

SECTION 16721 – FIRE ALARM SYSTEM

GENERAL

1.1 SECTION INCLUDES

- A. This performance 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. Smoke and fire detection.
 - 2. Sprinkler suppression system monitoring and control.
 - 3. Off-premise notification

- B. The following specific scope shall be provided:
 - 1. New Receiving Building
 - a. Provide a new addressable fire alarm control panel with voice annunciation.
 - b. Provide fire alarm devices and wiring as documented on the Contract Drawings.
 - 2. New Terminal Building
 - a. Provide a new addressable fire alarm control panel with voice annunciation.
 - b. Provide fire alarm devices and wiring as documented on the Contract Drawings.
 - 3. Existing VIS Building
 - a. Provide fire alarm devices and wiring as documented on the Contract Drawings. Connect new devices to the existing EST control panel. Modify the existing control panel as required to accommodate the new work.
 - b. Provide a new annunciator panel to annunciate the alarm status (by device address and name) for the following locations:
 - 1) Terminal Building
 - 2) Receiving Building
 - 3) VIS Building
 - c. Provide a connection to the existing municipal fire alarm box system to notify an alarm condition at any of the following locations:
 - 1) Terminal Building
 - 2) Receiving Building
 - 3) VIS Building

1.2 GENERAL REQUIREMENTS

- A. Strict conformance to this specification is required to ensure that the installed and programmed system will function as designed, and will accommodate the future requirements and operations of the building owner. All specified operational features must be met without exception.

- B. The authorized representative of the manufacturer of the major equipment shall be responsible for the satisfactory installation of the complete system.

- C. 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 approvals agency for use as part of a protected premises protective signaling system, access control, and smoke control. 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.

- D. All control panel assemblies and connected field appliances shall be provided by the same system supplier, and shall be designed and tested to ensure that the system operates as specified. The system shall utilize independently addressed, microprocessor-based smoke detectors, heat detectors, as described in this specification.
- E. All equipment and components shall be installed in strict compliance with the manufacturer's recommendations.

1.3 RELATED SECTIONS

- A. Section 16010 – General Electrical Requirements
- B. Section 16130 – Boxes

1.4 REFERENCES

- A. All work and materials shall conform to all applicable Federal, State and local codes and regulations governing the installation. If there is a conflict between the referenced standards, federal, state or local codes, and this specification, it is the bidder's responsibility to immediately bring the conflict to the attention of the Resident for resolution. National standards shall prevail unless local codes are more stringent. The bidder shall not attempt to resolve conflicts directly with the local authorities unless specifically authorized by the Engineer.
- B. System components proposed in this specification shall be UL listed to operate together as a system. The supplier shall provide evidence, with his submittal, of listings of all proposed equipment and combinations of equipment. The supplier shall be responsible for filing of all documents, paying all fees (including, but not limited to plan checking and permit) and securing all permits, inspections and approvals. Upon receipt of approved drawings from the authority having jurisdiction, the supplier shall immediately forward two sets of drawings to the Owner. These drawings shall either be stamped approved or a copy of the letter stating approval shall be included.
- C. The equipment and installation shall comply with the current provisions of the following codes and standards:
 - 1. NFPA 11 - 1998 Low Expansion Foam
 - 2. NFPA 12 - 2000 Carbon Dioxide Extinguishing Systems
 - 3. NFPA 12A - 1997 Halon 1301 Fire Extinguishing Systems
 - 4. NFPA 13 - 1999 Installation of Sprinkler Systems
 - 5. NFPA 15 - 1996 Water Spray Fixed Systems for Fire Protection
 - 6. NFPA 16 - 1999 Installation of Foam-Water Sprinkler and Foam-Water Spray Systems
 - 7. NFPA 17 - 1998 Dry Chemical Extinguishing Systems
 - 8. NFPA 2001 - 2000 Clean Agent Fire Extinguishing Systems
 - 9. NFPA 70 - 2002 National Electric Code®
 - 10. NFPA 72 - 1999 National Fire Alarm Code®
 - 11. NFPA 101- 2000 Life Safety Code®
 - 12. UL 864 - Control Units for Fire Protective Signaling Systems.
 - 13. UL 268 - Smoke Detectors for Fire Protective Signaling Systems.
 - 14. UL 268A - Smoke Detectors for Duct Applications.

15. UL 217 - Single and Multiple Station Smoke Alarms
16. UL 521 - Heat Detectors for Fire Protective Signaling Systems.
17. UL 228 - Door Closers-Holders, With or Without Integral Smoke Detectors.
18. UL 464 - Audible Signaling Appliances.
19. UL 38 - Manually Actuated Signaling Boxes for Use with Fire-Protective Signaling Systems
20. UL 346 - Waterflow Indicators for Fire Protective Signaling Systems.
21. UL 1971 - Signaling Devices for the Hearing-Impaired.
22. UL 1481 - Power Supplies for Fire Protective Signaling Systems.
23. UL 1635 - Digital Alarm Communicator System Units
24. Factory Mutual (FM) approval
25. Americans with Disabilities Act (ADA)
26. Maine State Elevator Code

1.5 SYSTEM DESCRIPTION

A. General:

1. The Contractor shall furnish all labor, services and materials necessary to furnish and install a complete, functional fire alarm system (System). The System shall comply in respects with all pertinent codes, rules, regulations and laws of the Authority, and local jurisdiction. The System shall comply in all respects with the requirements of the specifications, manufacturer's recommendations and Underwriters Laboratories Inc. (ULI) listings.
2. It is further intended that upon completion of this work, the Owner be provided with:
 - a. Complete information and drawings describing and depicting the entire system(s) as installed, including all information necessary for maintaining, troubleshooting, and/or expanding the system(s) at a future date.
 - b. Complete documentation of system(s) testing.
 - c. 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 Section 1-6.2 of NFPA 72 - 1999 edition.

B. Description: One & Two-way Audio:

1. Provide and install a new fire detection and alarm system that shall consist of:
 - a. Fire Alarm Control Panel with one-way and two-way emergency audio communications systems control located as shown on the drawings.
 - b. LCD remote annunciator(s) located as shown on the drawings.
 - c. Manual pull stations located as shown on the drawings.
 - d. Area smoke detectors located as shown on drawings.
 - e. Area heat detectors located as shown on drawings.
 - f. Duct smoke detectors located as shown on the drawings.
 - g. Sprinkler system waterflow(s) and valve supervisory switch(s) located as shown on the drawings.
 - h. Interface with suppression system as shown on the drawings.
 - i. Provide speakers/speaker strobes located as shown on the drawings.
 - j. Provide synchronized visual notification appliances located as shown on the drawings.
 - k. Provide magnetic door holders, located as shown on drawings.

- l. Provide elevator recall functions for primary and alternate floors and elevator power shunt trip activation.
 - m. Provide connection to The City of Portland municipal box system.
- C. Sequence of Operations:
- 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. The LCD display shall indicate all applicable information associated with the alarm condition including; device type, device location and time/date.
 - b. Any remote or local annunciator LCD/LED's associated with the alarm shall be illuminated.
 - c. Activate notification audible appliances throughout the building.
 - d. 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.
 - e. Transmit an alarm signal to the central station.
 - f. All automatic events programmed to the alarm point shall be executed and the associated outputs activated.
 - g. All self-closing fire/smoke doors held open shall be released.
 - 2. 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. The LCD display shall indicate all applicable information associated with the alarm condition including; device type, device location and time/date.
 - b. Any remote or local annunciator LED's associated with the alarm shall be illuminated.
 - c. Transmit signals to the remote annunciator located in the VIS Building.
 - d. Transmit an alarm signal to the central station.
 - e. Shutdown the local air-handling unit.
 - f. All automatic events programmed to the alarm point shall be executed and the associated outputs activated.
 - 3. 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. Any remote or local annunciator LCD/LED's associated with the supervisory activation shall be illuminated.
 - d. Transmit a supervisory signal to the central station.
 - 4. 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.
- D. Fire Suppression System Interface
- 1. Smoke detection within the Terminal Building shall be provided by grid of alternating photoelectric smoke detectors. Activation of any detector in the grid shall activate the "first detector" functions described below. Activation of a detector of a different type from the first detector activated shall start the "confirmation sequence" below.
 - 2. Provide an automatic extinguishing agent release interface modules at the locations shown on the drawings. The releasing interface shall be suitable for controlling the release of sprinkler pre-action or deluge systems furnished by others.
 - 3. Each interface shall provide supervised connections for: two agent release solenoid valves, two supervised pre-release notification circuits, a supervised manual release circuit, and a supervised abort switch circuit.
 - 4. Upon operation of the "first detector" associated with the protected area the system shall:
 - a. Activate fire alarm system
 - b. Display activated initiating device on annunciator.
 - c. Activate visual pre-discharge notification appliances in protected area
 - d. Pulse the audible discharge notification appliances in the protected area
 - e. Release door holders and fire/smoke dampers
 - f. Shut down HVAC system supplying protected area
 - 5. Upon confirmation of the alarm by a "second detector," the system shall:
 - a. Display second activated initiating device on annunciator
 - b. Start the automatic discharge delay timer (selectable from 0 to 60 seconds in 10 sec. increments)
 - c. Cause the audible discharge notification appliances in the protected area audible to sound continuously 10 seconds before agent release.
 - d. Activate the agent release solenoids at the expiration of the automatic discharge delay timer.
 - 6. Upon activation of the manual agent release station the system shall:
 - a. Activate fire alarm system
 - b. Display activated initiating device on annunciator.
 - c. Activate visual pre-discharge notification appliances in protected area
 - d. Pulse the audible discharge notification appliances in the protected area
 - e. Release door holders and fire/smoke dampers
 - f. Shut down HVAC system supplying protected area
 - g. Start the manual discharge delay timer (selectable from 0 to 30 seconds in 10 sec. increments)
 - h. Cause the audible discharge notification appliances in the protected area audible to sound continuously 10 seconds before agent release.
 - i. Activate the agent release solenoids at the expiration of the automatic discharge delay timer.
 - 7. System Abort: If the abort switch is initiated before the automatic discharge delay timer expires, the system will prevent agent release and the automatic discharge delay timer will stop. When the abort switch is restored, the automatic discharge delay timer will reset and restart at t = 0. Agent release will occur with the expiration of the timer setting less 10 seconds.

- E. System Configuration
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.
 3. 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. Auxiliary power shall be 24 Vdc at 1A. Smoke power shall be 24vdc at 500mA. 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. The power supply shall be an EST model 2-PPS.
 4. 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. The auxiliary power supply shall be an EST model SIGA-APS.
 5. 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. The display module shall be an EST model 2-LCD.
 6. 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 A (Style "D" or "E"). The Initiating device circuits shall be EST Signature series modules.

7. 24 VDC Notification appliance circuits (NAC) shall be Class A (Style "Z"). 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. The 24 VDC Notification appliance circuits shall be EST Signature series modules.
8. One-way audio notification appliance circuits (NAC) shall be Class A (Style "Z"). 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. The one-way audio notification appliance circuits shall be EST Signature series modules.
9. The signaling line circuit shall communicate from a panel/node to analog/addressable detectors, input modules, output modules, isolation modules and notification appliance circuits.
10. Each signaling circuit connected to addressable/analog devices shall provide a minimum of 20 spare addresses.
11. When a signaling line circuit covers more than one fire/smoke compartments, a wire-to-wire short shall not effect the operation of the circuit from the other fire/smoke compartments.
12. The signaling line circuit (SLC) connecting panels and annunciators shall be Class A (style 7).
13. The signaling line circuit connecting to addressable/analog devices including, detectors, monitor modules, control modules, isolation modules, and notification circuit modules shall be Class A (style 6 or 7).
14. The panel shall have 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. The dialer shall be an EST model DL2.

1.6 SUBMITTALS

- A. The contractor shall purchase no equipment for the system specified herein until the owner has approved the project submittals in their entirety and has returned them to the contractor. It is the responsibility of the contractor to meet the entire intent and functional performance detailed in these specifications. Approved submittals shall only allow the contractor to proceed with the installation and shall not be construed to mean that the contractor has satisfied the requirements of these specifications. The contractor shall submit complete sets of documentation within 30 calendar days after award of purchase order.
- B. Each submittal shall include a cover letter providing a list of each variation that the submittal may have from the requirements of the contract documents. In addition the contractor shall provide specific notation on each shop drawing, sample, catalog cut, data sheet, installation manual, etc. submitted for review and approval, of each such variation.
- C. All drawings and diagrams shall include the Contractor's title block, complete with drawing title, contractor's name, address, date including revisions, and preparer's and reviewers initials
- D. Product Data: Data sheets with the printed logo or trademark of the manufacturer for all

equipment. Indicated in the documentation will be the type, size, rating, style, and catalog number for all items proposed to meet the system performance detailed in this specification. The proposed equipment shall be subject to the approval of the Resident.

- E. Shop Drawings: A complete set of shop drawings shall be supplied. The shop drawings shall be reproduced electronically in digital format. This package shall include but not be limited to:
 - 1. Control panel wiring and interconnection schematics.
 - 2. Complete point-to-point wiring diagrams.
- F. Riser diagrams: Complete floor plan drawing locating all system devices and 1/4" = 1'-0" scale plan and elevation of all equipment in the Fire Command Station. Including showing the placement of each individual item of fire alarm equipment as well as raceway size and routing, junction boxes, and conductor size, quantity, and color in each raceway.
- G. Detailed system operational description. Any specification differences and deviations shall be clearly noted and marked.
- H. Complete system bill of material.
- I. All drawings shall be reviewed and signed off by an individual having a minimum of a NICET certification in fire protection engineering technology, subfield of fire alarm systems.
- J. System Calculations:
 - 1. Complete calculations shall be provided which show the electrical load on the following system components:
 - 2. Each system power supply, including stand-alone booster supplies.
 - 3. Each standby power supply (batteries).
 - 4. Each notification appliance circuit.
 - 5. Each auxiliary control circuit that draws power from any system power supply.
- K. Closeout Submittal
 - 1. Two (2) copies of the following documents shall be delivered to the building owner's representative at the time of system acceptance. The close out submittals shall include:
 - a. 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.
 - b. 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 as verified in the presence of the Resident and/or the end-user unless device addressing is electronically generated, and automatically graphically documented by the system.
 - 1) All drawings shall be provided in standard .DXF format. A vellum plot of each sheet shall also be provided.
 - 2. The application program listing for the system as installed at the time of acceptance by the building owner and/or local AHJ (disk, hard copy printout, and all required passwords).
 - 3. Provide the name, address and telephone of the authorized factory representative.
 - 4. A filled out Record of Completion similar to NFPA 72, 1999 edition figure 1-6.2.1.

1.7 QUALITY ASSURANCE

A. Qualifications of Contractor

1. The contractor shall have successfully installed similar system fire detection, signaling control components on a previous project of comparable size and complexity. The Owner reserves the right to reject any control components for which evidence of a successful prior installation performed by the contractor cannot be provided.
2. The contractor shall have in-house engineering and project management capability consistent with the requirements of this project. Qualified and approved representatives of the system manufacturer shall perform the detailed engineering design of central and remote control equipment. Qualified and approved representatives of the system manufacturer shall produce all panel and equipment drawings and submittals, operating manuals. The contractor is responsible for retaining qualified and approved representative(s) of those system manufacturers specified for detailed system design and documentation, coordination of system installation requirements, and final system testing and commissioning in accordance with these specifications.

B. Pre-installation Meetings

1. The provider shall submit a detailed project plan that will describe in detail how the provider will approach the project, from inception to finalization. The plan must include at a minimum the following information:
 - a. Project Staging
 - b. Project Management
 - c. Equipment Schedules
 - d. Installation Time Lines
 - e. Other Trade Requirements
 - f. Final Acceptance Testing
 - g. Personnel Resumes
 - h. Progress Report Sample
2. All equipment and components shall be installed in strict compliance with each manufacturer's recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc. before beginning system installation. Refer to the manufacturers riser/connection diagram and details for all specific system installation/termination/wiring data.

1.8 PROJECT CONDITIONS

- A. It shall be the Contractor's responsibility to inspect the job site and become familiar with the conditions under which the work will be performed. Inspection of the building may be made by appointment with the Owner. Contractors are requested to inspect the building prior to the pre-bid meeting.
- B. A pre-bid meeting will be held to familiarize the Contractors with the project. Failure to attend the pre-bid meeting may be considered cause for rejection of the Contractor's bid. The minutes of this meeting will be distributed to all attendees and shall constitute an addendum to these specifications.
- C. All work shall be conducted during normal working hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, by properly coordinating the work with the Owner. Noise restrictions do apply.

- D. The Contractor shall be responsible for prior coordination of all work and demolition with the Owner.

1.9 WARRANTY AND MAINTENANCE

- A. Warranty
 - 1. The contractor shall warranty all materials, installation and workmanship for one (1) year from date of acceptance, unless otherwise specified. A copy of the manufacturer's warranty shall be provided with closeout documentation and included with the operation and installation manuals.
 - 2. 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. The Contractor shall supply the following spare parts:
 - 1. Automatic detection devices - Two percent of the installed quantity of each type.
 - 2. Manual fire alarm stations - Two percent of the installed quantity of each type.
 - 3. Audible and visible devices - One percent of the installed quantity of each type, but no less than two (2) devices.
 - 4. Keys - A minimum of three (3) sets of keys shall be provided and appropriately identified.

1.10 TRAINING

- A. The System Supplier shall schedule and present a minimum of 2 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 Local Authority Having Jurisdiction.

PRODUCTS

2.1 MANUFACTURER

- A. The system shall be as manufactured by Edwards Systems Technology, Inc. No substitutions will be considered.

2.2 PANEL COMPONENTS & FUNCTIONS

A. General:

1. The control panel 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 shall include all required hardware, software and system programming to provide a complete and operational system. The control panel shall assure that life safety takes precedence among all panel activities.
3. The control panel 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 networked remote annunciators.
 - c. Support a DACT (dialer) for off premise notification.
 - d. Support up to 576 chronological events in history.
4. The control panel shall include the following features:
 - a. Provide auto-programming 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 auto-program, enable mapping, 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. 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.

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 Owner is required.
2. Receipt of alarm, trouble, and supervisory signals shall activate integral audible devices at the control panel(s) and at each remote annunciation device.
3. The annunciator shall contain the following system status indicators:
 - a. 80-character Backlit Liquid Crystal Display.
 - b. System Power Indicator – green LED.
 - c. System Common Alert – 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. The networked annunciator(s) shall be an 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 1-5.2 of NFPA 72 - 1999. 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. The power supply shall be an EST model 2-PPS/6A.
- D. System Message Processing and Display Operations:
- 1. The system shall allow message routing to be configured to any or all annunciators.
 - 2. All system printer ports shall be configurable to output any combination of alarm, supervisory, trouble, or monitor, event messages.
 - 3. Each LCD display on each annunciator shall be configurable to display the status of any combination of alarm, supervisory, trouble, or monitor, event messages.
 - 4. Clear distinction shall be provided between alarm, supervisory, trouble, and monitor status messages.
 - 5. 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.
 - 6. 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 be 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. The DACT shall be an 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. 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. The one-way emergency audio communications module shall be an EST model 2-MIC/2-AAC. The pre-recorded digital message unit shall be an 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 or Class A wiring, rated at 30 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 backup 1kHz 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 backup 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. The one-way emergency audio amplifiers shall be EST model SIGA-AAxx.
- H. 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 & 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 - Photoelectric
 - a. Provide analog/addressable photoelectric smoke detectors at the locations shown on the drawings. 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. The analog/addressable photoelectric smoke detector shall be an EST model SIGA-PS.
 - 3. Duct Detector Mounting Plate
 - a. Where smoke detectors are directly inserted into a low-velocity duct 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. The duct detector mounting plate shall be an EST model SIGA-DMP.

4. 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. The smoke detector duct housing shall be an EST model SIGA-DH.
 5. Fixed Temperature-ROR Heat Detector
 - a. Provide analog/addressable combination fixed temperature / rate-of-rise detectors at the locations shown on the drawings. 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. The analog/addressable combination fixed temperature / rate-of- rise heat detector shall be EST model SIGA-HRS.
 6. Detector Base - Standard
 - a. Provide standard detector mounting bases suitable for mounting on either North American 1-gang, 3½ or 4-inch octagon box and 4-inch square box, or European BESA or 1-gang box. The base shall, contain no electronics and support all series detector types.
 - b. The standard detector base shall be an EST model SIGA-SB.
- B. Manual Station - Double Action Single Stage
1. 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 North American 2 ½ (64mm) deep 1-gang boxes and 1 ½ (38mm) deep 4 square boxes with 1-gang covers.
 2. The analog/addressable double action, single stage fire alarm station shall be EST model SIGA-278.
- C. Notification Appliances
1. General (signals)
 - a. All appliances that 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. Any appliances that do not meet the above requirements, and are submitted for use must show written proof of their compatibility for the purpose intended. Such proof shall be in the form of documentation from all manufacturers that

- clearly states that their equipment (as submitted) is 100% compatible with each other for the purpose intended. All strobes shall be provided with lens markings oriented for wall mounting.
- d. All notification appliances shall be red unless noted otherwise on the drawings.
2. Low-Profile Horns
 - a. Provide low-profile wall-mount horns at the locations shown on the drawings. The horn shall provide an 84 dBA sound output at 10 ft. when measured in reverberation room per UL-464. The horn shall have a selectable steady or synchronized temporal output. In and out screw terminals shall be provided for wiring. The horn shall mount in a North American 1-gang box.
 - b. The low-profile wall-mount horns shall be EST Genesis series.
 3. Low-Profile Horn-Strobes
 - a. Provide low-profile wall-mount horn/strobes at the locations shown on the drawings. The horn/strobe shall provide an audible output of 84 dBA at 10 ft. when measured in reverberation room per UL-464. Strobes shall provide synchronized flash outputs. The strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 60cd, 75cd & 110cd devices. The horn shall have a selectable steady or synchronized temporal output. In and out screw terminals shall be provided for wiring. Low-profile horn/strobes shall mount in a North American 1-gang box.
 - b. The low-profile wall-mount horn/strobes shall be EST Genesis series.
 4. Low-Profile Speaker
 - a. Provide low profile wall mount speakers at the locations shown on the drawings. 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 North American 4" x 2 1/8" square electrical box, without trims or extension rings.
 - c. The low-profile wall-mount speaker shall be EST Genesis G4 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, which 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 North American 4" x 2 1/8" square electrical box, without trims or extension rings.
 - c. The low-profile wall-mount speaker/strobes shall be EST Genesis G4 series.
 6. 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 North American 1-gang box.
- b. The low-profile wall-mounted strobes shall be EST Genesis series.
- D. Initiation & Control Modules
- 1. Intelligent Modules – General
 - a. It shall be possible to address each intelligent module without the use of DIP or rotary switches. Devices using DIPswitches 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 DIPswitch 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 that 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:
 - (1) Temperature: 32°F to 120°F (0°C to 49°C)
 - (2) Humidity: 0-93% RH, non-condensing
 - 2. Control Relay Module - SIGA-CR
 - a. 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 North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers.
 - b. The addressable control relay circuit module shall be an EST model SIGA-CR.
 - 3. Dual Input Module - SIGA-CT2
 - a. 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 North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers. The dual input module shall support the following circuit types:
 - (1) Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.)
 - (2) Normally-Open Alarm Delayed Latching (Waterflow Switches)
 - (3) Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.)
 - (4) Normally-Open Active Latching (Supervisory, Tamper Switches
 - b. The intelligent dual input module shall be an EST model SIGA-CT2.
 - 4. Dual Input Signal Module - SIGA-CC2
 - a. 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 North American 2 ½" (64mm) deep 2-gang boxes and 1 ½" (38mm) deep 4" square boxes with 2-gang covers, or European 100mm square boxes. The dual

- input signal module shall support the following operation:
- b. Audible/Visible Signal Power Selector (Polarized 24 Vdc @ 2A, 25 Vrms @ 50w or 70 Vrms @ 35w of Audio).
 - c. The intelligent dual input signal module shall be an EST model SIGA-CC2.
5. Isolator Module - SIGA-IM
- a. 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 North American 2 1/2" (64mm) deep 2-gang boxes and 1 1/2" (38mm) deep 4" square boxes with 2-gang covers, or European 100mm square boxes.
 - b. The intelligent fault isolator module shall be an EST model SIGA-IM.
6. Monitor Module - SIGA-MM1
- a. 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 North American 2 1/2" (64mm) deep 1-gang boxes and 1 1/2" (38mm) deep 4" square boxes with 1-gang covers.
 - b. The intelligent monitor module shall be an EST model SIGA-MM1.
7. Single Input Module - SIGA-CT1
- a. 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 North American 2 1/2" (64mm) deep 1-gang boxes and 1 1/2" (38mm) deep 4" square boxes with 1-gang covers. The single input module shall support the following circuit types:
 - (1) Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.)
 - (2) Normally-Open Alarm Delayed Latching (Waterflow Switches)
 - (3) Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.)
 - (4) Normally-Open Active Latching (Supervisory, Tamper Switches)
 - b. The intelligent single input module shall be an EST model SIGA-CT1.
8. Single Input Signal Module - SIGA-CC1
- a. 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 North American 2 1/2" (64mm) deep 2-gang boxes and 1 1/2" (38mm) deep 4" square boxes with 2-gang covers, or European 100mm square boxes. The single input signal module shall support the following operations:
 - (1) Audible/Visible Signal Power Selector (Polarized 24 Vdc @ 2A, 25Vrms @50w or 70 Vrms @ 35 Watts of Audio)
 - (2) Telephone Power Selector with Ring Tone (Fire Fighter's Telephone)
 - b. The intelligent single input signal module shall be an EST model SIGA-CC1.
9. Universal Class AB Module - SIGA-UM
- a. 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 North

American 2 1/2" (64mm) deep 2-gang boxes and 1 1/2" (38mm) deep 4" square boxes with 2-gang covers, or European 100mm square boxes. The universal class A/B module shall support the following circuit types:

- (1) Two (2) supervised Class B Normally-Open Alarm Latching.
 - (2) Two (2) supervised Class B Normally-Open Alarm Delayed Latching.
 - (3) Two (2) supervised Class B Normally-Open Active Non-Latching.
 - (4) Two (2) supervised Class B Normally-Open Active Latching.
 - (5) One (1) form "C" dry relay contact rated at 2 amps @ 24 Vdc.
 - (6) One (1) supervised Class A Normally-Open Alarm Latching.
 - (7) One (1) supervised Class A Normally-Open Alarm Delayed Latching.
 - (8) One (1) supervised Class A Normally-Open Active Non-Latching.
 - (9) One (1) supervised Class A Normally-Open Active Latching.
 - (10) One (1) supervised Class A 2-wire Smoke Alarm Non-Verified.
 - (11) One (1) supervised Class B 2-wire Smoke Alarm Non-Verified.
 - (12) One (1) supervised Class A 2-wire Smoke Alarm Verified
 - (13) One (1) supervised Class B 2-wire Smoke Alarm Verified
 - (14) One (1) supervised Class A Signal Circuit, 24Vdc @ 2A.
 - (15) One (1) supervised Class B Signal Circuit, 24Vdc @ 2A.
- b. The intelligent class A/B module shall be an EST model SIGA-UM.
10. Waterflow-Tamper Module - SIGA-WTM
- a. 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 North American 2 1/2" (64mm) deep 1-gang boxes and 1 1/2" (38mm) deep 4" square boxes with 1-gang covers.
 - b. The intelligent waterflow/tamper module shall be an EST model SIGA-WTM.

EXECUTION

3.1 INSTALLATION SEQUENCE

- A. Installation of the systems shall be conducted in stages and phased such that circuits and equipment are installed in the following order:
 1. Riser conduits, AC power conduits and control cabinets.
 2. Fire command center, remote control panel(s), control component(s), annunciator(s).
 3. Conduits and wiring for complete notification circuits and appliance installation throughout facility.
 4. Pre-test the audible and visual notification appliance circuits.
 5. Install all new detection devices.
 6. Terminations between field devices and the associated control equipment.
 7. The detection system shall be switched over and end of each day the system shall be operational. At no time will the system be placed out of service over night.
 8. Complete the interface to the building automation system.
 9. Complete contractor pre-test of system.
 10. Complete system testing.

- B. Conductor Installation
1. 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.
 2. All circuits shall be rated power limited in accordance with NEC Article 760.
 3. All new system conductors shall be of the type(s) specified herein.
 4. 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.
 5. 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.
 6. All non-addressable initiating device circuits, 24 VDC auxiliary function circuits shall be 18 AWG minimum or per manufacturer's requirements.
 7. All notification appliance circuit conductors shall be solid copper or bunch tinned (bonded) stranded copper. Where stranded conductors are utilized, a maximum of 7 strands shall be permitted for No. 16 and No. 18 conductors, and a maximum of 19 strands shall be permitted for No. 14 and larger conductors.
 8. All audible notification appliance circuits shall be 14 AWG minimum twisted pairs or twisted pairs shielded or per manufacturer's requirements.
 9. All visual notification appliance circuits shall be 14 AWG minimum THHN or twisted pairs or twisted shielded pairs or per manufacturer's requirements.

3.2 ELEVATOR INTERFACE

- A. Interlock alarm system heat detectors at the top and bottom of elevator shaft, and in the Elevator shaft with the elevator power service shunt trip such that an alarm condition at any of these detectors shall automatically disable the elevator electrical service feeder. Provide an interlock between the fire alarm system smoke detectors at the Elevator Lobbies on each floor, and the smoke detector in the Elevator Machine Room, such that:
1. Alarm activation by the detector at the upper floor Elevator Lobby smoke detector, or at the detector in the Elevator Machine Room, shall automatically send the elevator to the first floor.
 2. An alarm condition activated by the first floor Elevator Lobby smoke detector shall automatically send the elevator car to the second floor.
- B. Provide a tamper switch for each sprinkler system valve at all sprinkler lines extended into the elevator shaft.

3.3 FIELD QUALITY CONTROL

- A. Test & Inspection
1. All intelligent analog addressable devices shall be tested for current address, sensitivity, and user defined message.
 2. All wiring shall be tested for continuity, shorts, and grounds before the system is activated.
 3. All test equipment, instruments, tools and labor required to conduct the tests shall be made available by the installing contractor.

4. The system including all its sequence of operations shall be demonstrated to the Owner, his representative, and the local fire inspector. In the event the system does not operate properly, the test shall be terminated. Corrections shall be made and the testing procedure shall be repeated until it is acceptable to the Owner, his representatives and the fire inspector.
5. At the final test and inspection, a factory-trained representative of the system manufacturer shall demonstrate that the system functions properly in accordance with these specifications. The representative shall provide technical supervision, and participate during all of the testing for the system.
6. All fire alarm testing shall be in accordance with National Fire Alarm Code, NFPA 72 - 1999, Chapter 7.
7. A letter from the Contractor certifying 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.

END OF SECTION