

SECTION 28 31 13

FIRE ALARM & SMOKE DETECTION SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This section of the specification includes the modifications/expansion of the existing microprocessor controlled, analog addressable intelligent fire alarm system to form a complete, operative, coordinated system. It shall include, but not be limited to, additional alarm initiating devices, alarm notification appliances, auxiliary control devices, power supplies and wiring as indicated on the drawings and specified herein.

1.2 RELATED SECTIONS

- A. Section 26 05 33 – Raceway and Boxes.

1.3 REFERENCES

- A. No. 70 National Electric Code (NEC).
- B. No. 72-1996 National Fire Alarm Code.
- C. No. 90A Air Conditioning Systems.
- D. No. 92A Smoke Control Systems.
- E. No. 101 Life Safety Code.
- F. UL268 - Smoke Detectors for Fire Protective Signaling Systems.
- G. UL864 - Control Units for Fire Protective Signaling Systems.
- H. UL268A - Smoke Detectors for Duct Applications.
- I. UL521 - Heat Detectors for Fire Protective..
- J. UL464 - Audible Signaling Appliances.
- K. UL38 - Manually Actuated Signaling Boxes.
- L. UL1481 - Power supplies for Fire Protective Signaling Systems.
- M. UL1971 - Visual Notification Appliances.
- N. Local Electrical Codes: The system shall be installed in accordance with national and local electrical codes.

1.4 QUALIFICATIONS

- A. All bidders must provide a listing of five similar size projects having the same scope of work using the proposed information delivery equipment. This listing shall be complete with facility names, completion dates, names of contacts and their telephone numbers.
- B. The Contractor shall be an authorized factory agent or distributor of the existing fire alarm system. An electrical contractor shall not be acceptable unless proof of factory qualification is provided with the bid documents. The system provider shall have ready access to spare parts. A documented minimum of five years' experience in the application of similar systems and equipment is required.
- C. The Contractor shall employ factory-trained technical service personnel with a minimum of 2 years of experience installing the proposed system.

#### 1.5 SUBMITTALS

- A. Submit under provisions of Division 1 and Section 26 00 00.
- B. Submit manufacturer's specification sheets on each type of equipment proposed for use in the system. Each specification sheet provided shall be clearly marked to indicate the exact item provided. The submittal package shall include a system functional block diagram and a system riser diagram showing interconnection of all major equipment and devices required for the entire building system both new and existing.
- C. Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnections between the items of equipment.
- D. Submit battery calculations for power supply panels.
- E. Certifications:
  - 1. 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.

#### 1.6 WARRANTY

- A. All The Contractor shall warranty all electronic components for five (5) years and workmanship and labor for a period of one (1) year from the date of system acceptance or beneficial usage by the Owner. Neither the final payment, nor any provisions in the contract documents shall relieve the Contractor (or General Contractor) of the responsibility for faulty materials and/or workmanship for a period of one year. This Contractor shall remedy any defects due thereto, and pay for any damage to work resulting therefrom.

#### 1.7 COORDINATION

- A. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans and specifications. It is the Contractor's responsibility to review the architectural, structural, mechanical, and electrical drawings, as well as the specifications, for any

details that may impact the installation or provisioning of the system. Any discrepancies discovered shall be brought to the attention of the engineer and Owner.

## 1.8 APPROVALS

- A. The new system components must have proper listing and/or approval from the following nationally recognized agencies:
  - 1. UL Underwriters Laboratories Inc.
  - 2. FM Factory Mutual

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. The existing fire alarm system is manufactured by *Edwards*. The existing control panel is a series iO500 Intelligent Life Safety System. All new devices provided under this contract shall be certified by *Edwards* as being compatible for use with the existing alarm system.

### 2.2 EQUIPMENT AND MATERIAL

- A. 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 protected premises protective signaling (fire alarm) system.
- B. All equipment and components shall be installed in strict compliance with the existing manufacturer's recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc. before beginning system installation. Refer to the riser/connection diagram for all specific system installation/termination/wiring data.
- C. 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.

### 2.3 CONDUIT AND WIRE

- A. Conduit:
  - 1. Conduit shall be in accordance with Specification Section 26 05 33.
  - 2. Conduit shall be provided from device boxes in walls, vertically to accessible ceilings spaces above. Provide conduit bushings at tops of conduit stubbed into ceiling spaces.
  - 3. Cable 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 Article 760-29.
  - 4. Wiring for 24 volt control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. 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.

5. Conduit 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.
- B. Wire:
1. All fire alarm system wiring must be new. Initiating and Notification Circuits wiring shall be power limited fire-protective signaling cable, copper conductor, 300 volts insulation rated 105 degrees C.
  2. 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, but not less than 18 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 16 AWG (1.32 mm) for Notification Appliance circuits.
  3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
  4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NFPA 70 (e.g., FPLR).
  5. The system shall permit the use of IDC and NAC wiring in the same conduit with the multiplex communication loop.
  6. All field wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, removal of any internal modules, or any open circuits in the field wiring; a trouble signal will be activated until the system and its associated field wiring are restored to normal condition.
- C. Terminal Boxes and Junction Boxes:
1. All boxes and cabinets shall be UL listed for their intended purpose and shall be as specified in Section 26 05 33.
  2. Initiating circuits shall be arranged to serve like categories (manual, smoke, waterflow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

## 2.4 SYSTEM COMPONENTS

- A. Strobe Lights – *EST # G1RF-VM*
1. Strobe lights shall meet the requirements of the ADA, UL Standard 1971 and shall meet the following criteria:
  2. The maximum pulse duration shall be 2/10 of one second.
  3. Strobe intensity shall meet the requirements of UL 1971.
  4. The flash rate shall meet the requirements of UL 1971.
- B. Audible/Visual Combination Devices – *EST # G1RF-HDVM*:
1. Shall meet the applicable requirements of Section A listed above for audibility.
  2. Shall meet the requirements of Section B listed above for visibility.
- C. Addressable Devices - General
1. Addressable devices shall provide an address-setting means using rotary decimal switches.
  2. Addressable devices shall use simple to install and maintain decade (numbered 0 to 9) type address switches. Devices which use a binary address or special tools for setting the device address, such as a dip switch are not an allowable substitute.

3. Detectors shall be Analog and Addressable, and shall connect to the fire alarm control panel's Signaling Line Circuits.
  4. Addressable smoke and thermal detectors shall provide dual (2) status LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the flashing mode operation of the detector LEDs can be programmed off via the fire control panel program.
  5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity can be automatically adjusted by the panel on a time-of-day basis.
  6. 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 7.
  7. The detectors shall be ceiling-mount and shall include a separate twist-lock base which includes a tamper proof feature.
  8. The following bases and auxiliary functions shall be available :
    - a. Sounder base rated at 85 DBA minimum.
    - b. Form-C Relay base rated 30VDC, 2.0A
    - c. Isolator base
  9. 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 magnetic switch) or initiated remotely on command from the control panel.
  10. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (PHOTO, THERMAL).
- D. Addressable Pull Box (manual station) – *EST #SIGA-278*
1. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. 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.
  2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
  3. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger.
- E. Intelligent Photoelectric Smoke Detector – *EST # SIGA-PS/SIGA-SB*  
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.
- F. Intelligent Thermal Detectors – *EST # SIGA-HFS*  
Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.
- G. Intelligent Duct Smoke Detector – *EST # SIGA-SD/SD-T42/SD-TRK*

1. The in-duct smoke detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.
2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

H. Addressable Control Module – *EST # SIGA-CR*:

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs 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.
2. The control module shall mount in a standard 4-inch square, 2-1/8 inch deep electrical box, or to a surface mounted backbox.
3. The control module NAC may be wired for Style Z or Style Y (Class A/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.
4. 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.
5. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

I. Isolator Module – *EST # SIGA-CT2*:

1. 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 floor or protected zone of the building.
2. 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.
3. 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.
4. 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.

2.5 BATTERIES AND EXTERNAL CHARGER:

A. Battery:

1. Shall be 12 volt, Gel-Cell type.
2. Battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.
3. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.

B. External Battery Charger:

1. Shall be completely automatic, with constant potential charger maintaining the battery fully charged under all service conditions. Charger shall operate from a 120-volt 60 hertz source.
2. Shall be rated for fully charging a completely discharged battery within 48 hours while simultaneously supplying any loads connected to the battery.
3. Shall have protection to prevent discharge through the charger.
4. Shall have protection for overloads and short circuits on both AC and DC sides.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. 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.
- B. 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.
- C. 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.
  1. Manual Pull Stations shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches, nor more than 48 inches above the finished floor.
- D. Initiation devices shall be labeled with a unique identity number visible from the floor for tracking of maintenance.

### 3.2 TYPICAL OPERATION

- A. Actuation of any manual station, smoke detector, heat detector or water flow switch shall cause the following operations to occur unless otherwise specified:
  1. Actuate horn/strobe units until the panel is reset.
  2. Release all magnetic door holders to doors to adjacent zones on the floor from which the alarm was initiated.
  3. Interlock alarm system heat detectors at the top and bottom of elevator shafts, and in the Elevator Machine Rooms with the elevator power service shunt trips such that an alarm condition at any of these detectors shall automatically disable the associated elevator electrical service feeder. Provide an interlock between the fire alarm system smoke detectors at the Elevator Lobbies on each floor, and the smoke detector in the Elevator Machine Room, such that:
    - a. An alarm activation by either the detector at the second floor Lobby or at the detector in the Elevator Machine Room, shall automatically send the elevator to the first floor Lobby.
    - b. An alarm condition activated by the first floor Lobby smoke detector shall automatically send the elevator car to the second floor.
  4. Duct type smoke detectors shall, in addition to the above functions, shut down the ventilation system or close associated control dampers as appropriate.

5. Activation of any sprinkler system low pressure switch, on valve tamper switch, shall cause a system supervisory alarm indication.

### 3.3 TEST

- A. 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.
- B. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
- C. Open initiating device circuits and verify that the trouble signal actuates.
- D. Open signaling line circuits and verify that the trouble signal actuates.
- E. Open and short notification appliance circuits and verify that trouble signal actuates.
- F. Ground initiating device circuits and verify response of trouble signals.
- G. Ground signaling line circuits and verify response of trouble signals.
- H. Ground notification appliance circuits and verify response of trouble signals.
- I. Check alert tone and prerecorded voice message to all alarm notification devices.
- J. Check installation, supervision, and operation of all intelligent smoke detectors using walk test.
- K. 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.

### 3.4 FINAL INSPECTION

- A. At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.

### 3.5 INSTRUCTION

- A. 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.
- B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

END OF SECTION 28 31 13