



SECTION 28 31 00 - FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 SUMMARY

- A. This performance specification provides the minimum requirements for the Life Safety System. The work provided shall include, but not limited to furnishing all permits, equipment, materials, delivery, labor, documentation, testing and services necessary to design and furnish and install a complete, operational system Fire Alarm System.
- B. At the time of bid, all exceptions taken to these Specifications, all variances from these Specification and all substitutions of operating capabilities or equipment called for in these Specification shall be listed in writing and forwarded to the Designer. Any such exception, variances or substitutions that were not listed at the time of bid and are identified in the submittal, shall be grounds for immediate disapproval without comment.
- C. The contractor must prepare the appropriate fire alarm system design and shall submit all the required drawings, equipment specifications, riser diagrams, worst case voltage drop calculations, battery calculations, mounting details and equipment to the city of Los Angeles Fire Department for review and obtain the permit under a deferred approval.
- D. Contractor is responsible for verifying existing fire alarm devices located within the terminal and providing connection to main fire alarm system for a complete working system.
- E. The contractor shall be responsible to repair or replace damaged electrical conduit or wiring and shall maintain cleanliness in the fire control room during any given project.

1.2 REFERENCES

- A. All work and materials shall conform to all applicable Federal, State and local codes and regulations governing the installation.
- B. Fire alarm system, equipment, installation, and wiring materials and methods used shall comply with the following codes and standards:
 - 1. System components proposed in this specification shall be UL listed for its intended use.
 - 2. California State Fire Marshal Listed Components.
 - 3. NFPA 72 - National Fire Alarm Code®, as amended by CA code.
 - 4. NFPA 13 – Standards for the installation of fire sprinkler systems.

1.3 CONTRACTOR QUALIFICATIONS

- A. All work in this Section shall be performed (furnished, installed and connected) by a qualified fire alarm contractor. The fire alarm contractor shall provide the following documentation to show compliance with the contractor qualifications within 14 days after notice of award of contractor.



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1. **Contractor's License:** A copy of the contractor's valid State of California License. The contractor must be licensed in the state of project location and have been incorporated in the business in that state for a minimum of 5 years.
2. **Proof of Experience:** Proof that the fire alarm contractor has successfully installed similar system fire detection, evacuation voice and visual signaling control components on a previous project of comparable size and complexity. Provide a statement summarizing any pending litigation involving an officer or principal of /or the company, the nature of the litigation and what effect the litigation may carry as it relates to this work in the worst case scenario. Non-disclosure of this item, if later discovered, may result, at the LAWA's discretion, in the contractor bearing all costs and any cost related to associated delays in the progress of the work.
3. **Insurance Certificates:** Copy of fire alarm contractor's current liability insurance and state industrial insurance certificates in conformance with the contract document.
4. **Service Capability:** The fire alarm contractor shall have in-house Engineering, installation and service personnel with a maintenance office within 50 miles of the project location
5. **Authorization Letters:** Letters from the fire alarm equipment manufacturer stating that the fire alarm contractor is a Factory Authorized Distributor, and is trained and certified for the equipment proposed on this project and is licensed to purchase and install the software required to provide the specified functions.
6. **Certifications:**
 - a. Provide a copy of the National Institute for Certification in Technologies (NICET) Technician Level 3 Certificate for the employee actively involved in this project.
 - b. Documentation that the fire alarm contractor has on staff personnel factory-trained and certified for the equipment proposed for this project.
7. The Contractor shall be an EST Authorized Strategic Partner or contracted with LAWA's fire alarm maintenance contractor to install EST3 equipment. Proof of authorization shall be required.

1.4 SCOPE OF WORK

- A. New EST3 fire control panel to add to existing FireWorks Graphical User Interface at CUP shall be installed. All new fire alarm equipment and devices shall be a product of GE, EST Life Safety & Communications.
- B. The system supplied under this specification shall be a microprocessor-based direct wired, multi-priority peer-to-peer networked system. The system shall utilize independently addressed, microprocessor-based smoke detectors, heat detectors, and modules as described in this specification. It shall be complete with all necessary hardware, software and memory specifically tailored for this installation. It shall be possible to permanently modify the software on site by using a plug-in programmer.
- C. The Contractor shall obtain and pay for all permits and related fees including any fees for after-hours testing and expedited plan check.



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- D. The Contractor will be responsible for providing all required professional Engineering stamps/certification and all required contractor's license requirements, which are required by the Authority Having Jurisdiction (AHJ).
- E. The fire alarm systems shall be operational at all times unless an approved Fire Watch is in place. The system shall not be left out of service during weekends. The contractor shall be responsible for notifying the General Contractor 48 hours in advance of any fire watch in areas that will not be protected by the fire alarm system.
- F. The Contractor shall guarantee for a period of one year upon completion and final acceptance by LAWA that all addressable control relay modules, SIGA-CRs, shall be properly installed so that the SIGA-CRs do not "hang-up" or stay on a tripped state after the fire alarm has been reset.
- G. Provide and be responsible for fire-watch as required by the AHJ.
- H. All smoke detectors in the Contractor's area of responsibility/construction area must be covered with a compatible smoke detector cover (plastic bags are not allowed) to prevent nuisance fire alarms and dirt accumulation on the detectors.
- I. All covered active smoke detectors must have the covers removed at the end of each work day or a fire watch must be established in the affected area. All return air grills/registers in the Contractor's area of responsibility/construction area must be covered with the appropriate filter element to prevent dust from being introduced into the A/C ductwork and activating the associated duct smoke detectors. These filter elements must be inspected regularly and replaced if necessary.
- J. Provide LAWA list of Fire Life Safety devices including locations that will be physically removed during construction.
- K. A factory trained technician shall be on site to supervise the installation.
- L. The Contractor shall be responsible to contract with the Existing LAWA Maintenance Contractor to program the Fire Works system at the Central Utilities Plant and to integrate with the existing EST3 system. The Contractor shall ensure current programming efforts are coordinated with other work and contractors.
- M. The fire alarm scope of work shall consist of the following minimum requirements.
 - 1. Control Panels and Annunciators
 - a. Fire Control Panels
 - (1) A new EST3 fire alarm control panel shall be provided. New panels will be connected to main EST3 panel located at new or existing fire control room. Additional related remote data gathering panels shall be provided at these locations as needed.
 - (2) All FACP, remote data gathering panels and annunciators shall complete the "network" between all areas of the building(s) allowing for common monitoring and control.
 - (3) A new matrix graphic annunciator will be provided in the new or existing fire control room as part of the project depicting the final terminal layout. The



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contractor will be responsible for providing new LED's at the Matrix annunciator as follows:

- i. Horizontal rows of LED's for each alarm zone (floor) arranged vertically in columns by Pull Station, Area Smoke/Heat Detector, Elevator Lobby Smoke Detector, Duct Smoke Detector, Elevator Shaft Smoke/Heat Detector, Sprinkler Water Flow, Sprinkler Valve Tamper Switch, Beam Smoke Detector (if applicable), Vesda or Air Sampling/Aspirating Smoke Detection System (if applicable) and Special Extinguishing System Zones.
- ii. Emergency Generator Run & Fail (if applicable).
- iii. Fire/Booster Pump Run & Fail (if applicable).
- iv. Common Trouble and Power LED's.
- v. Lamp Test Push Button.

2. Initiating Devices

- a. All initiating devices shall be new addressable devices and shall be clearly and accurately labeled with the corresponding device addresses using an electronic label maker, e.g. "P-touch". Any conventional initiating devices utilized shall have individual addressable monitor modules provided for each conventional device for unique addressing and annunciation.
- b. All initiating devices should be clearly and accurately labeled with the corresponding device addresses using an electronic label maker, such as a "P-Touch."
- c. Smoke detectors shall be added as follows:
 - (1) All Mechanical, Electrical, Telephone, Elevator, Transformer, Generator or similar room.
 - (2) At each elevator lobby.
 - (3) Magnetically held open or automatic-closing doors.
 - (4) Roll doors and/or one-hour fire-resistive occupancy separations.
 - (5) Elevator Shafts if required per code.
 - (6) Storage areas.
 - (7) Smoke and combination Smoke/Fire Dampers.
 - i. Duct smoke detectors not required for dampers where the entire space served by the smoke damper is protected by a system of area smoke detectors.
 - (8) Above each fire alarm control panel or booster power supply.
 - (9) Beam pockets shall be covered as needed in order to meet current code requirements.
 - (10) Provide and install new smoke detectors in rooms designated with pre-action systems. Smoke detectors shall be compatible with pre-action panel designated in the sprinkler specification. All pre-action smoke detectors shall be appropriately labeled indicating zone assignments or similar designations with an electronic label maker such as a "P-Touch."



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- d. Manual pull stations shall be added as follows:
 - (1) At all exits from the building.
 - (2) At every exit from every level
 - (3) At each elevator lobby if required by AHJ.
 - (4) Additional manual pull stations shall be provided so that the travel distance to the nearest manual pull station will not be in excess of (200 ft) measured horizontally on the same floor.
 - (5) A conventional weatherproof Pull Station shall be provided with an individual addressable module per pull station for any exterior locations.
 - e. Duct Detectors shall be added as follows:
 - (1) Downstream of the air filters and ahead of any branch connections in air supply systems having a capacity greater than 944 L/sec (2000 ft³/min)
 - (2) At each story prior to the connection to a common return and prior to any recirculation or fresh air inlet connection in air return systems having a capacity greater than 7080 L/sec (15,000 ft³/min) and serving more than one story.
 - i. Return system smoke detectors shall not be required where the entire space served by the air distribution system is protected by a system of area smoke detectors.
 - (3) Smoke detectors shall not be required for fan units whose sole function is to remove air from the inside of the building to the outside of the building.
 - (4) Smoke and combination Smoke/Fire Dampers.
 - i. Duct smoke detectors not required for dampers where the entire space served by the smoke damper is protected by a system of area smoke detectors.
 - (5) Remote LED's w/ test stations shall be provided for all duct detectors located above ceilings or out of sight.
 - f. Heat Detectors shall be added as follows:
 - (1) Elevator Machine Rooms
 - (2) Elevator Shafts if required per code.
 - (3) All Kitchens with cooking and heating equipment.
 - (4) Trash Rooms
 - g. Sprinkler tamper and water flow switches shall be individually monitored as follows:
 - (1) Provide one (1) supervisory module circuit for each sprinkler valve supervisory and water flow switch.
 - (2) Tamper switches in fire pump room only may be grouped together as allowed per coded.
 - h. Vesda Laser Plus Detector shall be provided per plans as required.
3. Notifications Appliances



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- a. All notification appliances shall be new.
 - b. Speakers shall be added as follow:
 - (1) Shall be added throughout public and private spaces to achieve 15db above ambient as needed to maintain intelligibility in all areas during paging and meet current code requirements.
 - (2) Elevator Cabs and Stairwells for Paging Only.
 - (3) Elevator Lobbies
 - (4) Corridors
 - (5) Rooms and tenant spaces exceeding 1,000 square feet.
 - (6) Public Restrooms for intelligibility during paging.
 - c. Strobes shall be added as follows:
 - (1) Restrooms and Similar Uses: Public, Staff, locker rooms and dressing rooms.
 - (2) Corridor System and Similar Uses: Public, Staff and Service Corridors, Vestibules and Passageways.
 - (3) Occupied Rooms where Ambient Noise Impairs Hearing of the Fire Alarm and Similar Uses: Mechanical equipment rooms, Generator rooms.
 - (4) Lobbies and Similar Uses
 - (5) Rooms used for Sleeping and Similar Uses: Sleeping rooms and suites for persons with hearing impairments.
 - i. Strobes that are required in sleeping areas shall be located within 16' of pillow and have a minimum intensity of 110cd. For strobes located less than 24" from ceiling the minimum intensity shall be 117cd.
 - (6) Any other area for common use.
 - (7) Additional strobes shall be added in ADA rooms as needed.
 - (8) Sized Per ADA coverage and NFPA72
 - (9) Combination Audible/Visual appliances may be used as needed.
 - (10) Areas having more than 2 strobes in the field of view shall be synchronized
 - i. Booster Power Supplies shall be distributed throughout the facility to provide the power necessary for all indicating devices. Power Supplies shall be initiated by Synchronized Signal Modules. Synchronization by means of a common pair of wires chaining power supplies shall not an acceptable means of synchronization between units. There must be accurate labels indicating what areas of the building each zone the booster power supply provides power to (for example, a booster power supply can supply power up to four zones. Each zone must be accurately identified with the building location. This is a big help in identifying the location of strobes when troubleshooting is required.). All labels shall be made with an electronic label maker and shall be located at the front panel of the booster power supply.
4. Fan and Damper control as follows:



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- a. Transmit signal to the building automation system per zone for smoke control operation of all fans and dampers identified in the smoke control sequence of operation. All other dampers and fans shall be non-managed and shutdown or closed by the fire alarm system.
 - b. Interface and provide fan shutdown control for all non-managed fans not identified in the smoke control sequence of operation. An addressable control relay shall be provided for each unit and each addressable control relay shall be clearly labeled with the correct logical address, using an electronic label maker, such as a “P-Touch.”
 - c. Interface and provide non-managed smoke damper shutdown for all dampers not identified in the smoke control sequence of operation. Provide addressable control relays at each electrical panel where smoke dampers are powered.
5. Other device/controls shall be added as follows:
- a. Primary, Alternate elevator recall and shunt trip shall be required for each elevator.
 - b. The fire alarm panel shall monitor individual Fire Pump and Emergency Generator “Run” & “Fail” status for each unit. Run & Fail Status shall report as Monitor points.
 - c. Interface with any door lock\card accesses release circuits. An addressable control relay shall be provided at each lock location obstructing the emergency exit path. Stairwell door locks may have one common control.
 - d. Provide and Interface with magnetic door holder release circuits. Provide addressable control relays as required. Sources of electrical power to the magnetic door release circuits must be correctly identified with labels made with an electronic label maker. These labels must be located right next to the addressable SIGA control relays of the magnetic door circuits.
 - e. Sources of electric power for the magnetic door holders must be properly identified in the as-built drawings and with labels that will be located next to the corresponding addressable SIGA-CR modules.
 - f. Magnetic door holders shall be provided as part of this section at elevator lobby doors and all cross-corridor doors and as required per code.
 - g. Fireman’s phone jack shall be provided at all elevators, stairwells and elevator control rooms.

1.5 SEQUENCE OF OPERATIONS

- A. General Alarm Operation: Upon alarm activation of any area smoke detector, duct smoke detector, heat detector, manual pull station, sprinkler waterflow, Vesda Detector, the following functions shall automatically occur:
 1. The internal audible device shall sound at the control panel, annunciator or command center.
 2. The LCD Display shall indicate all applicable information associated with the alarm condition including zone, device type, device location and time/date.
 3. All system activity/events shall be documented on the system printer.



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4. Any remote or local annunciator LCD/LED's associated with the alarm zone shall be illuminated.
 5. The following notification signals and actions shall occur simultaneously: (At the Terminals, the strobes are activated and messages are transmitted manually by authorized personnel.)
 - a. An evacuation message shall be sounded on fire floors (zones). The signal shall be a slow whoop tone. (Evacuation message is broadcast manually by authorized personnel in the Terminals.)
 - b. Activate visual strobes on the fire floors (zones). The visual strobe shall stop operating when the "Alarm Silence" is pressed. (Strobes are activated when the evacuation microphone is keyed by authorized personnel in the Terminals.)
 6. Provide selective paging to each individual floor (zone). In addition to the message/channels detailed above, a dedicated page channel shall be capable of simultaneously providing live voice instructions without interrupting any of the messages listed above shall be provided.
 7. Transmit a signal to the building automation system to activate the automatic smoke control sequences.
 8. If a fire originates in any place other than in the communication rooms, all HVAC units will shut down, except the DX units serving the IT, MPOE and telecom rooms. If a fire originates within the communication rooms, the associated DX units will shut down.
 9. All stairwell/exit doors shall unlock throughout the building.
 10. All self-closing fire/smoke doors held open shall be released.
 11. All automatic events programmed to the alarm point shall be executed and the associated outputs activated.
 12. All Sequence of Operations Matrices shall be in picture framed (min. size 11"x17") mounted next to the fire alarm panel.
 13. EST Fireworks
 - a. Display the address of the alarm or off normal point with type and description and time of the event in a prioritized color-coded event list. Highlighting an event in the event list shall automatically cause the other three quadrants (described below) to display information relating to the highlighted event.
 - b. Display color graphical representation of the area in which the alarm or off normal device is located. It shall be possible for the operator to manually zoom down to any portion of a vector-based graphic without aliening, artifacting, or pixilation of the image. Preset zoom levels shall not be considered equal.
 - c. Display a set of written operator instructions for each point.
 - d. Log operator's comments for each event to history with time and date.
 - e. Log all events and operator actions to history for future review.
 14. Smoke evacuation louvers shall open.
- B. Elevator Lobby / Equipment Room Detectors: Upon alarm activation of any elevator lobby smoke detector or equipment room detector the following functions shall automatically occur:
1. Perform general alarm sequence above.



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2. Elevator Lobby smoke detectors shall recall the elevators to primary floor
 3. Elevator Lobby smoke detectors located on the primary recall floor shall recall the elevator the alternate floor.
 4. Equipment room smoke detectors shall recall the elevator to the primary floor.
 5. Activation of the Equipment room heat detector shall initiate the shunt trip in the associated elevator equipment room.
- C. Supervisory Operation: Upon supervisory activation of any sprinkler valve supervisory switch, fire pump off-normal, clean agent fire suppression system trouble, Vesda Detector, the following functions shall automatically occur:
1. The internal audible device shall sound at the control panel, annunciator or command center.
 2. The LCD display shall indicate all applicable information associated with the supervisory condition including; zone, device type, device location and time/date.
 3. All system activity/events shall be documented on the system printer.
 4. Any remote or local annunciator LCD/LED's associated with the supervisory zone shall be illuminated.
 5. Transmit signal to the central station with point identification.
 6. EST Fireworks
 - a. Display the address of the supervisory or off normal point with type and description and time of the event in a prioritized color-coded event list. Highlighting an event in the even list shall automatically cause the other three quadrants (described below) to display information relating to the highlighted event.
 - b. Display color graphical representation of the area in which the supervisory or off normal device is located. It shall be possible for the operator to manually zoom down to any portion of a vector-based graphic without aliening, artifacting, or pixilation of the image. Preset zoom levels shall not be considered equal.
 - c. Display a set of written operator instructions for each point.
 - d. Log operator's comments for each event to history with time and date.
 - e. Log all events and operator actions to history for future review.
- D. Trouble Operation: Upon activation of a trouble condition or signal from any device on the system, the following functions shall automatically occur:
1. The internal audible device shall sound at the control panel, annunciator or command center.
 2. The LCD keypad display shall indicate all applicable information associated with the trouble condition including; zone, device type, device location and time/date.
 3. All system activity/events shall be documented on the system printer.
 4. Any remote or local annunciator LCD/LED's associated with the trouble zone shall be illuminated.
 5. Transmit signal to the central station with point identification.



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6. EST Fireworks
 - a. Display the address of the trouble or off normal point with type and description and time of the event in a prioritized color-coded event list. Highlighting an event in the event list shall automatically cause the other three quadrants (described below) to display information relating to the highlighted event.
 - b. Display color graphical representation of the area in which the trouble or off normal device is located. It shall be possible for the operator to manually zoom down to any portion of a vector-based graphic without aliening, artifacting, or pixilation of the image. Preset zoom levels shall not be considered equal.
 - c. Display a set of written operator instructions for each point.
 - d. Log operator's comments for each event to history with time and date.
 - e. Log all events and operator actions to history for future review.
- E. Monitor Activation: Upon activation of any device connected to a monitor circuit (fire pump/emergency generator status, Vesda Detector), the following functions shall automatically occur:
 1. The LCD display shall indicate all applicable information associated with the status condition including; zone, device type, device location and time/date.
 2. All system activity/events shall be documented on the system printer.
 3. Any remote or local annunciator LCD/LED's associated with the status zone shall be illuminated.
 4. EST Fireworks
 - a. Display the address of the monitor or off normal point with type and description and time of the event in a prioritized color-coded event list. Highlighting an event in the event list shall automatically cause the other three quadrants (described below) to display information relating to the highlighted event.
 - b. Display color graphical representation of the area in which the monitor or off normal device is located. It shall be possible for the operator to manually zoom down to any portion of a vector-based graphic without aliening, artifacting, or pixilation of the image. Preset zoom levels shall not be considered equal.
 - c. Display a set of written operator instructions for each point.
 - d. Log operator's comments for each event to history with time and date.
 - e. Log all events and operator actions to history for future review.
 5. Smoke evacuation louvers shall open.

1.6 SYSTEM DESIGN PARAMETERS

- A. Standby power
 1. The standby power supply shall be an electrical battery with capacity to operate the system under maximum supervisory load for twenty four (24) hours and capable of operating the system for five (5) minutes of evacuation alarm on all devices, operating at maximum load. The system shall include a charging circuit to automatically maintain the



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electrical charge of the battery. The system shall automatically adjust the charging of the battery to compensate for temperature.

- B. Voltage Drop
 - 1. The point-to-point Ohm's Law voltage drop calculations of all alarm system circuits shall no exceed 10%.
- C. Spare Capacity
 - 1. The system shall be engineered to accommodate 20% spare capacity on each individual loop, and 20% spare on system power supplies.
- D. Circuiting Guidelines
 - 1. Initiating Device Circuits
 - a. Where necessary, conventional initiating device circuits (i.e. waterflow switches, valve supervisory switches, fire pump functions, etc.) shall be Class B (Style "A" or "B").
 - 2. Notification Appliance Circuits
 - a. All notification appliance circuits shall be Class B (Style "Y"). The notification circuits shall be power limited. Non-power limited circuits are not acceptable.
 - 3. Signaling Line Circuits: Addressable Analog Devices
 - a. The signaling line circuit connecting to addressable/analog devices including, detectors, monitor modules, control modules, isolation modules, intrusion detection modules and notification circuit modules shall be Class B (style 4).
 - b. Each addressable analog loop shall be circuited so device loading is not to exceed 80% of loop capacity in order to leave for space for future devices.
 - 4. Signaling Line Circuits: Data & Audio for FACP & Annunciator Network
 - a. The signaling line circuit connecting network panel/nodes, annunciators, command centers, shall be Class A (style 7). The media shall be copper except where fiber optic cable is required.

1.7 SUBMITTALS

- A. General
 - 1. It is the responsibility of the contractor to meet the entire intent and functional performance required in these specifications.
 - 2. The proposed equipment shall be subject to the approval of LAWA.
 - 3. 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.
- B. Equipment Submittal
 - 1. Provide list of all types of equipment and components provided. This shall be incorporated as part of a Table of Contents, which will also indicate the manufacturer's



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part number, the description of the part, and the part number of the manufacturer's product datasheet on which the information can be found.

2. Provide manufacturer's ORIGINAL printed data sheets with the printed logo or trademark of the manufacturer for all equipment. Photocopied and/or illegible product data sheets shall not be acceptable.
3. 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.
4. CSFM listing sheet for each component
5. Installer's NICET 3 Certification
6. Letter or Certificate from the fire alarm manufacturer stating that the fire alarm contractor is an authorized EST Strategic Partner of the specified product.
7. Submit a copy of the system supplier's training certification for the specified product issued by the manufacturer of the integrated life safety system.
8. Equipment submittals and other documentation shall be incorporated bound with the above information indexed and tabbed for quick reference.

C. Shop Drawings

1. 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:
 - a. 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 reviewer's initials
 - b. Complete system bill of material with peripheral device backbox size information, part numbers, device mounting height information
 - c. Detailed system operational description. Any Specification differences and deviations shall be clearly noted and marked.
 - d. A riser diagram that individually depicts all control panels, annunciators, addressable devices and notification appliances. Field addressable devices and notification appliances may be grouped together by specific type per loop or circuit if allowed by AHJ. All addressable devices, initiating and relay, must have the identifying addresses in all drawings. All annunciators and control panels, including booster power supply panels, must be clearly identified and accurately located in all drawings.
 - e. Complete 1/8" = 1'-0 scale floor plan drawing locating all system devices and elevation of all equipment at the Fire Command Station. Floor plans shall indicate accurate locations for all control and peripheral devices as well as raceway size and routing, junction boxes, and conductor size, and quantity in each raceway. All notification appliances shall be provided with a candela rating and circuit address that corresponds to that depicted on the Riser Diagram. If individual floors need to be segmented to accommodate the 1/8" scale requirements, KEY PLANS and BREAK-LINES shall be provided on the plans in an orderly and professional manner. End-of-line resistors (and values) shall be depicted.



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- f. All drawings shall be reviewed and signed off by an individual having a minimum of a NICET 3 certification in fire protection Engineering technology, subfield of fire alarm systems.
- g. Control panel wiring and interconnection schematics. The drawing(s) shall depict internal component placement and all internal and field termination points. Drawing shall provide a detail indicating where conduit penetrations shall be made, so as to avoid conflicts with internally mounted batteries. For each additional data-gathering panel, a separate control panel drawing shall be provided, which clearly indicated the designation, service and location of the control enclosure.
- h. Any additional requirements if required by AHJ for approval.
- i. Complete calculations shall clearly indicate the quantity of devices, the device part numbers, the supervisory current draw, the alarm current draw, totals for all categories, and the calculated battery requirements. Battery calculations shall also reflect all control panel component, remote annunciator, and auxiliary relay current draws.
- j. System (Load & Battery) calculations shall be provided for each system power supply, each notification appliance circuit and each auxiliary control circuit that draws power from any system power supply.

1.8 OPERATING AND MAINTENANCE MANUALS

- A. The manual shall contain a detailed narrative description of the system Architecture, inputs, notification signaling, auxiliary functions, annunciation, sequence of operations, expansion capability, application considerations and limitations.
- B. Manufacturer's data sheets and installation manuals/instructions for all equipment supplied.
- C. Minimum two (2) copies of the closeout documents shall be delivered to LAWA's representative at the time of system acceptance.
- D. Provide the name, address and telephone of the authorized factory representative.
- E. A filled out Record of Completion similar to those provided in NFPA 72.
- F. A simplified set of fire alarm system operating instructions shall be installed next to the fire alarm panel.

1.9 AS-BUILT PROJECT DRAWINGS AND DATA

- A. Drawings consisting of: a scaled plan of each building showing the placement of each individual item of the Integrated Life Safety System equipment as well as raceway size and routing, junction boxes, and conductor size, quantity, and color in each raceway.
- B. All drawings must reflect point to point wiring, device address and programmed characteristics as verified in the presence of the Designer and/or the end user unless device addressing is electronically generated, and automatically graphically self-documented by the system.



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- C. All drawings shall be provided in standard AutoCAD format. Submit to LAWA Project Manager 2 complete sets of drawings in CD drawn in AutoCAD dwg format and 2 full size sets of hard copy drawings printed in minimum 36"x24" paper size.
- D. All initiating devices, addressable relay modules, fire alarm panels, and booster power supply panels shall be clearly labeled with the corresponding device or panel addresses on the As-built drawings. As-built drawings must be updated and submitted to LAWA Project Manager immediately upon the completion of the project.
- E. Contractor must provide a complete device list on an Excel spreadsheet that shows all initiating and output devices and includes the following information at the minimum:
 - 1. Device addresses
 - 2. Device type
 - 3. Location of devices
- F. All fire alarm device lists shall be updated and provided to LAWA Project Manager whenever the fire alarm system is modified.
- G. A fire alarm device map shall be created at the end of each fire alarm installation/modification. A fire alarm device map shows point-to-point wiring from each data card to the last fire alarm device in the data loop. Each fire alarm device on the map has its associated device type, serial number, and address. All device maps shall be updated immediately after the completion of the fire alarm system modification.
- H. The Contractor shall furnish the LAWA Project Manager a list of all fire alarm panels, and booster power supply panels with the appropriate detailed locations in the close-out documentation. This list shall be updated whenever fire alarm panels or booster power supply panels are added or deleted in a fire alarm system upgrade.
- I. Contractor shall provide as-built Sequence of Operation matrix posted in picture frame (Min. size 11"x17") next to the fire alarm panel in the Fire Control Room.
- J. Contractor shall provide in a Binder two (2) complete sets of Fire Alarm Operating Instructions dedicated for the Fire Control Room as part of closeout documentation.
- K. Contractor shall provide additional one (1) complete set of as-built drawings in the Fire Control Room.

1.10 WARRANTY

- A. The contractor shall warranty all materials, installation and workmanship for one (1) year.
- B. A copy of the manufacturer's warranty shall be provided with closeout documentation and included with the operation and installation manuals.
- C. The System Supplier shall maintain a service organization with adequate spare parts stock within 50 miles of the installation. Any defects that render the system inoperative shall be repaired within 24 hours of the LAWA notifying the contractor.



1.11 EXTRA MATERIALS

- A. Provide 10% of each type of manual stations (minimum of one for each type).
- B. Provide six keys of each type.
- C. Provide 10% of each type of smoke and heat detector (minimum of one for each type).
- D. Provide 10% of each type of audible and visual indicating appliances (minimum of one for each type).

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. GE Security: EST Fire & Life Safety – EST3 to match existing system and network.
- B. The Contractor shall be an EST Authorized Strategic Partner or contracted with LAWA's fire alarm maintenance contractor to install EST3 equipment. Proof of authorization shall be required.

2.2 GENERAL

- 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 (fire alarm) system.
- B. The contractor shall provide, from the acceptable manufacturer's current product lines, equipment and components, which comply, with the requirements of these specifications. Equipment or components, which do not provide the performance and features, required by these specifications are not acceptable, regardless of manufacturer.
- C. All System components shall be the cataloged products of a single supplier. All products shall be UL listed by the manufacturer for their intended purpose.
- D. All control panel assemblies and connected field appliances shall be both designed and manufactured by the same company, and shall be tested and cross-listed as to ensure that a fully functioning system is designed and installed.
- E. All fire alarm devices shall be labeled clearly with the identifying addresses using P-touch labeler or similar labeling device. The use of marker is not acceptable.
- F. Before demolition, notify LAWA Instrument shop by e-mail when the demolition is about to start to take a snapshot of the existing fire alarm panel.
- G. Before demolition, all fire alarm conduits and devices should be clearly identified by the fire alarm contractor to prevent the accidental removal of active fire alarm system devices and data highway wiring.



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- H. All active smoke detectors in the construction area should be properly covered during work hours and remove at the end of the work day.
- I. All active supply and return air diffusers/registers within the construction zone should be provided with construction filters to prevent construction dust from activating the duct smoke detectors.

2.3 FIRE ALARM CONTROL PANEL

A. General, EST3.

1. The fire alarm control panel or panels and all system devices (Audible-Visuals, Visuals, pull stations, smoke and heat detectors, etc. shall be GE Security (EST). All under one label "UL/ULC listed and approved" for the use of fire alarm systems in this area of the United States of America.
2. The operating controls shall be located behind locked door with viewing window. All control modules shall be labeled, and all zone locations shall be identified.
3. The main controller 3-CPU shall be supervised, site programmable, and of modular design supporting up to 64 network nodes. The peer-to-peer network shall contain multiple nodes consisting of the command center, main controller, remote control panels, LCD/LED annunciation nodes, and workstations. Each node is an equal, active functional node of the network, which is capable of making all local decisions and generating network tasks to other nodes in the event of node failure or communications failure between nodes. When utilizing a network and multiple wiring faults occur, the network shall re-configure into many sub-networks and continue to respond to alarm events from every panel that can transmit and receive network messages.
4. The Main Controller Module shall control and monitor all local or remote peripherals. It shall support a large 168 character LCD, power supply, remote LCD and zone display annunciators, printers, and support communication interface standard protocol (CSI) devices such as color computer annunciators and color graphic displays.
5. Each controller shall contain a RS232 printer/programming port for programming locally via an IBM PC. When operational, each controller shall support a printer through the RS232 port and be capable of message routing.
6. The programmer shall be able to download all network and firmware applications from the configuration computer to all the network panels from a single location on the system.
7. The panels shall have the ability to add an operator interface control/display at each node that shall annunciate command and control system functions.
8. The system shall store all basic system functionality and job specific data in non-volatile memory. All site specific and operating data shall survive a complete power failure intact. Passwords shall protect any changes to system operations.
9. The control panel shall contain a standby power supply that automatically supplies electrical energy to the system upon primary power supply failure. The system shall include a charging circuit to automatically maintain the electrical charge of the battery.

B. Signaling Line Circuits

1. The main controller 3-CPU shall be supervised, site programmable, and of modular design supporting up to 125 detectors and 125 remote modules per addressable Signaling



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line Circuit (SLC). The CPU shall support up to 10 SLC's per panel for a total system capacity of 2500 Intelligent Addressable points. The system shall be designed with peer-to-peer networking capability for enhanced survivability, with support for up to 64 nodes, each with up to 2500 points and an overall capacity of 160,000 points.

2. The system shall provide electronic addressing of analog/addressable devices.
3. The system shall have built-in automatic system programming to automatically address and map all system devices attached to the main controller.
4. The system shall use full digital communications to supervise all addressable loop devices for placement, correct location, and operation. It shall allow swapping of "same type" devices without the need of addressing and impose the "location" parameters on replacement device. It shall initiate and maintain a trouble if a device is added to a loop and clear the trouble when the new device is mapped and defined into the system.
5. The system shall have a UL Listed Detector Sensitivity test feature, which will be a function of the smoke detectors and performed automatically every 4 hours.

C. Integrated Digital Audio

1. The system shall be capable of delivering multi-channel audio messages simultaneously over copper and/or fiber media.
2. All audio messages and live pages shall originate at the one-way audio control unit.
3. The one-way audio control unit shall store pre-recorded audio messages digitally. These messages shall be automatically directed to various areas in a facility under program control.
4. The system shall support remote cabinets with zoned amplifiers to receive, amplify and send messages through speakers over supervised circuits.
5. The one-way emergency audio control shall provide control switches to direct paging messages as follows:
 - a. "All Call" to direct the page message to all areas in the facility, overriding all other messages and tones.
 - b. "Page to Evacuation Area" to direct the message to the evacuation area(s), overriding all other messages and tones.
 - c. "Page to Alert Area" to direct page messages to the area(s) receiving the alert message and tones, overriding all other messages and tones.
 - d. "Page to Balance Building" to direct page messages to the areas) in the facility NOT receiving either the evacuation area or alert area messages.
 - e. "Page by Phone" switch to select the firefighter's telephone system as the source for paging.
6. Audio Amplifiers (Multi-Channel)
 - a. Provide as minimum one twenty (20) watt audio amplifier per paging zone.
 - b. The system software shall be capable of selecting the required audio source signal for amplification.



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- c. To enhance system survivability, each audio amplifier shall automatically provide a local 3-3-3 1000 Hz temporal pattern output upon loss of the audio communications with the one-way audio control unit, during an alarm condition.
- d. Audio amplifiers shall be power limited and protected from short circuits conditions on the audio circuit wiring.
- e. Each amplifier shall include a dedicated, selectable 25/70 Vrms output.
- f. Each amplifier shall also include a notification appliance circuit rated at 24Vdc @ 3.5A for connection of visible (strobe) appliances. This circuit shall be fully programmable and it shall be possible to define the circuit for the support of audible, visible, or ancillary devices.

D. DACT

1. The system shall provide off premise communications capability (DACT) for transmitting system events to multiple Central Monitoring Station (CMS) receivers.
2. The system shall capable of providing the CMS(s) with point identification of system events using Contact ID or SIA DCS protocols.
3. In the event of a panel CPU failure during a fire alarm condition, the DACT degrade mode shall transmit a general fire alarm signal to the CMS.

E. User Interfere

1. Main Control & Display

- a. The main display shall be a large 168 character LCD with normal, alarm, trouble, supervisory, disabled point and ground fault indicators.
- b. The interface shall show the first and most recent highest priority system events without any operator intervention. All system events shall be directed to one of four message queues. Messages of different types shall never intermixed to eliminate operator confusion. A "Details" switch shall provide additional information about any device highlighted by the operator.
- c. Receipt of alarm, trouble, and supervisory signals shall activate integral audible devices at the control panel(s) and at each remote annunciation device. The integral audible devices shall produce a sound output upon activation of not less than 85 dBA at 10 feet.
- d. The internal audible signal shall have different programmable patterns to distinguish between alarm, supervisory, trouble and monitor conditions.
- e. The annunciator shall contain the following controls:
 - (1) System Reset Switch with Indicator.
 - (2) System Alarm Silence Switch with Indicator.
 - (3) System Panel Silence Switch with Indicator.
 - (4) Programmable Switch with Indicator.
 - (5) Details Switch.
 - (6) System Message Queue Scroll Switches.
 - (7) 10-Digit Keypad to Enable/Disable System and Functions.



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- f. An authorized operator shall have the ability to operate or modify system functions like system time, date, passwords, holiday dates, restart the system and clear control panel event history file.
 - g. An authorized operator shall be capable of performing test functions within the installed system.
2. Additional Annunciation & Control
- a. The system shall be capable to receive, monitor, and annunciate signals from individual devices and circuits installed throughout the building.
 - b. Each zone, stairwell and elevator bank shall have a control switch to initiate paging. Each paging switch shall have an associated Green LED (zone indicating circuit on) and Yellow LED (zone indicating circuit trouble).
 - c. Manufacturers' 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 LAWA is required.
- F. Internal Modular Power Supply
1. System power supply(s) shall provide multiple power limited 24 VDC output circuits as required by the panel.
 2. Upon failure of normal (AC) power, the affected portion(s) of the system shall automatically switch over to secondary power without losing any system functions.
 3. Each system power supply shall be individually supervised. Power supply trouble signals shall identify the specific supply and the nature of the trouble condition.
 4. All standby batteries shall be continuously monitored by the power supply. Low battery and disconnection of battery power supply conditions shall immediately annunciate as battery trouble and identify the specific power supply affected.
 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 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 the disconnect serves.
- G. Reports
1. The system shall provide the operator with system reports that give detailed description of the status of system parameters for corrective action, or for preventative maintenance programs. The system shall provide these reports via the main LCD, and shall be capable of being printed on any system printer.
 2. The system shall provide a report that gives a sensitivity listing of all detectors that have less than 75% environmental compensation remaining. The system shall provide a report that provides a sensitivity (% Obscuration per foot) listing of any particular detector.



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3. The system shall provide a report that gives a listing of the sensitivity of all of the detectors on any given panel in the system, or any given analog/addressable device loop within any given panel.
4. The system shall provide a report that gives a chronological listing of up to the last 1740 system events.
5. The system shall provide a listing of all of the firmware revision listings for all of the installed network components in the system.

2.4 ANNUNCIATORS

A. General

1. The system shall have the capacity to support 64 network annunciators or EST3 network panel nodes.

B. Remote LCD Annunciator, 3ANN.

1. Remote LCD annunciators shall display each and every point in the system and be sized with the same number of characters as in the main FACP display. Annunciators not capable of displaying each point will not be considered equal. Grouping points to “zones” will not be acceptable.
2. Network alphanumeric annunciators shall be located throughout the facility as indicated on the plans and in the fire safety director's office. This annunciator shall be an Integral part of the Peer to Peer Network for survivability. Systems that require a “host” Network Node to control remote annunciators shall not be considered acceptable.
3. Each annunciator shall contain a supervised, back lit, liquid crystal with a minimum of 8 line with 21 characters per line. Where required, the annunciator shall include additional zonal annunciation and manual control without additional enclosures. The annunciator shall support full ability to serve as the operating interface to the system and shall include the following features;
 - a. Matched appearance with other system displays
 - b. Each LCD Display on each node (cabinet) in the system shall be configurable to show the status of any or all of the following functions anywhere in the system:
 - (1) Alarm
 - (2) Supervisory
 - (3) Trouble
 - (4) Monitor
4. Each annunciator must be capable of supporting custom messages as well as system event annunciation. It must be possible to filter unwanted annunciation of trouble, alarm or supervisory functions on a by point or by geographic area. The annunciators shall be mounted in stand-alone enclosures or integrated into the network panels as indicated on the plans.

C. Graphic Annunciator, ENVOY.

1. The annunciator shall depict the graphical diagrams or matrix lamps as required per the contract drawings and AHJ.



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2. It shall operate on nominal 24 V DC and is battery backed up.
3. All annunciator switches shall be system input points and shall be capable of controlling any system output or function.
4. The graphic annunciator shall be UL, ULC and CSFM Listed.
5. The graphic shall be backlit using high intensity LEDs.
6. The unit shall be semi-flush or surface mounted to match existing.
7. The main graphic door shall be tamper resistant and equipped with a key lock.
8. It shall be possible to update the graphic image in the field without replacing the entire graphic.

2.5 EXISTING FIREWORKS COMPUTER (CUP CONTROL ROOM)

A. Overview

1. The existing Fireworks computer at the CUP control room currently functions as the center point for all operational and administration functions required for the systems provided within the specification. The graphical workstation provides command control and monitoring of the systems provided by this specification. Individual point annunciation shall be provided. Grouping of initiating devices into zones shall not meet the intent of the specification.
2. The existing Fireworks computer at the CUP control room shall be modified to show the final graphic configuration. Custom graphics shall be created or existing graphics modified to show the final site plan of the facility followed by photo building profile and every level of building floor plan map. Additional floor plan sections within a level shall be provided to allow for each initiating device to be clearly shown on a detailed floor plan map

2.6 INTELLIGENT ADDRESSABLE DETECTORS

A. General

1. Each remote device shall have a microprocessor with non-volatile memory to support its functionality and serviceability. Each device shall store as required for its functionality the following data: device serial number, device address, device type, personality code, date of manufacture, hours in use, time and date of last alarm, amount of environmental compensation left/used, last maintenance date, job/project number, current detector sensitivity values, diagnostic information (trouble codes) and algorithms required to process sensor data and perform communications with the loop controller.
2. Each device shall be capable of electronic addressing, either automatically or application programmed assigned, to support physical/electrical mapping and supervision by location. Setting a device's address by physical means shall not be necessary.
3. The System Intelligent Detectors shall be capable of full digital communications using both broadcast and polling protocol. Each detector shall be capable of performing independent fire detection algorithms. The fire detection algorithm shall measure sensor signal dimensions, time patterns and combine different fire parameters to increase reliability and distinguish real fire conditions from unwanted deceptive nuisance alarms.



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Signal patterns that are not typical of fires shall be eliminated by digital filters. Devices not capable of combining different fire parameters or employing digital filters shall not be acceptable.

4. Each detector shall have an integral microprocessor capable of making alarm decisions based on fire parameter information stored in the detector head. Distributed intelligence shall improve response time by decreasing the data flow between detector and analog loop controller. Detectors not capable of making independent alarm decisions shall not be acceptable. Maximum total analog loop response time for detectors changing state shall be 0.75 seconds. The integral microprocessor shall dynamically examine values from the sensor and initiate an alarm based on the analysis of data. Systems using central intelligence for alarm decisions shall not be acceptable.
5. The detector shall continually monitor any changes in sensitivity due to the environmental effects of dirt, smoke, temperature, aging and humidity. The information shall be stored in the integral processor and transferred to the analog loop controller for retrieval using a laptop PC or the SIGAPRO Signature Program/Service Tool.
6. Each detector shall have a separate means of displaying communication and alarm status. A green LED shall flash to confirm communication with the analog loop controller. A red LED shall flash to display alarm status.
7. The detector shall be capable of identifying up to 32 diagnostic codes. This information shall be available for system maintenance. The diagnostic code shall be stored at the detector.
8. Each smoke detector shall be capable of transmitting pre-alarm and alarm signals in addition to the 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.
9. Each detector microprocessor shall contain an environmental compensation algorithm, which identifies and sets ambient "Environmental Thresholds" approximately six times an hour. The microprocessor shall continually monitor the environmental impact of temperature, humidity, other contaminants as well as detector aging. The process shall employ digital compensation to adapt the detector to both 24 hour long-term and 4 hour short-term environmental changes. 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. Differential sensing algorithms shall maintain a constant differential between selected detector sensitivity and the "learned" base line sensitivity. The base line sensitivity information shall be updated and permanently stored at the detector approximately once every hour.
10. The intelligent analog detectors shall be suitable for mounting on any Signature Series detector mounting base.
11. The Fire alarm system shall have the ability to set individual smoke detectors for alarm verification. Detector in the alarm verification mode shall indicate, by point in a text format at the main control and at the remote LCD annunciators.

B. Photoelectric Smoke Detector, SIGA-PS.

1. Provide intelligent photoelectric smoke detectors SIGA-PS. The analog photoelectric detector shall utilize a light scattering type photoelectric smoke sensor to sense changes in air samples from its surroundings.



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2. The photo detector shall be rated for ceiling installation at a minimum of 30 ft (9.1m) centers and be suitable for wall mount applications.
 3. The photoelectric smoke detector shall be suitable for direct insertion into air ducts up to 3 ft (0.91m) high and 3 ft (0.91m) wide with air velocities up to 5,000 ft/min. (0-25.39 m/sec) without requiring specific duct detector housings or supply tubes.
 4. The percent smoke obscuration per foot alarm set point shall be field selectable to any of five sensitivity settings ranging from 1.0% to 3.5%. The photo detector 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
 - c. Installation Attitude: no limit
- C. Fixed Temp/Rate of Rise Heat Detector, SIGA-HRS.
1. Provide intelligent combination fixed temperature/rate-of-rise heat detectors SIGA-HRS. The heat detector shall have a low mass thermistor heat sensor and operate at a fixed temperature and at a temperature rate-of-rise. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm.
 2. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. Systems using central intelligence for alarm decisions shall not be acceptable.
 3. The intelligent heat detector shall have a nominal fixed temperature alarm point rating of 135 degrees F (57 degrees C) and a rate-of-rise alarm point of 15 degrees F (9 degrees C) per minute.
 4. 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.
- D. Standard Detector Bases, SIGA-SB/SIGA-SB4
1. Provide standard detector mounting bases SIGA-SB suitable for mounting on North American 1-gang, 3½” or 4” octagon box and 4” square box. The base shall, contain no electronics, support all Signature Series detector types and have the following minimum requirements:
 - a. Removal of the respective detector shall not affect communications with other detectors.
 - b. Terminal connections shall be made on the room side of the base. Bases, which must be removed to gain access to the terminals, shall not be acceptable.
 - c. The base shall be capable of supporting one (1) Signature Series SIGA-LED Remote Alarm LED Indicator. Provide remote LED alarm indicators where shown on the plans.
- E. Relay Detector Bases, SIGA-RB / SIGA-RB4
1. Provide standard detector mounting bases SIGA-RB suitable for mounting on North American 1-gang, 3½” or 4” octagon box and 4” square box. The base shall support all Signature Series detector types and have the following minimum requirements:



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- a. Removal of the respective detector shall not affect communications with other detectors.
- b. Terminal connections shall be made on the room side of the base. Bases, which must be removed to gain access to the terminals, shall not be acceptable.
- c. The relay shall be a bi-stable type and selectable for normally open or normally closed operation.
- d. The position of the contact shall be supervised.
- e. The relay shall automatically de-energize when a detector is removed.
- f. 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.
- g. Form "C" Relay contacts shall have a minimum rating of 1 amp @ 30 V DC and be listed for pilot duty.

F. Duct Detector, SIGA-SD

1. Provide intelligent addressable photoelectric duct smoke detectors SIGA-SD. The analog photoelectric detector shall utilize a light scattering type photoelectric smoke sensor to sense changes in air samples from its surroundings. The integral microprocessor shall dynamically examine values from the sensor and initiate an alarm based on the analysis of data. Systems using central intelligence for alarm decisions shall not be acceptable. The detector shall continually monitor any changes in sensitivity due to the environmental effects of dirt, smoke, temperature, aging and humidity. The information shall be stored in the integral processor and transferred to the analog loop controller for retrieval using a laptop.
2. The percent smoke obscuration per foot alarm set point shall be field selectable to any of five sensitivity settings ranging from 0.79% to 2.46%. The duct detector shall be suitable for operation in the following environment:
 - a. Temperature: -20°F to 158°F (-29°C to 70°C)
 - b. Humidity: 0-93% RH, non-condensing
 - c. Air velocity: 100 to 4000 ft/min
3. Provide an air exhaust tube and an air sampling inlet tube, which extends into the duct air stream up to ten feet. The sampling tube can be installed with or without the cover in place and can be rotated in 45 degree increments to ensure proper alignment with the duct airflow.
4. Status LEDs shall remain visible through a clear assembly cover.
5. The unit shall contain a magnet-activated test switch.
6. One integral form C auxiliary alarm relay shall be provided. The relay contact shall be capable of being individually programmed from the control panel. The contact shall be rated for 2.0A at 30VDC
7. Provide Key-activated Remote Test station w/ integral remote alarm indicator SD-TRK where detectors must be accessed by ladder. (CSFM 7300-1657:226)



- G. Vesda LaserPlus Detector shall be provided.

2.7 CONVENTIONAL INITIATING DEVICES

A. General

1. All initiating devices shall be UL Listed for Fire Protective Service.
2. All initiating devices shall be of the same manufacturer as the Fire Alarm Control Panel specified to assure absolute compatibility between the devices and the control panels, and to assure that the application of the initiating devices is done in accordance with the single manufacturer's instructions.

B. Weatherproof Pull Stations, MPSR1-S45W-GE

1. Provide single action, single stage MPSR series fire alarm stations with terminals for wire connections rated for outdoor use.
2. Key reset shall be provided with keys identical to those required for the specified fire alarm panels, booster power supplies and other locked fire alarm cabinets.
3. Finish the station in red plated surface to inhibit corrosion.
4. Compatible factory weatherproof box w/ gasket shall be provided in all locations.
5. Pull Stations shall be individually monitored by addressable monitor module.

C. Projected Beam Smoke Detector, EC-50R/100R

1. The projected beam type smoke detector shall be a 4-wire 12/24 V DC device used with UL listed separately supplied 4-wire control panels only.
2. The unit shall be listed to UL 268 and shall consist of an integrated transmitter and receiver.
3. The detector shall operate between a range of 15 and 330 ft.
4. The temperature range of the beam shall be -22 °F to 131 °F.
5. The beam detector shall feature automatic gain control, which will compensate for gradual signal deterioration caused by dirt accumulation on the lenses.
6. The unit shall include a wall mounting bracket.
7. Testing shall be carried out using a calibrated test filter.
8. Provide wall mounted, EC-LLT, test station at ground level. Test stations shall include Power and Alarm LEDs with a key activated test switch on a single gang plate. (CSFM 7260-1657:234)
9. The unit shall be individually monitored for alarm trouble by addressable monitor module.



2.8 INTELLIGENT ADDRESSABLE MODULES

A. General

1. Each remote device shall have a microprocessor with non-volatile memory to support its functionality and serviceability. Each device shall store as required for its functionality the following data: device serial number, device address, device type, personality code, date of manufacture, hours in use, time and date of last alarm, amount of environmental compensation left/used, last maintenance date, job/project number, current detector sensitivity values, diagnostic information (trouble codes) and algorithms required to process sensor data and perform communications with the loop controller.
2. Each device shall be capable of electronic addressing, either automatically or application programmed assigned, to support physical/electrical mapping and supervision by location. Setting a device's address by physical means shall not be necessary.
3. It shall be possible to address each Intelligent Signature Series 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. Single Input Module, SIGA-CT1

1. Provide intelligent single input modules SIGA-CT1 for monitoring of PIV's, Fan Status, Tamper Switches, Flow Switches, Generator & Fire Pump Status, Pre-action System Alarm or Trouble or any other dry contact required to be monitored.
2. 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.
3. 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.
4. 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)

C. Dual Input Module, SIGA-CT2



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1. Provide intelligent dual input modules SIGA-CT2 for monitoring of sets of PIV's, Fan/Damper Status, Tamper Switches, Flow Switches, Generator & Fire Pump Status, Pre-action System Alarm or Trouble or any other sets of dry contacts required to be monitored.
2. 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.
3. 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.
4. 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)

D. Signal Module, SIGA-CC1

1. Provide intelligent single input signal modules SIGA-CC1 for activation of booster power supplies, audible/visual circuits, speaker circuits or for monitoring and communication of phone jacks.
2. 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.
3. 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.
4. The single input signal module shall support the following operations:
 - a. Audible/Visible Signal Power Selector (Polarized 24 V DC @ 2A, 25Vrms @50w or 70 Vrms @ 35 Watts of Audio)
 - b. Telephone Power Selector with Ring Tone (Fire Fighter's Telephone)
5. When selected as a telephone power selector, the module shall be capable of generating its own "ring tone".

E. Synchronized Signal Module, SIGA-CC1S

1. Provide intelligent single input signal modules SIGA-CC1S for activation of booster power supplies and/or audible/visual circuits that require synchronization.
2. 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.
3. 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.
4. The single input signal module shall support the following operations:



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- a. Audible/Visible Signal Power Selector (Polarized 24 V DC @ 2A, 25Vrms @50w or 70 Vrms @ 35 Watts of Audio)
 - b. Telephone Power Selector with Ring Tone (Fire Fighter's Telephone)
5. Provides UL1971 auto-sync output for synchronizing multiple notification appliance circuits
- F. Control Relay Module, SIGA-CR
1. Provide intelligent control relay modules SIGA-CR for activation and/or shutdown of fans, dampers, door holder circuits, door locks, shunt trip, elevator recall or any other fail safe system requiring control or activation.
 2. The Control Relay Module shall provide one form "R" dry relay contact rated at 2 amps @ 24 V DC to control external appliances or equipment shutdown.
 3. The control relay shall be rated for pilot duty and releasing systems.
 4. The position of the relay contact shall be confirmed by the system firmware.
 5. All addressable control relay modules, SIGA-CRs, shall be clearly labeled with the appropriate addresses, using an electronic label maker such as a "P-Touch."
 6. The addressable control relay module shall be suitable for mounting on North American 2 1/2" (64mm) deep 1gang boxes and 1 1/2" (38mm) deep 4" square boxes with 1-gang covers.
- G. Manual Pull Station, SIGA-270
1. Provide intelligent single action, single stage fire alarm stations SIGA-270. The fire alarm station shall be of metal construction with an internal toggle switch. Provide a locked test feature. Finish the station in red with silver "PULL IN CASE OF FIRE" English lettering.
 2. The manual station 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.
 3. Provide compatible surface mount red box, 276B-RSB, at all surface mount locations. Standard electrical boxes are not acceptable.

2.9 NOTIFICATION APPLIANCES

A. General

1. All appliances shall be UL Listed for Fire Protective Service.
2. All strobe appliances or combination appliances with strobes shall be capable of providing the "Equivalent Facilitation" which is allowed under the Americans with Disabilities Act accessibility guidelines (ADA (AG)), and shall be UL 1971.
3. 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 manufacturers' instructions.
4. Any appliances, which do not meet the above requirements, and are submitted, for use must show written proof of their compatibility for the purposes intended. Such proof



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shall be in the form of documentation from all manufacturers which clearly states that their equipment (as submitted) are 100% compatible with each other for the purposes intended.

B. Wall Strobes, Genesis G1 Series

1. Strobes shall provide synchronized flash outputs. The light output shall be an even "FullLight" pattern with no hot spots. Strobes using specular reflectors are not acceptable.
2. It shall be possible to flash the strobe at a temporal flash rate to match the Chime and meet the intent of UL Private Mode signaling.
3. The strobe shall have selectable 15, 30, 75 or 110 cd settings.
4. It shall be possible to change the strobe setting without removing the device from the wall
5. The strobe shall be a low profile design, finished in neutral white and shall not protrude more than 1" off the wall. In-out screw terminals shall be provided for wiring.
6. The strobe shall be suitable for wall mounting and shall mount in a standard North American 1gang box. All mounting hardware shall be captive and there shall be no mounting screws visible after the device is installed.

C. Ceiling Strobes, Genesis GC Series

1. Strobes shall provide synchronized flash outputs. The light output shall be an even "FullLight" pattern with no hot spots. Strobes using specular reflectors are not acceptable.
2. It shall be possible to flash the strobe at a temporal flash rate to match the Chime and meet the intent of UL Private Mode signaling.
3. The standard ceiling strobe shall have selectable 15, 30, 75 or 95 cd settings.
4. The high output ceiling strobe shall have selectable 95, 115, 150 or 177 cd settings.
5. It shall be possible to change the strobe setting without removing the device from the ceiling.
6. The strobe shall be a low profile design, finished in neutral white and shall not protrude more than 1.6" off the ceiling. In-out screw terminals shall be provided for wiring.
7. The strobe shall be suitable for ceiling mounting and shall mount in a standard 4" square 2 1/8" (54 mm) deep electrical box. All mounting hardware shall be captive and there shall be no mounting screws visible after the device is installed.

D. Weatherproof Wall or Ceiling Strobes, Integrity CS405 Series

1. In and out screw terminals shall be provided for wiring.
2. Strobes shall provide synchronized flash.
3. Strobe output shall be determined as required by its specific location and application from a family of 15cd, 60cd, or 110cd devices
4. Strobes shall mount in a North American 1-gang box. For weatherproof application provide weatherproof wall boxes for mounting.



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E. Wall Speakers, Genesis G4 Series

1. It shall be a low profile design, finished in neutral white and shall not protrude more than 1" off the wall. In-out screw terminals shall be provided for wiring.
2. 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.
3. Wattage setting shall be visible with the cover installed.
4. It shall be suitable for wall mounting and shall mount in a standard North American 4" x 2 1/8" square electrical box. All mounting hardware shall be captive and there shall be no mounting screws visible after the device is installed.

F. Wall Speaker-Strobes, Genesis G4 Series

1. Strobes shall provide synchronized flash outputs. The light output shall be an even "FullLight" pattern with no hot spots. Strobes using specular reflectors are not acceptable.
2. It shall be possible to flash the strobe at a temporal flash rate to match the horn and meet the intent of UL Private Mode signaling.
3. The strobe shall have selectable 15, 30, 75 or 110 cd settings.
4. The high output strobe shall have selectable 95, 115, 150 or 177 cd settings.
5. It shall be possible to change the strobe setting without removing the device from the wall.
6. It shall be a low profile design, finished in neutral white and shall not protrude more than 1" off the wall. In-out screw terminals shall be provided for wiring.
7. 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.
8. Wattage setting shall be visible with the cover installed.
9. It shall be suitable for wall mounting and shall mount in a standard North American 4" x 2 1/8" square electrical box. All mounting hardware shall be captive and there shall be no mounting screws visible after the device is installed.

G. Ceiling Speaker-Strobes, Genesis GC Series

1. Strobes shall provide synchronized flash outputs. The light output shall be an even "FullLight" pattern with no hot spots. Strobes using specular reflectors are not acceptable.
2. It shall be possible to flash the strobe at a temporal flash rate to match the horn and meet the intent of UL Private Mode signaling.
3. The standard ceiling strobe shall have selectable 15, 30, 75 or 95 cd settings.
4. The high output strobe shall have selectable 95, 115, 150 or 177 cd settings.



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5. It shall be possible to change the strobe setting without removing the device from the ceiling
6. The low profile speaker shall 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.
7. Wattage and Candela setting shall be visible with the cover installed.
8. It shall be a low profile design, finished in neutral white and shall not protrude more than 1.6" off the ceiling. In-out screw terminals shall be provided for wiring.
9. The strobe shall be suitable for ceiling mounting and shall mount in a standard flush mounted 4" square 2 1/8" (54 mm) deep electrical box. All mounting hardware shall be captive and there shall be no mounting screws visible after the device is installed.

H. Wall Weatherproof Speakers, Integrity 757 Series

1. Provide 4" surface weatherproof re-entrant speakers at the locations as required.
2. Speakers shall provide 2w, 4w, 8w, and 15w power taps for use with 25V or 70V systems.
3. The re-entrant speakers shall utilize high efficiency compression drivers. Cone type drivers are not acceptable.
4. At the 15 watt setting, the speaker shall provide a 102 dBA sound output over a frequency range of 400-4000 Hz. when measured in reverberation room per UL-1480.

I. Weatherproof boxes (EST 757A-WB) shall be provided for outdoor mounting.

2.10 ACCESSORY EQUIPMENT

A. Multi-Voltage Control Relays, MR Series

1. General
 - a. Provide remote control relays connected to supervised ancillary circuits for control of fans, dampers, door releases, etc.
 - b. Relay contact ratings shall be SPDT and rated for 10 amperes at 115 VAC.
 - c. A single relay may be energized from a voltage source of 24 VDC, 24 VAC, 115 VAC, or 230 VAC.
 - d. A red LED shall indicate the relay is energized.
 - e. A metal enclosure shall be provided.
2. MR-100 Series
 - a. Relay contact ratings shall be SPDT and rated for 10 amperes at 115VAC.
3. MR-200 Series
 - a. Relay contact ratings shall be DPDT and rated for 10 amperes at 115VAC.

B. Electromagnetic Door Holders, EST 1500 Series, CSFM 3550-1501:137



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1. General - Electromagnetic door holders submitted for use must have written proof of their compatibility for the purposes 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.
 2. Wall Mounted, 1504/1505/1508/1509 Series
 - a. Provide flush, semi-flush or surface wall mounted electromagnetic door holder/releases selectable to 24VAC/DC or 120VAC as directed by the Consulting Designer. Finish shall be brushed zinc.
- C. Remote Booster Power Supplies, BPS6A/BPS10A, CSFM 7300-1657:229
1. Unit shall be a self-contained with 24VDC power supply and batteries housed in its own locked enclosure. Keys provided shall be identical to the keys provided for all other fire alarm equipment provided.
 2. Power supply shall be available in both 10 Amp or 6.5 Amp models and 110VAC or 220VAC.
 3. On board LED indicators for each resident NAC, battery supervision, ground fault and AC power.
 4. The power supply shall provide four (4) independent 3Amp NACs. Each circuit can be configurable as an auxiliary output.
 5. Configurable for any one of three signaling rates: 120SPM; 3-3-3 temporal; or, continuous.
 6. Two independent and configurable inputs switch selectable to allow correlation of the two (2) inputs and the four (4) outputs.
 7. NACs shall be configurable for either four Class B or two Class A circuits.
 8. The unit shall be compatible with SIGA-CC1S for synchronization of multiple power supplies without inter-connect wiring.
 9. Brackets shall be provided inside the enclosure to allow mounting the signaling modules. All signaling modules shall be listed to be located inside the booster power supply enclosure.
 10. A selectable dip switch shall enable built in synchronization for horns and strobes which may be used to synchronize downstream devices, as well as other boosters and their connected devices. As-built drawings should also provide this information.
 11. All circuit breakers and electrical panels providing AC power to the booster power supply panels must be properly identified using an electronic label maker and these labels shall be installed inside the front cover of the panels. As-built drawings should also provide this information.
- D. Pre-Action/FM 200 Panel or Specialized Fire Suppression Panel
1. A sequence of operation in picture framed (min. size 11"x17") shall be installed next to the pre-action or FM 200 panel.
 2. A simple set of operating instructions in picture framed (min. size 11"x17") shall be installed within three feet of the pre-action or FM 200 panel



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3. All pre-action or FM 200 smoke detectors shall be appropriately labeled indicating zone assignments or similar designations with an electronic label maker such as a “P-Touch.”
4. A map (min. size 11”x17” plastic laminated) indicating the locations of all smoke detectors shall be installed next to the pre-action or FM 200 panel.
5. Update Fire Control Room existing sequence of operations to reflect the changes.

2.11 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 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 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.
 5. All audible notification appliance circuits shall be 14 AWG THHN minimum twisted pairs or per manufacturer's requirements.
 6. All visual notification appliance circuits shall be 14 AWG minimum THHN twisted pairs or per manufacturer's requirements.
 7. All wiring shall be color-coded throughout, to National Electrical Code standards.

2.12 CONDUIT RACEWAY

- A. All systems and system components listed to UL864 Control Units for Fire Protective Signaling System may be 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.



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- 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. Existing conduit raceway system may be re-used where possible.
- H. 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.
- I. 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.
- J. 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.
- K. All penetration of floor slabs and firewalls shall be sleeved (1" conduit minimum) fire stopped in accordance with all local fire codes.
- L. All junction box covers shall be painted red.

PART 3 - INSTALLATION

3.1 INSTALLATION CONDITIONS

- A. 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.
- B. The entire system shall be installed in a workmanlike manner, in accordance with approved manufacturer's wiring diagram.
- C. The Contractor shall be responsible to contract with the Existing LAWA Maintenance Contractor to program the Fire Works system at the Central Utilities Plant and to integrate with the existing EST3 system. The Contractor shall ensure current programming efforts are coordinated with other work and contractors.



3.2 INSTALLATION REQUIREMENTS

- A. Concrete floors shall be X-rayed prior to core drilling.
- B. All pull stations shall be mounted 48 inches above the finished floor, as measured on handle.
- C. Pull stations currently mounted at the incorrect height shall be lowered accordingly when replaced.
- D. All manual pull stations shall be flush mounted. Surface mounted pull stations shall be identified and requested prior to submittal. They shall only be allowed if approved by the Designer prior to installation. All surface mount pull station shall be provided w/ manufacturer's listed back box.
- E. All new audio/visual devices shall be mounted at a minimum of 80 inches and no more than 96 inches above the finished floor, as measured on strobe center. Devices shall be mounted no less than 6 inches from the ceiling.
- F. No area smoke detectors shall be mounted within 36 inches of any HVAC supply, return air register or lighting fixture.
- G. No area smoke or heat detector shall be mounted within 12 inches of any wall.
- H. All fire alarm devices shall be accessible for periodic maintenance. Should a device location not meet this requirement, it shall be the responsibility of the installing contractor to bring it, in writing, to the attention of the Project Designer. Failure to bring such issues to the attention of the Project Designer shall be the exclusive liability of the installing Electrical Contractor.
- I. End of Line Resistors shall be furnished as required for mounting as directed by the manufacturer.
- J. Devices containing end-of-line resistors shall be appropriately labeled. Devices should be labeled so removal of the device is not required to identify the EOL device. All EOL resistors shall be clearly identified in shop and As-built drawings.
- K. All addressable modules shall be mounted within 36 inches of the monitored or controlled point of termination. This shall include, but is not necessarily limited to, fan shutdown, elevator recall, shunt trip, sprinkler status points, or door release. Label all addressable modules as to their function.
- L. Power-limited/Non-power-limited NEC wiring standards SHALL BE OBSERVED.
- M. Auxiliary relays shall be appropriately labeled on the exterior to indicate "FIRE ALARM SYSTEM" and their specific function (i.e. FAN S-1 SHUTDOWN) to match existing.

3.3 TEST & INSPECTION

- A. All fire alarm testing and inspection shall be in accordance with the requirements of Chapter 14 of the latest edition of NFPA 72 and applicable LAFD Fire Code.



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- B. The system shall be pre-tested and documented prior to the final inspection by the AHJ. The LAWA shall be notified of the pretest 48 hours in advance and shall witness this test if desired.
- C. The pre-test shall include the following:
 - 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. Proper operation and execution of all its sequences
- D. Perform a magnahelic test on all new duct smoke detectors to verify proper installation. Provide a copy of all measurements to LAWA.
- E. Perform 10% functional testing to all installed initiating devices. If 10% of the test sample failed, add additional 10% new initiating devices pick at random by AHJ for testing. If 20% of the initial test sample failed, add 20% new initiating devices pick at random by AHJ for testing. If 30% of the initial test sample failed, add 30% new initiating devices pick at random by AHJ for testing. If greater than 30% of the initial test sample failed, test 100% all installed initiating devices.
- F. At the final test and inspection, a factory-trained representative of the system manufacturer shall demonstrate to the LAWA, his representative, and the local fire inspector all its sequence of operations and any additional tests required by the AHJ. In the event the system does not operate properly, the test may be terminated. Corrections shall be made and the testing procedure shall be repeated until it is acceptable to LAWA and the fire inspector.

3.4 TRAINING

- A. The System Supplier shall schedule and present a minimum of (2) 4 hour segments of documented formalized instruction for the building, detailing the proper operation of the installed System. One training segment shall be available at the completion of the project. The second training segment may be required within the warranty period. Training shall be for a minimum of 10 personnel. Multiple training sessions may be required to accommodate off-shift LAWA personnel.
- 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.

END OF SECTION 28 31 00