

SECTION 284621.11 - DIGITAL, ADDRESSABLE FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

A. Product Data

1. For each type of devices including catalog numbers, electrical characteristics, ratings, color, temperature limitations, etc.
2. Submit as separate submittal (PD) but at same time as Shop Drawings for this section.

B. Shop Drawings

1. Provide a complete set of floor plan drawings showing conduit sizes and number of conductors required to all components plus detailed wiring connections required at each type of device. Clearly show the intended location of all field devices and their connections to the system. Include battery calculations, voltage drop calculations, critical dimensions, ductwork sizes for sampling tubes and associated required dimensions, wiring diagrams, sequence of operation, cable sizes and types, etc.
2. Shop Drawings shall be prepared by persons with the following qualifications: Trained and certified by manufacturer in fire-alarm system design, and licensed and certified by authorities having jurisdiction.
3. Submit as separate submittal (SD) but at same time as Product Data for this section.

1.2 GENERAL REQUIREMENTS

- A. Refer to Division 26 sections for requirements associated with all electrical work not specifically defined in this section, which shall be considered additional and concurrent scope of work that is associated with work of this section.
- B. Apply for and pay all required permits and fees. Submit to AHJ and issue revisions to AHJ as required to keep AHJ documentation current. It shall be the responsibility of the Fire Alarm System Manufacturer to furnish submittals to the authority having jurisdiction for approval. This action shall be taken during the shop drawing procedure. The system must be approved by this authority and a copy submitted to the Engineer for review.
- C. Fire Alarm System Design: Provide the final Fire Alarm System design completed by an approved and certified Fire Alarm System contractor, who shall coordinate the final design, configuration, programming, etc. with all national and local codes and regulations, and AHJ (Authority/Authorities Having Jurisdiction), prior to furnishing

Fire Alarm System submittals. Receipt of submittals by the project design professional shall be taken to mean that all such coordination and related compliance has occurred.

- D. Provide complete and working Fire Protective Signaling System (NFPA 72) suitable for type of occupancy as defined by Local Building Code and as approved by local Fire Marshall or (AHJ). Work Included: Provide equipment; Provide wiring, connectors, and device plates; Provide custom programming of all supplied programmable equipment; Provide detailed installation-level engineering documentation; Provide system commissioning, testing, warranty and training.
- E. Provide a complete multiplexed intelligent addressable fire alarm system throughout the building as shown on the drawings and in accordance with NFPA 72 and all authorities having jurisdiction. All equipment shall be UL listed. Each smoke detector shall be intelligent/addressable for the exact location in the building, capable of giving a print out of the sensitivity and have a sensitivity adjustment remotely from the console. This sensitivity shall also be adjusted automatically from the system clock if the user wishes changes during a 24-hour period. The system shall use analog data transmission in order to accomplish the previous requirements. Manual stations, fire suppression devices and all other "contact only" closing devices shall be Addressable. An Addressable only system will not be acceptable.
- F. Spare Capacities: Provide minimum 25% spare capacity for each data loop. Provide minimum 25% spare capacity for each alarm-indicating circuit.
- G. Comply with current applicable provisions of the following standards:
 - 1. National Fire Protection Standards
 - a. Central Station Signaling Systems-Protected Premises Unit, NFPA 71
 - b. National Fire Alarm Code, NFPA 72
 - c. Automatic Fire Detectors, NFPA 72
 - d. Life Safety Code, NFPA 101
 - 2. National Electric Code (including Article 760)
 - 3. Local and State building codes
 - 4. All requirements of the Local Authority/Authorities Having Jurisdiction (AHJ)
 - 5. Provide system and components that are listed by Underwriters Laboratories, Inc. for use in Fire Protective Signaling Systems under the following standards as applicable:
 - a. Control Units for Fire Protective Signaling Systems (including UUKL sublisting), UL 864
 - b. Smoke Detectors for Fire Protective Signaling Systems, UL 268
 - c. Smoke Detectors for Duct Applications, UL 268A
 - d. Smoke Detectors, Single and Multiple Stations, UL 217
 - e. Heat Detectors for Fire Protective Signaling Systems, UL 521
 - f. Door Closers-Holders for Fire Protective Signaling Systems, UL 228
 - g. Audible Signaling Appliances, UL 464

- h. Visual Signaling Appliances, UL 1638
 - i. Visual Notification Appliances / Signaling Devices for the Hearing Impaired, UL 1971
 - j. Manually Actuated Signaling Boxes, UL 38
 - k. Waterflow Indicators for Fire Protective Signaling Systems, UL 346
 - l. Power Supplies for Fire Protective Signaling Systems, UL 1481
- H. Be able to demonstrate through valid references and other means determined necessary by the Design Professional that the installing entity has completed at least 25 systems successfully. Upon request, provide detailed information on these reference systems within 16 business hours of request. Reference systems shall be of like type and scope to that specified herein. Provide the assistance of manufacturer/factory personnel as needed to assist in the programming, technical review of work being performed, as well as in commissioning of the systems and resolutions of problems arising during the course of the project.
- I. Designers, installers, programming personnel, inspection personnel, testing personnel and maintenance personnel shall be trained and certified by manufacturer for installation of units required for this Project, and shall be qualified in compliance with requirements of NFPA, including Chapter 10.5 of NFPA 72. Obtain fire-alarm system from single source from single manufacturer. Electrical components, devices, and accessories shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application. Obtain certification according to NFPA 72 by a UL-listed Fire Alarm Certificate Corporation.
- J. Comply with UL 864. Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.
- K. Provide the owner with a one (1) year service contract. Indicate the cost of renewing this contract for an additional one, two and three year period at the owner's option.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Do not presume that all equipment necessary to provide a complete and working system is fully enumerated within these specifications. Use these specifications in conjunction with the information provided in the drawings to conclude the requirements and intent. If a conflict arises between these specifications and the drawings, the higher quality, higher quantity, and more stringent requirement shall apply.

- B. Provide all specified items, plus all incidentals and required items necessary to provide a complete and working system, installed in a professional manner, and in accordance with applicable codes and industry accepted “best practices”.
- C. Provide cables and conductors that are fully compliant with all applicable aspects of NFPA 70 (including Article 760), NFPA 72, and all other applicable codes and standards.
- D. Where specified brands and models are listed on the drawings, interpret so that these products set the Standard-of-Quality that represents the characteristics, and minimum performance and feature-set considered acceptable. Where approved manufacturers are listed, interpret only to mean that the supplier/installer may select and use a product from the list of alternate manufacturers that either by itself, or in combination with other projects, meets or exceeds all specifications and capabilities of the product listed. Do not interpret to mean that the approved alternate manufacturer has a single product that is an exact equal in its product line.
- E. Be aware of physical characteristics, including size, of the products listed as the Standard of Quality. Additional costs, if any, associated with the approved use of an alternate product is the exclusive responsibility of the supplier/installer, including but not limited to additional costs incurred by the project’s Design team and construction trades working on the projects.

2.2 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, the basis of design is specified as a Notifier system (by Premier Engineer Systems Distributors) and any listed catalog numbers are based on Notifier. Additional Acceptable Manufacturers are Siemens, EST, Simplex Co., Gamewell FCI.

2.3 SYSTEMS OPERATIONAL DESCRIPTION

- A. Duct Smoke Detectors: Program to report as an alarm signal or as a supervisory signal, based on prevailing codes and direction from AHJ – verify with AHJ in field.
- B. Fire-alarm signal initiation shall be by one or more of the following devices and systems:
 - 1. Manual stations.
 - 2. Smoke detectors.
- C. Fire-alarm signal shall initiate the following actions:
 - 1. Continuously operate alarm notification appliances.
 - 2. Identify alarm at fire-alarm control unit and remote annunciators.
 - 3. Transmit an alarm signal to the remote alarm receiving station.
 - 4. Unlock electric door locks in designated egress paths.
 - 5. Activate audible/visual alarm components and devices.

- 6. Close smoke dampers in air ducts of designated air-conditioning duct systems.
 - 7. Activate emergency shutoffs for designated gas and fuel supplies.
 - 8. Record events in the system memory.
- D. Supervisory signal initiation shall be by one or more of the following devices and actions:
- 1. Valve supervisory switch.
- E. 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.
- F. System Trouble and Supervisory Signal Actions: Annunciate at fire-alarm control unit, at remote annunciator(s). Also, annunciate at monitoring central station for actions that require it based on prevailing codes and based on direction from AHJ. Coordinate with AHJ.
- G. Include the following in sequences of operation:

FIRE ALARM SYSTEM SCHEMATIC SEQUENCE OF OPERATIONS											
Activate A/V annunciate of all event alarm/trouble signals at FACU and at remote annunciator(s) and transmit to History Log.											
Initiation Device	Event	Notify FACU and FARA	Activate A/V Alarm Devices	Notify Central Station	Shut Down Assoc. Eq.	Shut Down Elev.	Activate Phase ½ Fireman Service	Activate Exh. Hood Fire Alarm Sequence	Activate Smoke Control/ Evac. Seq.	Activate Door Releases	Notes
Manual Pull Station	Alarm	X	X	X	X					X	1
	Trouble	X		X						X	
Ceiling Smoke/Heat Detector	Alarm	X	X	X	X					X	1
	Trouble	X		X							
Kitchen Exh. Hood Fire Protection Activation	Alarm	X	X	X	X			X		X	2,4
	Trouble	X		X							
Smoke Detectors Assoc. with Other Mech. Eq.	Alarm	X	See Note 1	X	X					X	1
	Trouble	X		X							
Carbon Monoxide (CO) Detectors	Alarm	X		V.I.F.							3
	Trouble	X		V.I.F.							

Sequence of Operation Notes:

- 1 Program to report as an alarm signal or as a supervisory signal, based on prevailing codes and direction from AHJ – verify with AHJ in field)
- 2 Provide interface with the Kitchen Exhaust Hood fire protection system. See Section 26 05 90 as applicable.
- 3 Activate all dedicated Carbon Monoxide (CO) alarm indicating devices. Meet with Owner and AHJ to determine if automatic notification to Central Station is required as well.
- 4 Activate emergency shutoffs for gas and fuel supplies if required by prevailing codes and/or authorities having jurisdiction, if supplies to equipment are not essential to life safety.

2.4 FIRE-ALARM CONTROL UNIT

- A. General Requirements for Fire-Alarm Control Unit: Provide field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL. 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. Include a real-time clock for time annotation of events on the event recorder and printer. Provide addressable initiation devices that communicate device identity and status. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at fire-alarm control unit. Temperature sensors shall additionally test for and communicate the sensitivity range of the device. Provide addressable control circuits for operation of mechanical equipment.
- B. Alphanumeric Displays 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, 1 line(s) of 80 characters, minimum.
 2. Keypad: Arranged to permit entry and execution of programming, display, and control command and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.
 3. Program detailed device and room descriptions so that any trouble, supervisory or alarm condition clearly annunciates floor level, room number, room name, device, and indication of normal, alarm, trouble and supervisory status at fire alarm control panel(s), at fire alarm annunciator panel(s) and at the supervising central station.
- C. Circuits:
 1. Initiating Device, Notification Appliance and Signaling Line Circuits: Class A or Class A and B (provide Class A for circuits that provide isolation module protection for zones).
 - a. Signaling Line Circuits: Provide style consistent with Class specified above.
 - b. Install addressable devices to Notification Appliance Circuits so that no more than 75 percent of each circuit is utilized.

- c. Install addressable devices to signaling line circuits so that no more than 75 percent of each circuit is utilized.
 2. Provide isolation modules as required to isolate wire to wire shorts on a data loop to limit the number of other modules or detectors that are incapacitated by the short circuit fault and/or grounds. Isolation modules shall be part of the smoke detector base. The isolation modules shall permit the entire system to operate independently of the area disconnected by the isolation module due to wiring faults. Provide isolation modules and wiring configurations (using Class A, or Class A and B, pathways) for fault isolation so that any one fault will not cause any part of the system to go down other than the zone of the fault; provide zoning compliant with prevailing codes, including NFPA 72, with at least one zone per floor (more if areas are subdivided into multiple zones by fire and/or smoke barriers, or for other reasons).
 3. Provide power-limited cables that have a temperature rating of at least 60 degrees C; provide additional marking for conductor size and temperature ratings for cables rated in excess of 60°C (140°F).
 4. Serial Interfaces: Two RS-232 ports for printers.
- D. Notification Appliance Circuit: Operation shall sound in a Temporal-Three alarm signal.
- E. Door Controls: Door hold-open devices at doors in smoke barrier walls shall be controlled by fire-alarm system.
- F. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.
- G. 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 signals supervisory and digital alarm communicator transmitters and digital alarm radio transmitters shall be powered by 24-V dc source. Alarm current draw of entire fire-alarm system shall not exceed 75 percent of the power-supply module rating.
- H. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch. Alarm current draw of entire fire-alarm system shall not exceed 75 percent of the secondary power-supply rating. Batteries shall be sealed lead calcium.
- I. 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. General Requirements for Manual Fire-Alarm Boxes (“pull stations”): Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions

in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key- or wrench-operated switch.

2.6 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be four-wire or two-wire type as required to fulfill project requirements for a complete operational system.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
5. Integral Visual-Indicating Light: LED (light emitting diode) type indicating detector has operated and power-on status.
6. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector: Primary status; Device type; Present average value; Present sensitivity selected; Sensor range (normal, dirty, etc.).
7. Photoelectric Smoke Detectors: 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.

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

1. Provide, wire and program duct smoke detectors, and provide associated sampling tubes per NFPA. Division 23 installer will install the units.
2. 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.
3. Provide keyed test/monitor station (with status/alarm/trouble indicating LED's) on the ceiling or wall (flush in finished areas) beneath the duct detector at discreet but readily visible location as determined in field unless specific location is shown on drawings. Provide engraved (or approved equivalent method) plate at each remote station to read: "##### Duct Smoke Detector", where ##### is the equipment identification used on drawings. Connect to fire alarm system.
4. If required by authority having jurisdiction, provide identified key-operated air handler reset station on the ceiling or wall (flush in finished areas) beneath the air handler at discreet but readily visible location as determined in field unless specific location is shown on drawings. Provide engraved (or approved equivalent method) plate at each reset station to read: "##### Reset Switch to reset

after a duct smoke detection event has been cleared and the fire alarm system has been reset.”, where ##### is the equipment identification used on drawings. Coordinate with authority having jurisdiction for verification of, or required modification to, the language to be engraved. Connect to fire alarm system.

2.7 MONITOR MODULES

- A. Provide monitor modules in quantities as required to interface all "non-intelligent" devices into the system. Application examples include fire alarm system remotes panels, remote power supplies, Kitchen Hoods, etc. as applicable. Refer to documents of all trades since some such devices may not be specifically shown on electrical drawings. Review fire suppression system submittals and installation drawings to determine exact quantities and locations for devices that require monitor modules, as project drawings may not include all devices that require monitoring; provide monitor modules, wiring, connections, programming, etc. accordingly.

2.8 CONTROL/RELAY MODULES

- A. Provide number as required to interface all necessary supervised-control functions. Provide control/relay modules for all auxiliary devices including door closures and all supervised control functions such as air handler shut-downs, elevator recall, elevator shunt trip, elevator inoperable, etc.

2.9 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. Provide combination devices as 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 (“Strobes”): 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: 15/30/75/110 cd, selectable in the field. Provide 177 cd units in all sleeping areas.
 - 2. Mounting: Wall mounted unless otherwise indicated.
 - 3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
 - 4. Flashing shall be in a temporal pattern, synchronized with other units.
 - 5. Strobe Leads: Factory connected to screw terminals.
 - 6. Mounting Faceplate: Factory finished, red.
- C. Audible Notification Appliances (“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 from the horn, using the coded signal prescribed in UL 464 test protocol.

2.10 REMOTE ANNUNCIATOR

- A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing. Mounting: Flush enclosure, NEMA 250, Type 1. Provide alphanumeric display and LED indicating lights that match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.11 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.

2.12 DIGITAL ALARM COMMUNICATOR TRANSMITTER (DACT)

- A. General:
1. Receive, install, wire, connect and test Owner-furnished digital communicator - programmed to report to the Owner's UL approved Central Station monitoring agency.
 2. Ensure that all work is provided in strict compliance with all prevailing codes and ordinances, including Chapter 26 of NFPA 72.
 3. Note that depending on the requirements set forth by the Owner-selected Central Station monitoring company, the digital communicator may be remote from the fire alarm control unit, i.e. at main telephone service entrance backboard.
 4. The Digital Communicator will be UL listed for fire alarm use, will be mounted in single dedicated equipment housing containing battery charger and battery with coupler cable, and will be furnished via the Owner by the Owner-selected Central Station monitoring company.
 5. Provide one duplex telephone outlet (with two RJ31X connecting blocks) within two feet of Digital Communicator for connection to telephone system. Wire and connect each block to a separate phone line, which shall be the first in-house device tied to the respective phone line. Connect to a "loop start" telephone circuit; do not connect to a party line or a "ground start" telephone circuit.
 6. Provide wiring in conduit from two sets of dry contacts on the Fire Alarm Control Unit to the Digital Communicator; one set for alarm and one set for trouble.
 7. Immediately upon commencing with work on the project, make arrangements with owner for procurement of the Digital Communicator so delivery of same does not delay the project. Subsequently coordinate directly with owner-selected Central Station monitoring company to determine equipment locations, electrical characteristics, special or job-specific requirements, etc. Provide labor and

- materials as required to render the entire fire alarm system, including remote UL Central Station monitoring, fully tested and operational prior to certificate-of-occupancy walk-throughs by authorities having jurisdiction.
8. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.
 9. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture one telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.
 10. Local functions and display at the digital alarm communicator transmitter shall include the following:
 - a. Verification that both telephone lines are available.
 - b. Programming device.
 - c. LED display.
 - d. Manual test report function and manual transmission clear indication.
 - e. Communications failure with the central station or fire-alarm control unit.
 11. Digital data transmission shall include the following:
 - a. Address of the alarm-initiating device.
 - b. Address of the supervisory signal.
 - c. Address of the trouble-initiating device.
 - d. Loss of ac supply or loss of power.
 - e. Low battery.
 - f. Abnormal test signal.
 - g. Communication bus failure.
 12. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

PART 3 - EXECUTION

3.1 GENERAL

- A. The work performed under this section shall be conducted by a team of qualified individuals. Comply with NFPA 72 for installation of fire-alarm equipment. Install wall-mounted devices at the following heights above finished floor. In cases where using center of box for measurement would result in a switch-height device having an operable component higher than 48 inches above finished floor, install boxes lower as needed so that uppermost part of operable component is no higher than 48 inches.

1. Fire Alarm Manual Pull Stations: 46" to top of operating handle.
 2. Fire Alarm A/V Notification Appliances: 80" to bottom of outlet box.
- B. Provide required 20A/120VAC power as required to energize all components of the fire alarm system. This shall include home-runs for fire alarm control units, and shall also include home-runs and wiring for accessory devices such as remote power supplies/panels, dialer, etc. as applicable. This requirement applies whether or not such power work is shown on the drawings. Branch circuits serving fire alarm equipment shall be dedicated to fire alarm equipment only.
- C. Installation:
1. Install equipment, with tops of cabinets not more than 72 inches above the finished floor.
 2. Smoke Detector Spacing: Smooth ceiling spacing shall not exceed 30 feet. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A in NFPA 72.
 3. Smoke Detector Placement Restrictions:
 - a. Locate detectors no closer than 3 feet horizontally from air-supply diffuser or return-air opening.
 - b. Locate detectors not closer than 12 inches from any part of a lighting fixture.
 - c. Locate detectors no closer than 3 feet horizontally from the tip of a ceiling fan blade.
 - d. Locate detectors no closer than 3 feet horizontally from the door or opening of a bathroom that contains a bathtub or shower, unless this would prevent placement of a smoke detector that is required by prevailing codes.
 - e. Locate detectors no closer than 6 feet horizontally from a permanently installed cooking appliance, unless this would prevent placement of a smoke detector that is required by prevailing codes.
 4. Annunciator: Install at 48 inches above finished floor to center of unit, with operable buttons or other operable interfaces no higher than 46 inches above finished floor.
 5. 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.
 6. Device Location-Indicating Lights: Locate in public space near the device they monitor.
 7. Wall-Mounted Audible/Visual Notification Appliances: Install on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.
- D. Provide ceiling mounted smoke detector located above each control/power unit (all types, including those for associated systems), and above all remote annunciators.

- E. Provide weatherproof audible alarm notification device on the exterior wall at the location where the fire suppression sprinkler system water service enters the building.
- F. Provide all required power as required to energize all new fire alarm related components. This requirement applies whether or not such power work is shown on the drawings. Branch circuits serving fire alarm related equipment shall be dedicated to fire alarm related equipment only. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a grounding conductor from ground electrode system to fire-alarm control unit.
- G. Provide all auxiliary components and all connections, interfaces, etc. as required to render the entire system fully operational, including, but not limited to, monitoring and alarm connections for all building systems and components that have ancillary interfaces with the building fire alarm system.
- H. Properly identify system components, wiring, cabling, and terminals. Install framed instructions in a location visible from fire-alarm control unit. Provide red color on jacket of all fire alarm cables associated with the fire alarm system. Provide red-colored breaker handle and red-colored lock-on device at source circuit breakers that feed fire alarm related equipment. Provide red coloring for all fire alarm system junction boxes, along with identification.

3.2 FIELD QUALITY CONTROL, DEMONSTRATION AND CLOSEOUT

- A. Pre-Test Submittal: Provide type-written and signed certification that the system is complete, working fully and complies with the drawings and specifications and is ready for acceptance testing. Upon the design professionals' receipt of and approval of the pre-test submittal, contact the design professionals to schedule acceptance testing. Provide not less than 14 days of advance notice to the Design Professional.
- B. Upon completion of the installation, the system shall be checked and tested by a fire alarm inspector that is State-Licensed, NICET Level II Certified, or approved equivalent. Have available at the project site test equipment, cables, tools and personnel necessary to demonstrate full compliance with these specifications. Present a copy of the most up-to-date as-built documentation at this time. Provide labor services to completely verify and test the systems in the presence of the design professional(s). Rectify deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the specifications and complies with applicable standards.
 - 1. Visual Inspection: Conduct visual inspection prior to testing. 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. 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.
 4. Fire-alarm system will be considered defective if it does not pass tests and inspections. Prepare test and inspection reports.
- C. If, for reasons of non-compliance and/or incomplete work, the design professional(s) should be required to return to the project site to perform acceptance testing beyond the initial time, incur related costs, up to \$1500 per day, plus travel and expenses. At the exclusive choice of the design professionals, these fees may be deducted from monies owed to the installer under the project or invoiced to the installer directly by the Design Professional.
- D. In the presence of the design professional(s), the inspecting authority, and the owners, demonstrate the presence of all specified equipment, cabling and installation methods. Demonstrate the operation of the system and shall be prepared to make any electronic, physical or software related adjustments to the system or any of its components to the satisfaction of the design professionals, as required, to demonstrate and achieve full compliance with the specifications.
- E. Submit a minimum of three duplicate sets of Compact Disc(s), or other approved electronic media, containing complete electronic documentation of the system including the most up-to-date equipment configuration files for 100% of all software configurable/programmable products used in the project. These files shall include the editable source code files necessary to make changes. Where permissible by manufacturer software licensing agreements, include copies of all pertinent applications necessary for viewing and editing of the supplied configuration/programming source code files. Include copies of all applicable manufacturer and third-party software license agreements. This information is in addition to all other closeout documentation requirements applicable to this section. Submit this information with transmittal directly to the Design Professional where it will be distributed to other entities as appropriate. Submit all other closeout documentation through normal project channels.

END OF SECTION 284621.11