

SECTION 13845 (28 31 00)

FIRE ALARM SYSTEM

PART 1 GENERAL

1.1 APPLICABLE DOCUMENTS

The Latest adopted edition of the following codes or standards shall apply to the design and fabrication of the products and equipment to be supplied by this Section.

- A. Florida Building Code - FBC, and State Requirements for Educational Facilities - SREF
- B. NFPA-70, - National Electrical Code – NEC
- C. NFPA-72, - National Fire Alarm and Signaling Code
- D. NFPA-101, - Life Safety Code
- E. NFPA-20, - Standard for the Installation of Stationary Pumps for Fire Protection.
- F. NFPA-111, - Standard on Stored Electrical Energy Emergency and Standby Power Systems.
- G. Florida Statutes - FS
- H. Americans with Disabilities Act - ADA.

1.2 RELATED SECTIONS

- A. Section 15100 - Valves
- B. Section 15300 – Fire Protection System
- C. Section 15320 – Fire Pump and Controls
- D. Section 16050 – Basic Materials and Methods
- E. Section 16060 – Grounding
- F. Section 16080 – Electrical Inspection and Testing
- G. Section 16114 – Cable Trays
- H. Section 16120 – Wire & Cables
- I. Section 16130 – Raceways and Boxes
- J. Section 16132 – Conduit, Fittings and Supports
- K. Section 16137 – Pull and Junction Boxes
- L. Section 16415 – Surge Protection

1.3 REQUIREMENTS

- A. Installation: Conform to the appropriate editions of the National Fire Protective Association Standards and SREF, Florida's State Requirements for Educational Facilities, Florida Building Code (latest adopted edition).
- B. The Contractor; Fire alarm factory company representative: Hold, and submit a copy of, a current certificate of competency from the office of the State Fire Marshall indicating that said holder is qualified to engage in the business of contracting for fire alarm protection systems. FASA training certification also required.
- C. The systems as specified herein are of the microprocessor-based technology and should be capable of operating with an addressable device.
- D. For existing Fire Alarm Systems: All newly added fire alarm devices must be compatible with the existing fire alarm system.
- E. Due to the electronics components of the main fire alarm control panels (FACP), notification appliance control panels (NACP) and remote annunciators (RA), they shall always be housed in air-conditioned spaces.
- F. The work covered by this section of the specifications includes the furnishing of all labor, equipment, materials and performance of all operations associated with the expansion of the existing Fire Alarm System as shown on the drawings and as herein specified. System installation: Comply with all other sections of Division 16.
- G. The General Contractor is responsible for the supervision of the actual installation.
- H. Closely coordinate the installation of the fire alarm wiring with the fire alarm system factory company representatives.

1.4 FACTORY TRAINING

Requirement for the training that is specified in this Section 1.4 is to be determined once a contract has been awarded and the Fire Alarm Panel manufacturer is identified by the successful bidder.

The bid form will require a line item for training to meet the requirements of 1.4. If training is determined not to be required, a deduct change order in the amount specified will be processed as soon as a decision is reached.

The BCPS representative, Consultant and Contractor will meet to confirm which panel and manufacturer have been included in the awarded construction contract.

If; there has been no training of district personnel as specified in 1.4 on the fire alarm panel in the job starting at the date of Substantial Completion as stipulated in the Construction Agreement working in the past three (3) years, then: Training must be conducted per Section 1.4.

If district personnel are actively certified and equipped with the most current Software and Software Key for the panel which makes them capable of programming the new system, then; No training is required. A deduct change order will be processed in the amount shown on the bid form submitted by the Contractor as part of their bid package.

In either case, the mandatory turn-over training by the installer for building and district personnel remains required at all times.

- A. Training Course Requirement:
 - 1. Training Curriculum to be provided by the Manufacturer, approved by the District and shall contain at minimum the following:
 - (a) In-house three (3) day session for ten (10) School Board Personnel.
 - (b) One (1) factory-trained instructor and one (1) factory-trained assistant.
 - (c) Testing of minimum one (1) hardware and one (1) software-troubleshooting problem.
 - (d) Training manuals.
 - (e) All logistical support required for training.
 - (f) Technicians need to supply individual voltmeters and hand tools for class.
 - (g) Upon completion and at no cost to BCPS, BCPS personnel to be fully trained for service, programming, maintenance and operation of installed Fire Alarm System including Voice Evacuation.
 - (h) All regularly released Factory service updates and technical bulletins to be mailed directly to BCPS Physical Plant Operations Fire Alarm Department.
- B. Training of BCPS operation and maintenance personnel is required in cooperation with BCPS Representative.
 - 1. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed system including Voice Evacuation.
 - 2. Schedule the instruction in coordination with BCPS Representative after submission and approval of formal training plans.
- C. Comply with Section 01810 – Commissioning, for further contractor training requirement.

1.5 SYSTEM DESCRIPTION

- A. The system in the building: A local fire alarm system actuated by manual sending stations and/ or automatic detectors causing alarm status until reset. Installing a new and complete addressable, microprocessor based electronic fire alarm system unless otherwise noted, complete with:
 - 1. Control unit (FACP) and remote annunciator panel (if required and shown on plans)
 - 2. Initiating devices
 - 3. Notification appliances
 - 4. Monitoring and control devices
 - 5. Installation of a voice fire alarm system
 - 6. Installation of additional speakers as needed to ensure audibility and intelligibility throughout the facility.
 - 7. Fire alarm system must be capable of including a remote command center with voice at specified locations
 - 8. Fire alarm system must convert to a stand-alone system if network or SLC data is disrupted. Either transponder or node must be fully controllable without communication from main FACP. System must indicate communication lost with main FACP
 - 9. All building to building communication must be done with fiber optic cable

- B. Performance and capabilities of Signaling Line Circuits (SLC): Class B. Performance and capabilities of Notification Appliance Circuits (NAC): Class A. Wire all the notification circuits for Class "A" supervision and operation.
- C. General Alarm Operations: All strobes shall flash at the rate specified under NFPA & ADA continuously until silenced. The NFPA Standard Evacuation Signal, three-pulse temporal pattern, shall be applied to all audible appliances throughout the facility.
- D. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation.
- E. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control panel. Loss of primary and secondary power shall not erase the instructions stored in memory.
- F. The system shall provide a means to recall alarm and trouble conditions in chronological order to recreate an event log. Alarm and trouble logs shall be separate.
- G. The FACP shall have the ability to be accessible for diagnostics, maintenance reporting and information access through software that allows a personal laptop computer access equipped with the appropriate software for the system.
- H. A communication port for printing logs

1.6 SYSTEM OPERATION

- A. The system alarm operation subsequent to the alarm activation of any manual station, confirmed automatic detector, or sprinkler flow switch as follows:
 - 1. Perform the annunciation operations as described elsewhere in the specifications and as indicated on the drawing.
 - 2. A pulsing alarm tone shall occur within the control panel until the event has been acknowledged.
Alarm condition shall be immediately displayed on the control panel alphanumeric display and on any remote annunciators, and alphanumeric display indicating all information associated with the fire alarm including type of device, its location and the time and date of its activation. Alarm LED's shall flash on the control panel and annunciator until the alarm has been acknowledged. Once acknowledged the same LED shall latch on. A subsequent alarm received from another device after acknowledgement shall flash the alarm LED on the control panel and show the new alarm information. Active alarms shall take priority over trouble conditions.
 - 3. Transmit the appropriate signal to the fire alarm monitoring company
 - 4. General Alarm: Operates all audible and visible alarm Notification Appliances.
 - 5. Shut off gas and oil supplied via solenoid valves (except the emergency generator fuel). Reset: Not remote from the solenoid valve. Kitchen hood systems shall provide micro switch to shut down gas upon alarm.
 - 6. Upon alarm, shut down all air-handling units, existing and new over 2000 cfm. Otherwise, duct detectors shall create a supervisory notification at the FACP. (Verifying code for this area)
 - 7. Close, by duct detector, all fire, smoke, or combination dampers in the affected area as shown on the drawings
 - 8. Shut down make up air and supply air fans as required.
 - 9. Release of all doors in project, which are held by magnetic door holders (1 per door leaf).

10. Annunciation via indicating LCD at the control as specified elsewhere in this specification.
 11. Spare alarm, trouble, supervisory and programmable contracts shall be located in control panel for future alarm transmission.
 12. Upon the activation of the general alarm ensure the following occurs:
 - (a) All programmable bell operations shall be suspended to preclude the possibility of confusing normally programmed bell activity with a “recall signal” until fire panel is reset.
 - (b) When this suspension of pre-programmed bell activity is accomplished, there shall be a “supervisory or trouble notification” at the Fire Alarm Control Panel and each remote annunciation with the alphanumeric description indicating the suspended condition.
 - (c) After system reset, this suspension of the school bell system shall be automatically released upon the absence of any and all alarms or manual test conditions, without manual intervention on the part of the user, so that the preprogrammed functions restore to normal operations.
- B. Coordinate a recall switch in an approved location for activating the recall signal. The recall program will be as follows:
1. Coordinate the Fire Alarm system interface operations with the Clock & Bell system. The recall switch will activate the class bells to ring for 30 seconds continuously to indicate an all clear signal. The Clock & Bell system shall suspend all normally scheduled class change operations until this signal has been reset at the Fire Alarm Control Panel.
 2. The recall functions shall be a function of the intercom/bell system.
- C. The actuation of the program “Test Set-Up”/ Walk Test at the control panel activates the “Silent Walk Test” mode of the system based on approved manufacturer UL listed and NFPA 72 requirements.
- D. Each graphic display map, as specified elsewhere in this specification, to include the following:
1. Each manual pull station.
 2. Each heat detector.
 3. Each smoke detector.
 4. Each duct smoke detector
 5. The kitchen hood unit.
 6. Each sprinkler flow indicator.
 7. Each tamper switch (one module for each tamper)
 8. Each inspector test valve (automatic sprinkler systems).
 9. Each Post Indicator Valve.
 10. Each Fire Alarm Terminal Cabinet, remote NAC Booster/Transponder
 11. Each fire alarm control relay.
 12. Identify all above ceiling devices.

1.7 ANNUNCIATOR OPERATION

- A. Addressable Systems
1. Addressable Systems for the purpose of this specification: Defined as a system, which utilizes signaling line, circuits (SLC) and may include a limited use of initiating device circuits (IDC).
 2. Display each alarm, supervisory and trouble condition. Display information to show the following information:
 - (a) Custom point label (must include location information)
 - (b) Device Type Identifier

(c) Device Status (Alarm, Trouble & Normal)

3. Each graphic display map, as specified elsewhere in this specification, to include items listed in Section 2.4 b.
4. Provide remote LCD annunciators
5. All custom labels to be reviewed by the Office of the Chief Fire Official.

1.8 SUPERVISION

- A. Auxiliary manual controls: Supervised so that an “off normal” position of any switch shall cause an “off normal” system trouble. (Example, AHU shut down, test switch, etc.).
- B. The System Modules: Electrically supervised for module placement. Should a module become disconnected the system trouble indicator shall illuminate and the audible trouble signal shall sound.
- C. The system: Password protected provisions for disabling and enabling all circuits individually for maintenance or testing purposes. (Password to be provided by the Owner).
- D. Install the addressable systems with a minimum of two (2) separate leg facilities for each addressable signaling line circuit (For Portable installations only).
 1. Provide each leg with a fault isolation module installed so as to achieve the effective isolation from shunting out the SLC.
 2. Where one building may have more than 50 addressable devices the fault isolation module shall be installed in such a way as to isolate no more than 50 addressable devices per fault isolation unit or according to manufacturer’s specifications whichever is lower.
 3. Should a wire-to-wire short occur on one of the legs, this module shall isolate the affected circuit from all other legs and the trunk facility so that the remaining system can continue communications.
 4. Provide alarm and trouble monitoring as well as remote reset controls of the independent fire alarm control panel for the portables. These panels provide annunciation of initiating devices only.
- E. Notification Appliance Circuits(s) for the Portables: Independent of the circuits within the school. Provide a separate Notification Appliance Circuit Extender panels complete with power supply, charger & batteries. Provide dedicated emergency 120VAC power and terminate at the NAC extender panel located within the main structure and interconnect to operate as part of the central/School fire alarm system.
- F. Ensure all relay peripheral to the FACP is supervised either by using a NAC circuit or wiring the relay for fail-safe operation.
- G. Fire pump system supervisory conditions shall be individually monitored. Monitoring points shall include the following:
 1. Fire Pump Running
 2. Fire Pump Power Failure
 3. Fire Pump System Control Valves
 4. Fire Pump Phase Reversal
 5. Engine Driven fire pump driver or controller trouble (low oil pressure, bad batteries, etc.)
 6. Engine driven controller switch not in “automatic”

1.9 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01330, "Submittal Procedures".
- B. Submit manuals for approval:
 - 1. System wiring and conduit layout diagram.
 - 2. User wiring diagram.
 - 3. All equipment
 - 4. Diagram of magnetic door holder, mounting, backing, etc.
 - 5. A complete battery load calculation with work sheets for project.
- C. Submit shop drawings of all equipment for approval including a system-wiring diagram.
- D. Manufacturer: Provide wiring diagrams for the complete system showing connections and numbering system of each terminal connection, wire color-coding at each and every device and function and terminal cabinets. Since this drawing will be used as an "As Built Diagram", no typical wiring diagrams will be allowed.
- E. Electrical Contractor: Verify existing conduit layouts and provide this information to the fire alarm equipment manufacturer for the point-to-point wiring diagram.
- F. Submit supporting documentation that fire alarm control units, equipment, and components are of a type listed and/or approved for the purpose intended as determined by a nationally recognized agency such as Underwriters' Laboratory, Inc. or Associated Factory Mutual Laboratories. All equipment, devices, cables, etc., shall be listed by Underwriters Laboratories, Inc., for use in Fire Protection Signaling Systems.
If a UL listing for a specific device is unavailable, equipment approved by Factory Mutual Global (FM) will be acceptable. Specific FM Approvals Guide information shall be presented to the Owner's Designated Representative.
- G. Approval: Evidenced by the attachment of the agency seal or label. Agency approval does not relieve the Contractor from compliance with the requirements of this specification.
- H. Equipment submittals: Contain a sample form of the company's test and inspection agreement, and inspection agreement, and the inspection form. The fire alarm vendor shall submit in writing that the equipment to be supplied is not at or near the end of its life cycle. The vendor shall also submit in writing that replacement components for the fire alarm system shall be available from the vendor for 10 years from date of installation. The Owner or Owner's Designated Representative, at their sole choice and discretion, may request a demonstration of the proposed equipment.
- I. The sequence of operations as supplied by the engineer of record and approved by the Owner that describes how the system will operate during alarm, supervisory and trouble conditions. The description shall include FACP indications, initiating devices, notification appliances and auxiliary functions (such as elevator and HVAC functions, etc.).
 - 1. In addition to written sequence of operations, an input/output matrix, similar in form to that illustrated in NFPA 72 shall be provided by the engineer of record and approved by the Owner and AHJ with the design drawings.
- J. Positive Alarm Sequence
 - 1. This function shall be available but not activated until approved by the AHJ
 - 2. The sequence of operations shall be taken from NFPA 72.
 - 3. Annunciator/FACP shall be installed in a constantly monitored location.

4. A second alarm nullifies Positive alarm sequence
 5. Must be capable of turning positive alarm sequence on and off via button.
- K. Technician Qualifications
1. The fire alarm technician shall be NICET Level II and FASA trained.
 2. Technician shall be factory trained on all equipment to be installed.
 3. Once assigned the technician shall not be changed without the approval of the Owner or Owner's Representative.
- L. The electrical contractor shall provide a schedule to the Owner's Designated Representative indicating the installation sequence and time frame prior to beginning work. Where an existing system, is being upgraded, this schedule shall include a detailed description indicating how the system is being upgraded, this schedule shall include a detailed description indicating how the new FACP switch over is to occur to ensure that the fire alarm system will be out of service for not more than 12 hours. The electrical contractor shall provide weekly updates to the Owner's Designated Representative.
- M. The software and software key will be turned over to BCPS personnel (Physical Plant Operations Fire Alarm Supervisor) immediately upon receiving final completion of project.

1.10 TESTS AND INSPECTIONS

- A. The contractor must have two (2) qualified fire alarm technicians on site for the following Fire Alarm System Activities:
1. Pre-testing of system.
 2. Function testing with the AHJ.
- B. Non-qualified personal shall not operate the fire alarm panel at any time during the project.
- C. A preliminary test of the entire system shall be conducted by the electrical contractor and the fire alarm installer. Any deficiencies found shall be corrected prior to the final acceptance test.
- D. At a minimum, the electrical contractor & fire alarm installer shall perform the following:
1. Operate every building fire alarm system device to ensure:
 - (a) Proper operation.
 - (b) Correct device address/fish location (custom label).
 - (c) Correct annunciation at each remote annunciator (if required and shown on the drawings).
 - (d) Correct annunciation at the FACP
 - (e) Proper operation of auxiliary functions.
 - (f) Where applying heat would destroy any detector, they may be manually operated
 2. Circuits shall be opened and checked for the reporting to FACP correct supervisory/trouble indications/ground fault
 3. Checking code for requirement.
 4. Verify all signals are transmitted and received by the monitoring company
- E. Prior to company's "Final Test & Inspection", the installation contractor together with the Fire Alarm company's representative: Provide the following:
1. Completed device test/report printout

2. Printed point list
 3. Inspection report for all devices installed and drawings showing the location of every device along with the number assigned to each device in the system.
 4. Place a copy of above documentation in a readily accessible clear Plexiglas holder adjacent to the Fire Alarm Panel.
 5. Provide an electronic copy in a flash drive.
 6. Ensure this report complies with the NFPA 72 "Certificate of Compliance" and a sticker of compliance be affixed to the main panel. Meet the requirements of Rule 69A-48 as set forth by the State of Florida.
- F. Technician's State Credentials: Submitted to the Project Consultant and Owner.
1. The Contractor: Provide the manufacturer with a written notification of the date for the final inspection at least five (5) days prior to this inspection.
 2. Manufacturer: Have the same technician present at the time of final acceptance by the Owner and Project Consultant.
 3. FASA Certification
- G. Contractor: Provide all necessary instruments and special apparatus to conduct any test (inclusive of fog machine/smoke stick, wire-megger, etc.) that may be required to ensure the system is free of all improper grounds and short circuits and that all feeders be properly balanced. System as installed: Checked for quality, capacity and completeness and conform to full requirements and intent of plans and specifications.
- H. Contractor: Submit state fire alarm qualifying credentials to the Project Consultant and Owner.
- I. Contractor: During the course of construction, call for inspection by the Owner during the normal phases of installation and at the completion for the final inspection. General Contractor shall be responsible for notifying each of the parties in writing with a minimum of 5 days' notice to the Owner's Designated Representative. At each inspection a representative from each of the following entities shall be present:
1. General Contractor
 2. Electrical Sub-Contractor's Qualifier
 3. Fire Alarm Company Technician
 4. Electrical Engineer
 5. Physical Plant Operations Fire Alarm Department Representative
 - ~~6.~~ Inspectors from the Building Department and Office of the Chief Fire Official
 7. These field representatives are responsible for: The general layout of the conduit and wiring system of the actual installation, and the development of the final "as-built" drawings, kept in the school's vault for future use of the Maintenance electricians.
- J. Electrical contractor shall notify Owner's Representative in writing of the date and time of the preliminary tests and of the final acceptance test.
1. The system shall be considered ready for the Final Acceptance Test only after all preliminary tests have been made by the electrical contractor and the fire alarm technical representative, and all deficiencies have been found and corrected (inclusive of labels).
- K. The Owner's Representative: Inspect as Owner and as the building department by authority of Florida Statute and Board policy.
- L. The Contractor: Provide for a pressure differential test, to be performed at duct detectors, and be responsible for instruments and labor for such test. This test shall be performed at all duct detectors at Owner's discretion and only in the presence of

the Owner as per NFPA 90A. Each duct detector shall have manometer reading prior to final testing.

1.11 GUARANTEE AND FINAL TEST

- A. The Contractor: Guarantee all equipment and wiring free from mechanical and electrical defects for a period of one year, from the date of final acceptance when system is complete.
1. Perform a test on the system, before the installation is considered completed and acceptable by the building code authority, as follows:
 - (a) The Contractor's Licensed Qualifier, in the presence of a representative of the Owner:
 - (b) Operate every fire alarm device to ensure proper operation, correct annunciation at each remote annunciator and control panel.
 - (c) Verify all signals are transmitted and received by the monitoring company
 - (d) Where applying heat would destroy any detector, they may be manually operated.
 - (e) The signaling line circuit and the indicating signal circuits: Opened in at least two locations per zone to check for the presence of correct supervisory circuitry and ground fault detection.
 - (f) When the testing has been completed to the satisfaction of both the Contractor's Licensed
 - (g) Qualifier, and the representative of the manufacturer and Owner, a notarized letter co-signed by the Contractor and the manufacturer's representative attesting to the satisfactory completion of said testing to be forwarded to Owner.
 2. The Alarm Vendor's Shop drawing submittal: Provide four (4) indexed and bound copies of all maintenance manuals, wiring diagrams, control panel interconnect diagrams and the individual module wiring diagrams supplied with the control panel including any and all proprietary components and information, also the system software and configuration programming supplied from the factory.
 - (a) This submittal shall be followed by final revised submittal showing field adjustments when required.
 - (b) Interconnect diagrams: Mounted adjacent to the control panel in a steel-framed, Plexiglas-front, code-card holder with condensed operating instructions for the school personnel, or where directed by Owner.
 - (c) Contractor: Obtain the Owner's approval prior to installation of diagrams.
 3. Contractor: Leave the fire alarm system in proper working order and without additional expense to the Owner; replace any defective materials or equipment provided by him under this contract within one (1) year from the date of final acceptance by the awarding authority.
 4. Prior to final test, the Owner must be notified within a reasonable time of test date, at least five (5) days.
 5. The Contractor: Include in his bid price a one-year test and inspection contract. This contract includes two tests and inspections. The first inspection: After 6 months of operation and consist of both a complete functional test, and a 100 percent test and inspection of each and every device connected to the system. The second inspection: Performed 6 months later, but before the expiration of the one-year warranty period. Both tests to be performed in front of Physical Plant Operations Fire Alarm personnel and a member of the Chief Fire Officials Office.

6. The Manufacturer: Provide four copies of the completed test and inspection form for the 12th month inspection and test to the Owner's Representative and one to the Maintenance Department. List all type and quantities of devices tested on the test and inspection form. For the 12th month inspection and test: Satisfy every requirement of the guideline test and inspection form set forth in NFPA –72, National Fire Code.

1.12 AS BUILT DRAWINGS AND TESTING AND MAINTENANCE INSTRUCTIONS

- A. The Manufacturer's shop drawing submittal: Provide four (4) indexed and bound copies of all maintenance manuals, wiring diagrams, control panel interconnect diagrams and the individual module wiring diagrams supplied with the control panel including all proprietary components and information. This submittal: Followed by the final revised submittal showing field adjustment when required.
- B. Deliver to the Owner upon completion of system: A complete set of reproducible as-built on a flash drive in AutoCAD latest adopted version, showing installed wiring and color-coding and wire tag notations for exact locations of all installed equipment, specified interconnections between all equipment and internal wiring of the equipment. The Consultant shall provide a base drawing to the contractor.
- C. Deliver to the Owner upon completion of the system: Complete, simple, comprehensive, step-by-step, testing instructions giving recommended and required testing frequency of all equipment, methods for testing each individual piece of equipment, complete trouble-shooting manuals explaining what might be wrong if a certain malfunction occurs and explaining how to test the primary internal parts of each piece of equipment.
- D. Ensure Maintenance Instructions are complete, easy to read, understandable, and provide the following information:
 1. Instruction on replacing any components of the system, including internal parts.
 2. Instructions on periodic cleaning and adjustment of equipment with a schedule of these functions.
 3. A complete list of all equipment and components with information as to the address and phone number of both the manufacturer and local supplier of each item.
 4. Site specific user operating instruction: Provide prominently displayed on the cabinet front or on a separate sheet located next to the control unit in accordance with U.L. 864.
 5. Deliver to the Owner: System manufacturer's software and all field configuration programming information necessary to perform all possible future servicing, testing, repairs, systems and component diagnostics, and improvements. Include any future changes in: System software, software licenses and security keys, regularly updated diagnostic tools and technical bulletins dealing with the particular system installed. All this equipment shall be delivered to the owner upon initial acceptance.
 6. Place a copy of the above documentation in a readily accessible clear Plexiglas holder adjacent to the Fire Alarm Panel.
- E. Supply, with the control panel, four (4) copies of the control panel interconnect diagrams and the individual module wiring diagrams Confer with Chief Fire Official and Physical Plant Operations Fire Alarm Department prior to completion (NOTE: large projects may require additional copies). Located as directed by owner and furnish:
 1. One (1) steel-frame for the fire alarm graphics map per page.
 2. Provide and contain site-specific operating instructions

- F. Provide and contain site-specific operating instructions. Alarm Control Modules: Listed by Underwriters' Laboratories, Inc. for service in accordance with NFPA Standards 70 and 72.

PART 2 PRODUCT

2.1 FLOW SWITCHES AND TAMPER SWITCHES

- A. Flow Switches and Tamper Switches provided by Division 15
- B. Comply with Section 15300 – Fire Protection System
- C. Comply with Section 15320 – Fire Pump and Controls
- D. Provide flow switches and tamper switches, when required, with its own addressable module:
 - 1. Tamper switches: Operate as supervisory service connection and provided with its own addressable module.
 - 2. Sprinkler Systems: Requires post indicator valves, water flow and valve tamper switch addressable modules.

2.2 MANUFACTURERS

- A. The only acceptable manufacturers are Simplex, Notifier and Gamewell FCI, when meeting the full intent of these specifications and they represent the standard of quality for these systems.
- B. The system: Built up of components manufactured by the same company. All components and devices: U.L. listed for their intended use and compatibility as a complete system.
- C. On the event of renovation, the new equipment and devices shall be of the existing manufacturer using the latest technology. Consultant shall coordinate with District Maintenance Fire Alarm Department. When the renovations are complete, the existing system and new addition shall function as one system, with one panel to comply with NFPA 72 and UL.
- D. The SBBC recognizes the fact that each manufacturer has its own design and accordingly there will be slight differences in the overall layout of their systems.

2.3 CONTROL PANELS

- A. Cabinets:
 - 1. Equipped with standard hinged outdoor frame assembly.
 - 2. Cabinet: Mounted as shown on the drawings.
 - 3. Lock: Tumbler type on outer door, supply three (3) set of keys.
 - 4. Capable of being recessed in an occupied and common location
- B. The Fire Alarm Control Panel:
 - 1. Microprocessor based and have as a minimum a 1000 point capability in any combination of Addressable, Initiating, Notification or Control points/circuits. The base fire alarm control panel shall have the necessary SLC (addressable) modules to support additional addressable devices as described for each of the following type facilities at a minimum:

- (a) 300 points for Elementary schools
 - (b) 500 points for Middle schools
 - (c) 1000 points for High Schools
 - (d) Provide all necessary electronic components in the FACP as part of the itemized bid.
 - (e) Panel must be network capable
 - (f) Compatible with legacy products
 2. Panel Wiring Diagram: Show all factory interconnection wiring as a typical contractor wiring connection for each module.
 3. Identify, with descriptive labels, all module indicating lights and switches.
 4. All modules in the fire alarm control panel:
 - (a) Shown on the factory control panel-wiring diagram.
 - (b) Identified as to its function.
 - (c) Mark all terminal connections and identify with the same designation as the associated zone indicating lights.
 - (d) Utilize manufacturer's Stamped Knock-out only.
 5. Provide 25 percent additional spare load for each type of notification and initiating device to notification appliance circuits for future use. This requirement must be complied with at the time of installation and as accepted by the Office of the Chief Fire Official.
 6. Circuit shall not be loaded above 75% of rated capacity for new construction or manufacturers recommendations whichever is lower.
 7. The FACP shall store a record of alarm and trouble events in a nonvolatile history file. This file shall contain, at least, the most recent 500 events, where one input or control module, or device equals one (1) point, with time and date of each event. The history fire shall remain intact in the event of a loss of AC and battery power.
 8. Fire alarm control panels and supplementary panels shall be recessed whenever possible.
 9. Fire alarm annunciators with voice evacuation microphones shall be provided areas where occupancies are 300 or more or determined by the AHJ at locations field determined by the AHJ.
- C. Alarm Control Modules: Listed by Underwriters' Laboratories, Inc. for service in accordance with NFPA Standards 70 and 72.
- D. The control panel shall operate from a 120 VAC supply and internal 24 VDC back-up battery. Separately fuse all power connections whether AC or DC within the control panel.
- E. The FACP shall have a label on the inside, which shall indicate the electric panel and circuit breaker which protect the feeders to the control panel.
- F. Provide momentary or maintained contact switches for System Reset, Lamp Test and Trouble Silence Functions, Alarm Silencing and acknowledging provided it complies with SREF.
1. The System Reset Switch: Causes the system to reset from the alarm condition to the normal condition.
 2. The Trouble Silence Switch: Silences the audible trouble signal and arranged so that the visual system trouble indicator will remain lighted until the system is restored to normal.
 3. The Lamp Test: Test all supervised visual alarm indicators.
 4. Acknowledge switches: acknowledge any trouble, alarm or supervisory signal.
- G. Fire alarm reset shall not cause all Air Handling Units to re-start automatically. Trouble should be reported on the display to "Reset AHU's". Provide a separate key switch or

FACP button at the Fire Alarm Control Panel, with a label "AHU RESET". When this switch is operated, it will power the control circuit for the AHU, which will start on a normal starting sequence.

- H. Control Panel:
1. Capable of providing system expansion without removal of any card and have as standard features:
 - (a) Two sets of SPDT alarm operated relay contacts.
 - (b) Terminals for connection of remote trouble indicator units.
 - (c) Trouble dry contacts
 - (d) Supervisory contacts
 2. Compatible with:
 - (a) Remote alarm silence.
 - (b) Remote reset units.
 - (c) Remote zone annunciation of an alarm or trouble and have the ability to activate, individually or collectively.
 - (d) Signaling output from any initiation input by zone.
 - (e) Remote acknowledgement
 3. A yellow visual and an audible trouble indicator shall signal any of the following trouble conditions:
 - (a) Removal of a device from its particular setting.
 - (b) An open, short or ground fault in a signaling line circuit.
 - (c) An open, short or ground fault in an audible signal circuit.
 - (d) A ground fault on any D.C. line.
 - (e) Removal of system modules.
 - (f) Annunciator power trouble.
 - (g) Annunciator and control panel switch is an off-normal position.
 - (h) System battery disconnection.
 - (i) System is in a service or inspection mode.
- I. Provide auxiliary contacts for the panel:
1. One output indicating an alarm condition.
 2. Another for alarm status to be form "C" contacts.
 3. Identify each in the panel.
 4. Waterflow contacts and supervisory contacts.
 5. When controlling high voltage equipment, use of MR-101 relays must be used. Software controlled relay will be used to power MR-101, 24 VDC non-resettable power.
- J. Signaling line circuit module:
1. Communicates with remote addressable devices for initiation, initiation and control.
 2. Operation: Over a two (2) wire addressable circuit, individual initiating devices communicate their exact identification, and status, and type of device.
 3. Provide individually controlled Notification Appliance circuits and control circuits.
- K. Notification Appliance Circuit Modules:
1. Pull Stations, horns and strobe boxes must be red in color.
 2. Capable of supplying 1.75 amperes minimum of signal capacity of DC power.
 3. Supply operating power and supervision via a Class A circuit.
 4. Provide a trouble LED, visible on enclosure front.
 5. Provide supervision for short circuit, open circuit and ground faults
 6. Furnish system trouble of resound type; individual or common programmed alarming features.
 7. NAC circuits shall not be loaded more than 75 percent of their capacity.

8. Supervision of NAC panels shall be done utilizing monitor modules across the trouble contacts and shall be programmed with specific location information.
 9. Capable of providing voice/tone evacuation
- L. Evacuation/Recall:
1. Ensure the general Evacuation audible signal is The NFPA Standard Evacuation Signal
 2. The General Evacuation Signal: All strobes shall flash at the rate specified under NFPA & ADA continuously until reset.
 3. The Standard Audible Recall Signal: A Clock and Bell System.
- M. Power Supply and Battery back-up System:
1. Power: Derives from the building emergency power source.
 2. Disconnect means: Identified and painted RED.
 3. Provide surge suppression at disconnect in addition to manufacturer MOV located in control panel.
 4. Fuse 120 VAC as needed.
 5. Furnish a battery back-up system with a float charger.
 6. The back-up power:
 - (a) Without Standby Generator: Batteries only, the battery capacity must be sufficient to operate the fire alarm system in a non alarm condition for a minimum of twenty-four (24) hours and then still be able to operate in the alarm mode for fifteen (15) minutes of full-load alarm capacity.
 - (b) Without Standby Generator: An Uninterruptible Power Supply (UPS), the UPS option requires that the UPS be a type 0, class 24, Level 1 system per NFPA 111. Type 0 means that there is no switchover time when power is transferred from the primary power source to the UPS batteries. The batteries shall be capable of operating the fire alarm system under maximum normal load for twenty-four (24) hours and then still be able to operate in the alarm mode for fifteen (15) minutes of full-load alarm capacity.
 - (c) With a Standby Generator: Batteries shall be capable of operating the fire alarm system under maximum load for four (4) hours
 - (d) Hurricane Shelter Facilities require a seventy-two (72) hours standby plus (+) fifteen (15) minutes of alarm. (verifying code test requirements)
- N. Power Supply Modules:
1. Two (2) minimum. Furnish a power supply module(s) capable of supplying three (3) amperes DC of the proper voltage for system power and auxiliary devices (smoke detectors, door holders, fan shutdown, auxiliary relays).
 2. The Module: Contain a "Normal Power" LCD display.
 3. Provide visual LCD annunciation of status and current draw on front of enclosure.
 4. System: Provide a minimum of 9 DC amps at 24 VDC.
- O. Auxiliary Relay Board: (Quantity as required) provide a supervised auxiliary relay board for:
1. Release of doors held open by magnetic door holders.
 2. Air handling unit shut down.
 3. Other miscellaneous functions.
 4. Air Handling Units: Not affected by the recall signal and AHU reset shall be a manual function.

- P. Fire Alarm panels and nodes shall have a connector for RS232 and/or IP communications for extracting logs and reports.
- Q. Fire Alarm System shall be monitored wireless from a remote location, the communication between the main fire alarm panel and the remote location shall take place using a Wireless Fire Alarm Communicator for AES-Intellinet similar to a 7788F/7744F Series Unit with an AES-7794 IntelliPro Fire Full Data Module or approved equal. The wireless fire alarm communicator shall be tested for signal strength as additional communicators or antennas may be required. Exterior antenna installation shall comply with FBC High Velocity Hurricane Zone Requirements. Installation of the communicator shall follow manufacturer's recommendations or other methods approved by the AHJ.
- R. Installation of new fire sprinkler system connected to an existing Fire Alarm system shall follow manufacturer's recommendations or other methods approved by the AHJ.

2.4 GRAPHIC DISPLAY MAP

- A. Provide addressable systems with a graphic display map to indicate each fire alarm device as indicated on the drawings. Graphic display map size: Not less than 36 inches wide x 30 inches high.
- B. Each graphic display map, as specified elsewhere in this specification, to include the following:
 - 1. Each manual pull station with address ID.
 - 2. Each heat detector with address ID.
 - 3. Each smoke detector with address ID.
 - 4. Each duct smoke detector with address ID
 - 5. The kitchen hood unit with address ID.
 - 6. Each sprinkler flow indicator with address ID.
 - 7. Each tamper switch with address ID.
 - 8. Each inspector test valve (automatic sprinkler systems).
 - 9. Each Post Indicator Valve with address ID.
 - 10. Each Fire Alarm Terminal Cabinet, remote NAC Booster/Transponder
 - 11. Each Notification Circuit End-Of-Line Resistor. (Only for class "B" style "Y" installation.)
 - 12. Each fire alarm control relay.
 - 13. Identify all above
- C. Graphic symbols used to represent devices:

1. Manual Stations	-	Square
2. Duct Detectors	-	Hexagram
3. Ceiling Area Smoke Detectors	-	Circle
4. Heat Detector	-	Triangle
5. Flow Switch	-	Rhombus (Diamond)
6. Alarm Misc.	-	Rectangle
7. Supervisory (PIV)	-	Pentagon
8. Supervisory (Tamper)	-	Octagon
9. Control Relays	-	Describe locations by note on
10. The map.		
11. Terminal cabinet	-	Rectangle with the letters "TC"
12. Inside.		
13. NAC Booster/Transponder.	-	Rectangle with the letters "FCPS" inside.
14. Each NAC E.O.L resistor/device.	-	Industry standard resistor symbol

15. Magnetic Door Holders - Rectangle with the letter "M" inside
 16. Fire Alarm Portable Panel - Rectangle with the letters "Portable" inside.
- D. Use drawings, as a basic format at 1 inch equals 30 feet depicting floors, as indicated in plans.
- E. Utilize different symbols and colors to best enhance the appearance and intelligence of the display. The display: Functionally represents the entire school, especially the exit ways and stairs, prominent features and names. Show exterior walls with heavier lines than interior walls.
- F. Provide and install a graphic display map at a location to be determined by the Office of the Chief Fire Official.

2.5 OPERATION

- A. Provide both the fire alarm control panel and remote annunciator with the following control switches. Secure all switches from operation by either a locked viewable door, a keyed enable switch or individually keyed switches.
1. LED Test Switch
 2. Keyed Enable Switch (Remote annunciator only)
 3. Test Switch
 4. Manual Recall Function Switch
 5. Alarm Silence Switch and LED
 6. Trouble Silence Switch and LED
 7. Green "Power On" LED
 8. System Reset Switch
 9. Local Tone Alert
 10. Three (3) sets of keys
 11. Provide a Keyed AHU restart or programmable utility button.

2.6 INITIATION

- A. Fire Alarm Stations
1. Addressable Pull Stations:
 - (a) Must contain electronics that communicate the station status (alarm, normal) to the control panel over two wires.
 - (b) The address will be set on each station.
 - (c) Must be capable of field programming of its "address" location on an addressable signaling line circuit.
 2. Manual Stations:
 - (a) Must be single action and may have a break glass rod and be constructed of high impact, red lexan or metal with raised white lettering and a smooth high gloss finish.
 - (b) Provide a hinged front with key lock for the break glass rod station.
 - (c) Key all stations alike with the fire alarm control panel.
 3. Provide pull station signs where shown and be of the following minimum construction, "FIRE ALARM PULL STATION INSIDE" reverse engraved in white
 - (a) Lettering: 1-1/2 inches high.
 - (b) The sign: 8-1/2 inches x 11 inches minimum.
 4. Provide pull station covers with sounders throughout the school.
 5. All surface mounted devices shall use manufacturer's boxes.

- B. Heat Detectors:
- (a) The Detector must be compatible with:
 - (1) Other addressable detectors
 - (2) Addressable manual stations
 - (3) Addressable Modules on the same circuit.
 - 2. Automatic Heat Detectors:
 - (a) For Temperature rating, refer to NFPA 72 ambient room temperature table 2.2.1.1.1.
 - (b) When the fixed-temperature portion is activated, the units must be non-restorable and give visual evidence of such operation.
 - (c) Fixed temperature devices to be used only in electrical, generator, mechanical, water heater, Somat rooms, under stages and kiln rooms, attics and crawl spaces (if applicable).
 - 3. Explosion proof automatic heat detectors:
 - (a) 190 degrees and meet the explosion proof criteria.
 - (b) Provide these units in all flammable and chemical storage rooms.
- C. Smoke Detectors:
- 1. Provide addressable photoelectric smoke detector where indicated on the plans.
 - (a) Detectors: Listed to U.L. Standard 268 and documented compatible with the control equipment to which it is connected.
 - (b) Detectors: Listed for this purpose by Underwriters Laboratories, Inc.
 - 2. The detector light source: An LED (light emitting diode). Operate detector on the multiple-cell concept and control LED intensity by a regulating photocell circuit match to smoke detector-circuit.
 - 3. Each Detector: A flashing status indicating LED for visual supervision. When the detector is actuated, the flashing LED will latch on steady and at full brilliance.
 - 4. To minimize nuisance alarms, voltage and RF transient suppression techniques employ-as-well-as a smoke verification circuit and an insect screen.
 - (a) The Detector Design: Provide full solid-state construction and compatibility with other normally open fire alarm detection loop devices, (heat detectors, pull stations, etc.).
 - (b) The Detector Head: Easily disassembled to facilitate cleaning.
 - (c) Capable of alarm verification (Chief Fire Official approval required)
- D. Duct Smoke Detectors:
- 1. Duct Smoke Detectors:
 - (a) Solid state photoelectric type
 - (b) Designed to ignore invisible airborne particles or smoke densities that are below the factory set alarm point.
 - 2. Detector Construction:
 - (a) Split type that is mounting base with twist-lock detecting head.
 - (b) Removal of the detector: Interrupts the supervisory circuit of the fire alarm detection loop and causes a trouble signal at the control panel.
 - (c) Provide an alarm LED visible through a front cover.
 - (d) Installation must comply with NFPA-90A.
 - (e) Sampling tubes: Sized to extend the full width of the duct.
 - (f) Duct detectors must be programmed to report as supervisory devices.
- E. Monitor Adapter Module: Used for monitoring of water flow, valve tamper, Agent Discharge Control Panels, non-addressable detectors and for control of evacuation Notification Appliances and AHU systems. All components must meet the manufacturers UL Listing for applications.

1. The Addressable Monitor Module:
 - (a) Supervised and uniquely identified by the control panel.
 - (b) Device Identification: Transmitted to the control panel for processing according to the program instructions.
 - (c) Provide a discrete trouble signal, unique to the device, transmitted to, and annunciated at the control panel, should the addressable module become non-operational, tampered with or removed.
2. The Monitor Module:
 - (a) Capable of being programmed for its "Address" location on the addressable device signaling line circuit.
 - (b) Compatible with addressable manual stations addressable or analog detectors on the same addressable circuit.
3. All Devices:
 - (a) Will be supervised for trouble condition (open, short, device missing/failed).
 - (b) Should a device fail, it will not hinder the operation of other system devices.
 - (c) Should a problem occur on a particular wire run, it will not affect other wire runs.

2.7 NOTIFICATION DEVICES

- A. Notification Devices:
 1. All surface notification devices shall use manufacturer's boxes.
 2. All exterior notification devices shall use manufacturer's weatherproof boxes.
- B. Horns: Surface, Semi-Flush (for existing systems).
 1. The Horns: Electronic, polarized and operated by 24 VDC.
 2. Horn Assembly: Shall be UL listed for service.
 3. Not Accepted: T-tapping of notification device conductors to notification circuit conductors.
- C. Audible/visible and visible only appliances.
 1. The visible, comprised of:
 - (a) Xenon flash tube with a strobe intensity under provisions of NFPA and ADA.
 - (b) An entirely solid state assembly.
 2. The Assembly:
 - (a) 24VDC with a low inrush and current drain.
 - (b) Polarized and provided with in/out wiring for proper operation and ease of wiring.
 3. The Unit: U.L. listed for its use.
 4. For correct orientation use a wall type.
 5. Mount the visible only base to any single gang electrical box and mount the A/V base to any standard 4-inch square electrical box.
 6. Design the A/V to accommodate either ceiling or wall strobes assemblies or any standard 4-inch mounted audible appliances.
 7. Provide protection cover for all visible or audio/visual appliances in gymnasiums, building exterior, or as shown on the drawings.
 8. Devices shall be red in color with white lettering.
- D. In projects where a voice evacuation panel and microphone panel are installed, the unit shall be located within the space is serving. Location of the panel/microphone shall be approved by the Office of the Chief Fire Official. Voice evacuation devices shall not be collocated with audible devices since one device will interfere with the other and the voice evacuation will not be intelligible.

1. Audible Notification shall be by speakers or audio visual appliances, as shown on the design drawings, capable of delivering a digitized recorded voice message providing the occupants with emergency instructions and, at the end of the message sequence, the activation of a temporal code 3 National Evacuation Signal in the building notification zones receiving the alarm.
 2. Failure of the pre-recorded message sequence shall cause the system to default to a standard evacuation, temporal code 3 pattern.
 3. The FACP shall be equipped with an emergency voice alarm communication module that will take precedence over the pre-recorded message when the module microphone is activated.
- E. All strobe circuits shall be independent from the speaker circuits and the power load on each strobe circuit shall not exceed 75% of the individual circuit power available from the FACP.
- F. The speaker, whether integral with a combination speaker/strobe unit or a separate appliance, shall have a minimum output designation form UL of 85 peak dBA at 10 feet. All speaker circuits shall be independent from strobe circuits and the power load shall not exceed 60% of the individual circuit power available from the fire alarm system amplifiers.
- G. Where buildings have automatic sprinklers, a separate bell circuit water motor gong shall be installed to operate one exterior, weatherproof bell located where shown on the drawings. This bell/water gong shall be programmed to operate only on sprinkler water flow.
- H. All strobes shall conform to both the American with Disabilities Accessibility Guidelines (ADAAG) and NFPA 72, National Fire Alarm and Signaling Code requirements.
- I. All appliances shall be rated at 24 VDC.
- J. All speaker circuits shall be rated at 25 VRMS or 70 VRMS
- K. All speakers shall operate on 25 VRMS or 70 VRMS with field selectable output taps available from 0.25 watts to 2.0 watts, with a minimum frequency response of 400 Hz to 4000 Hz
- L. The audibility levels required by the latest adopted edition of NFPA 72, National Fire Alarm and Signaling Code
- M. Voice message intelligibility shall be provided as indicated on the design drawings in acoustically distinguishable spaces (ADS), or in ADS's as determined by the Owner's Designated Representative. Chief Fire Official.
- N. All strobes shall be synchronized to flash at the same rate throughout the signaling zone or campus designated area.

2.8 NOTIFICATION DEVICES FOR THE DEAF AND HEARING IMPAIRED

- A. Fire alarm notification devices for deaf and hearing impaired shall be provided in schools determined by the owner and the AHJ.
- B. Accepted Manufacturers:
1. Alertus Technologies.
 2. BCPS approved equal.

- C. Desktop Notification System:
 - 1. Emergency notification alerting software solution for overriding computer displays across the school network with critical alert messages.

- D. Audible/Visible Beacon:
 - 1. Wall mounted integrated audible visual notification device with sounder and flashing strobes and large text display.
 - 2. The devices shall be UL listed for service.
 - 3. The devices shall be installed in areas adjacent to the bathrooms.

- E. LED Marquee Display Board.
 - 1. The display boards shall be configured and activated through the emergency notification software.
 - 2. The display boards shall be installed in large public areas and/or all assembly areas (median center, gym, auditorium, dining area, front office, etc)

2.9 AUXILIARY DEVICES AND CONNECTIONS

- A. Door Holders 24VDC:
 - 1. Provide a stainless steel pivotal mounted armature with shock absorbing nylon bearing.
 - 2. Unit: Capable of being either surface, flush, semi-flush or floor mounted as required.
 - 3. UL listed for their intended purpose from approved manufacturer.
 - 4. Mounted according to the manufacturer's installation instructions.
 - 5. Run in separate raceway.
 - 6. Provide one (1) holder per leaf, mounted 5 inches plus or minus from top.

- B. Magnetic Closer/Holder
 - 1. UL listed for this intended purpose from approved manufacturer.
 - (a) 24VDC.
 - (b) One per door leaf.

- C. Control Relays:
 - 1. Provide a multi-voltage type unit, which operates from 24VDC, 24VAC or 115VAC inputs.
 - 2. Each Relay: Contain a red LED to indicate the relay coil activation.
 - 3. SPDT 10 Amp contacts minimum.
 - 4. MR 101 relay switched by software controlled relay

- D. Fire Pump:
 - 1. Provide addressable modules for the signal connections to the fire pump controller. Fire pump supervision contacts shall be connected to the FACP in accordance with NFPA 20.

- E. Solenoid Valves:
 - 1. Gas solenoid valve: Install valve in gas pipe and provide all necessary materials and labor.
 - (a) Normally closed type
 - (b) Electrically operated
 - (c) Manually reset
 - (d) 120 Volt AC, single phase, 60 Hz
 - (e) Solenoids controlled by suppression system micro switch

- F. Elevator Recall:
 - 1. Shall operate per NEC and ANSI

- G. Elevator Power Shut Down:
 - 1. Shall operate per NEC and ANSI.

- H. HVAC:
 - 1. The operation of a duct smoke detector shall cause the appropriate existing fan control relays to activate to cause the shutdown of the associated fan(s), or initiate the site specific smoke control sequence, as appropriate.

- I. Smoke Damper Controls:
 - 1. Where smoke dampers are present in the building, they shall be controlled by the fire alarm system. Upon activation of area smoke detectors or duct smoke detectors in the space being served by the HVAC duct, the fire alarm system shall cause the appropriate smoke damper control relays to activate causing associated damper(s) to close.

- J. Laboratory Hood/Fan Exhaust Systems:
 - The fire detection and alarm system operation shall not be interconnected to automatically shut down laboratory hood exhaust fans unless specified in the operational matrix developed by the engineer of record.

- K. Individual buildings are to be shut down independently of the campus.

- L. The system shall have a "walk-test" capacity of multiple programmable pass code protected groups so that the entire system does not require disabling during testing; i.e. sprinkler or fire suppression. Activation of this feature initiates:
 - 1. Control relay function bypassing
 - 2. Initiation of the FACP trouble condition and signal
 - 3. Alarm activation that allows the activated initiating device to cause an audible signal to sound and identify the initiating device
 - 4. Automatic reset after signaling is complete
 - 5. Opening of a device or appliance circuit shall cause a trouble signal to sound.

- M. Provide addressable control relay output modules for the following functions:
 - 1. Elevator recall
 - 2. Elevator power shunt trip
 - 3. Electronic door lock release operation
 - 4. Magnetic door hold-open release operations
 - 5. HVAC control
 - 6. Smoke damper control

- N. Coordinate a recall switch in an approved location for activating the recall signal. The recall program will be as follows:
 - 1. Coordinate the Fire Alarm system interface operations with the Clock & Bell system. The recall switch will activate the class bells to ring for 30 seconds continuously to indicate an all clear signal. The Clock & Bell system shall suspend all normally scheduled class change operations until this signal has been reset at the Fire Alarm Control Panel.
 - 2. The recall functions shall be a function of the intercom/bell system

- O. Areas of Refuge:

1. All areas of refuge, stairwell and main office shall communicate with first responder to await for further instructions or assistance during emergency situations.
2. All areas of refuge shall be provided with two-way emergency communication system, provide an audible and visual signal to indicate communication has occurred, and indicate to the receiver the location sending the signal.

2.10 INTELLIGENT WIRELESS SYSTEM

- A. Installation:
1. Intelligent wireless used as a component of a fire alarm system shall be installed only as a temporary installation.
 2. SBBC and the AHJ shall define the period of time of the temporary installation and the project locations.
- B. Fire Alarm Control Panel Connectivity:
1. Wireless devices used as components of a fire alarm system shall be capable of connection to a compatible Intelligent Fire Alarm Control Panel (FACP) via a Signaling Line Circuit (SLC) via a gateway.
 2. The gateway shall provide the link to one mesh network of wireless devices.
 3. Multiple gateways can be supported on the same intelligent FACP, up to (4) wireless mesh networks in the same radio space.
 4. All intelligent sensing functions supported for wired devices shall be supported by comparable wireless devices.
 5. Additionally, the panel shall allow wired devices to be identified with unique type codes which allow the system to display wireless trouble indications such as low battery, jamming, and tamper.
- C. Reliability:
1. Wireless communication for the wireless system shall incorporate an advanced mesh technology which incorporates UL 864 Class A approved supervised, redundant communication.
 2. All devices in the mesh network shall be capable of acting as repeaters for other devices in the same network.
 3. The wireless system shall also have a suite of tools that can be installed on a portable PC and used to assist in qualifying the site, installing the system, and verifying the proper operation of the system.
 4. Additionally, the panel shall allow wired devices to be identified with unique type codes which allow the system to display wireless trouble indications such as low battery, jamming, and tamper.
- D. Addressable Devices:
1. The system shall be capable of supporting intelligent addressable wireless detectors, modules, pull stations and AV devices with similar capabilities as wired addressable intelligent devices.
 2. Intelligent wireless devices shall utilize a gateway device to communicate with the intelligent fire alarm control panel, so that the wireless devices report to the panel using the established SLC protocol.
 3. Wireless devices shall be capable of co-existing on the same panel with wired devices, and shall be capable of participating in common control-by-event programming sequences.
 4. Device addressing for wireless device shall be consistent with intelligent wired devices, and shall use decade, decimal address switches. Wireless devices shall be capable of being set to an address in a range of 001 to 159.

5. Wireless devices (excepting the gateway) shall operate on batteries recommended by the manufacturer, and shall be UL tested and listed for 2 years of system operation on one set of batteries.
6. The gateway shall be connected to the panel SLC loop and shall be capable of being powered by the SLC loop as well. Alternately, the gateway shall be capable of connection to the SLC loop only for communication with the FACP, and power may be supplied via a separate 24VDC input.
7. Programmable and automatic sensing options supported by the intelligent FACP which are available for intelligent wired devices shall also be supported for equivalent intelligent wireless devices, including: ability to set the sensor sensitivity at the FACP, ability to adjust sensitivity based on time, ability to automatically compensate for dust accumulation and other slow environmental changes, ability to annunciate two dirty detector threshold states, and the ability to participate in cooperative sensing decisions with other intelligent wired or wireless detectors that are connected to the same panel.
8. Wireless devices shall be connected to a compatible intelligent fire alarm system, and shall be supported by the system as wireless devices. Trouble conditions that are unique to wireless devices shall be reported at the head end, such as: Low Battery, Jamming, and Tamper.
9. Intelligent wireless devices shall use a UL approved Class A mesh communication protocol to provide redundant supervised wireless communication links.
10. A wireless mesh shall be comprised of one gateway and up to forty-nine wireless devices.
11. Multiple wireless gateway systems may be connected to a single FACP.
12. The system shall allow for up to four wireless gateway systems in the same radio space.
13. Device status indicators (LEDs) on wireless devices shall not be required to match indications of wired devices, in particular for active indications where a steady on LED would reduce the battery life of the device.
14. Wireless devices shall include a tamper indication. The tamper trouble condition shall latch at the panel until the device is restored to the normal installed position and the trouble has been reset.
 - (a) Wireless detectors shall have dedicated bases with a magnetic tamper mechanism that initiates a trouble when the device is removed from the base.
 - (b) Wireless modules shall have a dedicated cover that requires unfastening two screws to remove. The cover shall have a built-in magnet, and removal of the cover shall initiate a trouble condition at the panel.
 - (c) Wireless AV bases shall have a dedicated mounting plate with a magnetic tamper mechanism that initiates a trouble when the AV base is removed from the mounting plate.
 - (d) Wireless pull stations shall have a dedicated battery cover with a magnetic tamper mechanism that indicates a trouble when the battery door is opened.
15. Wireless modules shall be capable of being mounted in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box. The optional surface mount Lexan enclosure shall be used for this purpose, except where installation of the wireless monitor module in a metal box has been tested and adequate performance for the application using the metal box has been confirmed.
16. Wireless AV bases shall connect directly to a wired System Sensor AV notification appliance.

17. Wireless AV bases shall have two separate battery groups which includes one to provide power for wireless communication and one to provide power for the audio and/or visual indication.
18. Wireless AV systems shall offer synchronization within a single mesh network.
19. A secondary module shall provide synchronization between wired System Sensor AV notification appliances and wireless AV notification appliances.
20. A synchronization module shall operate from 24VDC power with supplemental battery support.
21. Available Wireless devices shall include:
 - (a) Intelligent wireless smoke detector (photoelectric technology)
 - (b) Intelligent wireless smoke/heat combo detector
 - (c) Intelligent wireless fixed temperature heat detector, 135 degrees F.
 - (d) Intelligent wireless rate of rise heat detector, 135 degrees F.
 - (e) Wireless monitor module
 - (f) Wireless relay module
 - (g) Wireless synchronization module
 - (h) Wireless AV base for use with wired AV devices
 - (i) Wireless pull station
 - (j) Wireless gateway
22. Unprogrammed wireless devices shall be capable of being used to perform a site survey to assist in determining the viability of a site for a wireless application. Tests shall include point to point connectivity, and a background RF
23. A program that supports qualification of potential wireless applications, configuration and installation, and diagnostics shall be available. This program shall be installed on a Windows® PC, and shall be capable of communicating with wireless devices by use of a USB adapter that plugs into the computer.

- E. Manufacturers:
1. Honeywell SWIFT Addressable Devices
 2. Gamewell FCI Addressable Devices

- F. Approvals:
1. UL
 2. FM
 3. FCC

2.11 SURGE PROTECTION DEVICES - SPD

- A. Provide Surge Protection Device (SPD) integral with the Control Panels; supplied the SPD at the supply 120 VAC voltage side.
1. Provide SPD on all 120 VAC serving the fire alarm control panels.
- B. Provide Surge Protection Devices on all fire alarm wiring, which extends beyond the main building. Locate the SPD as close as practicable to the point at which the circuit leave or enter the building where the Fire Alarm Control Panel is located.
1. Provide equipment ground and connected to the building grounding electrode system per NEC.
 2. Provide a dedicated cabinet to house the SPD. Locate cabinet within 5 feet to 25 feet of the fire alarm panels.

2.12 TERMINAL CABINETS AND BACKING BOARDS

- A. Fire Alarm Terminal Cabinets:

1. Match panel boards for box and cover design and contain a plywood backboard with white art board covering, for a markable surface, over which terminal blocks will be placed in rows no closer than 6 inches edge to edge.
 2. Above ceiling boxes: Minimum 24 inches x 24 inches x 6 inches with a hinged cover, red stenciled "FIRE ALARM" on cover, and interior to match above.
 3. Isolate and identify separately the terminals for:
 - (a) Smoke detectors
 - (b) Door releases
 - (c) Flow switches
 - (d) Stations and other related wiring
 4. Provide terminal box at or near the control panel whether or not shown on the drawings.
 5. Enter control panel with only those wires to terminal at panel.
- B. Provide a grounding bar in every terminal cabinet and bond to the main building grounding system with a #8 AWG.
- C. Permanently label all fire alarm terminal boxes, panels and relay enclosures (Fire Alarm).
- D. Backing Boards:
1. Provide 3/4-inch marine plywood backing boards for support of all fire alarm equipment surface mounted on masonry walls.
 2. Paint both sides of boards with two (2) coats of Gray enamel, including all edges.

2.13 FIRE ALARM WIRE AND CABLE

- A. Comply with Section 16120 – Wire & Cables
- B. Power-Limited Fire Alarm circuits and Non-Power-Limited Fire Alarm circuit shall comply with NEC Article 760.
- C. Signal Circuits, Door Holder and Annunciator wiring shall comply with NEC Article 310
- D. Provide in accordance with manufacturer's instructions and requirements of these specifications all wiring, conduit, boxes, etc., required for the erection of a complete system as described herein and as shown on drawings.
1. Wires: color-coded and tagged at all junction points and test free from opens, grounds or shorts between conductors.
 2. Wiring: Minimum #14 THHN/THWN in color coded metal raceways and tagged with markers indicating circuit designation and function.
 3. Provide wire listed for direct burial for the signaling line circuits (SLC) on all underground conduit runs.
 4. All wires: Stranded only.
 5. Post wiring color code and I.D. in all terminal cabinets.
 6. Use terminal strips at terminal cabinets and wire nuts in fire alarm junction boxes.
 7. Provide equipment ground through entire system and bonded to each device, junction box, terminal box and control panel.
 8. If manufacturer's recommendation is shielded cable, the shield shall not be grounded at any point other than at the main fire alarm panel.
 9. All underground wire in raceway or duct bank shall be fiber optic cable rated for submersible installation. No splices or terminations allowed on underground boxes.

10. All underground wire shall be rated for wet location.
11. Provide spare Signal Line Circuit in all terminal cabinets

2.14 RACEWAY SYSTEM

- A. Comply with Section 16130 – Raceways and Boxes.
- B. Comply with Section 16132 – Conduits, Fittings and Supports.
- C. Provide flexible conduit to duct detectors.
- D. Provide rigid galvanized steel heavy wall for all conduits exposed to the weather or buried. Seal tight for outside junction boxes.
- E. Label conduit at each terminal cabinet as to its destination, building number, direction interior or exterior.
- F. All conduit connections to terminal cabinets and control cabinets shall have bushings installed.
- G. Maximum number of conductors in a conduit shall not exceed 40% conduit fill.
- H. Raceways containing conductors identified as “fire alarm and emergency communications system” conductors shall not contain any other conductors, and no AC carrying conductors will be allowed in the same raceway with the DC fire alarm and emergency communications system detection and signaling conductors.
- I. All fire alarm Junction Box (JB) covers shall be painted orange or marked “Fire Alarm” to distinguish the JB as connected to a fire alarm raceway. Switch boxes, fire alarm boxes, terminal pull boxes: Painted with a suitable priming coat and not less than 2 finish coats of hard, durable weather-proof lacquer or enamel.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install system in accordance with manufacturer’s instructions.
- B. Make conduit and wiring connections to sprinkler flow switches, sprinkler valve tamper switches, fire-suppression system control panels, duct smoke detectors, door release devices, and all other specified peripherals.
- C. Ensure there are no cuts or splices in the wiring between terminal boxes.
- D. Mounting:
 1. Manually operated sending stations: Mount near all main exits located in classrooms or other supervised areas with clearly visible signs, “Fire Alarm Pull Stations Inside”, posted to the exterior of the spaces indicating the sending station’s location.
 - (a) Lettering: No smaller than 1-1/2 inch. See detail on drawing.
 - (b) Signs: 8-1/2 inches x 14 inches x .125 clear lexan minimum, with red letters back stenciled or front engraved.
 - (c) Provide minimum size fasteners with resets and an adhesive back.
 2. For conduits larger than 1 inch, use a 4-11/16 inch box and an extension box.

3. Audible/Visible Units: Mount units such that the strobe unit is placed wall-mounted appliances shall be mounted such that the entire device is not less than 80 in and not greater than 96 in above the finished floor.
4. Duct Detectors:
 - (a) Mounted according to the latest manufacturer's recommendations.
 - (b) Provide at least a minimum of 3 feet of clearance between the front of the detector housing and any obstructing object or structure.
 - (c) Install all sampling tubes the full width of the duct to go through the opposite wall of the duct and capped.
 - (d) Provide one layer of insulation between the A/C supply duct and the duct detector housing.
5. Remote Duct Detector Indicators:
 - (a) Uniformly surface mounted on the wall between 48 and 54 inches above the floor.
 - (b) For duct detectors that are above a ceiling or on a roof, flush mount the remote indicators on the ceiling or nearest wall below the unit such that the unit is not above 80 inches from the highest floor level.
6. Wall Mounted Door Holders:
 - (a) Properly align base and device.
 - (b) Provide solid 2 inch x 4-inch wood backing when holders are mounted on stud walls, furred surfaces, and other surfaces that are not already solid.
 - (c) Submit shop drawings showing holder, mounting, backing and other necessary information.
 - (d) Holders: Provide minimum of 70 pounds of holding force.
 - (e) In renovation, old door holders are to be replaced utilizing existing wiring
7. Closers
 - (a) 120 Volt
 - (b) One per door leaf.
8. Install tamper switches so the probe will be vertical and down.
9. Upon system reset, program bell to interface with fire alarm for recall as follows:
 - (a) Ensure all programmable bell operations are suspended to preclude the possibility of confusing normally programmed bell activity with a "recall signal" until fire panel is reset.
 - (b) Ensure this suspension of the school bell system is automatically released upon the absence of any and all alarms or manual test conditions, without manual intervention on the part of the user, so that the preprogrammed functions restore to normal operations.
10. Automatic detectors shall be mounted on the structural ceiling or finished ceiling and not on the bottom or side of any type of construction or structure which extends down from the ceiling. The mounting location of every device shall be shown on the drawings, and as approved by the owner.
11. Automatic detectors shall be located near points where air currents normally intersect. However, no detectors shall be located in the direct path of the draft from an HVAC air supply grille, a door, window or hallway and a minimum of three feet from a diffuser.
12. Automatic detectors shall be located out of the direct stream of air currents; minimum 3 feet from any diffuser.
13. Where applicable, completely remove the existing fire protection and fire alarm control panel equipment, components, and equipment that are not specified as being a part of the new system. The equipment removed shall be boxed, labeled and delivered to the Physical Plant Operations Fire Alarm Department. All unused existing fire alarm system wiring and cable shall be removed and disposed of off-site by the electrical contractor.

14. Fire Stopping
 - (a) Comply with Section 07270 – Firestopping and Small Barrier Caulking
 - (b) Where penetrations of floor or walls are made, they shall be fire-stopped with approved or UL-listed fire stopping material acceptable to the Authority Having Jurisdiction.
15. The electrical contractor shall not install smoke detectors prior to completion by other trades that may be working in the space into which the fire alarm system is being installed as per NFPA 72
16. Fire alarm batteries shall not be located above 6.5 feet or mounted above de ceiling.

3.2 FIRE ALARM WIRE AND CABLE COLOR CODE

- A. Provide fire alarm circuit conductors with color code insulation as follows:
 1. Signaling Line Circuit: Twisted Shielded Pair - #16 AWG (or non-shielded according manufacturer recommendations)
 2. Notification Appliance Circuit: #14 AWG minimum or addressable relay ORANGE (+) and BLACK (-)
 3. Annunciator Serial Communication: Twisted Shielded Pair - #16 AWG minimum
 4. Auxiliary Power Circuit: #14 AWG minimum BROWN (-) and YELLOW (+)
 5. Air Handling Control: #14 AWG minimum PURPLE (-) and PINK (+) or addressable relay
 6. Door Holder/Release Control: #14 AWG minimum RED (+) and WHITE (-)
 7. Power Supervisory Circuit: One (1) #14 minimum BROWN (-) and YELLOW (+)
 8. Spare: Two (2) #14 Minimum, WHITE
 9. Initiation circuit for hardwire system, Red (+) and Blue (-).
 10. Equipment Grounding Conductor: #12 AWG, Green

3.3 SITE INVESTIGATION

- A. Contractor: Apprise himself fully regarding equipment peculiarities and limitations of space available for installation of materials under contract. Include all necessary contingencies for the above in base bid.
- B. Do all cutting, sleeving, excavating and backfilling necessary for installation of equipment and patching thereafter, but do not cut other work without consent of Owner.

3.4 CLEANING UP

- A. Contractor: Responsible for making arrangements for removal of cartons, boxes, paper, scrap wire, conduit, etc. off the site.
- B. The electrical contractor shall perform all removal work efforts in neat and workmanship like manner.
- C. Clean the inside of the terminals cabinets and other enclosures from wire cuts and other installation debris.

END OF SECTION

((Specifier leave this line)) SBBC Design & Material Standards, July 25, 2022 JA Standards Committee)