# SECTION 284600 - FIRE DETECTION AND ALARM

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Fire-alarm system control units.
2. Dedicated function control units.
3. Fire-alarm auxiliary power supplies.
4. Fire-alarm audio amplifiers.
5. Heat-sensing fire detectors.
6. Smoke-sensing fire detectors.
7. Audible notification appliances.
8. Visual notification appliances.
9. Combination audible/visual notification appliances.
10. Fire-alarm cables.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional requirements applicable to coordinating, scheduling, and sequencing of the Work specified in this Section.
2. Section 078413 "Penetration Firestopping" specifies materials and methods for sealing penetrations of rated walls and partitions referenced by this Section.
3. Section 087100 "Door Hardware" specifies door hardware control interfaces referenced by this Section.
4. Section 260529 "Hangers and Supports for Electrical Systems" specifies hangers, supports, and concrete bases referenced by this Section.
5. Section 260533.13 "Conduits for Electrical Systems" specifies raceway types installed by this Section.
6. Section 260548 "Vibration and Seismic Controls for Electrical Systems" specifies vibration isolation and seismic [ and wind] control devices referenced by this Section.
7. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs installed by this Section.
8. Section 260923 "Lighting Control Devices" specifies emergency lighting control interfaces referenced by this Section.
9. Section 262816 "Enclosed Switches and Circuit Breakers" specifies shunt-trip control interfaces referenced by this Section.
10. Section 270528 "Pathways for Communications Systems" specifies additional



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requirements for raceway materials, routing, locations, and identification of communications equipment and cabling.

1.2 REFERENCES

A. Abbreviations and Acronyms for Electrical Terms and Units of Measure:

1. AWG: American wire gauge; see ASTM B258.
2. BAS: Building automation system.
3. BMS: Building management system.
4. cd: Candela, the SI fundamental unit of luminous intensity.
5. DACR: Digital alarm communicator receiver.
6. DACT: Digital alarm communicator transmitter.
7. dB(A-weighted) or dB(A): Decibel acoustical sound pressure level with A-weighting applied in accordance with IEC 61672-1.
8. EMP: Electrical maintenance program (operation and maintenance); electromagnetic pulse (transient analysis).
9. EPS: Emergency power supply.
10. EPSS: Emergency power supply system.
11. ERCES: Emergency responder communications enhancement system.
12. ESS: Energy storage system.
13. FACU: Fire-alarm control unit.
14. FAS: Fire-alarm system.
15. IDC: Initiating device circuit.
16. IP: Internet Protocol.
17. IR: Infrared.
18. LAN: Local area network.
19. LCD: Liquid-crystal display.
20. LED: Light-emitting diode.
21. Li-ion: Lithium-ion.
22. NAC: Notification appliance circuit.
23. N.C.: Normally closed.
24. Ni-Cd: Nickel-cadmium.
25. Ni-MH: Nickel-metal hydride.
26. N.O.: Normally open.
27. PC: Personal computer.
28. PLFA: Power-limited fire alarm.
29. PoE: Power over Ethernet.
30. POTS: Plain old telephone service. See "public switched telephone network" definition.
31. PSTN: Public switched telephone network.
32. RAT: Radio alarm transmitter.
33. SLC: Signaling-line circuit.
34. TR: Tamper resistant.
35. UL: (Standards) UL Standards & Engagement; (product categories) UL Solutions.
36. UL CCN: UL Category Control Number.
37. UPS: Uninterruptible power supply.
38. VoIP: Voice over Internet Protocol.



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39. VPN: Virtual private network.
40. VRLA: Valve-regulated lead acid; also called "sealed lead acid (SLA)" or "valve-regulated sealed lead acid."
41. WAN: Wide area network.
42. WR: Weather resistant.

B. Abbreviations and Acronyms for Electrical Raceway Types:

1. CR: Communications cable raceway.
2. CR-GP: General-purpose communications cable raceway.
3. CR-P: Plenum communications cable raceway.
4. CR-R: Riser communications cable raceway.
5. EMT: Electrical metallic tubing.
6. EMT-A: Aluminum electrical metallic tubing.
7. EMT-S: Steel electrical metallic tubing.
8. EMT-SS: Stainless steel electrical metallic tubing.
9. ERMC-A: Aluminum electrical rigid metal conduit.
10. ERMC-S: Steel electrical rigid metal conduit.
11. ERMC-S-G: Galvanized-steel electrical rigid metal conduit.
12. ERMC-S-PVC: PVC-coated-steel electrical rigid metal conduit.
13. ERMC-SS: Stainless steel electrical rigid metal conduit.
14. FMC: Flexible metal conduit.
15. FMC-A: Aluminum flexible metal conduit.
16. FMC-S: Steel flexible metal conduit.
17. IMC: Steel electrical intermediate metal conduit.
18. LFMC: Liquidtight flexible metal conduit.
19. LFMC-A: Aluminum liquidtight flexible metal conduit.
20. LFMC-S: Steel liquidtight flexible metal conduit.
21. LFMC-SS: Stainless steel liquidtight flexible metal conduit.
22. LFNC: Liquidtight flexible nonmetallic conduit.
23. LFNC-A: Layered (Type A) liquidtight flexible nonmetallic conduit.
24. LFNC-B: Integral (Type B) liquidtight flexible nonmetallic conduit.
25. LFNC-C: Corrugated (Type C) liquidtight flexible nonmetallic conduit.
26. OFR: Optical-fiber raceway.
27. OFR-GP: General-purpose optical-fiber raceway.
28. OFR-P: Plenum optical-fiber raceway.
29. OFR-R: Riser optical-fiber raceway.
30. PVC: Rigid PVC conduit.
31. PVC-40: Schedule 40 rigid PVC conduit.
32. PVC-80: Schedule 80 rigid PVC conduit.
33. RGS: See ERMC-S-G.
34. RMC: See ERMC raceway types above.

C. Abbreviations and Acronyms for Electrical Single-Conductor and Multiple-Conductor Cable Types:

1. CI: Circuit integrity cable.
2. FPL: Power-limited fire-alarm cable.
3. FPLP: Power-limited fire-alarm plenum cable.
4. FPLR: Power-limited fire-alarm riser cable.



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5. MC-FPL/FPLR/FPLP: Metal-clad cable containing FPL, FPLR, or FPLP.
6. NPLF: Non-power-limited fire-alarm circuit cable.
7. NPLFP: Non-power-limited fire-alarm circuit cable for environmental air spaces.
8. NPLFR: Non-power-limited fire-alarm circuit riser cable.
9. OFC: Conductive optical fiber general-purpose cable.
10. OFCG: Conductive optical fiber general-purpose cable.
11. OFCP: Conductive optical fiber plenum cable.
12. OFCR: Conductive optical fiber riser cable.
13. OFN: Nonconductive optical fiber general-purpose cable.
14. OFNG: Nonconductive optical fiber general-purpose cable.
15. OFNP: Nonconductive optical fiber plenum cable.
16. OFNR: Nonconductive optical fiber riser cable.

D. Definitions:

1. Cable: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "cable" is (1) a conductor with insulation, or a stranded conductor with or without insulation (single-conductor cable); or (2) a combination of conductors insulated from one another (multiple-conductor cable).
2. Conductor: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "conductor" is (1) a wire or combination of wires not insulated from one another, suitable for carrying an electric current; (2) (National Electrical Safety Code) a material, usually in the form of wire, cable, or bar, suitable for carrying an electric current; or (3) (general) a substance or body that allows a current of electricity to pass continuously along it.
3. Conduit: A structure containing one or more duct raceways.
4. Designated Seismic System: An architectural, electrical, or mechanical system and its components for which the component importance factor is greater than 1.0 when determined in accordance with Section 018123 "Facility Seismic and Wind Criteria."
5. Direct Buried: Installed underground without encasement in concrete or other protective material.
6. Duct Bank: An arrangement of conduit providing one or more continuous duct raceways between two points.
7. Duct Raceway: A single enclosed raceway for conductors or cable.
8. Emergency Systems: Those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction that are designed to ensure continuity of lighting, electrical power, or both, to designated areas and equipment in the event of failure of the normal supply for safety to human life.
9. Public Switched Telephone Network (PSTN): Analog telephone technology that uses twisted pair cables from a telephone-provider central office for the transmission medium. "PSTN" refers to the telephone network; "POTS" refers to the individual subscriber line.
10. Voice over Internet Protocol (VoIP): Digital telephone packet technology that uses the internet for its transmission medium.
11. Wire: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "wire" is a



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slender rod or filament of drawn metal. A group of small wires used as a single wire is properly called a "stranded wire." A wire or stranded wire covered with insulation is properly called an "insulated wire" or a "single-conductor cable." Nevertheless, when the context indicates that the wire is insulated, the term "wire" will be understood to include the insulation.

## 1.3 ACTION SUBMITTALS

A. Product Data: For each type of specified product. In addition to information identified in Section 013300 "Submittal Procedures," submit the following:

1. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.

    a. If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
    b. Listing criteria identified in approval letter must match specified listing criteria. UL label indicating approval of equipment's enclosure is not considered approval of equipment for intended application.
    c. Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for discontinued or superseded products are not acceptable for submitted product.

2. Include manufacturer's sample extended warranty language.

B. Shop Drawings: Prepare and submit the following:

1. Cover sheet indicating protected premises name and location and Owner information, name of installer, device legend and symbols in accordance with NFPA 170, and date of issue and any revision dates.
2. Floor Plans:

    a. Floor or level identification.
    b. Point of compass (indication of north).
    c. Graphic scale.
    d. All walls and doors.
    e. All partitions extending to within 15 percent of the ceiling height.
    f. Room and area descriptions.
    g. Acoustically distinguishable spaces.
    h. Minimum required illumination levels.
    i. System devices/component locations.
    j. Locations of the system's primary power disconnecting means.
    k. Locations of monitor/control interfaces to other systems.
    l. System riser locations.
    m. Type and number of system components/devices on each circuit, on each floor or level.
    n. Type and quantity of conductors for each circuit.



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o. Pathway class designations, including the location of any end-of-line supervisory or power devices that are required by the pathway class.

3. Wiring Diagrams:

a. System riser diagrams coordinated with the floor plans and indicating the following information:

1) General arrangement of the system in building cross-section.
2) Number of risers.
3) Type and number of circuits in each riser.
4) Type and number of system components/devices on each circuit, on each floor or level.
5) Number of conductors for each circuit.
6) Pathway class designation, including the location of any end-of-line supervisory or power devices that are required by the pathway class.
7) Pathway survivability level designations.

b. Control unit diagrams for all control equipment, power supplies, battery chargers, and annunciators indicating the following information:

1) Identification of control equipment depicted.
2) Location(s) of control equipment.
3) All field wiring terminals and terminal identifications.
4) All circuits connected to field wiring terminals and circuit identifications.
5) All indicators and manual controls.
6) Field connections to supervising station signaling equipment, and emergency safety control interfaces.

c. Typical fire-alarm component schematic wiring diagrams for all initiating devices, notification appliances, remote test stations, and annunciators.

4. Fire-Alarm Input/Output Sequence: Include a narrative description or input/output matrix of operation to describe the fire-alarm system sequence of operation.
5. Details:

a. Component installation details.
b. Custom graphic annunciator layout.

6. Calculations:

a. Battery calculations.
b. Voltage-drop calculations.
c. Speaker circuit calculations.
d. Spare capacity circuit calculations.

C. Field Quality Control Reports: For specified tests and inspections.



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1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's Written Instructions: For each type of specified product.

B. Field Reports:

1. Manufacturer's field reports for field quality-control support.
2. Manufacturer's field reports for system startup support.
3. Field reports for software and firmware upgrades.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Special Tools: Furnish to Owner proprietary equipment, keys, and software required to operate, maintain, repair, adjust, or implement future changes to fire detection and alarm system, that are packaged with protective covering for storage on-site and identified with labels describing contents. Include the following:

1. Keys for control equipment cabinets.
2. Keys for remote test switches.
3. Wrench for manual fire-alarm boxes.

1.6 REGULATORY AGENCY APPROVALS

A. Submittals for fire detection and alarm system requiring approval by authorities having jurisdiction must be signed by qualified NICET FAS engineering technician or life-safety professional engineer responsible for their preparation. Obtain approval by authorities having jurisdiction prior to submitting for action by Architect.

PART 2 - PRODUCTS

2.1 EXISTING PRODUCTS TO BE REMOVED AND RE-INSTALLED

A. Basis for Pricing: IFP Photo Smoke/Heat Detectors.

2.2 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70 or NFPA 72, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

B. System Description: Noncoded, UL-certified system with multiplexed signal transmission and voice -and-strobe notification for evacuation.

C. System Inputs:

1. Fire-Alarm Signal Initiation: Signal initiation must be by one or more of the



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following devices and systems:

a. Manual fire-alarm boxes.
b. Heat detectors.
c. Smoke detectors.
d. Flame detectors.
e. Duct smoke detectors.
f. Air-sampling smoke-detection system.
g. Carbon monoxide detectors.
h. Combustible gas detectors.
i. Automatic sprinkler system water flow.
j. Preaction system alarm.
k. Fire-extinguishing system operation.
l. Fire standpipe system.
m. Dry-pipe sprinkler system pressure flow switch.
n. Fire pump is running.

2. Supervisory Signal Initiation: Signal initiation must be by one or more of the following devices and actions:

a. Valve supervisory switch.
b. High- or low-air pressure switch of dry-pipe or preaction sprinkler system.
c. Alert and Action signals of air-sampling smoke-detection systems.
d. Duct smoke detectors.
e. Elevator shunt-trip control circuit supervision.
f. Independent fire-detection and fire-suppression systems.

g. Power to the fire pump has phase reversal.
h. Zones or individual devices have been disabled.
i. FACU has lost communication with network.
j. Hose cabinet door is open.

3. System Trouble Signal Initiation: Signal initiation must be by one or more of the following devices and actions:

a. Open circuits, shorts, and grounds in designated circuits.
b. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
c. Loss of communication with addressable sensor, input module, relay, control module, remote annunciator, or ethernet module.
d. Loss of primary power at FACU.
e. Ground or single break in internal circuits of FACU.
f. Abnormal AC voltage at FACU.
g. Break in standby battery circuitry.
h. Failure of battery charging.
i. Abnormal position of switch at FACU or remote annunciator.
j. Voice signal amplifier failure.

4. Carbon Monoxide Alarm Signal Initiation: Signal initiation must be by the following devices:



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a. Carbon monoxide detectors.

D. System Outputs:

1. Fire-Alarm Signal: Signal must initiate the following actions:

a. Continuously operate alarm notification appliances, including voice evacuation notices.
b. Identify alarm and specific initiating device at FACU, connected network control panels, off-premises network control panels, and remote annunciators.
c. Transmit alarm signal to remote alarm receiving station.
d. Unlock electric door locks in designated egress paths.
e. Release fire and smoke doors held open by magnetic door holders.
f. Activate voice/alarm communication system.
g. Switch HVAC equipment controls to fire-alarm mode.
h. Activate smoke-control system (smoke management) at firefighters' smoke-control system panel.
i. Activate stairwell and elevator-shaft pressurization systems.
j. Close smoke dampers in air ducts of designated air-conditioning duct systems.
k. Activate preaction system.
l. Recall elevators to designated or alternate recall levels only upon activation of smoke detectors in respective elevator lobbies, machine rooms, or hoistways.
m. Activate elevator power shunt trip only upon activation of associated heat detector.
n. Activate emergency lighting control.
o. Activate emergency shutoffs for gas and fuel supplies, except for shutoffs serving legally required life-safety systems such as emergency generators and fire pumps.
p. Record events in system memory.
q. Indicate device in alarm on graphic annunciator.

2. System Supervisory Signal: Signal must initiate the following actions:

a. Initiate supervisory notification appliances.
b. Identify specific device initiating event at FACU, connected network control panels, off-premises network control panels, and remote annunciators.
c. After time delay of 200 seconds, transmit trouble or supervisory signal to remote alarm receiving station.
d. Transmit system status to building management system.
e. Display system status on graphic annunciator.

3. Carbon Monoxide Alarm Signal: Signal must initiate the following actions:

a. Initiate carbon monoxide notification appliances and sound temporal-4 signal.
b. Identify specific device initiating event at FACU, connected network control panels, off-premises network control panels, and remote annunciators.



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c. Transmit carbon monoxide alarm signal to remote alarm receiving station.

## 2.3 FIRE-ALARM SYSTEM CONTROL UNITS

A. Description: A component of the fire-alarm system, provided with primary and secondary power sources, which receives signals from initiating devices or other fire-alarm control units, and processes these signals to determine part or all of the required fire-alarm system output functions.

B. UL UOJZ - Addressable Fire-Alarm System Control Units :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Notifier; Honeywell International, Inc.
   b. Fahrenheit

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

   a. Electrical Control Units for Fire-Protective Signaling Systems: UL CCN UOJZ, including UL 864 and NFPA 72.

4. Standard Features:

   a. Product Reference Standards: Ch. 23 of NFPA 72.
   b. Voice /alarm communications.
   c. Indication of which communication zones have been silenced.
   d. Provide selective silencing of alarm notification appliances by building communication zone.
   e. Real-time clock for time annotation of events on the event recorder.
   f. Communication between the FACU and remote circuit interface panels, annunciators, and displays.
   g. The FACU must be listed for connection to a central station signaling system service.
   h. Provide non-volatile memory for system database, logic, operating system, and event history.
   i. The system must not require manual input to initialize in the event of a complete power-down condition.
   j. Alphanumeric display and system controls.
   k. Minimum of one Class B signaling-line circuits with expansion capability to add circuits.
   l. Minimum of one Class B notification appliance circuits with expansion capability to add circuits.
   m. Synchronization of notification appliance circuits.

5. Other Available Features Required by Project:



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a. Printer interface.
b. Smoke-alarm verification.

## 2.4 DEDICATED FUNCTION CONTROL UNITS

A. Description: A protected premises fire-alarm control unit specifically listed for supervising a single function, such as releasing service that is part of a fire-suppression system and which provides control outputs to release a fire-suppression agent based on either automatic or manual input.

B. UL SYZV - Addressable Non-Extinguishing and Non-Water-Based Releasing Device Control Unit :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. fahrenheit

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Releasing Device Control Units for Fire-Protective Signaling Systems: UL CCN SYZV, including UL 864 and NFPA 72.

4. Standard Features:

a. Product Reference Standards: Ch. 23 of NFPA 72.
b. Built-in alarm, trouble, supervisory, and security relays.
c. Minimum of one Class B signaling-line circuits with expansion capability to add circuits.
d. Auto programming and walk test reports.
e. Manual sensitivity adjustments.
f. Maintenance alerts.
g. Battery charger supports.
h. Non-alarm points for lower-priority functions.

5. Other Available Features Required by Project:

a. Printer interface.
b. Synchronization of notification appliance circuits.

## 2.5 FIRE-ALARM REMOTE ANNUNCIATORS

A. Description: A unit containing one or more indicator lamps, alphanumeric displays, or other equivalent means in which each indication provides status information about a fire-alarm system device, circuit, condition, or location.



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## 2.6 FIRE-ALARM AUXILIARY POWER SUPPLIES

A. Description: An auxiliary source of low-voltage electrical operating power for fire-alarm system equipment, including the circuits and terminations connecting it to the equipment being powered. Auxiliary power supplies are often referred to as remote power supplies, booster power supplies, or notification appliance power supplies.

B. UL UOXX - Fire-Alarm Auxiliary Power Supplies :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. fahrenheit

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

    a. Control Unit Accessories for Fire-Protective Signaling Systems: UL CCN UOXX, including UL 864 and NFPA 72.

4. Standard Features:

    a. Product Reference Standards: Chs. 10 and 23 of NFPA 72.
    b. Minimum of one 24 V(dc) auxiliary power circuits.

5. Other Available Features Required by Project:

    a. Synchronization of notification appliance circuits.
    b. Addressable-type notification appliance power supply, which connects directly to a signaling-line circuit.

## 2.7 FIRE-ALARM AUDIO AMPLIFIERS

A. Description: A component of in-building fire emergency voice/alarm communications systems that takes a low-level audio input and amplifies the power output to distribute to fire-alarm loudspeakers. Amplifiers can be an integral component of the fire-alarm control unit or can be remotely located in a separate cabinet within the building.

B. UL UEAY2 - Fire-Alarm Audio Amplifiers :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. fahrenheit

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing



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laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Amplifiers for Fire-Protective Signaling Systems: UL CCN UEAY2, including UL 1711, UL 1480, UL 1480A, UL 864, and NFPA 72.

4. Standard Features:

a. Product Reference Standards: Chs. 18, 23, and 24 of NFPA 72.
b. Supervised high-fidelity audio for emergency voice evacuation fire-alarm systems.
c. Frequency Response: 275 Hz - 6.5 kHz.
d. Speaker Outputs: power limited.
e. Minimum of one Class B speaker output circuits.

5. Other Available Features Required by Project:

a. Minimum of one Class B synchronized strobe power circuits.

b. Push-to-Talk (PTT) microphone.

## 2.8 FIRE-ALARM TERMINAL CABINETS

A. Description: A cabinet with hinged, lockable cover clearly labeled and intended for termination of fire-alarm conductors at junction points. Screw-type terminal blocks are provided within the terminal cabinet for conductor splices.

## 2.9 MANUAL FIRE-ALARM BOXES

A. Description: A manually operated device used to initiate a fire-alarm signal. Manual fire-alarm boxes come in both conventional or addressable models and may require a single-action (pull down) or double-action (push in and pull down) to initiate a fire-alarm signal. These initiating devices are sometimes referred to as manual fire-alarm stations, pull stations, or call points.

## 2.10 HEAT-SENSING FIRE DETECTORS

A. Description: A fire detector that detects either abnormally high temperatures or rate-of-temperature rise, or both.

B. UL UQGS - Fixed-Temperature Heat Detectors :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. fahrenheit



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2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

    a. Heat-Detecting-Type Automatic Fire Detectors: UL CCN UQGS, including UL 521 and NFPA 72.

4. Standard Features:

    a. Product Reference Standards: Ch. 17 of NFPA 72.
    b. Actuated by temperature that exceeds fixed temperature of 135 deg F regardless of rate of temperature rise.
    c. Addressable -type initiating device.
    d. Detector must have functional humidity range of 10 to 90 percent.

## 2.11 SMOKE-SENSING FIRE DETECTORS

A. Description: A device that detects visible or invisible particles of combustion and initiates an action. Types of smoke-sensing fire detectors include spot-type detectors, air-sampling detectors, projected beam-type detectors, duct detectors, multi-criteria detectors, and video image smoke detectors.

B. UL UROX - Spot-Type Smoke Detectors :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. fahrenheit

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

    a. Detectors Designed for Smoke Particles: UL CCN UROX, including UL 268 and NFPA 72.

4. Standard Features:

    a. Product Reference Standards: Ch. 17 of NFPA 72.
    b. Field programmable.
    c. Resettable from the control unit.
    d. Removable from the base assembly without the use of tools and without disturbing the wiring connections.
    e. Sensing Type: Photoelectric.

C. UL UROX - Duct Smoke Detectors :



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1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. fahrenheit

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

    a. Detectors Designed for Smoke Particles: UL CCN UROX, including UL 268 and NFPA 72.

4. Standard Features:

    a. Product Reference Standards: Ch. 17 of NFPA 72.
    b. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
    c. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
    d. Integral Visual-Indicating Light: LED type, indicating detector has operated.
    e. Detectors must be four- or two-wire type.
    f. Detector address must be accessible from fire-alarm control unit and must be able to identify the detector's location within the system and its sensitivity setting.
    g. Operator at FACU, having designated access level, must be able to manually access the following for each detector: primary status, device type, present average value, present sensitivity selected, and sensor range.

## 2.12 CARBON MONOXIDE DETECTORS

A. Description: A device that detects the presence of a specific carbon monoxide concentration.

## 2.13 AUDIBLE NOTIFICATION APPLIANCES

A. Description: A fire-alarm system component such as a horn or loudspeaker that provides audible output to alert occupants by the sense of hearing.

B. UL UUMW - Loudspeakers :

1. Source Limitations: Obtain products from single manufacturer.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

    a. Speakers and Amplifiers Used in Fire-Alarm and/or Emergency



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Communication Systems: UL CCN UUMW, including UL 1480 and NFPA 72.

3. Standard Features:

a. Product Reference Standards: Ch. 18 of NFPA 72.
b. Flush and ceiling-tile mounting with use of ceiling tile brackets.
c. Field-selectable voltage and power tap settings.
d. Operating Temperature Range: 32 deg F to 120 deg F.
e. Compatible with wires up to 12 AWG.

C. Accessories:

1. Audible appliance protective guard.

## 2.14 VISUAL NOTIFICATION APPLIANCES

A. Description: A fire-alarm system component that provides a visible output to alert occupants by the sense of sight, including visual strobes.

B. UL UVAV - Strobe :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. fahrenheit

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Visual-Signal Appliances for Fire-Protective Signaling Applications: UL CCN UVAV, including UL 1638 and NFPA 72.

4. Standard Features:

a. Product Reference Standards: Ch. 18 of NFPA 72.
b. Operating Temperature Range: 32 deg F to 120 deg F.
c. Compatible with wires up to 12 AWG.
d. Rated Light Output: 6, 13, 15, 30, 75, or 110, or 177 candela.
e. Field-selectable candela settings.
f. Clear or nominal white polycarbonate lens mounted on faceplate.

5. Other Available Features Required by Project:

a. For units with guards to prevent physical damage, light output ratings must be determined with guards in place.
b. Weather resistant to provide protection against water, humidity, and



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corrosion.

C. Accessories:

1. Visual appliance protective guard.

## 2.15 COMBINATION AUDIBLE/VISUAL NOTIFICATION APPLIANCES

A. Description: A fire-alarm system component such as a horn/strobe or loudspeaker/strobe that provides both an audible and a visible output to alert occupants by the sense of hearing and sight.

B. UL UUMW and UVAV - Combination Loudspeaker/Strobe Appliances :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. fahrenheit

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Electrically Operated Signal-Sounding Appliances or Visual-Signal Appliances for Fire-Protective Signaling Applications: UL CCN UUMW and UVAV, including UL 1480, UL 1638, and NFPA 72.

4. Standard Features:

a. Product Reference Standards: Ch. 18 of NFPA 72.
b. Operating Temperature Range: 32 deg F to 120 deg F.
c. Compatible with wires up to 12 AWG.
d. Rated Light Output: 6, 13, 15, 30, 75, or 110, or 177 candela.
e. Clear or nominal white polycarbonate lens mounted on faceplate.
f. Strobe flash rate of 1 Hz over its entire operating range.
g. Field-selectable candela settings.
h. Field-selectable voltage and power settings.
i. Universal mounting plate for ceiling units.

5. Other Available Features Required by Project:

a. For units with guards to prevent physical damage, light output ratings must be determined with guards in place.

6. Accessories:

a. Combination audible/visual appliance protective guard.
b. Weather resistant to provide protection against water, humidity, and



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corrosion.

## 2.16 FIRE-ALARM SUPERVISED CONTROL MODULE INTERFACES FOR FIRE SAFETY FUNCTIONS

A. Description: An addressable fire-alarm control module that interfaces to another building system for the purpose of initiating an action for that system based upon activation of a supervisory or alarm condition on the fire-alarm system. The interface between the control module and the other building system or equipment is supervised.

## 2.17 FIRE-ALARM SUPERVISORY SIGNAL-INITIATING DEVICES

A. Description: An initiating device such as a valve supervisory switch, water-level indicator, low-air-pressure switch, or low-temperature switch in which the change of state signals to the fire-alarm control unit an off-normal condition and its restoration to normal of a fire-protection or life-safety system; or a need for action in connection with guard tours, fire-suppression systems or equipment, or maintenance features of related systems.

## 2.18 FIRE-ALARM CABLES

A. UL HNHT - Non-Power-Limited Fire-Alarm Circuit Plenum Cable (NPLFP) :

1. Listing Criteria:

a. Non-Power-Limited Fire-Alarm Cable: UL CCN HNHT; including UL 1425 and Article 760 of NFPA 70.
b. Vertical-Tray Flame Test: UL 1685.
c. Limited Smoke "ST1" Marking: UL 1685 or UL 2556.
d. Plenum Rating: NFPA 262.

2. Standard Features:

a. Solid copper conductors with 600 V rated, 75 deg C, color-coded insulation.
b. Minimum Conductor Size: 18 AWG.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine field conditions with Installer present for compliance with requirements for fire detection and alarm systems and other conditions affecting performance of the Work.

B. Examine all materials, products, and equipment received for defects or damage.



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C. Reject all materials, products, and equipment that show signs of defects or damage.

D. Examine roughing-in for fire detection and alarm system piping to verify actual locations of piping connections before equipment installation.

E. Examine walls, floors, ceilings, and roofs for suitable conditions where fire detection and alarm system components will be installed.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 SELECTION OF CABLING FOR FIRE ALARM

A. Field Circuits:

1. SLC: 12 to 18 AWG unshielded FPLR.
2. NAC: 12 to 18 AWG unshielded FPLR.
3. Audio Circuits: 12 to 18 AWG shielded FPLR.
4. Auxiliary Power Circuits: 12 to 18 AWG unshielded FPLR.
5. Network Communication Circuits: 12 to 18 AWG unshielded single-mode fiber-optic cable.

## 3.3 SELECTION OF RACEWAYS FOR FIRE ALARM

A. Identification: At a minimum, all junction box covers for fire-alarm raceways must be identified using the color red.

B. Indoor Pathways:

1. Exposed and Subject to Physical Damage: EMT. Locations include the following:

a. Locations less than 2.5 m (8 ft) above finished floor.
b. Stub-ups to above suspended ceilings.
c. <Insert designations of applicable spaces or locations>.

2. Exposed and Not Subject to Physical Damage: EMT.
3. Concealed above Suspended Ceilings: Hooks.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Damp or Wet Locations: EMT.

6. In Vertical Runs: EMT.

## 3.4 INSTALLATION, GENERAL

A. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's written instructions, comply with the following:



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1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Maintenance: NFPA 70B and NECA NEIS 91.
3. Electrical Safety: NFPA 70E.
4. Temporary Electric Power Work: NECA NEIS 200.
5. Commissioning of Electrical Systems: NECA NEIS 90.
6. Commissioning of Active and Passive Fire-Protection Features: NFPA 3 and NFPA 4.
7. Hot Work: NFPA 51B.
8. Fire-Alarm and Premises Security Work: NFPA 72, NFPA 731, NFPA 1225, and NECA NEIS 305.
9. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
10. Communications Work: BICSI N1.
11. Work in ITE Rooms: NFPA 75.
12. Work in Health Care Facilities: NFPA 99 and Article 517 of NFPA 70.
13. Life-Safety and Means of Egress Work: NFPA 101.
14. Emergency and Standby Power Work: NFPA 110, NFPA 111, and NECA NEIS 416.
15. Work in Confined Spaces: NFPA 350.
16. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
17. Field Evaluation of Unlabeled Electrical Equipment: NFPA 791.
18. Work in Museums, Libraries, Places of Worship, and Historic Structures: NFPA 909 and NFPA 914.
19. Consult Architect for resolution of conflicting requirements.

## 3.5 INSTALLATION OF FIRE DETECTION AND ALARM SYSTEMS

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:

1. Fire-Alarm and Premises Security Work: NFPA 72, NFPA 731, NFPA 1225, and NECA NEIS 305.
2. Fire-Alarm Circuits and Pathways: Ch. 12 of NFPA 72 and Article 760 of NFPA 70.
3. Fire-Alarm Initiating Devices: Ch. 17 of NFPA 72.
4. Fire-Alarm Notification Appliances: Ch. 18 of NFPA 72.
5. Fire-Alarm Control Equipment: Ch. 23 of NFPA 72.
6. Fire-Alarm Transmitting Equipment: Ch. 23 and Ch. 26 of NFPA 72.
7. Consult Architect for resolution of conflicting requirements.

C. Interfaces with Other Work:

1. Identification: Provide labels for all initiating devices, control equipment cabinets, and associated electrical equipment.

a. Identify field-installed conductors, interconnecting wiring, and components.



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b. Label initiating devices with unique identification.
c. Identify source of AC power inside each control equipment cabinet.
d. Identify circuit disconnecting means at AC power source with red engraved label. Provide approved locking device for circuit disconnecting means.
e. Label enclosures with engraved metal or laminated-plastic nameplate.
f. Identify junction box covers using the color red.
g. Identify <Insert raceway component> using the color red.

D. Systems Integration: Relay modules for doors.

## 3.6 FIELD QUALITY CONTROL OF FIRE DETECTION AND ALARM SYSTEMS

A. Administrant for Fire-Alarm Tests and Inspections:

1. Administer and perform tests and inspections.

B. Field tests and inspections must be witnessed by authorities having jurisdiction.

C. Tests and Inspections:

1. Perform manufacturer's recommended tests and inspections.
2. Perform system acceptance testing in accordance with Ch. 14 and Appendix D of NFPA 72.
3. Contractor is responsible for completing pre-acceptance testing to verify proper operation of the fire detection and alarm systems. Correct system deficiencies prior to scheduling a final acceptance test.

D. Nonconforming Work:

1. Initiating devices, notification appliances, control equipment, and system accessories will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

E. Field Quality Control Reports: Collect, assemble, and submit test and inspection reports.

F. Manufacturer Services: Engage factory-authorized service representative to support field tests and inspections.

1. Manufacturer's Field Reports for Field Quality-Control Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at Project site.

## 3.7 SYSTEM STARTUP

A. Perform startup service.



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1. Complete installation and startup checks in accordance with manufacturer's published instructions.
2. Provide power to the FACU and configure internal settings.
3. Test all field wiring prior to connecting field devices and prior to connecting to the FACU. Ensure field wiring is free from ground faults and short circuits.
4. Connect field devices to field wiring.
5. Connect field wiring inside FACU cabinet.
6. Ensure system is normal and free from ground faults, open circuits, or short circuits.

B. Manufacturer Services: Engage factory-authorized service representative to support system startup.

1. Manufacturer's Field Reports for System Startup Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at Project site.

## 3.8 PROTECTION

A. After installation, protect fire detection and alarm system equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 284600



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