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SPECIFICATIONS FOR
FIRE DETECTION AND ALARM SYSTEMS
NEW MEXICO PUBLIC SCHOOLS

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SECTION 16721
ADDRESSABLE FIRE DETECTION AND ALARM

1.0 GENERAL

1.1 RELATED DOCUMENTS

Related Documents: Drawings, Notice to Bidders, General Conditions, Project Coordination, RFP Format, Requested RFP Alternatives, Cutting and Patching, Standard Terms and Conditions, and all Appendices apply to the work of this section.

1.2 DESCRIPTION OF WORK

A. Provide all required labor, warranty labor, materials, equipment, system programming, submittals and services necessary for new devices, replacement devices, equipment upgrades and required circuits to provide complete and operational fire alarm systems and the fire alarm networking annunciation as hereinafter described and as shown on the drawings.

B. Work shall begin at the source of 120 volt AC power for the fire alarm panel and shall include but not be limited to providing the following:

1. Intelligent/Addressable Fire Alarm Control Panels
2. SLC Circuits
3. Dedicated Power Circuits
4. Initiation Circuits
5. Notification Circuits
6. Control Circuits
7. Monitoring Circuits
8. Conduit Sleeves as shown on the Drawings
9. Detection Devices
10. Monitoring of Automatic Sprinkler Tamper and Flow Switches
12. Audible/Visual Devices
13. Alarm Verification
14. HVAC Shutdown
15. Door Release/Unlock
16. Connection to Building Automation System
17. Monitoring of Releasing Panels
18. Digital Alarm Communicator Transmitter (DACT)
19. DACT Circuits to Telephone Equipment
20. Alpha-Numeric Annunciator

C. Provide a minimum of six hours training for staff personnel, in the operation and use of the system.

D. Remove all fire alarm system devices, equipment, conductors exposed raceway, and any other components of fire alarm systems installed prior to this contract that are not specifically called out to be reused by these specifications or the drawings.
E. The system equipment and devices to be installed can be more specifically described as:

1. PROVIDE DESCRIPTION OF THE FACILITY, LOCATION, BUILDING, LEVEL OF ALTERATION AND GENERAL SCOPE OF THE FIRE ALARM SYSTEM PROJECT

1.3 REFERENCES

A. All work shall be installed in accordance with all applicable codes and referenced design standards: VERIFY THE CURRENT ADOPTED CODES AND EDITION DATES

4. NFPA 72 - National Fire Alarm Code
5. NFPA 70 - National Electrical Code
6. American National Standards ICC/ANSI A117.1
7. Factory Mutual Industrial Risk Insurers Recommended Practices

1.4 SYSTEM DESCRIPTION

A. The system shall operate as a low voltage fire alarm system and shall be a complete intelligent addressable supervised fire alarm system as hereinafter specified. Initiation circuits shall meet the minimum requirements of Class B, Style B. Supervisory circuits shall meet the minimum requirements of Class B, Style B. Notification circuits shall meet the minimum requirements of Class B, Style Y. Signaling line circuits shall meet the minimum requirements of Class B, Style 4. Auxiliary circuits, where not installed as signaling line circuits, shall meet the minimum requirements of a Class B, Style W notification circuit. Circuits for relay coil operation shall be 24 volt maximum.

B. The control panel shall receive its power from a 120 volt AC dedicated branch circuit /connected to the emergency generator/ and labeled “Fire Alarm”. The 24 volt DC power for all system initiation, supervisory, notification and control circuits shall be provided by the main fire alarm control panel power supplies or listed auxiliary power supplies.

C. Upon loss of power to the control panel, the entire system shall transfer to secondary power within 10 seconds, and without loss of signals. The system shall operate under secondary power in normal or trouble conditions for twenty-four (24) hours and have sufficient power to support complete alarm condition operation for a subsequent five (5) minutes.

D. Upon loss of primary power to the control panel(s), all emergency exits that are locked by electronic means and that can prevent egress by manual means, shall be unlocked.

E. System network topography shall be master-subordinate. The Local Area Network circuit medium between the network nodes shall be copper conductor Style 4. All network nodes shall have the capability for local operation of alarm detection, supervisory, occupant notification and control functions if network operation is impaired or disconnected. Systems using token ring or polling protocols shall be acceptable.
F. System Operation shall be:

1. Abnormal circuit conditions as required for the Class and Style of the circuit, shall initiate a "trouble" condition at the control panels and remote annunciators for that specific circuit. The "trouble" indication shall describe the nature of the condition on the affected circuit. The DACT shall transmit a general "trouble" condition to an Underwriters Laboratories, Inc. (U.L.) listed central station. A central station as approved by responding fire department or fire marshal.

2. Devices in an abnormal state shall initiate a "trouble" condition at the control panels and remote annunciators for that specific device. The "trouble" indication shall describe the nature of the condition and specific address and alpha-numeric description of the device affected. The DACT shall transmit a general "trouble" condition to a U.L. listed central station. A central station as approved by responding fire department or fire marshal.

3. The closed position of a sprinkler system control valve shall indicate a valve specific "supervisory" condition at the control panels and remote annunciators. The DACT shall transmit a general "supervisory" condition to a U.L. listed central station.

4. Activation of any pull station, return-side duct detector, heat detector, smoke detector, device monitoring water-flow in the sprinkler system, or device monitoring activation of any suppression system shall initiate a device specific "alarm" condition at the control panels and remote annunciators by device address and by device location label. The DACT shall transmit a general alarm to a U.L. listed central station.

5. Activation of any supply-side duct detector shall indicate a device specific "supervisory" condition at the control panels and remote annunciators. The DACT shall transmit a general "supervisory" condition to a U.L. listed central station.

6. Activation of any supply-side or return-side duct smoke detector shall shut down the affected air handling unit.

7. Activation of any water-flow monitoring device shall activate the audible device at the fire department connection on the exterior of the building.

8. Activation of any smoke detector adjacent to a fire door maintained open by electric holders shall release the door to close.

9. Activation of an alarm condition in a temporary or portable classroom shall indicate the building of alarm on the main panel and remote annunciators. Main building notification appliances shall not energize. The DACT shall transmit a general "alarm" condition to a U.L. listed central station.

10. Additional indications, notifications, enabling functions or control functions shall be as outlined in the Fire Alarm Control-by-Event Matrix in the appendix/on the drawings.
G. Initiation of an "alarm" condition shall result in the following functions to be performed by the system:

1. Initiate an alarm indication on the panel by tone and illuminate the corresponding device specific alphanumeric LCD description. Manually activating the "Alarm Silence" shall silence the tone at the panel. The alarm alphanumeric display shall remain "on" at the panel until the condition causing the alarm has been cleared and reset. An additional alarm reported to the panel subsequent to activating the "Alarm Silence" shall reactivate the panel tone.

2. Actuate all audible/visual and visual devices throughout the building.

3. Manually activating the "Alarm Silence" at the panel shall de-energize the (audible/visual, speaker/visual, visual, and speaker) devices. An additional alarm reported to the panel subsequent to activating the "Alarm Silence" shall re-energize the audible/visual, visual, and speaker devices.

4. Transmit an “alarm” signal to the U.L. listed central station.

5. Control panel shall initiate a change of status for output contacts to notify the Building Automation System (BAS).

6. Unlock all emergency exits which are equipped with locking hardware and can prevent egress by manual means.

H. All wiring 7 feet or less above the finished floor and not concealed in partitions, or subject to physical damage, or non-power limited, or in elevator hoistways or where required by applicable codes shall be installed in conduit.

1.5 QUALITY ASSURANCE

A. All work shall meet the requirements of the applicable codes, New Mexico State Fire Marshal's Office (Fire Marshal), Specific School District (The District), The Public School Facility Authority (Authority), and Engineer of Record.

B. All equipment and components shall be listed by Underwriters' Laboratories for the actual intended use unless hereinafter specifically excluded from such a listing.

C. Installation and supervision of installation shall be in strict compliance with the requirements of the regulations, licenses, and permits for fire alarm system installers in this jurisdiction and must possess a Certificate of Fitness from the Fire Marshal.

D. Installer must have been actively engaged in the business of selling, installing, and servicing fire alarm systems for at least three (3) years.

E. Installer must be an authorized representative of the Fire Alarm Equipment Manufacturer (FAEM) and have technical factory training specifically for the system proposed.

F. The FAEM shall have a representative supervise the final connection of devices and wiring and programming of the control panels.
1.6 REGULATORY REQUIREMENTS

A. All work shall meet the requirements of Section 1.3.

B. No approvals or interpretations of the design documents shall be pursued except through the Engineer of Record by written submission.

C. Any work performed prior to the satisfactory review of the shop drawings which shall be stamped and sealed by the Engineer of Record and determined to be non-compliant with the contract documents or applicable codes by the Authority’s Representative or Engineer of Record will be replaced at the Contractor’s expense.

D. Contractor shall submit all records of final testing to the Fire Marshal and Authority. The system will not be acceptable until final testing is complete and until receipt and approval of the Inspection and Testing Form is received from the Fire Marshal.

E. The Contractor hereby acknowledges that all dollar amounts quoted in contract documents, correspondence, unit prices, alternate proposals and any other prices provided by the Contractor or requested by the Owner’s representatives include all sales, use, value-added, excise or other taxes currently in place or enacted in the course of the project. No additional amounts of compensation are to be charged to the Owner for taxes applicable to this project.

1.7 SUBMITTALS

A. Prior to commencement of work the contractor shall submit to the Authority and the District’s Representative the following:

1. One (1) copy of the transmittal of the permit application to the Applicable local agency.
2. One (1) copy of the authorization that the installing contractor is a duly qualified representative of the fire alarm equipment manufacturer.
3. One (1) copy of the installing contractor’s Certificate of Fitness from the Fire Marshal.

B. Prior to application for the initial payment, the following documents shall be received and approved by the Authority and the District’s Representative:

1. Two sets of reproducible installation drawings and three sets of bond installation drawings. Submittal must be comprehensive of the entire project, complete in all detail, and include, but not be limited to, the following:
   a) All information and sheets required by the Fire Marshal’s published “Fire Detection and Alarm System Submittal Guidelines”.
   b) Floor plans showing equipment placement, including existing equipment placement. For equipment circuits to be installed in this project, floor plans shall show wiring types and sizes, conduit types and sizes, wiring and raceway routes. Floor plans shall be provided in AUTOCAD Release 14 or later version and also in PDF format.
   c) Sequence of Operations to include a detailed description of the operation of each system function.
   d) Point to point wiring diagrams for equipment to be installed in this contract.
   e) Single riser diagram for notification devices and circuits, auxiliary power supplies, audio devices and circuits, and existing devices and circuits.
f) Supervisory and alarm current calculations for primary power and emergency battery sizing.
g) Voltage drop and signal loss calculations for notification and communications circuits.
h) Manufacturers' literature on all system equipment and system conductors. Literature shall include specification and description of recommended supporting methods, enclosures or boxes, and wiring connections.

2. One (1) copy of an approved schedule of values to be the basis for all progress payment requests by the Contractor.

C. The following submittals shall be received by the Authority prior to the request for a State Fire Marshal acceptance inspection:

1. One (1) copy each of all installation manuals in hard copy and electronic media.
2. One (1) original of the Fire Marshal’s “Public School Fire Alarm Pre-inspection Checklist” in hard copy and electronic media.
3. One (1) sample copy of the documentation format for recording the fire alarm system acceptance test. Test document format shall, as a minimum, comply with the requirements of NFPA 72 and individually indicate each addressable initiating device.
4. Half scale (11 inches by 17 inches) contractor record drawings of the system showing all devices, circuit designations and device addresses.

1.8 PROJECT RECORD DOCUMENTS

A. Prior to final payment for the fire alarm system and the beginning of the warranty period, submit the following completed project record documents to the Authority and the District’s Representative:

1. Copies of all reports for tests and inspections as required by the Authority and Local Agencies.
2. All permits and licenses required to be in the possession of the Owner, the Authority and Local Agencies.
3. Record drawings of the complete installation to include, but not be limited to information required on the installation drawing submittal. All information shall accurately show the completed installation. Record drawings of the floor plans shall be provided in AUTOCAD Release 14 or later version and also in PDF format. Provide drawings in hard copy and electronic media.
4. Original warranty documents including, but not limited to, those of the fire alarm equipment manufacturer and installing contractor(s). Warranty documents shall reference and be binding to the warranty provisions specified.
5. Copies of all site specific programming on electronic media suitable for downloading into the fire alarm system.
6. Service directory which includes the main 24-hour emergency service number and at least three alternate numbers which are monitored on a 24-hour basis.
7. Three (3) sets of equipment warranties and three (3) set of operations and maintenance instructions to the Owner.

8. Preventive maintenance schedule for the system.

B. Contractor shall provide to the Engineer of Record, in writing, any comments from the local agencies or the Fire Marshal within five (5) working days after the receipt of their comments. Engineer of Record will determine the appropriate actions for response to the comments.

2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The following manufacturers are acceptable as the FAEM for this project.

1. INSTALL ACCEPTABLE MANUFACTURERS HERE
2. INSTALL ACCEPTABLE MANUFACTURERS HERE
3. INSTALL ACCEPTABLE MANUFACTURERS HERE
4. INSTALL ACCEPTABLE MANUFACTURERS HERE
5. Approved Equal.

B. The products of other vendors may be considered if compliant with the requirements of these contract documents and if submitted to the Engineer of Record for review three weeks prior to the published bid date. Acceptability of any alternate FAEM will be determined only and wholly by the Engineer of Record

C. All devices and equipment must be manufactured by the FAEM or by listed “OEM” producers for the FAEM.

2.2 CONTROL PANELS

A. Provide a control panel(s) that has/have modular components, utilizing distributed solid state programmable microprocessors to accomplish all system functions. These components shall include but not be limited to the following items:

1. System processing free of any operational impairments resulting in a change of date through the year 2030.
2. Non-volatile RAM memory that provides for no program loss if a primary and secondary power loss occurs.
3. Detection of removal, disconnection, or failure of any control panel module.
4. A real time clock circuit to execute custom time control programs and time/date stamp events.
5. System core processing capability of a minimum (400/600) addressable points including the necessary software, programming, motherboard/expansion card sockets.
6. Signaling line circuits (SLC) for a minimum (300/500) addressable points including a minimum (200/300) addressable detection devices and (100/200) addressable input modules and/or output modules. No SLC shall be assigned more than eighty (80) percent of its point capacity unless approved in writing by the Engineer of record.

7. System shall be capable of using each and every input or detection device address as an individual software input software zone. Manufacturers shall indicate on the submitted data sheets all limitations to such programming. Systems shall have, as a minimum, a quantity of input zones available to perform all specified functions with the additional spare capacity of 20% of the zones or the total quantity of addresses on the systems whichever is greater.

8. System shall be capable of controlling the state of contacts located in remote addressable modules, smoke detector base-mounted programmable relays, and outputs on the panel including all necessary hardware and software. Each and every output address shall be capable of individual control by the processor. Systems that have a quantity of output software zones fewer than the quantity of output addresses shall not be acceptable.

9. System shall be capable of “and/or” logical functions using the individual input and detection address states as inputs.

a) System processor shall be capable of reading and using the status of individual address devices (both input type and output type devices), software groupings of addresses, software zones and control panel modules as criteria to generate logical function outputs.

b) The system processor shall be capable of affecting the state or condition of individual addressable devices, software groupings of addresses, software zone states and control panel modules as outputs of logical functions.

10. Interface for supervised remote annunciators.

11. System processing capable of supporting initiation data circuits which can be "T-tapped" at any location on the signaling line circuit (SLC). Any circuit length limitations or branch tap length requirements of the system actually supplied shall be coordinated so that the full capacity of the circuits shown on the drawings and referenced in the specifications shall be available to the system. Any additional modules, programming, or required circuits to achieve the specified system capacity shall be provided and installed at no cost to the Owner.

12. Automatic detector test feature which permits reading and adjusting the sensitivity of all intelligent detectors from the control panel.

13. Drift compensation feature that monitors sensitivity variation and initiates a trouble condition if detector threshold reaches false alarm or non-alarm conditions. Feature shall perform electronic adjustments for existing conditions within the U.L. recommended limits.

14. Function testing of any intelligent detector or addressable interface device individually or by software zone from the control panel without actuation of notification devices.
15. An integral display with a minimum eighty (80) characters liquid crystal display (LCD). Provide light-emitting diodes (LED) for AC power, system alarm, system trouble, display trouble and disable. The display shall be visible through the control panel cabinet's transparent window. The processor shall be capable of displaying historical log data; current system status information; and all individual device addresses, descriptions and conditions on the integral display.

16. System processing capable of supporting addressable analog smoke detection, addressable analog heat detection, addressable pull stations, addressable monitoring modules, and remote addressable control modules.

17. Control panel shall be capable of including/shall include an integral module for serial data output (RS-232) to an ASCII based printer. This module shall be in addition to other RS-232 outputs (if any) required for other devices. The contractor shall assure proper operation of the output transmissions. The control panel cabinet and circuit board slots shall be of sufficient size and capacity for future addition of (this/these) modules.

18. Programming for the sequence of operations shall be able to be accomplished by all of the following three methods. The initial sequence of operation program shall be installed on the system by the method “a” described below. Modifications to the programming shall be permitted by any of the three methods listed. Systems that cannot be programmed by all methods listed below are not acceptable. Programmers or programming installers that cannot perform all methods listed below shall not be acceptable as FAEM representatives. The control panel shall be provided with any interface modules, software or firmware required to perform these methods. The “lap-top” computer or similar programming device shall remain the property of the Contractor unless otherwise specified in the contract documents.
   
a) The initial sequence of operation program is entered into a “lap-top” computer that is located remote from the project site. On site, the installer shall connect the computer to each control panel requiring programming and perform an automatic file transfer or download of the system sequence of operation program.

b) Modifications to the initial sequence of operation program shall be entered directly to the affected control panel from a “lap-top” computer connected to the panel after installation of the control panel at the project site.

c) Modifications to the initial sequence of operation program shall be entered directly to the affected control panel from the control keypad or switches on the panel after accessing the initial program with the appropriate level password.

19. Provide all power supplies, transformers, batteries, battery chargers and modules for output power to all system devices as required for a complete and operational system. This shall include all required output power circuits necessary for the operation of the system provided whether or not specifically called out in this
specification or on the drawings. As each system manufacturer may have different methods of device control and power, the contractor must provide sufficient output power to the devices to perform the specified functions shown in the Fire Alarm Control-by-Event Matrix, and provide for the stated spare capacity. This spare power capacity shall include all devices indicated on the drawings plus 10% additional power.

20. Modules for connection to the control panel of four (4) spare auxiliary circuits and four (4) spare notification circuits.

21. Provide and install an integral digital communicator within the fire alarm control panel. Include conduit and telephone cabling to the telephone terminal board.

22. History log capable of retaining the most recent 600 automatic or manual entry events (minimum). Access to the event information shall be by both fire alarm control panel display electronic scrolling and downloading to a remote “lap-top”.

23. A flush mounted/surface mounted, baked enameled cabinet with sufficient space for all the herein specified equipment and space for the future equipment modules herein specified. The cabinet shall have a hinged door keyed in common with all other keyed devices throughout the system. If multiple cabinets are required in one location, the cabinets shall be placed immediately adjacent to each other and match in finish and design.

B. Control panel for each temporary or portable classroom building shall include, but not be limited to the following:

1. A processor capable of monitoring a minimum of 20 addressable initiating devices/A minimum of two initiating device zones

2. One notification appliance circuit.

3. A minimum of one set of alarm condition output contacts listed for connection to a fire alarm system addressable monitor module.

4. A minimum of one set of trouble condition output contacts listed for connection to a fire alarm system addressable monitor module.

5. A flush mounted/surface mounted, baked enameled cabinet with sufficient space for all the herein specified equipment and space for the future equipment modules herein specified. The cabinet shall have a hinged door keyed in common with all other keyed devices throughout the system.

6. Power supplies, transformers, batteries, battery chargers and modules for output power to all system devices as required for a complete and operational system. Battery back-up shall be capable of providing 24 hours of stand-by operation with an additional 5 minutes of operation at a full alarm condition.
2.3 FIELD DEVICES

A. Monitor Modules

1. Provide addressable monitor modules where required to interface to contact alarm devices. Provide monitor modules to connect a supervised zone of conventional initiating devices (any normally open dry contact device, including 4-wire smoke detectors) to an intelligent SLC loop. Mount in a 4-inch square electrical box. Wire each zone for Class B, field selectable.

2. Provide address-setting means and store an internal identification code that the control panel shall use to identify the type of device. Provide LED(s) integral to the unit and visible when the unit is installed shall indicate a normal status/power condition (indicating that the monitor module is operational and in regular communication with the control panel). LED(s) integral to the unit and visible when the unit is installed shall indicate that the module activation has been detected.

3. Provide a magnetic test feature to field test the unit for functional operation. Provide an automatic test feature to permit functional testing of the device from the main control panel. Indicate results of the test on the LCD display.

B. Control Modules

1. Provide control/relay modules where required to provide audible alarm interface and/or relay control interface. Provide control modules to connect a supervised zone of conventional indicating devices (any 24 volt DC polarized notification appliance) to an intelligent loop. Mount in a standard 4-inch electrical box. Wire each zone Class B, field selectable. The control module may be optionally wired as a dry contact (Form C) relay. Provide power for the relay actuation from the intelligent detector loop to reduce wiring connection requirements. Provide notification device power from a separate loop from the main control panel or from supervised remote power supplies.

2. Provide address-setting means and store an internal identification code that the control panel shall use to identify the type of device. Provide LED(s) integral to the unit and visible when the unit is installed. It shall indicate a normal status/power condition (indicating that the monitor module is operational and in regular communication with the control panel). LED(s) integral to the unit and visible when the unit is installed shall indicate that a change of state to the module output has occurred.

C. Intelligent Photoelectric Smoke Detectors

1. Provide analog photoelectric smoke detectors. Provide detectors utilizing the photoelectric principal to measure smoke density and, on command from the control panel, send data to the panel representing the ANALOG level of smoke density. Provide automatic sensitivity "drift" compensation to provide long term stability and reliability. Provide a "maintenance alert" feature whereby the detector initiates a trouble condition should the unit's sensitivity approach the outside limits of the normal sensitivity window. Provide the detector with extensive RF and EMF noise reduction circuitry. Provide self-compensating solid state LED light source and photosensitive circuitry.
2. Provide a calibrated test method whereby the detectors will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself by activating the detector magnetic test switch, or may be activated remotely on command from the control panel.

3. Provide address-setting means and store an internal identification code for each detector that the control panel can use to identify the type and precise location of the detector.

4. Provide LED(s) integral to the unit and visible when the unit is installed. LED(s) shall indicate a normal status/power condition (indicating that the detector is operational and in regular communication with the control panel). LED(s) integral to the unit and visible when the unit is installed shall indicate that an alarm condition has been detected.

5. Provide an output connection in the base to connect an external remote alarm LED.

6. Provide semi-flush ceiling mounted, modular detector head with twist-lock base. Provide in smooth white finish, and back-sealed against dirt, vermin, and back pressure. Provide with fine mesh insect/contaminate screen. Provide UL listing with respective control panel.

D. Intelligent Thermal Detectors

1. Provide analog thermal detectors. Provide detectors utilizing dual electronic thermostats to measure temperature levels in its chamber and, on command from the control panel, send data to the panel representing the analog temperature level.

2. Thermal detectors installed in elevator hoistways or elevator equipment rooms that are to be programmed to initiate elevator power shunt-trip on alarm shall actuate in accordance with the U.L. standards for a “rate-of-rise” thermal detector. Combination “rate-of-rise” and “fixed temperature” activation is acceptable. “Fixed Temperature” activation of the detector shall be designed to occur prior to release of water by adjacent automatic sprinklers.

3. Provide a calibrated test method whereby detectors will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself, by activating a magnetic switch, or may be activated remotely on command from the control panel.

4. Provide address-setting means and store an internal identification code for each detector that the control panel can use to identify the type and precise location of the detector.

5. Provide LED(s) integral to the unit and visible when the unit is installed. LED(s) shall indicate a normal status/power condition (indicating that the detector is operational and in regular communication with the control panel). LED(s) integral to the unit and visible when the unit is installed shall indicate that an alarm condition has been detected.

6. Provide an output connection in the base to connect an external remote alarm LED.
7. Provide semi-flush, ceiling mounted, modular detector head with twist-lock base. Provide in smooth white finish, and be sealed against dirt, vermin and back pressure. Provide with fine mesh insect/contaminate screen. Provide U.L. listing with respective control panel.

E. Intelligent Duct Detectors

1. Provide duct mounted intelligent photoelectric smoke detectors. Provide the same type of detection head as specified by the "Intelligent Photo-electric Smoke Detectors" Paragraphs in this specification. Provide units capable of interchanging/accepting either photoelectric or ionization type sensors. Provide detectors operating in air velocities of 300 fpm to 4,000 fpm without adverse effects on detector sensitivity. Provide detectors that communicate directly with the fire alarm control panel without the use of monitor, control or power modules.

2. Provide a molded plastic enclosure with integral conduit knockouts. Provide housing with gasket seals to insure proper seating of the housing to the associated ductwork. Provide sampling tubes that extend a minimum of seventy-five percent (75%) across the width of the duct. Provide porosity filters to reduce sensor/chamber contamination. Provide with integral SPDT auxiliary control contacts.

3. Provide a calibrated test method whereby the detectors will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at a remote test station consisting of a key operated switch and indicating LED, or may be activated remotely on command from the control panel.

4. Provide address-setting means and store an internal identification code for each detector that the control panel can use to identify the type and precise location of the detector.

5. Provide LED(s) integral to the unit and visible when the housing is installed and closed. LED(s) shall indicate a normal status/power condition (indicating that the detector is operational and in regular communication with the control panel). LED(s) integral to the unit and visible when the unit is installed shall indicate that an alarm condition has been detected. LED(s) that are mounted on separate plates and at locations remote from the detector shall be provided/are not required.

6. Duct detector housing shall have ports that can be opened for testing of the duct smoke detector. Placement of the ports shall permit testing personal to measure air flow in the detector housing without removing the duct detector cover. Placement of the ports shall permit testing personnel to insert smoke into the duct detector housing without removing the duct detector cover.

7. Duct detectors that are not listed with the fire alarm control panel, non-addressable, or are provided as part of the HVAC equipment are not permitted.

F. Addressable Manual Pull Stations

1. Provide single action type manual pull stations. On command from the control panel, send data to the panel representing the state of the manual station.
2. Provide address-setting means and store an internal identification code that the control panel can use to identify the type of device.

3. Provide (semi-flush/surface) mounted stations on standard electrical box. Pull station shall be constructed of hi-impact red molded polycarbonate with instructions for station operation in raised white letters.

G. Visual Devices

1. Provide visual alarm devices operable at 24 volt DC and utilizing a high intensity solid state xenon strobe tube and associated lens/reflector system. Connect the visual devices to supervised circuits.

2. Provide (semi-flush/surface/flush) mounted, molded of high-impact red thermo plastic.

3. Provide synchronization on all visual devices where there are more than two devices in any field of view, and the devices are not spaced greater than 55 feet from each other. Provide modules in quantities sufficient to synchronize all required devices. Modules shall be capable of synchronizing devices with candela ratings ranging from 15/75 cd to 110 cd.

H. Combination Audible/Visual Devices

1. Provide solid-state electronic audible alarm devices operable at 24 volt DC and polarized supervised. Provide a temporal pattern tone producing a sound pressure level of 91 dBA to 98 dBA. Electro-mechanical solenoids or contacts will not be acceptable.

2. Provide visual alarm devices integral with the audible alarm devices, operable at 24 volt DC, and utilizing a high intensity solid state xenon strobe tube and associated lens/reflector system. Connect the audible/visual devices to supervised circuits.

3. Provide (semi-flush/surface/flush) mounted, molded of high-impact red thermo plastic.

4. Provide synchronization on all visual devices where there are more than two devices in any field of view, and the devices are not spaced greater than 55 feet from each other. Provide modules in quantities sufficient to synchronize all required devices. Modules shall be capable of synchronizing devices with candela rating from 15/75 cd to 110 cd.

I. Auxiliary Power Supplies:

1. Provide each auxiliary power supply unit in an individual, single, self-contained, lockable cabinet. Input shall be 120 volts AC nominal with an output of regulated 24 volt DC. Unit shall be capable of actuation from either a host panel notification circuit, or programmed dry contacts. Unit shall provide “trouble” indication to host panel upon loss of AC power or abnormal conditions on individual output circuits. Unit shall have a minimum of four (4) output notification circuits rated individually at a minimum of 2 amperes per circuit (minimum). Unit shall be capable of 8 amps total output. Circuiting is based upon auxiliary power supply units of this rating. If units providing equivalent operational features are approved, the
Contractor shall be responsible for all redesign, circuiting, or additional equipment costs to provide the necessary output amperage.

J. Exterior Audible Device
   1. Provide a solid-state electronic audible alarm device operable at 24 volt DC and polarized supervised. Provide a temporal pattern tone producing a sound pressure level of 91 dBA to 98 dBA. Electro-mechanical solenoids or contacts will not be acceptable. Connect the audible/visual device to a supervised circuit.
   2. Provide semi-flush mounted, molded of high-impact red thermo plastic and listed for exterior (weatherproof) installation.

K. Auxiliary Relays
   1. Provide relays for ventilating and air handling control interface. Provide heavy duty type rated up to 10 amps at 24 volt DC. Provide with NEMA I dust cover assembly and SPDT contacts.

L. Remote Annunciators
   1. Provide a remote annunciator with a minimum eighty (80) character liquid crystal display (LCD) which mimics the fire alarm control panel display. The remote annunciator shall have an enable key for operation of integral acknowledge, rest and silence switches. The remote annunciator shall derive all operational power from the fire alarm control panel.

2.4 CONDUCTORS
   A. Initiation, notification and auxiliary device circuit conductors shall be type FPLN, FPLPN, or FPLRN. Where conductors are installed in complete raceway systems, type THHN or TFFN may be used if approved by the manufacturer. Where the size or type of conductor hereinafter specified conflicts with the FAEM’s requirements, the larger size or more specialized conductor type shall be used.
   B. Conductors for any non-power limited circuits shall be type THHN.
   C. Conductors for wet locations shall be:
      1. Types RHW, TW, THW, THHW, THWN or XHHW.
      2. Type listed for use in wet locations.

2.5 RACEWAY
   A. The following raceway types shall permitted:
      1. EMT conduit
      2. RIGID conduit
      3. Non-Metallic conduit for wet locations.
      4. Surface mounted metallic race with a minimum size equivalent to 1/2-inch nominal conduit.
   B. Boxes, supports, and other accessories for the raceway installation shall be listed for the application.

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YELLOW HIGHLIGHT/PROJECT SPECIFIC - MEP TO REVISE
BLUE HIGHLIGHT/APPLICABLE TO SPRINKLERED BUILDING ONLY

DATE
2.6 WARRANTY

A. Repair all defective workmanship or replace all defective materials for a period of three years from the date of acceptance by the State Fire Marshal or the Authority or designated representative. Workmanship or equipment found to be defective during that period shall be replaced without cost to the Owner.

B. The warranty or any part of the warranty shall not be made void by any required operation or inspection of the system after acceptance during the warranty period. The Owner may, at the Owner’s option, select qualified firms other than Warrantor to provide required tests and inspections. System testing and inspections will be conducted only by a duly licensed company under contract with the Owner to perform scheduled testing and inspections as required by the Local Authority. The Warrantor may elect to have a representative present at the scheduled testing during the warranty period.

C. Warranty shall be documented by the issuance of a written service agreement in the name of the Owner.

3.0 EXECUTION

3.1 COORDINATION WITH OTHER TRADES

A. Coordinate closely with all other trades to expedite construction, accurately interface with related systems and avoid interferences.

3.2 INSTALLATION/APPLICATION

A. Furnish and install all circuit conductors, raceway, and outlet boxes.

B. Furnish and install all back-boxes, fire alarm equipment and fire alarm devices.

1. Back-boxes shall be of the exact type recommended by the FAEM as shown on the equipment and device submittals.

2. Devices and equipment must be installed by personnel legally permitted and currently licensed to install the devices and equipment. The cost of installation, warranty of installation and equipment, coordination of the installation, and supervision of the installation are responsibilities of the Contractor.

C. Open conductors and conduits shall be concealed from public view at all locations by routing on the inside of joists, above lay-in ceilings, over girders, within partitions or in any other manner acceptable to the Owner. All conductors and conduits shall be installed at right angles to the building walls, floors and ceilings.

D. Open conductors and conduits shall be supported in a manner and at intervals compliant with NEC requirements. Conductors and conduits installed above lay-in ceilings shall be supported from the building structure and shall not be permitted less than 9-inches above or behind removable panels or ceiling tiles.

E. Circuits shall be installed exposed in finished areas only upon approval of the District’s Representative. Provide surface-mounted metallic raceway for these circuits.

F. All wires shall be tagged at all junction points and shall test free from grounds or crosses between conductors.
G. No other conductors shall be installed in conduits with conductors for the fire alarm system.

H. Final connections between equipment and the wiring system shall be made under direct supervision of a representative of the FAEM. If other personnel are required by the local authorities to be present during final connections, this shall not relieve the Contractor of the responsibility of providing a representative of the FAEM for direct supervision.

### 3.3 EQUIPMENT MOUNTING

**A.** The control panel shall be surface mounted with no operational parts which may require maintenance mounted greater than 72-inches above the finished floor. The control panel annunciator display and control surface shall be mounted so that no switch, manually operated device, display or LED is greater than 60-inches above the finished floor.

**B.** Duct detectors shall be mounted as follows:

1. In the supply and/or return air duct of each HVAC unit of greater than 2,000 cfm capacity. Duct detectors shall be mounted in such a way as to obtain a representative sample of the airstream. Where possible, locate the duct detectors in the zone between 6 and 10 duct widths from any duct bends or inlets.

2. Detectors shall be accessible for cleaning and shall be mounted in accordance with the manufacturer’s instructions and NFPA standards. Coordinate placement of the detector with all affected trades and equipment. Connect all circuit conductors that terminate on the detector.

3. All HVAC equipment shutdown shall be initiated by [addressable control modules/relays](Note: Add the term 'addressable control modules/relays' in the text). Addressable control modules shall be mounted within 3 feet of the motor controller of the affected equipment. Install all control circuits and terminations on the “coil” side of the addressable control modules. Circuits for the “contact” side of the relays shall be by provider of the environmental air controls.

4. Any factory installed or other duct smoke detectors that are not listed for use with the fire alarm system control panel shall be removed and the integrity of the ductwork and HVAC unit shall be maintained.

**C.** Addressable control and monitor modules shall be mounted within 3 feet of the motor controller or output contacts of the affected equipment. Modules shall be mounted in an appropriate box or enclosure with cover. Cover shall be labeled with the module address and description of the monitored or controlled equipment.

**D.** The remote annunciator shall be mounted so that no switch, manually operated device, display, or LED is greater than 60-inches above the finished floor. The remote annunciator shall be located at the entrance designated for responding personnel or as otherwise acceptable to the Authority.

**E.** Manual pull stations shall be securely mounted with the operable part of the manual pull station no greater than 48-inches above the finished floor and no less than 42-inches above the finished floor. All manual stations, except those installed in mechanical rooms, shall be provided with hinged, sounding poly-carbonate covers.
F. Audible/visual and visual devices shall be wall-mounted with their bottoms at 80-inches above the finished floor or 6-inches below the ceiling, whichever is lower. Audible/visual and visual devices in the following locations shall be provided with vandal-resistant covers.

1. Corridors, student restrooms and locker rooms of high schools and middle schools.

2. Gymnasiums of all schools.

G. Weatherproof (audible/visual/visual/horn) notification devices shall be mounted (at the fire department connection on the building exterior and with the final location) as acceptable to the AHJ.

H. All Door release hardware shall be activated by (addressable control modules/ relays). Relays shall be mounted within 3 feet of the affected door release device. Install all control circuits and terminations on the “coil” side of the relays or modules. Connections and circuits for the “contact” side of the relays shall be by provider of the door holder non-power limited circuits.

I. Devices shall not be supported by ceiling tiles. Devices must be attached to back-box supported by the ceiling grid.

J. Smoke detectors shall be installed in accordance with the manufacturer’s recommendations, applicable code requirements, and the following:

1. Smoke detectors shall not be installed within thirty-six (36) inches of air discharge registers or intake registers unless the detectors are installed for the purposes of monitoring return air.

2. Smoke detectors shall not be mounted on beams or soffits protruding more than twelve (12) inches below the ceiling height.

3. Smoke detectors in corridors and common areas (high schools and middle schools only) shall be provided with vandal-resistant covers.

3.4 CUTTING, PATCHING AND FINISHES

A. All fire alarm raceway shall be thoroughly cleaned, removing all dirt, oil, etc. and made ready to receive paint.

1. All fire alarm raceway exposed in mechanical rooms, or exposed in attics or other unfinished areas shall be painted red with an enamel designed for covering metal or the other raceway material.

2. All fire alarm raceway exposed in finished areas shall be painted to match the adjacent existing finish or finished as more specifically described below.

B. Employ a skilled and experienced installer to perform cutting and patching new Work; restore Work with new Products.

C. Submit written request to Owner in advance of cutting or altering structural or building enclosure elements.
D. Holes in walls or floors cut during the performance of this work and all holes or cuts revealed by the removal of existing fire alarm system devices, equipment or circuits shall be patched or covered with standard escutcheon plates so as to completely conceal the cuts where they would otherwise be exposed to view.

E. Provide final finishes to match the existing finish of the existing adjacent surfaces so as to completely conceal patched holes.

OR

Patched surfaces shall be prepared to accept final finishes that match the finish of the existing adjacent surfaces so as to completely conceal patched holes. Final finishes shall be provided by others.

F. Fire stop all penetrations of fire rated assemblies with listed fire-stopping systems.

3.5 SYSTEM TESTS

A. All test and inspections specified in this section shall be reported in writing and submitted in accordance with this specification section.

B. Provide a complete pre-test of the fire alarm system, including fire safety control functions prior to the acceptance testing. Sufficient documentation of the pre-test shall be provided to verify that tests are thorough and performed using the proper methods and equipment. Smoke detectors shall be tested using smoke simulation products.

C. The acceptance tests for the system shall meet all the requirements of the listed applicable codes and the requirements of the Fire Marshal. The system tests, test methods, and test documents, including those required for and by the central station, shall meet the requirements of the Authority and the Fire Marshal.

D. Any additional costs resulting from improper system operation during acceptance testing shall be the responsibility of and paid for by the Contractor. This includes, but is not limited to costs associated with the attendance by the Fire Marshal, Authority, Engineer of Record, or District’s Representative during retesting.

E. All testing, inspection and retesting required for certification and required for all warranty work or replacements shall meet the requirements of the Authority and Fire Marshal. This certification, inspection, or testing shall be completed at no additional cost to the District.

F. Provide the testing date and Fire Marshal’s “Public School Fire Alarm Pre-inspection Checklist” completed in writing to the Fire Marshal a minimum of two weeks before the date. The Owner may, at the Owner’s option, have a representative present for testing.

G. The fire alarm system will not be acceptable until final testing and receipt of the testing certificates have been obtained.

3.6 RECEIVING AND HANDLING

The Contractor shall be responsible for all receiving, handling and storage of his materials at the job site. Use of loading docks, service driveways, and freight elevators shall be coordinated with the Owner.
3.7 RUBBISH REMOVAL

Contractor shall remove rubbish and debris resulting from his work on a daily basis from the work site. Rubbish not removed by the Contractor may be removed by the Architect and backcharged to the Contractor.

END OF SECTION