

Leon County Schools  
Fire Alarm Replacement – Lively Technical Center

LCS Project No. 24-17-P-73

MFE Addendum #1  
2/19/2018

Incorporate into the Construction Contract the following:

1. SPECIFICATION 16721 – FIRE ALARM SYSTEM

Add REVISED Specification 16721 – Refer to revised specification for the following changes:

Added approved manufacturers / systems.

Removed fiber optic modular network interface requirements.

Removed Digital Alarm Communicator Transmitter (DACT) requirements.

end

## **SECTION 16721 FIRE ALARM SYSTEM**

### **PART 1 - GENERAL**

#### **DESCRIPTION**

This section of the specifications includes the furnishing, installation, and connection of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panel, amplification, auxiliary control devices, annunciators, and wiring as shown on the drawings and specified here.

The fire alarm system installation shall comply with requirements of NFPA Standard No. 72 and local code requirements for protected premises signaling systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.

The fire alarm manufacturer shall be: Simplex Grinnell or Edwards.

The FACP and peripheral devices shall be manufactured 100% by a single manufacturer (or division thereof).

The ability for selective input/output control functions based on ANDing, ORing, NOTing, timing and special coded operations is to also be incorporated in the resident software programming of the system.

To accommodate and facilitate job site changes, initiation circuits shall be individually configurable on-site to provide either alarm/trouble operation, alarm only, trouble only, current limited alarm, no alarm, normally closed device monitoring, a non-latching circuit or a alarm verification circuit.

To accommodate and facilitate job site changes, notification appliance circuits shall be individually configurable on-site to provide, upon activation, a temporal code until reset upon any output circuit.

#### **BASIC PERFORMANCE**

Alarm, trouble, supervisory, and "gas" supervisory signals from all intelligent reporting devices shall be encoded onto an NFPA (Class B) signaling line circuit.

Initiation Device Circuits (IDC) shall be wired Class B.

Notification Appliance Circuits (NAC) shall be wired Class B.

Digitized electronic signals shall employ check digits or multiple polling.

Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.

#### **BASIC SYSTEM FUNCTIONAL OPERATION**

When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:

1. The System Alarm LED shall flash.

2. A local audible signal in the control panel shall sound.
3. A backlit LCD display shall indicate all information associated with the Fire Alarm condition, including the type of alarm point and its location within the protected premises.
4. Printing and history storage equipment shall log the information associated with each new fire alarm control panel condition, along with time and date of occurrence.
5. All system output programs assigned via control by event equations to be activated by the particular point in alarm shall be executed, and the associated System Outputs (alarm notification appliances and/or relays) shall be activated.
6. A supervised signal to notify the approved central station is to be activated. To accommodate and facilitate job site changes, the type of "city connection circuit" is to be on-site configurable to provide either a "reverse polarity", "local energy", "shunt" or dry contact connection. This circuit shall be configured as required to properly interface with digital dialer to be provided.
7. Refer to fire alarm matrix for site specific alarm actions.

When a supervisory condition is detected and reported by the system, such as a tamper switch, the following functions shall immediately occur:

1. Activate the system supervisory service audible signal and illuminate the LED at the control unit and the remote annunciator.
2. Pressing the Supervisory Acknowledge Key will silence the supervisory audible signal while maintaining the Supervisory LED "on" indicating off-normal condition.
3. Record the event in the FACP historical log.
4. Transmission of supervisory signal to the central monitoring station.
5. Restoring the condition shall cause the Supervisory LED to clear and restore the system to normal.
6. Refer to fire alarm matrix for site specific supervisory actions.

Priority of Signals: Fire alarm events have highest priority. Subsequent alarm events are queued in the order received and do not affect existing alarm conditions. Supervisory and Trouble events have second-, and third--level priority, respectively. Signals of a higher-level priority take precedence over signals of lower priority even though the lower-priority condition occurred first. Annunciate all events regardless of priority or order received.

Fire-alarm signal initiation shall be by one or more of the following devices and systems:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Verified automatic alarm operation of smoke detectors.
5. Automatic sprinkler system water flow.
6. Fire-extinguishing system operation.

Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. Duct smoke detectors.

“Gas” supervisory signal initiation shall be by one or more of the following devices and actions:

1. CO gas detectors

Fire Suppression Monitoring:

Water flow: Activation of a water flow switch shall initiate general alarm operations.

Sprinkler valve tamper switch: The activation of any valve tamper switch shall activate system supervisory operations.

System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at fire-alarm control unit.
4. Ground or a single break in fire-alarm control unit internal circuits.
5. Abnormal AC voltage at fire-alarm control unit.
6. Break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at fire-alarm control unit or annunciator.

## **SUBMITTALS**

General:

Submit manufacturer's data to the Engineer for review in accordance with Division 1 requirements.

All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent equipment (compatible UL Listed) from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.

For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

Shop Drawings:

Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

Include manufacturer's name(s), model numbers, ratings, power requirements, and performance in the form of standard data sheets.

Provide equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts drawn to scaled floor plan depiction.

Provide power requirements and battery sizing calculations for review.

Show remote annunciator layout, configurations, and terminations.

Manuals:

Submit simultaneously with the shop drawings, complete operating and maintenance manual listing the manufacturer's name(s) including technical data sheets.

Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnections between the items of equipment.

Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

Software Modifications:

Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.

Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

The Contractor's base bid shall include all programming and software modifications necessary to provide a fully functioning and properly operating system. Any modifications necessary for component additions or deletions to the system prior to system acceptance, and any modifications during the warranty period shall be included unconditionally in the base bid.

Certifications:

Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

**GUARANTY**

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

**APPLICABLE STANDARDS AND SPECIFICATIONS**

The specifications and standards listed below form a part of this specification. The system shall fully comply with all relevant standards currently adopted by the Florida Fire Prevention Code.

National Fire Protection Association (NFPA) - USA:

- |         |                                   |
|---------|-----------------------------------|
| No. 15  | Water Spray Systems.              |
| No. 17A | Wet Chemical Extinguisher System. |
| No. 72  | National Fire Alarm Code.         |
| No. 101 | Life Safety Code.                 |

Underwriters Laboratories Inc. (UL) - USA:

- |          |   |
|----------|---|
| No. 268  | Smoke Detectors for Fire Alarm Systems.               |
| No. 864  | Control Units for Fire Alarm Systems.                 |
| No. 268A | Smoke Detectors for Duct Applications.                |
| No. 521  | Heat Detectors for Fire Protective Signaling Systems. |

No. 464	Audible Signal Appliances.
No. 38	Manual Signaling Boxes for Fire Alarm Systems.
No. 346	Waterflow Indicators for Fire Protective Signaling Systems.
No. 1971	Signaling Devices for the Hearing Impaired.

#### Local and State Building Codes

All requirements of the Authority Having Jurisdiction (AHJ).

### **APPROVALS**

The system shall have proper listing and/or approval from the following nationally recognized agencies:

UL Underwriters Laboratories Inc.

The fire alarm control panel shall meet UL Standard 864, (Control Units) and UL Standard 1076 (Proprietary Burglar Alarm Systems). Addendum No. 1 2/19/2018

### **APPLICABLE MANUFACTURER AND MODEL**

The fire alarm control panel and system shall be one of the following:

Simplex Grinnell 4100ES  
Edwards EST3

Although individual buildings will have dedicate systems, all systems on campus shall be by the same manufacturer.

## **PART 2 - PRODUCTS**

### **EQUIPMENT AND MATERIAL, GENERAL**

All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protective signaling system, meeting the National Fire Alarm Code.

All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.

All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

### **CONDUIT AND WIRE**

Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.

All wiring shall be installed in a metal conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.

Power limited circuits must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC.

All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

Conduits shall not enter the Fire Alarm Control Panel, or any other remotely mounted Control Panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.

Conduit shall be 3/4 inch minimum.

#### Wire:

All fire alarm system wiring shall be new.

Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer.

All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.

Wiring used for the multiplex communication loop shall be twisted and shielded and support a minimum wiring distance of 10,000 feet.

Data line wiring shall be twisted shielded 18 gauge FPLP wire in a red jacket. All data wire shall meet current code requirements and manufacturer's specifications. Speaker wiring shall meet current code requirements and manufacturer's specifications, and have a different color jacket than the data wiring (minimum 18 gauge twisted shielded).

All field wiring shall be completely supervised.

#### Terminal Boxes, Junction Boxes and Cabinets:

All boxes and cabinets shall be UL listed for their use and purpose.

Initiating circuits shall be arranged to serve like categories (manual, smoke, water flow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

The Fire Alarm Control Panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the Power Distribution Panel or Safety Disconnect as FIRE ALARM CONTROL PANEL. The Control Panel Cabinet shall be grounded securely to service ground bus in main electrical panel.

#### **MAIN FIRE ALARM CONTROL PANEL**

The FACP shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent detectors, addressable modules, printer, annunciators, and other system controlled devices.

## System Capacity and General Operation

The control panel shall be capable of addressing and monitoring up to 2500 intelligent/addressable devices.

The system shall include two (2) form C alarm and trouble relays rated at a minimum of 2.0 amps @ 30 VDC. It shall also include four (4) Class B programmable Notification Appliance Circuits.

The system shall support up to [99] programmable EIA-485 driven relays.

The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display, individual, color coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire alarm system.

All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the Fire Alarm Control Panel.

The FACP shall provide the following features:

- A. Drift Compensation to extend detector accuracy over life.
- B. Sensitivity Test, meeting requirements of NFPA 72.
- C. Maintenance Alert to warn of excessive smoke detector dirt or dust accumulation.
- D. System Status Reports to display or printer.
- E. Rapid manual station reporting (under 3 seconds).
- F. Non-Alarm points for general (non-fire) control.
- G. Periodic Detector Test, conducted automatically by software.
- H. Cross Zoning with the capability of: counting two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.
- I. Temporal coding options.
- J. Walk Test, with check for two detectors set to same address.
- K. UL 1076 Security Monitor Points.
- L. Control-By-Time for non-fire operations, with holiday schedules.
- M. Day/Night automatic adjustment of detector sensitivity.

## Central Microprocessor

The Microprocessor unit shall communicate with, monitor, and control all external interfaces with the control panel. It shall include EPROM for system program storage; non-volatile memory for building specific program storage; and a "watch dog" timer circuit to detect and report microprocessor failure.

The Microprocessor Unit shall contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs shall be held in non-volatile programmable memory, and shall not be lost even if system primary and secondary power failure occurs.



The Microprocessor Unit shall also provide a real-time clock for time annotation of system displays, printer, and history file. The time-of-day and date shall not be lost if system primary and secondary power supplies fail. The real time clock may also be used to control non-fire functions at programmed time-of-day, day-of-week, and day-of-year.

#### Display

The display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.

The display shall include status information and custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.

The Display shall provide an 80 character back-lit alphanumeric Liquid Crystal Display (LCD). It shall also provide Light Emitting Diodes (LEDs), that indicate the status of the following system parameters: AC POWER, SYSTEM ALARM, SYSTEM TROUBLE, SIGNAL SILENCED, SUPERVISORY, (and PRE-ALARM).

The Display shall provide a key-pad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different access (password) levels shall be provided, one to prevent unauthorized system control, one to prevent programming.

The Display shall include the following operator functions: SIGNAL SILENCE, RESET, DRILL, and ACKNOWLEDGE.

#### Signaling Line Circuit (SLC)

The SLC Interface shall provide power to and communicate with up to 99 intelligent detectors (Ionization, Photoelectric, or Thermal) and 99 intelligent modules (monitor or control) for a system capacity of 198 devices. This shall be accomplished over a single SLC loop.

The Loop Interface Board shall receive analog information from all intelligent detectors that shall be processed to determine whether normal, alarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.

The detector software shall meet NFPA 72, chapter 14 requirements and be certified by UL as a calibrated sensitivity test instrument.

The detector software shall allow manual or automatic sensitivity adjustment.

#### Serial Interfaces

An EIA RS-485 port for the serial connection of the optional Annunciators and remote LCD displays shall be provided.

The EIA RS-485 interface may be used for network connection to a Proprietary Receiving Unit.

Addendum No. 1 2/19/2018

Enclosures:

The control panel shall be housed in a UL listed cabinet suitable for surface mounting. Cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.

The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators.

All interfaces and associated equipment are to be protected so that they will not be affected by voltage surges or line transients consistent with UL standard 864.

Addendum No. 1 2/19/2018

A relay module shall provide four (4) form C relays rated at 2.0 amps. The relays shall track programmable software zones and are in addition to the required alarm/trouble contacts.

Power Supply:

The Power Supply shall operate on 120 VAC, 60 Hz; shall be power-limited, and shall provide all necessary power for the FACP.

It shall provide notification appliance power using a switching 24 VDC regulator. Power capacity shall be sufficient to drive all audible/visual devices plus an additional 20% spare capacity. In no case shall capacity be less than 6 amps. An expansion power supply is acceptable to meet the required system capacity.

It shall provide a battery charger for 24 hours of standby using dual-rate charging techniques for fast battery recharge. Charger shall be capable of charging up to 110 Ah batteries without a separate external battery charger. Battery charger voltage and amperage values shall be accessible on the FACP LCD display.

It shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults on sensitive addressable modules.

Field Wiring Terminal Blocks:

All panel I/O wiring shall utilize terminal blocks with sufficient capacity for 18 to 12 AWG wire.

Operators Controls

Acknowledge Switch:

Activation of the control panel Acknowledge switch in response to new alarms and/or troubles shall silence the local panel audible signal and change the Alarm and Trouble LEDs from flashing mode to steady-ON mode.

Where multiple conditions exist, advancement of the LCD display to previous or subsequent Alarm or Trouble conditions shall be a feature.

Depression of the Acknowledge switch shall also silence all remote annunciator sounders.

Signal Silence Switch: Activation of the Signal silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.

System Reset Switch: Activation of the system reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.

A lamp test function shall be available.

Drill (Evacuate) Switch.

The Drill switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.

Field Programming

The system shall be programmable, configurable and expandable in the field without the need for special tools or electronic equipment and shall not require field replacement of electronic integrated circuits.

All programming may be accomplished through the standard FACP keypad.

All field defined programs shall be stored in non-volatile memory.

The programming function shall be enabled with a password that may be defined specifically for the system when it is installed. Two access levels with password protection shall be provided in addition to a key-lock cabinet

Program edit shall not interfere with normal operation and fire protection. If a fire condition is detected during programming operation, the system shall exit programming and perform fire protection functions as programmed.

An Auto-Program (self-learn) function shall be provided to quickly install initial functions and make the system operational.

An off-line programming function, with batch upload/download, shall also be available.

Specific System Operations

Smoke Detector Sensitivity Adjust: Means shall be provided for adjusting the sensitivity of any or all analog intelligent smoke detectors in the system from the System keypad. Sensitivity range shall be within the allowed UL window.

Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The Alarm Verification delay shall be programmable from 5 to 30 seconds and each detector shall be able to be selected for verification. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.

Point Disable: Any Device in the system may be Enabled or Disabled through the system keypad.

Point Read: The system shall be able to display or print the following point status diagnostic functions:

- a. Device status.
- b. Device type.
- c. Custom device label.
- d. View analog detector values.
- e. Device zone assignments.
- f. All Program Parameters.

System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system status:

System History Recording and Reporting: The Fire Alarm Control Panel shall contain a History Buffer that will be capable of storing up to 600 system alarms/troubles/operator actions. Each of these actions will be stored and time and date stamped with the actual time of the activation. The contents of the History Buffer may be manually reviewed, one event at a time, or printed in its entirety.

Although the foreground history buffer may be cleared for user convenience, a background, non-erasable buffer shall be maintained which provides the last 600 system events.

The History Buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable.

Automatic Detector Maintenance Alert: The Fire Alarm Control Panel shall automatically interrogate each intelligent smoke detector and shall analyze the detector responses over a period of time.

If any intelligent smoke detector in the system responds with a reading that is below or above normal limits, then the system will enter the Trouble Mode, and the particular detector will be annunciated on the system display, and printed on the optional printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.

Pre-alarm Function: The system shall have the capability to provide two levels of pre-alarm warning to give advance notice of a possible fire situation. Both pre-alarm levels shall be fully field adjustable. The first level shall give an audible indication at the panel. The second level shall give an audible indication and may also activate control relays. The system shall also have the ability to activate local detector sounder bases at the pre-alarm level, to assist in avoiding nuisance alarms.

Software Zones: The FACP shall provide 128 software zones. All addressable devices shall be capable of control-by-zone through field programming for control activation and annunciation purposes.

## **ONE-WAY VOICE COMMUNICATION**

Refer to construction documents for which buildings have voice communication and which buildings have horn communication.

The system shall incorporate one-way voice communication and tone generating capabilities.

A central audio control module shall be provided for the necessary alarm message/tone generation, main and remote microphone connections, music inputs, and mixer/pre-amplifier circuits. Continuous supervision shall be provided along with specific information as to the type of failure should a problem occur (eg. main microphone trouble, tone trouble, etc.). Audio outputs shall have individual gain control.

A hand-held, push-to-talk microphone shall be provided, recessed within a protective panel-mounted enclosure. The microphone shall be a noise-canceling communication type with a frequency range of 200 Hz to 4000 Hz and shall be equipped with a self-winding five-foot coiled cable. An LED indicator shall be provided to indicate the microphone push-to-talk button has been pressed and speaker circuits are ready for transmission. The microphone shall be supervised for disconnection.

An audio control switch module shall be furnished to provide manual access to audio operations for authorized personnel. The module shall include an "ALL Circuits" switch, "Aux Tone 1" switch, "Aux Tone 2" switch, tone generator stop switch, and "Audio Trouble Reset" switch. These switches and associated LED indicators shall be supervised for disarrangement or failure.

Audio power amplifiers shall be furnished with a self-contained filtered 24VDC power supply, transformer, and amplifier monitor circuits. The amplifiers shall provide a 25 Volt RMS output with a frequency response of 120 Hz to 12,000 Hz. Provide sufficient amplification to operate all system speakers simultaneously plus twenty (20) percent spare capacity.

The speaker circuits shall be capable of supplying 25 Volt RMS audio power from the system amplifiers. Supervision for open, short, or ground fault conditions shall be provided. Individual and distinct trouble indications shall be provided for each fault. Provide one circuit for each zone or area of distinct communication.

Digitized tones for alarm and auxiliary requirements (horn, chime, etc.) shall be provided.

A pre-recorded digitized voice message capability is to be provided for automatic transmission to building occupants during alarm conditions. The automatic message player shall not rely on a tape or other mechanical means of transmitting the evacuation message. A standard evacuation message shall be provided under this contract, however, the message player must be capable of transmitting a custom message of up to sixty seconds long. A self-contained speaker will provide testing of the message(s) without disturbing the occupants of the facility.

#### Automatic Voice Evacuation Sequence:

The audio alarm signal shall consist of an alarm tone for a maximum of 15 seconds followed by automatic pre-selected voice evacuation messages. At the end of each voice evacuation message, the alarm tone shall resume. The alarm tones shall sound alternately until the alarm silence switch at the fire alarm control panel has been operated.

All audio alarm operations (speaker circuit selection and alarm tone/voice message timing variations) shall be activated by the system software so that any required future changes to the evacuation sequence can be facilitated by authorized personnel without any component rewiring.

#### Manual Voice Paging Sequence:

The system shall be configured to allow selective voice paging. Upon activation of any speaker manual control switch, two (2) attention getting beeps shall sound over the speakers indicating an impending voice message will occur.

If any speaker manual control switches are activated, the control panel operator shall be able to make announcements via the push-to-talk paging microphone over the pre-selected speakers.

Facility for total building evacuation and paging shall be provided to allow for activation of all speakers. This shall be accomplished by the means of an "All Circuit" switch.

## **SYSTEM COMPONENTS**

### Programmable Electronic Sounders:

Electronic sounders shall operate on 24 VDC nominal.

Electronic Sounders shall be field programmable without the use of special tools, to provide interrupted tones with an output sound level of at least 91 dBA measured at 10 feet from the device.

These devices shall be capable of either ceiling or wall mounting.

Shall be flush mounted where shown on plans.

### Strobe Lights:

Shall operate on 24 VDC nominal.

Shall meet the requirements of the ADA as defined in section 702.1 of FBC Accessibility Chapter 7 and shall meet the following criteria:

The strobe intensity shall meet the requirements of section 702.1 of FBC Accessibility Chapter 7.

The flash rate shall meet the requirements of section 702.1 of FBC Accessibility Chapter 7.

The appliance shall be placed 80 inches above the highest floor level within the space, or 6 inches below the ceiling, which ever is the lower.

### Audible/Visual Combination Devices:

Shall meet the applicable requirements above for audibility.

Shall meet the requirements above for visibility.

Units shall provide a common enclosure for the fire alarm audible and the visual alarm devices.

The unit shall be clearly marked with "Fire" lettering visible from a 180 degree field of view.

### Speakers:

Provide speakers that are UL listed, with high quality tone and voice reproduction. Speakers shall have a frequency response 400 – 12,000 hz. Speakers for alarm notification shall be supervised.

Provide with internal taps for 1/4W, 1/2W, 1W, and 2W power output. Minimum sound pressure output shall be 88dB at 3 meters.

Ceiling mounted speakers shall have painted metal grilles and backboxes for each speaker. Provide supports, tile bridges and other installation accessories as required.

Speakers for exterior use, including parking areas, shall be corrosion resistant and listed for the service.

Provide exterior speakers of the double re-entrant horn type, bracket mounted with all purpose, multi-position bracket.

### Addressable Devices - General

Addressable Devices shall provide an address-setting means.

Detectors shall be Intelligent and Addressable, and shall connect with two wires to the Fire Alarm Control Panel Signaling Line Circuits.

Addressable smoke and thermal detectors shall provide an LED. LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and LED shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED.

Smoke detector sensitivity shall be set through the Fire Alarm Control Panel and shall be adjustable in the field through the field programming of the system. Sensitivity may be automatically adjusted by the panel on a time-of-day basis.

Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 14.

The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature.

The detectors shall provide a test means whereby they 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 switch) or initiated remotely on command from the control panel.

Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).

#### Addressable Pull Box (manual station)

Addressable Pull Boxes shall, on command from the Control Panel, send data to the panel representing the state of the manual switch. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.

Operating stations shall be single acting type where clear alarming covers are provided.

All operated stations shall have a positive, visual indication of operation and utilize a key type reset.

Manual Stations shall be constructed with clearly visible operating instructions provided on the cover.

Stations shall be suitable for or semiflush mounting as shown on the plans, and shall be installed not less than 42 inches, nor more than 48 inches above the finished floor.

#### Intelligent Photoelectric Smoke Detector

The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

#### Intelligent Ionization Smoke Detector

The detectors shall use the dual-chamber ionization principal to measure products of combustion and shall, on command from the control panel, send data to the panel representing the analog level of products of combustion.

### Intelligent Thermal Detectors

Thermal Detectors shall be intelligent addressable devices adjustable for activation temperature by software. Initial programming for all units shall be 135 degrees F and have a rate-of-rise element rated at 15 degrees F per minute. It shall connect via two wires to the Fire Alarm Control Panel Signaling Line Circuit. Up to 99 intelligent heat detectors may connect to one SLC loop.

The detectors shall use an electronic sensor to measure thermal conditions caused by a fire and shall, on command from the control panel, send data to the panel representing the analog level of such thermal measurements.

### Intelligent Duct Smoke Detector

In-Duct Smoke Detector Housing shall accommodate either an intelligent ionization sensor or an intelligent photoelectric sensor, of that provides continuous analog monitoring and alarm verification from the panel.

When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to shut down air handling systems.

Provide remote alarm/power LED indicator and key test switch where noted on the Drawings.

### Addressable CO Sensor

The CO Sensor shall be an addressable carbon monoxide (CO) sensing module providing both CO toxic gas detection and enhanced fire detection, and shall be listed to UL 268, Smoke Detectors for Fire Alarm Signaling Systems and UL 2075, Gas and Vapor Detectors and Sensors; allowing systems to be listed to UL 2034, Single and Multiple Station Carbon Monoxide Alarms.

The CO Sensor shall include CO sensor element mounted in the sensor base which can be easily replaced without replacing the complete sensor base assembly.

### Addressable CO Sounder Base

The CO Sensor base shall include an integral red LED to indicate the power-on, trouble, test mode or alarm status.

The CO Sensor base shall report the following CO Sensor troubles: Communication loss, Disabled, Almost Expired 12 Months, Almost Expired 6 Months, Expired (End of Life), and Sensor Missing/Failed.

The CO Sensing element shall support operation with a Sounder base; the CO Sounder base shall provide temporal code 4 (TC4) for toxic carbon monoxide alarms.

The CO Sounder base shall be listed to UL464, Audible Signal Appliances.

### Addressable Dry Contact Monitor Module

Addressable Monitor Modules shall be provided to connect one supervised IDC zone of conventional Alarm Initiating Devices (any N.O. dry contact device) to one of the Fire Alarm Control Panel Signaling Line Circuit (SLC) Loops.

The Monitor Module shall mount in a 4-inch square, 2-1/8" deep electrical box.



The IDC zone may be wired for Class B operation. An LED shall be provided that shall flash under normal conditions, indicating that the Monitor Module is operational and in regular communication with the control panel.

#### Two Wire Detector Monitor Module

Addressable Monitor modules shall be provided to connect one supervised IDC zone of conventional 2-Wire smoke detectors or alarm initiating devices (any N.O. dry contact device).

The Two-Wire Monitor Module shall mount in a 4-inch square, 2-1/8" deep electrical box or with an optional surface backbox.

The IDC zone may be wired for Class B operation. An LED shall be provided that shall flash under normal conditions, indicating that the Monitor module is operational and in regular communication with the control panel.

#### Addressable Control Module

Addressable Control Modules shall be provided to supervise and control the operation of one conventional Notification Appliance Circuit (NAC) of compatible, 24 VDC powered, polarized Audio/Visual Notification Appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay.

The Control Module shall mount in a standard 4-inch square, 2-1/8" deep electrical box, or to a surface mounted backbox.

The control module NAC circuit may be wired Class B with up to 1 Amp of inductive A/V signal, or 2 Amps of resistive A/V signal operation, or as a dry contact (Form C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised, UL listed remote power supply.

The control module shall provide address-setting means and shall also store an internal identifying code that the control panel shall use to identify the type of device. An LED shall be provided that shall flash under normal conditions, indicating that the control module is operational and is in regular communication with the control panel.

A magnetic test switch shall be provided to test the module without opening or shorting its NAC wiring.

The control module shall be suitable for pilot duty applications and rated for a minimum of .6 amps at 30 VDC.

#### Isolator Module

Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop. At least one isolator module shall be provided for each protected zone of the building.

If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the Isolator Module shall automatically reconnect the isolated section.

The Isolator Module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an Isolator Module after its normal operation.

The Isolator Module shall mount in a standard 4-inch deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the Isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

#### Serially Connected Annunciator Requirements

The Annunciator shall communicate with the fire alarm control panel via an EIA 485 communications loop and shall annunciate all zones in the system. Up to 10 annunciators may be connected to the EIA 485 communications loop.

The annunciator shall be supervised.

The annunciator shall provide a red Alarm LED per zone, and a yellow Trouble LED per zone. The annunciator will also have an "ON-LINE" LED, local piezo sounder, local acknowledge/lamp test switch, and custom zone/function identification labels.

The annunciator switches may be used for System control such as, Global Acknowledge, Global Signal Silence, and Global System Reset.

#### LCD Alphanumeric Display Annunciator:

The Alphanumeric display annunciator shall be a supervised, remotely located back-lit LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text.

The LCD annunciator shall display all alarm and trouble conditions in the system.

The annunciator shall connect to a two-wire EIA- 485 interface. The two-wire connection shall be capable of distances of 6,000 feet. The signal may be increased in 3,000 ft. increments with an optional repeater. An optional (UL 864 Listed) module shall be available which allows the EIA-485 signal to be transmitted over Fiber Optics.

The system shall allow a minimum of four LCD annunciators. Each LCD shall be capable of the following system functions: Acknowledge, Signal Silence and Reset.

### **TERMINAL CABINETS**

Provide manufacturer's standard surface mounted terminal cabinets for termination of circuits as required. Terminate all conductors on designated terminal blocks or strips with identification of each conductor in the cabinet.

Use of standard NEMA 1 control enclosure is acceptable. Construction shall be 16 gauge steel with hinged front cover with flush latch operated with coin or screwdriver. Provide units with separate backpanel for mounting terminal blocks. Do not mount terminal block directly to back of enclosure

### **BATTERIES**

Shall be 12 volt, gel cell type (at least two required).

Battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 15 minutes of alarm upon a normal AC power failure.

The batteries are to be completely maintenance free. Liquid electrolytes are not acceptable. To prevent spills and leakage, fluid level checks or refilling shall not be required.

## **PART 3 - EXECUTION**

### **INSTALLATION**

Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer. The manufacturer's authorized representative shall provide onsite supervision of installation.

All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

### **TEST**

Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 14.

Pretesting: Contractor shall determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved. Pretesting shall occur prior to AHJ and Engineer's inspections and testing.

Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.

Verify activation of all flow switches.

Open initiating device circuits and verify that the trouble signal actuates.

Open and short signaling line circuits and verify that the trouble signal actuates.

Open and short Notification Appliance Circuits and verify that trouble signal actuates.

Ground all circuits and verify response of trouble signals.

Check presence and audibility of tone at all alarm notification devices.

Check installation, supervision, and operation of all intelligent smoke detectors using the Walk Test.

Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying

controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

Verify all signals transmit properly to monitoring center.

Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

## **FINAL INSPECTION**

At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate to the AHJ and Engineer that the systems function properly in every respect.

## **CLOSEOUT**

Provide a spare parts kit that shall include one of every type of field device (one pull station, one speaker, one combination a/v, one strobe).

Provide any special tools, equipment, programming devices and cables needed to maintain or repair the system shall be provided.

## **OPERATION MANUALS**

General: The manuals shall include installation, operation, and service manuals.

A copy of the operating program on diskette, the appropriate cable to load the program from a laptop computer, and a programming manual shall be provided. A port and method for downloading detector sensitivity shall be provided.

## **AS-BUILT DRAWINGS**

Point-to-point Wiring Diagram: A point-to-point wiring diagram shall be included with the "as-built" drawings.

CAD Format As-Built Drawings: All as-built drawings shall be submitted on CD-ROM disk in AutoCAD format (check for latest acceptable release).

Field Devices: All field devices installed in the fire alarm control panel shall be included in all diagrams. These devices include, but are not limited to, air handler shut down relays and remote reporting relays.

Zone Map: A zone map of the building showing the physical location of the devices and the layout of the fire alarm zones shall be provided. Zone maps shall also be printed and installed inside FACP's for respective building.

Function Diagram: A one-line function diagram of the fire alarm control panel shall be provided.

## **MAINTENANCE ITEMS**

All spare parts, special tools, equipment, keys, etc. required for maintenance or operation shall be turned over to the owner when the system is accepted.

A copy of the field prints, drawings, etc. shall be given to the owner when the system is accepted.

**INSTRUCTION**

Provide instruction as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided. Provide a minimum of 8 hours' training.

The Contractor and/or the Systems Manufacturer's representatives shall provide a typewritten "Sequence of Operation" to the owner.

END OF SECTION