

SECTION 283100

FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 SUMMARY

- A. This specification provides the minimum requirements for the Life Safety System. The system shall include, but not limited to all equipment, materials, labor, documentation and services necessary to furnish and install a complete, operational system to include but not limited to the following functions:
 - 1. Protected premises fire alarm systems.
 - 2. Initiating devices.
 - 3. Notification appliances.
 - 4. Inspection and testing.
 - 5. Auxiliary fire alarm equipment.

- B. Related Sections:
 - 1. Section 260500 - Common Work Results for Electrical.
 - 2. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.
 - 3. Section 260533 – Raceway & Boxes for Electrical Systems.

1.2 REFERENCES

- A. All work and materials shall conform to all applicable federal, state and local codes and regulations governing the installation. The equipment and installation shall comply with the current provisions of the following codes and standards.

- B. American National Standards Institute (ANSI):
 - 1. ANSI S3.411, Audible Emergency Evacuation Signals.
 - 2. ANSI/UL 1971, Standard for Safety Signaling devices for Hearing Impaired.

- C. National Fire Protection Association (NFPA):
 - 1. NFPA 13, Installation of Sprinkler Systems.
 - 2. NFPA 70, National Electrical Code.
 - 3. NFPA 72, National Fire Alarm Code.
 - 4. NFPA 101, Life Safety Code.

- D. Underwriters Laboratories, Inc.(UL):
 - 1. UL 864 - Control Units for Fire Protective Signaling Systems.
 - 2. UL 268 - Smoke Detectors for Fire Protective Signaling Systems.
 - 3. UL 268A - Smoke Detectors for Duct Applications.
 - 4. UL 217 - Single and Multiple Station Smoke Alarms.
 - 5. UL 521 - Heat Detectors for Fire Protective Signaling Systems.
 - 6. UL 228 - Door Closers-Holders, With or Without Integral Smoke Detectors.
 - 7. UL 464 - Audible Signaling Appliances.
 - 8. UL 38 - Manually Actuated Signaling Boxes for Use with Fire-Protective Signaling Systems.
 - 9. UL 346 - Waterflow Indicators for Fire Protective Signaling Systems.
 - 10. UL 1971 - Signaling Devices for the Hearing-Impaired.
 - 11. UL 1481 - Power Supplies for Fire Protective Signaling Systems.
 - 12. UL 1635 - Digital Alarm Communicator System Units.

- E. Federal Codes and Regulations
 - 1. Americans with Disabilities Act (ADA)

- F. International Standards Organization (ISO)
 - 1. ISO-9000
 - 2. ISO-9001

- G. Factory Mutual (FM)
 - 1. Provide factory mutual approval.

1.3 DEFINITIONS:

- A. Authority Having Jurisdiction: See Public Authorities.
- B. Engineer of Record: A Professional Engineer Registered in the State where the project is located who undertakes design of the fire protection system.
- C. Owner: Building/facility owner, landlord/lessor, tenant/lessee, Insurance Carrier or any designated representative of these entities.
- D. Public Authorities: Local, State or Federal government body having jurisdiction over any portion of the project. This includes, but is not limited to: Fire Departments, Fire Marshal Offices, Aviation Authorities, Insurance Regulatory Boards, etc.

1.4 SYSTEM DESCRIPTION

- A. General
 - 1. The Contractor shall furnish all labor, services and materials necessary to furnish and install a complete, functional protected premises fire alarm system (System). The System shall comply in all respects with the requirements of the specifications, manufacturer's recommendations and Underwriters Laboratories Inc. (ULI) listings.
 - 2. Certification that the entire system(s) has/have been inspected and tested, is/are installed entirely in accordance with the applicable codes, standards, manufacturer's recommendations and ULI listings, and is/are in proper working order. Contractor shall use "Fire Alarm System Certification and Description" as required by NFPA 72.
- B. 24VDC NACs
 - 1. Provide and install a new fire detection and alarm system that shall consist of:
 - a. Fire Alarm Control Panel.
 - b. LCD remote annunciator(s).
 - c. A system printer.
 - d. Manual pull stations.
 - e. Area smoke detectors.
 - f. Area heat detectors.
 - g. Duct smoke detectors.
 - h. Sprinkler system waterflow(s) and valve supervisory switch(s).
 - i. Interface with suppression, smoke control and ancillary shutdown system(s).
 - j. Audible notification appliances.
 - k. Synchronized visual notification appliances.
 - l. Magnetic door holders.
 - m. Provide elevator recall functions for primary and alternate floors and elevator power shunt trip activation.
 - n. Connection to a central station. The owner shall arrange for two dedicated phone lines to be terminated as directed by the installing contractor.

1.5 SEQUENCE OF OPERATIONS

- A. General 24 VDC NACs

1. The alarm activation of any area smoke detector, heat detector, manual pull station, sprinkler waterflow, the following functions shall automatically occur:
 - a. The internal audible device shall sound at the control panel and remote annunciator.
 - b. The LCD display shall indicate all applicable information associated with the alarm condition including; device type, device location and time/date.
 - c. All system activity/events shall be documented in system history and on the system printer.
 - d. Any remote or local annunciator LCD/LED's associated with the alarm shall be illuminated.
 - e. Activate notification audible appliances throughout the building.
 - f. Activate visual strobes notification appliances throughout the building. The visual strobe shall continue to flash until the system has been reset. The visual strobe shall not stop operating when the "Alarm Silence" is pressed.
 - g. Transmit an alarm signal to the central station.
 - h. All automatic events programmed to the alarm point shall be executed and the associated outputs activated.
 - i. All exit doors shall unlock throughout the building.
 - j. All self-closing fire/smoke doors held open shall be released.

B. Duct Smoke Operation

1. The Alarm activation of any duct smoke detector, the following functions shall automatically occur:
 - a. The internal audible device shall sound at the control panel and remote annunciator.
 - b. The LCD display shall indicate all applicable information associated with the alarm condition including; device type, device location and time/date.
 - c. All system activity/events shall be recorded on the system printer and system history file.
 - d. Any remote or local annunciator LED's associated with the alarm shall be illuminated.
 - e. Transmit an alarm signal to the central station.
 - f. Shutdown the local air handling unit.
 - g. All automatic events programmed to the alarm point shall be executed and the associated outputs activated.

C. Supervisory Operation

1. Upon supervisory activation of any sprinkler valve supervisory switch, the following functions shall automatically occur:
 - a. The internal audible device shall sound at the control panel and remote annunciator.
 - b. The LCD display shall indicate all applicable information associated with the supervisory condition including; device type, device location and time/date.
 - c. All system activity/events shall be documented on the system printer and system history file.
 - d. Any remote or local annunciator LCD/LED's associated with the supervisory activation shall be illuminated.
 - e. Transmit a supervisory signal to the central station.

D. Trouble Operation

1. Upon activation of a trouble condition or signal from any device on the system, the following functions shall automatically occur:
 - a. The internal audible device shall sound at the control panel and remote annunciator.
 - b. The LCD display shall indicate all applicable information associated with the trouble condition including; device type, device location and time/date.
 - c. All system activity/events shall be documented on the system printer and system history file.
 - d. Any remote or local annunciator LCD/LED's associated with the trouble zone shall be illuminated.
 - e. Transmit a trouble signal to the central station.

1.6 SYSTEM CONFIGURATION

A. General

1. All Life Safety System equipment shall be arranged and programmed to provide a system for the early detection of fire, the notification of building occupants, the automatic summoning of the local fire department, the override of the HVAC system operation, and the activation of other auxiliary systems to inhibit the spread of smoke and fire, and to facilitate the safe evacuation of building occupants.
 2. The System shall utilize independently addressed, smoke detectors, heat detectors and input/output modules as described elsewhere in this specification.
- B. Power Supply
1. The power supply shall be a high efficiency switch mode type with line monitoring to automatically switch to batteries for power failure or brown out conditions. The automatic battery charger shall have low battery discharge protection. The power supply shall provide internal power and 24 Vdc at 4.5A continuous for notification appliance circuits. All outputs shall be power limited. The battery shall be sized to support the system for 60 hours of supervisory and trouble signal current plus general alarm for 5 minutes.
 2. Auxiliary power supplies shall be a high efficiency switch mode type with line monitoring to automatically switch to batteries for power failure or brown out conditions. The automatic battery charger shall have low battery discharge protection. The power supply shall provide internal power and 24 Vdc at 6.4 continuous for notification appliance circuits. The power supply shall be capable of providing 8A to output circuits for a maximum period of 100 ms. All outputs shall be power limited. The battery shall be sized to support the system for 60 hours of supervisory and trouble signal current plus general alarm for 5 minutes. All supervision of the auxiliary supply shall be transmitted via addressable analog loop without additional equipment.
- C. Display
1. The display module shall be of membrane style construction with a 4 line by 20 character Liquid Crystal Display. The LCD shall use super-twist technology and backlighting for high contrast visual clarity. In the normal mode display the time, the total number of active events and the total number of disable points. In the alarm mode display the total number of events and the type of event on display. Reserve 40 characters of display space for user custom messages. The module shall have visual indicators for the following common control functions; AC Power, alarm, supervisory, monitor, trouble, disable, ground fault, CPU fail, and test. There shall be common control keys and visual indicators for; reset, alarm silence, trouble silence, drill, and one custom programmable key/indicator. Provide four pairs of display control keys for selection of event display by type (alarm, supervisory, monitor and trouble) and forward / backward scrolling through event listings. The operation of these keys shall be integrated with the related common control indicator that lights when an event of its type is active. Allow the first event of the highest priority to capture the LCD for display so that arriving fire fighters can view the first alarm event "hands free". Provide system function keys; status, reports, enable, disable, activate, restore, program, and test. The module shall have a numeric keypad, zero through nine with delete and enter keys.
- D. Initiating Device Circuits
1. The Initiating device circuits (IDC) used to monitor manual fire alarm stations, smoke and heat detectors, waterflow switches, valve supervisory switches, fire pump functions, and air pressure supervisory switches shall be Class B.
- E. 24 VDC Notification Appliance Circuits
1. 24 VDC Notification appliance circuits (NAC) shall be Class B. All notification appliance circuits shall have a minimum circuit output rating of 2 amp @ 24 vdc. The notification circuits shall be power limited. Non-power limited circuits are not acceptable.
- F. Audio Notification Appliance Circuits
1. One-way audio notification appliance circuits (NAC) shall be Class B. All notification appliance circuits shall have a minimum circuit output rating of 35W @70Vrms. The notification circuits shall be power limited. Non-power limited circuits are not acceptable.
- G. Signaling Line Circuits (SLC-Data Circuits)

1. The signaling line circuit shall communicate from a panel/node to analog/addressable detectors, input modules, output modules, isolation modules and notification appliance circuits.
2. Each signaling circuit connected to addressable/analog devices shall provide a minimum of 20 spare addresses.
3. When a signaling line circuit covers more than one fire/smoke compartments, a wire-to-wire short shall not affect the operation of the circuit from the other fire/smoke compartments.
4. The signaling line circuit (SLC) connecting all components Class B (style 4).

H. DACT

1. The panel shall contain a dialer (alarm communicator transmitter (DACT)) module to transmit alarm, supervisory and trouble signals to a Central Monitoring Station (CMS). The DACT shall support dual telephones lines, 20 PPS 4/2 communications, and configured for dual tone multi-frequency (DTMF) or pulse modes. It shall be possible to delay AC power failure reports, auto test call, and site program using a touch tone phone and password

1.7 SUBMITTALS

A. Section 013300 - Submittal Procedures: Procedures for submittals.

1. Product Data:
 - a. Provide electrical characteristics and connection requirements.
 - b. Power and battery calculation.
2. Shop Drawings: Provide (graphic) annunciator layout and system wiring diagram showing each device and wiring connection required. Prior to commencement of installation, submit licensed Professional Engineer's system drawings (signed and sealed by Delegated Engineer) specified in "Quality Assurance" Article to Designated Reviewers. Include system calculations and equipment data. Submittals shall be complete and in bound sets. System drawings, prepared according to Contract Documents. Submittals shall be made to designated reviewers. Designated Reviewers are:
 - a. Additional Submittal: Submit shop drawings, product data, and calculations to Public Authorities for approval. Submit proof of approval to Contracting Officer.
 - b. Submittals to Contracting Officer:
 - c. Submittals to Engineer of Record:
3. Assurance/Control Submittals:
 - a. Design Data: System operation description indicating method of operation and supervision of each component and each type of circuit, and sequence of operations for all manually and automatically initiated system inputs for this specific Project. Manufacturer's standard descriptions for generic systems not permitted.
 - b. Test Reports: Submit the following reports directly to Contracting Officer from Manufacturer's Quality Control Inspector, with copy to Contractor. Prepare reports in conformance with Section 014000 - Quality Requirements:
 - 1) Pre-test.
 - 2) Acceptance test.
 - c. Certificates: Manufacturer's certificate certifying that components and Products meet or exceed specified requirements.
 - d. Qualification Documentation:
 - 1) Submit documentation of manufacturer and installer experience indicating compliance with specified qualification requirements. Include lists of completed projects with project names and addresses, and names of Engineers and Owners.
 - 2) Fire alarm contractor license issued by State or local authority having jurisdiction.
 - e. Manufacturer's Field Reports: Submit the following reports directly to Contracting Officer from Manufacturer's Quality Control Inspector, with copy to Contractor. Prepare reports in conformance with Section 014000 - Quality Requirements.
 - 1) Preparatory inspection.
 - 2) Initial inspection.
 - 3) Follow-up inspection.
 - 4) Final inspection.

- f. All drawings shall be reviewed and signed off by an individual having a minimum of a NICET level IV certification in fire protection engineering technology, subfield of fire alarm systems.
 - g. A copy of the installing technician's NICET certification shall be provided.
 - h. System Calculations: Complete calculations shall be provided which show the electrical load on the following system components:
 - 1) Each system power supply, including stand alone booster supplies.
 - 2) Each standby power supply (batteries).
 - 3) Each notification appliance circuit.
 - 4) Each auxiliary control circuit that draws power from any system power supply.
- B. Section 017704 - Closeout Procedures and Training: Procedures for closeout submittals:
- 1. Operation and Maintenance Data: Project specific operating manuals covering the installed Life Safety System. A generic or typical owner's instruction and operation manual shall not be acceptable to fulfill this requirement. Include user's software data and recommendations for spare parts to be stocked at the site. Provide names, addresses, and telephone numbers of service organizations that stock repair parts for the system.
 - 2. Project Record Documents: As-Built drawings consisting of: a scaled plan of each building showing the placement of each individual item of the Life Safety System equipment as well as raceway size and routing, junction boxes, and conductor size, quantity, and color in each raceway. All drawings must reflect point to point wiring, device address and programmed characteristics. All drawings shall be provided in AutoCad format. A vellum plot of each sheet shall also be provided. Provide the application program listing for the system as installed at the time of acceptance (disk, hard copy printout, and all required passwords).
 - 3. Record of Completion: Figure 4.5.2.1 NFPA 72.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm experienced in manufacturing equipment of the types and capacities indicated that have record of successful in-service performance with minimum 10 years documented experience. Prime system manufacturer and manufacturers of major system components required to qualify separately.
 - 1. Service Center: The System Supplier shall maintain a service organization with adequate spare parts stock within 75 miles of the installation. Any defects that render the system inoperative shall be repaired within 24 hours of the owner notifying the contractor.
- B. Installer Qualifications: Experience with systems of the type and scope indicated and certified as authorized service representative of the prime system manufacturer with minimum 5 years documented experience.
 - 1. System shall be installed by a single contractor that assumes responsibility for system components and their compatibility.
 - 2. Only manufacturer's certified installers with NICET Level II or higher shall be utilized.
- C. Regulatory Requirements:
 - 1. Calculations, Product Data, Shop Drawings: Provide stamp of approval from Public Authorities.
 - 2. Comply with requirements of Public Authorities for submittals, approvals, materials, installation, inspections, and testing.
 - 3. Comply with requirements of Contracting Officer and Owner's insurance underwriter for submittals, approvals, materials, installation, inspections, and testing.
 - 4. Provide certificate of compliance from Public Authorities indicating approval of field acceptance tests.
 - 5. Conform to applicable code for submission of design and calculations, reviewed shop and erection drawings and as required for acquiring permits.
 - 6. Cooperate with regulatory agency or authority and provide data as requested.
- D. Pre-Installation Meetings:

1. Convene a pre-installation meeting one week prior to commencing Work of this Section.
2. Require attendance of parties directly affecting Work of this Section.
3. Review conditions of operations, procedures and coordination with related Work.
4. Agenda:
 - a. Tour, inspect, and discuss conditions of building and building structure.
 - b. Review system design and requirements.
 - c. Review required submittals, both completed and yet to be completed.
 - d. Review system Drawings and data.
 - e. Review and finalize construction schedule related to system and verify availability of materials, personnel, equipment, and facilities needed to make progress and avoid delays.
 - f. Review required inspections, testing, certifying, and material usage accounting procedures.

1.9 POSITIVE ALARM SEQUENCE

- A. Positive Alarm Sequence: If permitted by the public authority, the fire alarm system shall be equipped with positive alarm sequence feature (per NFPA 72, 9.6.3.4) that allows initial fire alarm signals to be received at the constantly attended control panel location and for which human action is subsequently required to delay the general alarm by 180 seconds after the start of the alarm processing. The transmission of the alarm signal to the central station shall activate upon the initial alarm signal.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. All equipment and components shall be the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approval agency for use as part of a protected premises protective signaling (fire alarm) system. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.
- B. Subject to compliance with project requirements, manufacturers offering Products which may be incorporated in the Work include the following:
 1. Honeywell/Notifier, 973- 455-2000.
 2. UTC Fire and Security/Edward Systems Technologies, Inc. (EST), (800) 655-4497
 3. Siemens, 800-262-7976.
 4. Simplex/Grinnell, 978-731-2500
- C. Section 016000 - Product Requirements: Product options and substitutions. Substitutions: Permitted subject to approval of Contracting Officer.
 1. Conflicts, deviations, or change requests shall be submitted in writing to Contracting Officer with supporting documentation. Include written justification, designs, manufacturer's specifications, cost benefits, and any special circumstances dictated by local conditions. Documentation package shall be submitted in sufficient time to minimize any adverse effects of the proposed changes to the project construction schedule. Contracting Officer reserves the right to reject substitute and other systems.

2.2 PANEL COMPONENTS AND FUNCTIONS

- A. General
 1. The control panel(s) shall be a multi-processor-based system designed specifically for fire and releasing system applications. The control panel shall be listed and approved for the application standard(s) as listed under the General section.

2. The control panel(s) shall include all required hardware, software and system programming to provide a complete and operational system. The control panel(s) shall assure that life safety takes precedence among all panel activities.
3. The control panel(s) shall include the following capacities:
 - a. Support up to 380 analog/addressable points per panel (1,900 total with 5 networked panels)
 - b. Support up to 5 fully supervised network remote annunciators.
 - c. Support a DACT (dialer) for off premise notification
 - d. Support up to 576 chronological events in history.
4. The control panel(s) shall include the following features:
 - a. Provide autoprogramming and electronic addressing and mapping of analog/addressable devices.
 - b. Provide an operator interface display that shall include functions required for annunciation, command and control system functions.
 - c. Provide a discreet system control switch provided for reset, alarm silence, local silence, drill switch, up/down switches, status switch, program switch, enable and disable switches, activate and restore switches, reports switch and test switch.
 - d. Provide system reports that provide sensitivity and history details.
 - e. Provide an authorized operator with the ability to operate or modify system functions like system time, date, passwords; and autoprogram, enable mapping, and restart the system and clear control panel event history file.
 - f. Provide an authorized operator to perform test functions within the installed system.
5. Supervision of system components, wiring, initiating devices and software shall be provided by the control panel(s). Failure or fault of system component or wiring shall be indicated by type and location on the LCD display. Software and processor operation shall be independently monitored for failure. Control Panel:
6. Basis of Design: EST, EST2 Series.

B. Annunciation

1. The system shall be designed and equipped to receive, monitor, and annunciate signals from devices and circuits installed throughout the building. Manufacturer's standard control switches shall be acceptable if they provide the required operation, including performance, supervision and position indication. If the manufacturers' standard switches do not comply with these requirements, fabrication of custom manual controls acceptable to the contracting officer is required.
2. Receipt of alarm, trouble, and supervisory signals shall activate integral audible devices at the control panel(s) and at each remote annunciator panel.
3. The control panel(s) and remote annunciator(s) shall contain the following system status indicators:
 - a. 80 character Backlit Liquid Crystal Display.
 - b. System Power Indicator - green LED.
 - c. System Common Alarm - red LED.
 - d. System Common Trouble - yellow LED.
 - e. System Common Supervisory - yellow LED.
 - f. System Common Monitor - yellow LED.
 - g. System Ground Fault - yellow LED.
 - h. System CPU Fault - yellow LED.
 - i. System Disabled - yellow LED.
 - j. System Test Point(s) - yellow LED.
 - k. System Reset Switch with Integral yellow LED.
 - l. System Alarm Silence Switch with Integral yellow LED.
 - m. System Local Silence Switch with Integral yellow LED.
 - n. System Drill Switch with Integral yellow LED
 - o. System Message Queue Scroll Switches.
 - p. Additional buttons as required to provide system control and operator functions.
4. Basis of Design: EST EST2 series.

- C. Power Supply
1. Each system power supply shall be a minimum of 6 amps @ 24 vdc.
 2. Upon failure of normal (AC) power, the affected portion(s) of the system shall automatically switch over to secondary power without losing any alarm, trouble or operator acknowledgment signals.
 3. Each system power supply shall be individually annunciated and shall identify the inoperable power supply in the event of a trouble condition.
 4. All standby batteries shall be continuously monitored by the system. Low battery and disconnection of battery power supply conditions shall immediately annunciate as a trouble signal, identifying the deficient batteries.
 5. All system power supplies shall be capable of recharging their associated batteries, from a fully discharged condition to a capacity sufficient to allow the system to perform consistent with the requirements of this section, in 48 hours maximum.
 6. All AC power connections shall be to the building's designated emergency electrical power circuit and shall meet the requirements of Section 4.4.1.4 of NFPA 72. The AC power circuit shall be installed in conduit raceway. The power circuit disconnect means shall be clearly labeled FIRE ALARM CIRCUIT CONTROL and shall have a red marking. The location of the circuit disconnect shall be labeled permanently inside the each control panel.
 7. Basis of Design: EST model 2-PPS/6A.
- D. Display
1. System Message Processing and Display Operations:
 - a. The system shall allow message routing to be configured to any or all annunciators.
 - b. All system printer port(s) shall be configurable to output any combination of alarm, supervisory, trouble, or monitor, event messages.
 - c. Each LCD display on each annunciator shall be configurable to display the status of any combination of alarm, supervisory, trouble, or monitor, event messages.
 - d. Clear distinction shall be provided between alarm, supervisory, trouble, and monitor status messages.
 2. The system shall provide the ability to retrieve data from the analog/addressable detectors to a PC while the system is on-line and operational in the protected premises. The uploaded data may then be analyzed in a diagnostic program supplied by the system manufacturer.
 3. A standby power supply shall automatically supply electrical energy to the system upon primary power supply failure
- E. Dialer - DACT
1. The system shall provide an off premise Digital Alarm Communications Transmitter (DACT) capable of transmitting system alarm, trouble and supervisory events to a central monitoring station (CMS). The DACT shall support dual telephone lines, 20 PPS 4/2 communications, and configured for dual tone multi-frequency (DTMF) or pulse modes. It shall be possible to delay AC power failure reports, auto test call, and site program the DACT using a touch tone phone and password.
 2. Basis of Design: EST model DL2
- F. One-Way Emergency Audio Communications
1. A supervised one-way dual-channel emergency communications system shall be provided in the main control panel located within the maintenance operation's office. The main one-way audio controller shall provide a push-to-talk microphone with coiled cord, and switches that allow the emergency user to page to the evacuation channel, page to the alert channel or quickly place evacuation or alert tones on the selected channels. Switches shall also be provided to permit paging on the evacuation or alert channel using the firefighters telephone system as the paging source.
 2. Each channel shall have the capability to output a different tone or prerecorded message independent of each other. Each supervised branch audio circuit shall provide a connect/disconnect switch and indicators for active circuit selection and circuit trouble.

3. Basis of Design: One-way emergency audio communications module EST model 2-MIC/2-AAC; pre-recorded digital message unit EST model SIGA-MDM.
- G. One-Way Emergency Audio Amplifiers
1. The One-Way amplifiers shall be high-efficiency switch-mode audio amplifiers. Each amplifier must support dual channel audio. The audio output shall be configurable as 25VRMS or 70VRMS in Class B wiring, rated at 50 watts. The amplifiers shall support speakers connected directly to the output of the amplifier or the amplifier output shall be capable of being run as an audio riser to switching modules where speaker zone selection is made.
 2. Each amplifier shall have a built in back up 1 kHz tone generator that automatically activates with loss of input signal. Each amplifier shall have provision for a back up amplifier. It shall be possible to default to back up tone or standby amplifier in the event of the loss of input signals. System remote amplifiers must communicate their status directly to the main control panel. External monitoring is not acceptable. Onboard status LEDs shall be provided for quick visual indication of amplifier status
 3. Basis of Design: EST model SIGA-AAxx.
- H. System Printer
1. The event and status printer shall be a 9-pin, impact, dot matrix printer with a minimum print speed of 232 characters per second. The printer shall be capable of serial communications protocol. The printer shall list the time, date, type and user defined message for each event printed.
 2. Basis of Design: EST model PT-1S.
- I. Pager Interface
1. The system shall provide a module capable of transmitting alphanumeric system activity, by event, to a commercial paging system using TAP pager protocol. The system module shall be equipped with a high speed (V.32BIS or greater 14.4Kbaud) modem.
 2. Basis of Design: EST model API-8/232ME
- J. Reports
1. The system shall provide the operator with system reports that give detailed chronological description of the last 576 system events. The system shall provide a report that gives a listing of the sensitivity and environmental compensation usage of all of the detectors on the system, or specified analog/addressable circuit.
 2. The system report shall also include facility name, compiled date, compiler revision, project revision and report date. The system shall output these reports via the main LCD, and reports shall be capable of being printed on the system printer..

2.3 FIELD-MOUNTED SYSTEM COMPONENTS

- A. Smoke Detectors and Accessories
1. Analog Addressable Smoke General
 - a. Each analog addressable smoke detector's sensitivity shall be capable of being programmed individually as: most sensitive, more sensitive, normal, less sensitive or least sensitive.
 - b. An alternate alarm sensitivity level shall be provided for each detector, which can be set to any of the five (5) sensitivity settings manually or automatically using a time of day event.
 - c. The detector's sensing element reference point shall automatically adjust, compensating for background environmental conditions such as dust, temperature, and pressure. Periodically, the sensing element real-time analog value shall be compared against its reference value. The detector shall provide a maintenance alert signal that 80% to 99% compensation has been used. The detector shall provide a dirty fault signal that 100% compensation has been used.
 - d. The system shall allow for changing of detector types for service replacement purposes without the need to reprogram the system. The replacement detector type shall automatically continue to operate with the same programmed sensitivity levels and

functions as the detector it replaced. System shall display an off-normal condition until the proper detector type has been installed or change in the application program profile has been made.

2. Smoke Detector - Multi-Sensor Photo Thermal (Ceiling Mounted)
 - a. Provide analog/addressable multisensor combination photoelectric, thermal smoke detectors for all ceiling mounted locations. Alarm condition shall be based upon the combined input from the photoelectric and thermal detection elements. Separately mounted photoelectric detectors and heat detectors in the same location, clustered at the manufacturer's listed spacing is not an acceptable alternative. The system shall have the ability to set the sensitivity and alarm verification of each individual detector on the circuit. It shall be possible to automatically set the sensitivity of individual analog/addressable detectors for the day and night periods.
 - b. Each smoke detector shall be capable of transmitting alarm signals as well as normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity settings. Each detector microprocessor shall contain an environmental compensation algorithm that identifies and sets ambient environmental thresholds approximately six times an hour. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 80% and 100% of the allowable environmental compensation value.
 - c. Basis of Design: EST model SIGA-PHS.
 3. Smoke Detector - Photoelectric (Duct Mounted)
 - a. Provide analog/addressable photoelectric smoke detectors at all duct applications. The system shall have the ability to set the sensitivity and alarm verification of each of the individual detectors on the circuit. It shall be possible to automatically change the sensitivity of individual analog/addressable detectors for the day and night periods. Each smoke detector shall be capable of transmitting alarm signals as well as normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity settings. Each detector microprocessor shall contain an environmental compensation algorithm that identifies and sets ambient environmental thresholds approximately six times an hour. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 80% and 100% of the allowable environmental compensation value.
 - b. Provide key operated "normal-reset-test" switch at each duct smoke detector.
 - c. Basis of Design: EST model SIGA-PS.
 4. Duct Detector Mounting Plate
 - a. Where smoke detectors are directly inserted into a low velocity ducts 3 ft (0.91m) high x 3 ft (0.91m) wide, ceiling plenums, or raised floors, provide factory supplied mounting plate assemblies to facilitate mounting the detectors. The mounting plate shall be code gauge steel with corrosion resistant red enamel finish. The detector mounting plate shall support an analog/addressable detector along with a standard, relay or isolator detector-mounting base.
 - b. Basis of Design: EST model SIGA-DMP.
 5. Duct Detector Housing
 - a. Provide smoke detector duct housing assemblies to mount an analog/addressable detector along with a standard, relay or isolator detector mounting base. The housing shall also protect the measuring chamber from damage and insects. The housing shall utilize an air exhaust tube and an air sampling inlet tube that extends into the duct air stream up to ten feet. Drilling templates and gaskets to facilitate locating and mounting the housing shall also be provided. The housing shall be finished in baked red enamel. Remote alarm LED indicators and remote test stations shall be provided.
 - b. Basis of Design: EST model SIGA-DH.
- B. Heat Detectors
1. Fixed Temperature Heat Detector (Equipment Rooms)

- a. Provide analog/addressable fixed temperature heat detectors within all equipment rooms. The heat detector shall have a nominal fixed temperature alarm point rating of 135°F (57°C). The heat detector shall be rated for ceiling installation at a minimum of 70 ft (21.3m) centers and be suitable for wall mount applications.
 - b. Basis of Design: EST model SIGA-HFS.
 - 2. Fixed Temperature-ROR Heat Detector (Ceiling Mounted)
 - a. Provide analog/addressable combination fixed temperature / rate-of-rise detectors for all ceiling mounted locations. The heat detector shall have a nominal fixed temperature alarm point rating of 135°F (57°C) and a rate of rise alarm point of 15°F(9°C) per minute. The heat detector shall be rated for ceiling installation at a minimum of 70 ft (21.3m) centers and be suitable for wall mount applications.
 - b. Basis of Design: EST model SIGA-HRS..
- C. Detector Bases
 - 1. Detector Base - Standard
 - a. Provide detector mounting base suitable for mounting on single gang, 3½ or 4 inch octagon box or 4 inch square box. The base shall, contain no electronics and support all series detector types.
 - b. Basis of Design: EST model SIGA-SB.
 - 2. Detector Base - Relay
 - a. Provide relay detector mounting base suitable for mounting on single gang, 3½ or 4 inch octagon box and 4 inch square box. The relay base shall support all detector types and have the following minimal requirements.
 - b. The relay shall be a bi-stable type and selectable for normally open or normally closed operation.
 - 1) The position of the contact shall be supervised.
 - 2) The relay shall automatically de-energize when a detector is removed.
 - 3) The operation of the relay base shall be controlled by its respective detector processor. Detectors operating standalone mode shall operate the relay upon changing to alarm state. Relay bases not controlled by the detector microprocessor shall not be acceptable.
 - 4) Form "C" Relay contacts shall have a minimum rating of 1 amp @ 30 Vdc and be listed for pilot duty.
 - 5) Removal of the respective detector shall not affect communications with other detectors.
 - c. Basis of Design: EST model SIGA-RB
- D. Manual Stations
 - 1. Manual Station - Double Action Single Stage
 - a. Provide analog/addressable double action, single stage fire alarm stations at the locations shown on the drawings. The fire alarm station shall be of polycarbonate construction and incorporate an internal toggle switch. A locked test feature shall be provided. The station shall be finished in red with silver "PULL IN CASE OF FIRE" lettering. The manual station shall be suitable for mounting on 2 ½ (64mm) deep single gang boxes and 1 ½ (38mm) deep 4 square boxes with single gang covers.
 - b. Provide factory manufactured boxes for all surface mounted applications.
 - c. Basis of Design: EST model SIGA-278
- E. Notification Appliances
 - 1. General
 - a. All appliances which are supplied for the requirements of this specification shall be UL Listed for Fire Protective Service, and shall be capable of providing the "equivalent facilitation" which is allowed under the Americans with Disabilities Act Accessibilities Guidelines (ADA(AG)), and shall be UL 1971 Listed.
 - b. All appliances shall be of the same manufacturer as the fire alarm control panel specified to insure absolute compatibility between the appliances and the control panels, and to insure

- that the application of the appliances are done in accordance with the single manufacturer's instructions.
- c. All notification appliances shall be red unless noted otherwise on the drawings.
 2. Heavy Duty Horns (Exterior Locations)
 - a. Provide heavy duty electronic horns for exterior locations. Horns shall be selectable for high or low dBA output and steady or temporal output. At the high output setting, the horn shall provide an 85 dBA continuous sound output or an 82 dBA temporal sound output, when measured in reverberation room per UL-464. In and out screw terminals shall be provided for wiring. Weatherproof wall boxes shall be provided for outdoor applications.
 - b. Basis of Design: EST Integrity series.
 3. Low Profile Speaker (Interior Locations)
 - a. Provide low profile wall mount speakers within interior locations. The low profile speaker shall not extend more than 1" (2.5cm) past the finished wall surface, and provide a switch selectable audible output of 2W (90dBA), 1W (87dBA), 1/2W (84dBA), or 1/4W (81dBA) at 10 ft. when measured in reverberation room per UL-464.
 - b. Wattage setting shall be visible with the cover installed. When the cover is installed, no mounting hardware shall be visible. In and out screw terminals shall be provided for all wiring. The low profile speaker shall mount in a 4" x 2 1/8" square electrical box, without trims or extension rings.
 - c. Provide factory manufactured boxes for all surface mounted applications.
 - d. Basis of Design: EST Genesis G4 series.
 4. Speaker-Ceiling Mount-8in
 - a. Provide 8" ceiling mounted speakers at the locations shown on the drawings. In and out screw terminals shall be provided for wiring. Speaker baffles shall be round <square> steel with white finish as required. Provide square surface mount boxes with matching finish where required. Speakers shall provide 1/2W, 1W, 2W, and 4W power taps for use with 25V or 70V systems. At the 4 watt setting, the speaker shall provide a 94 dBA sound output a frequency of 1000 Hz. when measured in an anechoic chamber at 10 ft.
 - b. Basis of Design: EST Integrity series.
 5. Low Profile Speaker-Strobe
 - a. Provide low profile wall mount speaker/strobes at the locations shown on the drawings. The low profile speaker/strobe shall not extend more than 1" (2.5cm) past the finished wall surface, and provide a switch selectable audible output of 2W (90dBA), 1W (87dBA), 1/2W (84dBA), or 1/4W (81dBA) at 10 ft. when measured in reverberation room per UL-464.
 - b. Strobes shall provide synchronized flash output that shall be switch selectable for output values of 15cd, 30cd, 75cd & 110cd. Wattage and candela settings shall be visible with the cover installed. When the cover is installed, no mounting hardware shall be visible. In and out screw terminals shall be provided for all wiring. The low profile speaker/strobes shall mount in a 4" x 2 1/8" square electrical box, without trims or extension rings.
 - c. Provide factory manufactured boxes for all surface mounted applications.
 - d. Basis of Design: EST Genesis G4 series.
 6. Speaker-Strobe Ceiling Mount-8in
 - a. Provide 8" ceiling mounted speaker/strobes at the locations shown on the drawings. In and out screw terminals shall be provided for wiring. Speaker baffles shall be round or square, steel with white finish as required. Provide square surface mount boxes with matching white finish as required. Speakers shall provide 1/2w, 1w, 2w, and 4W power taps for use with 25V or 70V systems. At the 4 watt setting, the speaker shall provide a 94 dBA sound output a frequency of 1000 Hz. when measured in an anechoic chamber at 10 ft. Strobes shall provide synchronized flash outputs. Strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 75cd, and 110cd devices.
 - b. Basis of Design: EST Integrity series.
 7. Low Profile Strobes
 - a. Provide low profile wall mounted strobes at the locations shown on the drawings. In and out screw terminals shall be provided for wiring. Strobes shall provide synchronized flash outputs. Strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 60cd, 75cd, or 110cd devices. Low profile strobes shall mount in a single gang box.

- b. Provide factory manufactured boxes for all surface mounted applications.
- c. Basis of Design: EST Genesis series.

2.4 INITIATION AND CONTROL MODULES

A. General

1. It shall be possible to address each intelligent module without the use of DIP or rotary switches. Devices using DIP switches for addressing shall not be acceptable. The personality of multifunction modules shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller. Modules requiring EPROM, PROM, ROM changes or DIP switch and/or jumper changes shall not be acceptable. The modules shall have a minimum of 2 diagnostic LEDs mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes which can be retrieved for troubleshooting assistance. Input and output circuit wiring shall be supervised for open and ground faults. The module shall be suitable for operation in the following environment:
 - a. Temperature: 32°F to 120°F (0°C to 49°C)
 - b. Humidity: 0-93% RH, non-condensing

B. Control Relay Module

1. Provide intelligent control relay modules at the locations shown on the drawings. The Control Relay Module shall provide one form "C" dry relay contact rated at 2 amps @ 24 Vdc to control external appliances or equipment shutdown. The control relay shall be rated for pilot duty and releasing systems. The position of the relay contact shall be confirmed by the system firmware. The control relay module shall be suitable for mounting on 2 ½" (64mm) deep single gang boxes or 1 ½" (38mm) deep 4" square boxes with single gang covers.
2. Basis of Design: EST model SIGA-CR.

C. Dual Input Module

1. Provide intelligent dual input modules at the locations shown on the drawings.. The Dual Input Module shall provide two (2) supervised Class B input circuits each capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on 2 ½" (64mm) deep single gang boxes or 1 ½" (38mm) deep 4" square boxes with single gang covers. The dual input module shall support the following circuit types:
 - a. Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.)
 - b. Normally-Open Alarm Delayed Latching (Waterflow Switches)
 - c. Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.)
 - d. Normally-Open Active Latching (Supervisory, Tamper Switches)
2. Basis of Design: EST model SIGA-CT2.

D. Dual Input Signal Module

1. Provide intelligent dual input signal modules at the locations shown on the drawings. The Dual Input (Dual Riser Select) Signal Module shall provide a means to selectively connect one of two (2) signaling circuit power risers to one (1) supervised output circuit. The module shall be suitable for mounting on 2 ½" (64mm) deep 2-gang boxes or 1 ½" (38mm) deep 4" square boxes with 2-gang covers. The dual input signal module shall support the following operation:
2. Audible/Visible Signal Power Selector (Polarized 24 Vdc @ 2A, 25 Vrms @ 50w or 70 Vrms @ 35w of Audio).
3. Basis of Design: EST model SIGA-CC2.

E. Isolator Module

1. Provide intelligent fault isolators modules at the locations shown on the drawings. The Isolator Module shall be capable of isolating and removing a fault from a class A data circuit while allowing the remaining data loop to continue operating. The module shall be suitable for mounting on 2 ½" (64mm) deep 2-gang boxes or 1 ½" (38mm) deep 4" square boxes with 2-gang covers.
2. Basis of Design: EST model SIGA-IM.

- F. Monitor Module
1. Provide intelligent monitor modules at the locations shown on the drawings. The Monitor Module shall be factory set to support one (1) supervised Class B Normally-Open Active Non-Latching Monitor circuit. The monitor module shall be suitable for mounting on 2 ½" (64mm) deep 1-gang boxes or 1 ½" (38mm) deep 4" square boxes with 1-gang covers.
 2. Basis of Design: EST model SIGA-MM1.
- G. Single Input Module
1. Provide intelligent single input modules at the locations shown on the drawings. The Single Input Module shall provide one (1) supervised Class B input circuit capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on 2 ½" (64mm) deep 1-gang boxes or 1 ½" (38mm) deep 4" square boxes with 1-gang covers. The single input module shall support the following circuit types:
 - a. Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.)
 - b. Normally-Open Alarm Delayed Latching (Waterflow Switches)
 - c. Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.)
 - d. Normally-Open Active Latching (Supervisory, Tamper Switches)
 2. Basis of Design: EST model SIGA-CT1.
- H. Single Input Signal Module
1. Provide intelligent single input signal modules at the locations shown on the drawings. The Single Input (Single Riser Select) Signal Module shall provide one (1) supervised Class B output circuit capable of a minimum of 2 personalities, each with a distinct operation. When selected as a telephone power selector, the module shall be capable of generating its own "ring tone". The module shall be suitable for mounting on 2 ½" (64mm) deep 2-gang boxes or 1 ½" (38mm) deep 4" square boxes with 2-gang covers. The single input signal module shall support the following operations:
 - a. Audible/Visible Signal Power Selector (Polarized 24 Vdc @ 2A, 25Vrms @50w or 70 Vrms @ 35 Watts of Audio)
 2. Basis of Design: EST model SIGA-CC1.
- I. Suppression System Releasing Module
1. Provide addressable suppression system releasing interface modules at the locations shown on the drawings. The interface shall be suitable for preaction and deluge sprinkler systems and clean extinguishing agent release. The interface shall provide supervised Class B circuits required for solenoid activation, manual release, system abort, and audible and visible notification of pending release. The interface shall provide all required release and abort timing functions. The interface shall be listed for use with solenoid releasing valves that has both ULI listing and FM approval. The solenoid release circuit shall be provided with a manual disconnect switch for system maintenance.
 2. Basis of Design: EST model SIGA-REL.
- J. Universal Class AB Module
1. Provide intelligent class A/B modules at the locations shown on the drawings. The Universal Class A/B Module shall be capable of a minimum of fifteen (15) distinct operations. The module shall be suitable for mounting on 2 ½" (64mm) deep 2-gang boxes or 1 ½" (38mm) deep 4" square boxes with 2-gang covers. The universal class A/B module shall support the following circuit types:
 - a. Two (2) supervised Class B Normally-Open Alarm Latching.
 - b. Two (2) supervised Class B Normally-Open Alarm Delayed Latching.
 - c. Two (2) supervised Class B Normally-Open Active Non-Latching.
 - d. Two (2) supervised Class B Normally-Open Active Latching.
 - e. One (1) form "C" dry relay contact rated at 2 amps @ 24 Vdc.
 - f. One (1) supervised Class A Normally-Open Alarm Latching.
 - g. One (1) supervised Class A Normally-Open Alarm Delayed Latching.
 - h. One (1) supervised Class A Normally-Open Active Non-Latching.
 - i. One (1) supervised Class A Normally-Open Active Latching.
 - j. One (1) supervised Class A 2-wire Smoke Alarm Non-Verified.
 - k. One (1) supervised Class B 2-wire Smoke Alarm Non-Verified.

- l. One (1) supervised Class A 2-wire Smoke Alarm Verified
 - m. One (1) supervised Class B 2-wire Smoke Alarm Verified
 - n. One (1) supervised Class A Signal Circuit, 24Vdc @ 2A.
 - o. One (1) supervised Class B Signal Circuit, 24Vdc @ 2A.
2. Basis of Design: EST model SIGA-UM.
- K. Waterflow-Tamper Module
- 1. Provide intelligent waterflow/tamper modules at the locations shown on the drawings. The Waterflow/Tamper Module shall be factory set to support two (2) supervised Class B input circuits. Channel A shall support a Normally-Open Alarm Delayed Latching Waterflow Switch circuit. Channel B shall support a Normally-Open Active Latching Tamper Switch. The waterflow/tamper module shall be suitable for mounting on 2 ½" (64mm) deep 1-gang boxes or 1 ½" (38mm) deep 4" square boxes with 1-gang covers.
 - 2. Basis of Design: EST Model SIGA-WTM.

2.5 CONDUCTORS

- A. The requirement of this section apply to all system conductors, including all signaling line, initiating device, notification appliance, auxiliary function, remote signaling, AC and DC power and grounding/shield drain circuits, and any other wiring installed by the Contractor pursuant to the requirements of these Specifications.
- B. All circuits shall be rated power limited in accordance with NEC Article 760.
- C. Installed in conduit or enclosed raceway.
- D. All new system conductors shall be of the type(s) specified herein.
 - 1. All initiating circuit, signaling line circuit, AC power conductors, shield drain conductors and grounding conductors, shall be solid copper, stranded or bunch tinned (bonded) stranded copper.
 - 2. All signaling line circuits, including all addressable initiating device circuits shall be 18 AWG minimum multi-conductor jacketed twisted cable or twisted shielded or as per manufacturer's requirements.
 - 3. All non-addressable initiating device circuits, 24 VDC auxiliary function circuits shall be 18 AWG minimum or per manufacturer's requirements.
 - 4. All notification appliance circuit conductors shall be solid copper or bunch tinned (bonded) stranded copper. Where stranded conductors are utilized, a maximum of 19 strands shall be permitted for #12/AWG and larger conductors. Minimum size conductor shall be #12 AWG.
 - 5. All audible notification appliance circuits shall be 14 AWG minimum twisted pairs or twisted pairs shielded or per manufacturer's requirements.
 - 6. All visual notification appliance circuits shall be #12 AWG minimum THHN or twisted pairs or twisted shielded pairs or per manufacturer's requirements.
 - 7. Color code fire alarm conductors as follows:

<u>ITEM</u>	<u>COLOR</u>
Initiating Device	Orange/Brown
Horn (Exterior)	Blue and Yellow
Flashing Lights	Blue and Yellow
Control Panel Power	Black, White and Green
Air Handler Shutdown	Purple
Door Holders	White

- 8. All conductors shall be terminated with crimp type, open end, space lugs using tool approved by lug manufacturer. Terminal cabinets shall be provided with screw type terminal strips and plywood backboards.

2.6 CONDUCTORS AND RACEWAY

- A. Except as otherwise required by Code and/or these Specifications, the installation of all system circuits shall conform to the requirements of Article 760 and raceway installation to the applicable sections of NFPA 70, National Electrical Code. Fire alarm circuit wiring shall include all circuits described in Section 760.1 including Fine Print Note No. 1 (FPN No. 1), and as defined by the manufacturer's UL listing..
- B. The entire system shall be installed in a skillful manner in accordance with approved manufacturer's installation manuals, shop drawings and wiring diagrams. The contractor shall furnish all conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation. All wiring shall be of the type required by the NEC and approved by local authorities having jurisdiction for the purpose.
- C. Any shorts, opens, or grounds found on new or existing wiring shall be corrected prior to the connection of these wires to any panel component or field device.
- D. The contractor shall neatly tie-wrap all field-wiring conductors in the gutter spaces of the control panels and secure the wiring away from all circuit boards and control equipment components. All field-wiring circuits shall be neatly and legibly labeled in the control panel. No wiring except home runs from life safety system circuits and system power supply circuits shall be permitted in the control panel enclosures. No wiring splices shall be permitted in a control panel enclosure.
- E. All penetration of floor slabs and firewalls shall be fire stopped in accordance with all local fire codes.

2.7 OPEN CABLE

- A. Power-limited cable in accordance with NEC Article 760, where used, not installed in UL listed metal conduit or raceway shall be mechanically protected by building construction features:
- B. Installation shall be in areas not subjected to mechanical injury.
- C. All circuits shall be supported by the building structure. Cable shall be attached by straps to the building structure at intervals not greater than 10 feet. Wiring installed above drop ceilings, cable shall not be laid on ceiling tiles. Cable shall not be fastened in a manner that puts tension on the cable.
- D. Cable type shall be FPLP, FPLR or FPL, or permitted substitutions, selected for the installation application as required by NEC 70, Section 760-61.
- E. All cable that is not enclosed by conduit shall be supported and anchored with nylon straps or clamps. The use of staples is prohibited.

2.8 CONDUIT RACEWAY

- A. All systems and system components listed to UL864 Control Units for Fire Protective Signaling Systems maybe installed within a common conduit raceway system, in accordance with the manufacture's recommendations. System(s) or system components not listed to the UL864 standard shall utilize a separate conduit raceway system for each of the sub-systems.
- B. The requirements of this section apply to all system conduits, raceways, electrical enclosures, junction boxes, pull boxes and device back boxes.
- C. All system conduits shall be of the sizes and types specified.
- D. All system conduits shall be EMT, 3/4 -inch minimum, except for flexible metallic conduit used for whips to devices only, maximum length 6 feet, 3/4-inch diameter, minimum.

- E. All system conduits, which are installed in areas, which may be subject to physical damage or weather, shall be IMC or rigid steel, 3/4 -inch minimum.
- F. Conduits shall be sized according to the conductors contained therein. Cross sectional area percentage fill for system conduits shall not exceed 40%.
- G. All fire alarm conduit systems shall be routed and installed to minimize the potential for physical, mechanical or by fire damage, and so as not to interfere with existing building systems, facilities or equipment, and to facilitate service and minimize maintenance.
- H. All conduits, except flexible conduit whips to devices, shall be solidly attached to building structural members, ceiling slabs or permanent walls. Conduits shall not be attached to existing conduit, duct work, cable trays, other ceiling equipment, drop ceiling hangers/grids or partition walls, except where necessary to connect to initiating, notification, or auxiliary function devices.
- I. All system conduits, junction boxes, pull boxes, terminal cabinets, electrical enclosures and device back boxes shall be readily accessible for inspection, testing, service and maintenance.
- J. All system conduits installed in finished areas shall be painted to match existing ceilings, walls, etc.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 017300 - Execution: Verification of existing conditions before starting work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
 - 1. Examine areas in which Work of this Section is to be performed.
 - 2. Verify that surfaces and site conditions are ready to receive Work.
- C. Report in writing to Contracting Officer prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
- D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the United States Postal Service.

3.2 INSTALLATION

- A. General
 - 1. All equipment shall be attached to walls and ceiling/floor assemblies and shall be mounted firmly in place. Detectors shall not be supported solely by suspended ceilings. Fasteners and supports shall be sized to support the required load.
- B. Installation Sequence
 - 1. Installation of the systems shall be conducted in stages and phased such that circuits and equipment are installed in the following order:
 - a. Riser conduits, AC power conduits and control cabinets.
 - b. Control panel(s), control component(s), remote annunciator(s), and printer(s).
 - c. Conduits and wiring for complete notification circuits and appliance installation throughout facility.
 - d. Pre-test the audible and visual notification appliance circuits.
 - e. Install all new detection devices.
 - f. Terminate between field devices and the associated control equipment.

- g. Complete the interface to all suppression and ancillary shutdown systems.
 - h. Complete contractor pre-test of system.
 - i. Complete system testing
- C. Install products in accordance with NFPA standards and manufacturer's published instructions.
 - D. Install manual station with operating handle 48 inches (1.22 m) above floor. Install audible and visual signal devices in accordance with NFPA 72 and ANSI/UL 1971.
 - E. End-of-line resistor device at the last easily accessible mount device or separate box adjacent to last device.
 - F. Flush mount outlet box for electric door holder to withstand 80 pounds pulling force.
 - G. Make wiring connections to door release devices, sprinkler flow switches, sprinkler valve tamper switches, fire suppression system control panels, and all other devices.

3.3 PREPARATION

- A. Coordinate work of this Section with other affected work and construction schedule.

3.4 FIELD QUALITY CONTROL

- A. Section 014000 - Quality Requirements: Field testing and inspection.
- B. Test in accordance with NFPA 72 and local fire department requirements. Use "Record of Completion" Figure 4.5.2.1 (NFPA 72).
- C. Manufacturer's Field Services: Provide services of NICET certified Level III technician to supervise installation, adjustments, final connections, and system testing. Submit written certification on manufacturers letterhead to Contracting Officer that system has been installed in accordance with applicable codes and is functioning properly. Provide copy of "Certificate of Completion" and place inside plastic envelope at Fire Alarm Control Panel.
- D. Inspection:
 - 1. Inspect equipment installation, interconnection with system devices, mounting locations, and mounting methods.
 - 2. Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.
- E. Pretesting: Align and adjust system and perform pretesting of components, wiring, and functions to verify conformance with specified requirements. Correct deficiencies by replacing malfunctioning or damaged items with new items. Retest until satisfactory performance and conditions are achieved.
- F. Acceptance Operational Tests:
 - 1. Perform operational system tests to verify conformance with specifications:
 - a. Each alarm initiating device installed shall be operationally tested in the presence of a contracting officer's representative. Each device shall be tested for alarm and trouble conditions. Contractor shall submit a written certification that the Fire Alarm System installation is complete including all punch-list items. Test battery operated emergency power supply. Test emergency power supply to minimum durations specified. Test Remote Station Signal Transmitter. Coordinate testing with the Public Authority and Remote Station monitoring firm/entity. Submit written documentation from Remote Station monitoring firm/entity that Fire Alarm Signal Transmitter is operating properly.
 - b. Test each Signal Appliance installed for proper operation. Submit written report indicating sound levels at specified distances.

- c. Test Fire Alarm Control Panel(s) and Remote Annunciator(s).
 - 2. Provide minimum 10 days notice of acceptance test performance schedule to Contracting Officer, Remote Station monitoring firm/entity, and local fire authorities having jurisdiction.
 - 3. The Contractor shall provide certification that the system is installed entirely in accordance with the system manufacturer's recommendations and within the limitations of the required listings and approvals, that all system hardware and software has been visually inspected and functionally tested by a manufacturer's certified representative, and that the system is in proper working order.
- G. Retesting: Correct deficiencies and retest until total system meets the requirements of Specifications and complies with applicable standards.

3.5 WARRANTY AND MAINTENANCE

- A. Warranty: The contractor shall warranty all materials, installation and workmanship for 12 months from date of acceptance, unless otherwise specified. A copy of the manufacturer's warranty shall be provided with close-out documentation and included with the operation and installation manuals.
- B. Spare Parts
- 1. The Contractor shall supply the following spare parts:
 - a. Automatic detection devices -Five (5) percent of the installed quantity of each type.
 - b. Manual fire alarm stations - Five (5) percent of the installed quantity of each type.
 - c. Glass rods or panels for break glass manual fire alarm stations (if used) – Ten percent of the installed quantity, but no less than ten (10) devices.
 - d. Audible and visible devices - Five (5) percent of the installed quantity of each type.
 - e. Keys - A minimum of four (4) sets of keys shall be provided and appropriately identified.

3.6 TRAINING

- A. The System Supplier shall schedule and present a minimum of four (4) hours of documented formalized instruction for the building owner, detailing the proper operation of the installed System.
- B. The instruction shall be presented in an organized and professional manner by a person factory trained in the operation and maintenance of the equipment and who is also thoroughly familiar with the installation.
- C. The instruction shall cover the schedule of maintenance required by NFPA 72 and any additional maintenance recommended by the system manufacturer.
- D. Instruction shall be made available to the Local Municipal Fire Department if requested by the Public Authority

END OF SECTION

USPS Mail Processing Facility Specifications issued: 5/1/2014
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Edited by A/E Firm: 1/14/2015