset: Key-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: Provide where appropriate. Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.5 SYSTEM SMOKE DETECTORS

- A. General Requirements for System Smoke Detectors:
 - 1. Comply with UL 268; operating at 24-V dc, nominal.
 - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
 - 3. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
 - 4. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status. Provide remote status and alarm indicator and test station where noted or indicated.
 - 5. 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.

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- c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).
 - 3. Multipurpose type, containing the following:
 - a. Integral Addressable Module: Arrange to communicate detector status (normal, alarm, or trouble) to the FACP.
 - b. Piezoelectric sounder rated at 88 dBA at 10 ft. according to UL 464.
 - c. Heat sensor, combination rate of rise and fixed temperature.
 - C. 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. Each sensor shall have multiple levels of detection sensitivity.
 - 4. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
 - 5. Low Velocity Detectors: Design as recommended by manufacturer for the specific air velocity and installation conditions where applied.
 - 6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit or smoke damper control.
- 2.6 HEAT DETECTORS
- A. General Requirements for Heat Detectors: Comply with UL 521.
 - B. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F.
 - 1. Mounting: Adapter plate for outlet box mounting or twist-lock base interchangeable with smoke-detector bases depending on location.
 - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

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2.7 NOTIFICATION APPLIANCES

- A. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections. Color to be selected by Architect; on renovation projects, match color of existing devices.
 - 1. 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 1-inch-high letters on the lens.
 - 1. Rated Light Output:
 - a. 15/30/75 field adjustable cd (batteries based upon 75 cd).
 - 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 whenever more than two units are visible in any space.
 - 5. Strobe Leads: Factory connected to screw terminals.
- C. Voice/Tone Notification Appliances:
 - 1. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.
 - 2. High-Range Units: Rated 2 to 15 W.
 - 3. Low-Range Units: Rated 1/8 to 2 W.
 - 4. Mounting: Flush, semirecessed or surface mounted and bidirectional.
 - 5. Matching Transformers: Tap range matched to acoustical environment of speaker location.

2.8 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 25-lbf holding force.
 - 2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
 - 3. Rating: 24-V ac or 120-V ac. See plans.
- B. Material and Finish: Match door hardware.

2.9 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.

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- B. Integral Relay: Capable of providing a direct signal to elevator controller, motor controllers, dampers, circuit-breaker shunt trip, or other devices.

2.10 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. Install wall-mounted equipment, with tops of cabinets not more than 72 inches above the finished floor.
 - 1. Comply with requirements for seismic-restraint devices specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- C. 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 and monitoring equipment as necessary to extend existing control and monitoring functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.
- D. 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.
 - 3. Smooth ceiling spacing shall not exceed 30 feet.
 - 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 3 feet from air-supply diffuser or return-air opening.
 - 6. Luminaires: Locate detectors not closer than 12 inches from any part of a luminaire.
- E. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Install remote test switch and indicating light in location as directed in field. Coordinate installation with Division 23. Provide a permanent placard to clearly identify location of detector per

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NFPA 72. Provide one low velocity detector per each 36-inch width of transfer ducts. Locate test switch in same space as smoke detector.

- F. Transfer Duct and Plenum In-Duct Smoke Detectors: Comply with NFPA 72. Provide low velocity in-duct smoke detectors within transfer ducts and duct plenums. For transfer ducts up to 36 inches in width, provide one detector. For ducts up to 72 inches in width, provide two detectors at quarter points of the duct. For ducts greater than 72 inches in width, provide detectors 24 inches on center. Provide a permanent placard to clearly identify location of detector per NFPA 72. Provide one low velocity detector per each 36 inches in width of transfer ducts. Locate test switch in same space as smoke damper.
- G. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.
- 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 not less than 6 inches below the ceiling or 80 inches above finished floor, whichever is lower. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.
- J. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling. Install bottom of strobe not less than 6 inches below the ceiling or 80 inches above finished floor, whichever is lower. Install devices not less than 24 inches below the ceiling in sleeping rooms.
- K. Provide adjustable 4 watt speakers and 177 candela strobes for all mechanical, electrical, and equipment rooms with noise producing machines.
- L. Device Location-Indicating Lights: Locate in public space near the device they monitor.
- M. Manual Fire-Alarm Boxes: Install top of box at 48 inches above finished floor.
- N. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches above the finished floor.
- O. Annunciator: Install with top of panel not more than 72 inches 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 Section 087100 "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.

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- B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
 - 1. Smoke dampers in air ducts of designated air-conditioning duct systems.
 - 2. Smoke dampers in elevator shafts.
 - 3. Heating, ventilating and air conditioning designated equipment controls.
 - 4. Alarm-initiating connection to elevator recall system and components.
 - 5. Alarm-initiating connection to activate fire extinguishing system operation.
 - 6. Provide appropriate UL relays and auxiliary contacts to interface with mechanical equipment locally.
 - 7. Provide control and monitoring of hood systems, makeup air systems, equipment under hoods, gas valves and emergency shutoffs.
 - 8. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
 - 9. Supervisory connections at valve supervisory switches.
 - 10. Supervisory connections at elevator shunt trip breaker.
- C. Coordinate all features of fire alarm devices with HVAC systems, including interface with HVAC control systems, power and control wiring requirements. See Section 233300 "Air Duct Accessories" and HVAC control sections for requirements and sequence of operations.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Install framed instructions in a location visible from fire-alarm control unit.
- C. Paint power-supply disconnect switch red and label "FIRE ALARM."

3.4 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100.

3.5 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by Architect/Engineer and authorities having jurisdiction. Proper planning and scheduling (five days) is required.
- B. Perform tests and inspections.
 - 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.
- C. Provide additional factory-authorized technician site visits and field programming during field testing and twice for post occupancy programming adjustments and testing for Owner-initiated changes and tailoring to actual conditions during the first six months.

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D. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection shall be based on completed Record Drawings and system documentation that is required by 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. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
3. 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.

H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

I. 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.

J. Test and Inspection Records: Prepare according to NFPA 72, including demonstration of sequences of operation by using the matrix-style form in Appendix A in NFPA 70.

K. Provide two site visits for post occupancy follow-up programming to fine tune sensitive, audio, visual, and any follow-up programming required within first year.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system for a minimum of four hours of training on two separate visits.

3.7 FIREMEN'S WATCH

A. Provide a Firemen's Watch 24-hours per day for the time period when the existing building is unsupervised by the existing and/or new fire alarm systems. As the new fire alarm system is installed and activated, the size of the Firemen's Watch can be decreased.

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1. Fire watch shall be acceptable to the City Fire Marshal.
2. Coordinate with the Owner other time periods requiring a Firemen's Watch.
3. Submit with the Bid the proposed new fire alarm system phasing procedure.

END OF SECTION 283111

03/15/11