

## 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. Wireless Fire Alarm Control Panel
2. Wireless Fire Alarm Repeaters
3. Wireless Remote Annunciators
4. Wireless Manual Fire Alarm Pull Station boxes
5. Wireless Transmitters (Monitor Modules)
6. Wireless Control Relay Modules
7. Wireless System Smoke Detectors
8. Wireless Combination Smoke/Heat Detectors
9. Wireless Heat Detectors
10. Antennas
11. Notification Appliances
12. Device guards
13. Magnetic door holders
14. Remote annunciator
15. Digital alarm communicator transmitter

- B. Related Requirements:

1. Section 280513 "Conductors and Cables for Electronic Safety and Security" for cables and conductors for fire-alarm systems.

#### 1.3 DEFINITIONS

- A. EMT: Electrical Metallic Tubing.
- B. FACP: Fire Alarm Control Panel.
- C. NICET: National Institute for Certification in Engineering Technologies.
- D. PC: Personal computer.
- E. VESDA: Very Early Smoke-Detection Apparatus.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product, including furnished options and accessories.
1. Include construction details, material descriptions, dimensions, profiles, and finishes.
  2. Include rated capacities, operating characteristics, and electrical characteristics.
- B. Shop Drawings: For fire-alarm system.
1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
  2. Engineered Signal Survey Procedure: Utilizing a CWSI Signal Survey Unit and a CWSI Repeater the contractor will perform a series of signal surveys to determine appropriate locations for repeater installation. This shall be done by initially locating the repeater at the panel location and utilizing the survey unit to determine the first appropriate repeater location. The contractor shall use the repeater in conjunction with the survey tool to determine the quantity and locations necessary for full repeater network coverage. Appropriate locations shall be determined by the contractor performing signal surveys from the survey unit which should perform five (5) back-to-back signal queries from survey unit to the repeater. The final value shall be the average of the readings in a percentage form. No location is to be accepted with readings under 75%. A report shall be submitted showing values and said values shall also be noted on the riser diagram at the repeater locations.
  3. Include plans, elevations, sections, details, and attachments to other work.
  4. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
  5. Detail assembly and support requirements.
  6. Include voltage drop calculations for notification-appliance circuits.
  7. Include battery-size calculations.
  8. Include input/output matrix.
  9. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
  10. Include performance parameters and installation details for each detector.
  11. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
  12. Provide program report showing that air-sampling detector pipe layout balances pneumatically within the airflow range of the air-sampling detector.
  13. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.
    - a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
    - b. Show field wiring required for HVAC unit shutdown on alarm..
    - c. Locate detectors according to manufacturer's written recommendations.
    - d. Show air-sampling detector pipe routing.
  14. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
  15. Include floor plans to indicate final outlet locations showing address of each addressable device and wireless repeaters. Show size and route of cable and conduits and point-to-

point wiring diagrams including 120VAC circuits numbers and locations for FACP, Repeaters and all detectors and control relays requiring 120VAC.

C. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:
  - a. Trained and certified by CWSI in wireless fire-alarm system design.
  - b. NICET-certified, fire-alarm technician; Level II minimum.
  - c. Professional Engineer in Electrical, Electronics or Fire Protection Engineering
  - d. Licensed or certified by authorities having jurisdiction.

D. Delegated-Design Submittal: For notification appliances and smoke and heat detectors, in addition to submittals listed above, indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings showing the location of each notification appliance and smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the device.
2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72. Calculate spacing and intensities for strobe signals and sound-pressure levels for audible appliances.
3. Indicate audible appliances required to produce square wave signal per NFPA 72.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Field quality-control reports.

1.6 Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following and deliver copies to authorities having jurisdiction:
  - a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
  - b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.

- c. Diagrams showing connections between all devices and equipment requiring wiring. Each conductor shall be numbered at every junction point with indication of origination and termination points.
- d. Riser diagram.
- e. Device addresses.
- f. Record copy of site-specific software.
- g. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:
  - 1) Equipment tested.
  - 2) Frequency of testing of installed components.
  - 3) Frequency of inspection of installed components.
  - 4) Requirements and recommendations related to results of maintenance.
  - 5) Manufacturer's user training manuals.
- h. Manufacturer's required maintenance related to system warranty requirements.
- i. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

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.

1.8 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 Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
  - 2. Smoke Detectors, Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than one unit of each type.
  - 3. Keys and Tools: One extra set for access to locked or tamperproofed components.
  - 4. Audible and Visual Notification Appliances: one of each type installed.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by CWSI for installation of units required for this Project.
- B. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL (nationally recognized testing laboratory).
- C. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.
- D. NFPA Certification: Obtain certification according to NFPA 72 in the form of a placard by an FM Global-approved alarm company.

#### 1.10 PROJECT CONDITIONS

- A. Perform a full test of the existing system prior to starting work. Document any equipment or components not functioning as designed.
- B. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
  - 1. Notify Owner or Owner's representative 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 Owner or Owner's representative written permission.
- C. Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

#### 1.11 SEQUENCING AND SCHEDULING

- A. Prior to the start of design, a signal survey shall be conducted per the requirements of 1.4B.
- B. 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.
- C. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.
- D. In retrofit applications, interface wireless fire alarm control panel with the existing fire alarm control panel. Both systems shall be send and receive alarm, supervisory and trouble signals between the two systems prior to any field installation or demolition. A condition from the new and/or existing panel shall activate the facilities emergency response procedure and notify the central station.

#### 1.12 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
  - 2. Warranty Period: One year from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

- A. UL-certified, FCC certified 900 MHz frequency hopping spread spectrum wireless addressable system, with multiplexed signal transmission and voice/horn strobe evacuation as noted in the contract drawings.
- B. Approved Manufacturers: CWSI or approved equal.
- C. All components provided shall be listed for use with the selected 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.

### 2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:
  - 1. Wireless Manual pull stations.
  - 2. Wireless Heat detectors.
  - 3. Wireless Smoke detectors.
  - 4. Duct smoke detectors via Wireless Transmitters
  - 5. Wireless Carbon monoxide detectors.
  - 6. Combustible gas detectors via Wireless Transmitters.
  - 7. Automatic sprinkler system water flow via Wireless Transmitters.
  - 8. Preaction system via Wireless Transmitters.
  - 9. Fire-extinguishing system operation via Wireless Transmitters.
  - 10. Fire standpipe system via Wireless Transmitters.
  - 11. Dry system pressure flow switch via Wireless Transmitters.
  - 12. Fire pump running via Wireless Transmitters.
- B. Fire-alarm signal shall initiate the following actions (if applicable to the system design):
  - 1. Continuously operate alarm notification appliances, including voice evacuation notices (if denoted on contract drawings).
  - 2. Identify alarm and specific initiating device at fire-alarm control unit, connected network control panels, off-premises network control panels, and remote annunciators.
  - 3. Transmit an alarm signal to the remote alarm receiving station.
  - 4. Unlock electric door locks in designated egress paths via wireless control relays.
  - 5. Release fire and smoke doors held open by magnetic door holders via wireless control relays.
  - 6. Activate voice/alarm communication system (if applicable).
  - 7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode via wireless control relays.
  - 8. Activate stairwell and elevator-shaft pressurization systems.
  - 9. Close smoke dampers in air ducts of designated air-conditioning duct systems.
  - 10. Recall elevators to primary or alternate recall floors via wireless control and interposing relays.

11. Activate elevator power shunt trip via wireless control and interposing relays.
12. Record events in the system memory.
13. Indicate device in alarm on the graphic annunciator.

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

1. Valve supervisory switch via wireless control relays.
2. High- or low-air-pressure switch of a dry-pipe or preaction sprinkler system via Wireless Transmitters.
3. Elevator shunt-trip supervision via wireless and interposing control relays.
4. Fire-pump power phase reversal via Wireless Transmitters.
5. Independent fire-detection and -suppression systems via wireless control relays.
6. Loss of communication with any wireless device on the network or system.
7. Removal of a Wireless Device: The removal of a wireless device from its installed location shall send a unique supervisory signal indicating the exact device and location within the installation. This signal shall be re-transmitted every 200 seconds until the condition is restored to a normal state.

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 communication with any addressable sensor, transmitter, repeater, control relay and/or annunciator
4. Low Battery Reporting: A low battery from a wireless initiating device shall send a distinct signal and must be displayed at the control unit and indicate both the device and exact location within the installation. Once the initial low battery signal is received the device will continue to transmit low battery status every four hours and must continue to power the device for a minimum of seven days after receipt of initial low battery signal. If powering a smoke detector that contains an internal sounder, after seven days of low battery signals the smoke detector must be able to power the sounder for a minimum of five minutes.
5. Loss of primary power at fire-alarm control unit.
6. Ground or a single break in internal circuits of fire-alarm control unit.
7. Abnormal ac voltage at fire-alarm control unit.
8. Break in standby battery circuitry.
9. Failure of battery charging.
10. Abnormal position of any switch at fire-alarm control unit or annunciator.
11. Voice signal amplifier failure.

E. System Supervisory Signal Actions:

1. Identify specific device initiating the event at fire-alarm control unit connected network control panels, off-premises network control panels, and remote annunciators.
2. Transmit a supervisory signal to the remote alarm receiving station.
3. Display system status on graphic annunciator.

## 2.3 PERFORMANCE REQUIREMENTS

- A. The system shall provide for bi-directional radio frequency communication between all initiating devices, repeaters and control unit. Transmission format shall be Frequency Hopping Spread Spectrum (FHSS) with CRC data validation
- B. The System and components shall be UL listed to the requirements of NFPA Chapter 6 2002, 2007 Edition, NFPA Chapter 23 2010, 2013, and 2016 Editions “Special Requirements for Low Power Radio (Wireless) Systems.”
- C. Each initiating device shall be individually identified on the control unit by device type and location within the protected premises as determined by the owner or local authority having jurisdiction.
- D. The control unit shall separately identify each initiating device in both initial and continued alarm status.

## 2.4 FIRE-ALARM CONTROL PANEL

- A. Basis of design for the complete solution is CWSI, Wireless Fire Alarm Control Panels Models CP-3600 and CP-3600+
- B. General Requirements for Wireless Fire-Alarm Control Panel: The Control Panel shall have the capability of up to 2048 addressable points displayed on an LCD screen allowing for pinpoint status of all alarm, supervisory and trouble conditions. Network operation includes wireless command signals to repeaters and wireless relays for activation of control functions such as; appliance circuits, elevator recall, HVAC control and more. The Control Panel allows for the reporting of up to four separate alarm types and provides for event memory recall of alarm, supervisory and all control functions. The Control Panel shall be UL listed 10<sup>th</sup> Edition 864 & 1730. The control unit shall separately identify each initiating device in both initial and continued alarm status. The control panel shall maintain a perpetual recall memory of the last 1000 alarm and supervisory signals, 1000 trouble signals, and 1000 test log signals in the exact order received and 2000 all event log serialized enrollment shall be the method of identifying transmitters and repeaters within the installation. The control unit shall provide either 24 or 60 hour battery standby. The Control Panel and or Repeaters must be capable of sending wireless commands to other wireless peripherals such as wireless relays, repeaters, annunciators, control modules and said activation must comply with the 10 second rule.
- C. Wireless Annunciator (part # WRA-3): The Annunciator shall have a 4 x 20 character backlit LCD which will display alarm, supervisory and trouble signals from compatible CWSI panels and devices. Shall have 5 front panel LEDs for visual indication of A/C power, Alarm, Supervisory, Trouble and Silence. The annunciator shall provide acknowledge, signal silence and system rest control functions via a membrane keypad protected by a key lock. The Annunciator shall be UL 864 Listed Accessory Device with Bi-Directional RF Communication. The Annunciator shall utilize Frequency Hopping Spread Spectrum format. Rechargeable battery supply shall have a 24 hour backup time with built in alert sounder.
- D. Wireless Repeater (part #AR-5): The Repeater shall be a wireless addressable bi-directional repeater which is used to form a wireless network which receives, screens, verifies, and retransmits low power radio signals from other CWSI wireless initiating devices, repeaters and

control panels. In addition to providing RF signaling within the installation, the repeater shall provide two supervised addressable Notification Appliance Circuits (NACs). The repeater shall have an optional RM-5 Plug-in Relay Module which adds 5 Form C Relays to the repeater.

1. Each repeater shall be UL listed 864 and FM Approved and powered by a normal 120 VAC supply.
2. In the event of primary power interruption, a signal shall be sent to the control unit indicating loss of primary ac power within 200 seconds. Trouble relay activation at the control unit will be delayed for 120 minutes and when power is restored the condition will self-restore.
3. The internal battery back-up power source of each repeater shall provide full operation for a minimum of sixty (60) hours in the event of a primary loss of power. When used in conjunction with notification appliances or other ancillary equipment, the repeater shall, in the event of a loss of primary power, be able to operate the NAC outputs or other equipment for a minimum of 5 minutes after 60 hour battery backup time.
4. The repeater shall be supervised and transmit a separate and distinct low battery signal when the internal battery source reaches the predetermined low battery threshold as described by UL. This condition will display within 200 seconds at the control unit.
5. The repeater shall transmit a test signal evidencing its ability to communicate and verify that its signal strength is within the acceptable tolerance levels prescribed by the manufacturer to provide adequate transmission. Failure of the control unit to receive the test signal within 200 seconds will result in a trouble indication at the control unit.
6. Repeaters shall be installed in exact locations as determined by the site signal survey performed by a factory trained representative of the manufacturer.
7. Repeaters shall be configured and located in a manner whereby each initiating device shall report to a repeater with acceptable signal strength reception. In addition, each repeater's transmission shall likewise be received by a repeater and or control unit with acceptable signal strength reception.

E. Initiating Devices

1. Each initiating device shall be UL listed, CSFM Listed, NYFD Approved and FM Approved and powered by an internal battery(s) as specified to provide one year minimum operation.
2. Each initiating device shall transmit two levels of alarm status. Upon activation, the device shall transmit a signal indicating an initial alarm. Every sixty (60) seconds, while the device remains in alarm, a continuous signal shall be transmitted indicating continued alarm and this will continue until the devices automatically or manually restored.
3. Each initiating device shall transmit a test signal evidencing its ability to communicate and verify that its signal strength is within the acceptable tolerance levels prescribed by the manufacturer to provide adequate transmission. Failure of the control unit to receive the test signal within 200 seconds will result in a trouble indication at the control unit.
4. Stand Alone Technology: The system shall be designed so that the inoperability of a single wireless initiating device will not render any other wireless initiating device inoperable.
5. The internal power source of each initiating device shall be supervised and transmit a separate and distinct low battery signal when the battery voltage reaches the determined threshold set forth by UL. The initiating device shall be capable of full operation for a minimum of seven days after the initial low battery signal has been received at the control unit. This condition will report within 200 seconds.

6. The removal of an initiating device from its mounting shall result in a separate and distinct tamper signal which shall be transmitted within 200 seconds and displayed at the control unit.
  7. When utilizing a wired fire transmitter, the wiring shall be supervised and any loss of wiring integrity shall be reported within 200 seconds at the control unit.
- F. Notification-Appliance Circuit:
1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
  2. Where notification appliances provide signals to sleeping areas, the audible appliance shall be wireless & the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
  3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.
- G. Elevator Recall:
1. Elevator recall shall be initiated only by one of the following alarm-initiating devices:
    - a. Wireless elevator lobby detectors except the lobby detector on the designated floor.
    - b. Wireless smoke detector in elevator machine room.
    - c. Wireless smoke detectors in elevator hoistway.
  2. Elevator controller shall be programmed to move the cars to the alternate recall floor if lobby detectors located on the designated recall floors are activated.
  3. Water-flow alarm via a Wireless Transmitter connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.
    - a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.
- H. 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 if denoted on the riser diagram and shall be activated via a wireless control relay.
- I. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.
- J. Primary Power Source of Control Units and Repeaters: Each Control Unit and Repeater shall be powered by a primary uninterrupted 120 volt supply. If a control unit or repeater are providing external power to initiating circuits, they shall provide 60 hour battery standby and provide 5 minutes of continued operation.
- K. Secondary Power: 24-VDC supply system with batteries, automatic battery charger, and automatic transfer switch.
- L. Primary Power Source of Initiating Devices: Each wireless initiating device shall be powered by a single supervised 3 volt lithium battery

- M. 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.

## 2.5 MANUAL FIRE-ALARM BOXES

- A. Wireless Manual Pull Stations (part #310): The Fire Alarm Pull Station shall be a self-contained addressable dual action lexan fire pull station with a built in transmitter. In addition to the supervisory features such as low battery and tamper, the Pull Station shall also meet the 200 second polling requirement. The pull Station shall utilize Frequency Hopping Spread Spectrum (FHSS) signaling technology and provide bi-directional system communication to assure a secure and reliable communication network.
  1. Comply with UL 38.
  2. Shall be ADA compliant
  3. Double-action mechanism requiring two actions to initiate an alarm type; with integral wireless transmitter arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
  4. Station Reset: Key- or wrench-operated switch.
  5. 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

## 2.6 SYSTEM SMOKE DETECTORS

- A. Wireless Smoke Detectors (part #301/302): The Smoke Detectors shall be wireless addressable photoelectric smoke detectors. The Smoke Detector shall provide an internal 85dB temporal horn for smoke detectors applications, requiring signal point audibility and annunciation. Option of tandem interconnected Smoke Detector shall also available. A non-audible photoelectric smoke detector shall be available. All smoke detectors will be supervised for low battery, tamper, and 200 second polling. All models shall also provide bi-directional communication between the transmitter and smoke detector, allowing for hardware fault supervision of the detector itself.
  1. Shall comply with UL 268.
  2. Shall operate on single 3 volt battery with pre-low battery signal 48 hours prior to horn chirp.
  3. Shall have field replaceable chamber and hardware fault supervision
  4. Shall have precise field sensitivity diagnostics and pre-alarm maintenance signal.
  5. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base.
  6. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
  7. Detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, and alarm condition

## 2.7 CARBON MONOXIDE DETECTORS

- A. Wireless CO Detectors (part #350): Shall provide an internal 85dB temporal horn for CO detector applications, requiring signal point audibility and annunciation. The CO Detector shall utilize

Frequency Hopping Spread Spectrum (FHSS) signaling technology. The CO detector shall have a built in transmitter and sounder that complies with UL 2075.

1. Mounting: Adapter plate for outlet box mounting.
2. Testable by introducing test carbon monoxide into the sensing cell.
3. Detector shall send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
4. Provide means for addressable connection to fire-alarm system.
5. Test button simulates an alarm condition.

## 2.8 HEAT DETECTORS

- A. Wireless Fixed and Rate of Rise Heat Detector: The heat detector shall be an addressable wireless 135 degree fixed and rate of rise detector that complies to and is listed to UL 521. The heat detector shall be supervised for low battery, tamper and provide 200 second polling verification to the control unit. The heat detector shall also send a freeze warning supervisory signal to the control unit indicating that ambient temperature is reaching a threshold that would render the unit inoperable.

## 2.9 NOTIFICATION APPLIANCES

- A. Acceptable manufacturers: CWSI (Model 520R Wireless Low Frequency Sounder and Model MHR Wireless Mini Horn. ), Wheelock, Gentex or System Sensor UL Listed 464.
- B. General Requirements for Notification Appliances: Individually addressed, connected to a signaling-line circuit, equipped for mounting as indicated, and with screw terminals for system connections.
- C. Where notification appliances provide signals to sleeping areas, the audible appliance shall be wireless & the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
- D. 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.
  - ii. 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.
  - a. Chimes, Low-Level Output: Vibrating type, 75-dBA minimum rated output.
  - b. Chimes, High-Level Output: Vibrating type, 81-dBA minimum rated output.
  - c. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn, using the coded signal prescribed in UL 464 test protocol.

- d. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

## 2.10 REMOTE ANNUNCIATOR

- A. Wireless Remote Annunciator: The wireless annunciator shall display alarm, supervisory and trouble signals at remote locations throughout the installation on a backlit lcd display. Additionally there shall be five front LED's for visual indication of A/C power, Alarm, Trouble, Supervisory, and Silence. The annunciator shall also provide acknowledge, signal silence, and system reset control functions via a keypad. The keypad functions shall be protected by a key lock. The annunciator shall be listed UL 864 accessory device and provide a minimum of 24 hour battery standby. All remote annunciators shall be stand alone with no wiring or other physical interconnections between them and or the control unit.

## 2.11 ADDRESSABLE INTERFACE MODULE (WIRELESS TRANSMITTER)

- A. Wireless Transmitter (part #345): The Fire Transmitter shall be addressable transmitters (monitoring modules) designed specifically for connection to initiating devices, sprinkler flow and supervisory switches, and other UL miscellaneous accessories with normally open contacts. Shall be UL 864 Listed Accessory Devices. The Fire Transmitters shall be supervised for low battery, tamper, 200 second polling, and end of line violation. The Fire Transmitters shall offer the option of either Style 1 or Style 2 wiring configuration. The Fire Transmitter shall utilize Frequency Hopping Spread Spectrum (FHSS) signaling technology and shall provide bi-directional system communication.

1. Shall operate on single 3 volt battery.
2. Shall have remote reset.
3. Shall be available for installations requiring horizontal mounting.

## 2.12 ADDRESSABLE CONTROL MODULE (WIRELESS RELAY)

- A. Wireless Relay (part #SR-5): The Wireless Relay shall be a standalone unit providing five Form C relays activated by low power radio signals from either the control unit or repeaters. The wireless relay shall also provide N.C. trouble inputs for monitoring A/C loss, Low Battery and General Trouble on third party equipment.

1. The relay shall be powered by a 12 VAC wall transformer or UL 1481 Listed 24Vdc power supply.
2. Shall have 900 MHz Frequency Hopping Spread Spectrum Format.
3. Shall have rechargeable battery
4. Shall be a UL 864 Listed Accessory Device

Relay Box: Shall be an optional accessory for connection to the repeater. The Relay Box shall provide up to 40 programmable N.O. dry contact outputs. The Relay Box shall be UL 864 9<sup>th</sup> Edition Listed.

1. Shall be used for interconnection to other manufacturer's equipment when other interfaces are required.
2. Shall have bi-directional RF communication.
3. Shall have 900MHz Frequency Hopping Spread Spectrum Format.

4. Shall have 60hour battery standby time

## 2.13 ANTENNAS

A. Yagi: The Yagi shall be a highly directional antenna that shall be used to provide long distance reception and re-transmission of signals to outlying facilities.

1. Shall have a frequency range of 900 to 930 MHz
2. The Yagi shall have a gain of 15.2 dB Typical
3. Shall have an input connector- "N" female
4. The Polarity shall be VERT
5. The power handling shall be 500 Watts
6. The Yagi's mast size shall be 1-1/4" to 2" with a wind area/ survival of 0.4 Sq. Ft. / 100MPH.

B. Omni Antennas: The Omni OM-1 antennas shall be an omni-directional antenna used for bi-directional reception and re-transmission of signals equally, in all directions.

1. The OM-1 shall have a frequency range of 902-928 MHz and shall have a Gain of 2.5 dBi
2. The radiation shall be Omni and the polarization shall be vertical.
3. The OM-1 wave shall be ½ wave loaded.
4. The connector shall be SMA Plug
5. The operation temp for the OM-1 shall be -20degrees to +65 degrees C

The Omni OM-3 shall be a High Gain 5dB Antenna with a higher penetration capability. Use of the OM-3 shall vary based on site specific needs. The OM-3 Antenna shall be intended for use only on the Control Panel, Repeaters and FAST Survey tool.

1. The OM-3 shall mount directly onto the Control Panel or Repeater with no additional equipment necessary.
2. The OM-3 frequency range shall be 902-928 MHz and the Gain shall be 5 dBi.
3. The radiation shall be Omni and the polarization shall be vertical.
4. The OM-3 wave shall be ½ wave dipole, collinear.
5. The connector shall be SMA Plug.
6. The operation temp for the OM-3 shall be -30 degrees to +75 degrees C.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

B. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.

1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

C. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 EQUIPMENT INSTALLATION

- E. Comply with NFPA 72, International Building Code, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."
  - 1. Devices placed in service before all other trades have completed cleanup shall be replaced.
  - 2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.
- F. 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.
- G. Equipment Mounting: Install fire-alarm control unit, repeaters, & annunciators on finished floor.
- H. Install wall-mounted equipment, with tops of cabinets not more than 78 inches (1980 mm) above the finished floor.
- I. Manual Fire-Alarm Boxes:
  - 1. Install manual fire-alarm box in the normal path of egress within 60 inches (1520 mm) of the exit doorway.
  - 2. Mount manual fire-alarm box on a background of a contrasting color.
  - 3. The operable part of manual fire-alarm box shall be between 42 inches (1060 mm) and 48 inches (1220 mm) above floor level. All devices shall be mounted at the same height unless otherwise indicated.
- J. Smoke- or Heat-Detector Spacing:
  - 1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
  - 2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, 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 Annex A in NFPA 72.
  - 5. HVAC: Locate detectors not closer than 36 inches from air-supply diffuser or return-air opening.
  - 6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.

- K. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.
- L. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches (9100 mm) long shall be supported at both ends.
  - 1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.
- M. Air-Sampling Smoke Detectors: If using multiple pipe runs, the runs shall be pneumatically balanced.
- N. Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location. Do not install smoke detectors in sprinklered elevator shafts.
- O. 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.
- P. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.
- Q. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.
- R. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling. Install all devices at the same height unless otherwise indicated.
- S. Device Location-Indicating Lights: Locate in public space near the device they monitor.

### 3.3 PATHWAYS

- T. Pathways shall be installed in EMT.
- U. Exposed EMT shall be painted red enamel.

### 3.4 CONNECTIONS

- V. 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 listed for use with installed fire-alarm system before making connections.

- W. Make addressable connections with a wireless transmitter to the following devices and systems. Install the interface device less than 36 inches 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 firefighters' smoke-control system panel.
  2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
  3. Smoke dampers in air ducts of designated HVAC duct systems.
  4. Magnetically held-open doors.
  5. Electronically locked doors and access gates.
  6. Alarm-initiating connection to elevator recall system and components.
  7. Alarm-initiating connection to activate emergency lighting control.
  8. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
  9. Supervisory connections at valve supervisory switches.
  10. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
  11. Supervisory connections at elevator shunt-trip breaker.
  12. Data communication circuits for connection to building management system.
  13. Data communication circuits for connection to mass notification system.
  14. Supervisory connections at fire-extinguisher locations.
  15. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
  16. Supervisory connections at fire-pump engine control panel.

### 3.5 IDENTIFICATION

- X. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- Y. Install framed instructions in a location visible from fire-alarm control unit.

### 3.6 GROUNDING

- Z. 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.
- AA. Ground shielded cables at the control panel location only. Insulate shield at device location.

### 3.7 FIELD QUALITY CONTROL

- BB. Field tests shall be witnessed by Engineer of Record & Authorities having jurisdiction.
- CC. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- DD. Perform tests and inspections.
- EE. Perform the following 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 the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
    - b. Comply with the "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 the "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" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
- FF. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- GG. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- HH. Prepare test and inspection reports.
- II. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- JJ. 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.

### 3.7 MAINTENANCE SERVICE

- KK. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
1. Include visual inspections according to the "Visual Inspection Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
  2. Perform tests in the "Test Methods" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3. Perform tests per the "Testing Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

END OF SECTION 283111