

DIVISION 13

SPECIAL CONSTRUCTION

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SECTION 13852

FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 Scope

- A. This specification document provides the requirements for the installation, programming and configuration of a complete digital protocol analog addressable fire alarm system. This system shall include, but not be limited to, system cabinet, power supply, built in Signaling Line Circuit (SLC), 80 character LCD annunciator, built in dual line Digital Communicator associated peripheral devices, batteries, wiring, conduit and other relevant components and accessories required to furnish a complete and operational Life Safety System.
- B. The contractor shall furnish and install a complete 24 VDC, electrically supervised, analog addressable fire alarm system as specified herein and indicated on the drawings. The system shall include but not be limited to all control panels, power supplies, initiating devices, audible and visual notification appliances, alarm devices, and all accessories required to provide a complete operating fire alarm system.
- C. All fire alarm system equipment shall be listed for its intended purpose and be compatibility listed to assure the integrity of the complete system.

1.2 Standards

- A. The fire alarm equipment and installation shall comply with the current provisions of the following standards and shall be listed for its intended purpose and be compatibility listed to insure integrity of the complete system.
- B. NEC, Article 760
- C. NFPA
 - 1) NFPA 13 Installation of Sprinkler Systems
 - 2) NFPA 15 Water Spray Fixed Systems
 - 3) NFPA 16 Deluge Foam Water Systems
 - 4) NFPA 72 National Fire Alarm Code
 - 5) NFPA 101 Life Safety Code
- D. Local and State Building Codes
- E. Local Authorities Having Jurisdiction
- F. UL
 - 1) All equipment shall be approved by Underwriters Laboratories, Inc. for its intended purpose, listed as power limited by Underwriters Laboratories, Inc., for the following standards as applicable:

- a) UL 864
- b) UL 864
- c) UL 268 Smoke Detectors for Fire Protective Signaling systems
- d) UL 268A Smoke Detectors for duct application
- e) UL 217 Smoke Detectors for Single Stations
- f) UL 521 Heat Detectors for Fire Protective Signaling systems
- g) UL 228 Door Holders for Fire Protective Signaling systems
- h) UL 464 Audible Signaling appliances
- i) UL 1638 Visual Signaling appliances
- j) UL 38 Manually Activated Signaling Boxes
- k) UL 346 Waterflow indicators for Fire Protective Signaling systems
- l) UL 1481 Power Supplies for Fire Protective Signaling systems

1.3 General Requirements

A. Submittals

- 1) The contractor shall submit three (3) complete sets of documentation within thirty (30) calendar days after award of the purchase order. Indicated in the document will be the type, size, rating, style, catalog number, manufacturers names, photos, and /or catalog data sheets for all items proposed to meet these specifications. The proposed equipment shall be subject to the approval of the Architect/Engineer and no equipment shall be ordered or installed on the premises without that approval.
- 2) Submittal of shop drawings shall contain at least three (3) copies of original manufacturer specification and installation instruction sheets. Subsequent information may be copies. All equipment and devices on the shop drawings to be furnished under this contract shall be clearly marked in the specification sheets.
- 3) Suppliers and contractor qualifications shall be submitted indicating years in business, service policies, warranty definitions, NICET certification, and completion of factory training program and a list of similar installations.
- 4) The contractor shall provide hourly Service Rates for this installed Life Safety System with the submittal. These hourly service rates shall be guaranteed for a 1-year period

B. Contract close-out Submittals

- 1) Deliver two (2) copies of the following to the owner's representative within Thirty (30) days of system acceptance. The closeout submittals shall include:
 - a) Installation and Programming manuals for the installed Life Safety System.
 - b) Point to point diagrams of the entire Life Safety System as installed. This shall include all connected Smoke Detectors and addressable field modules.
 - c) All drawings must reflect device address as verified in the presence of the engineer and/or end user.

C. Warranty: Warranty all materials, installation and workmanship for a 12 month period, unless otherwise specified. A copy of the manufacturer warranty shall be provided with the close out documentation.

- D. All equipment furnished for this project shall be new and unused. All components shall be designed for uninterrupted duty. All equipment, materials, accessories, devices and other facilities covered by this specification or noted on the contract drawings and installation specification shall be best suited for the intended use and shall be provided by a single manufacturer. If any of the equipment provided under this specification is provided by different manufacturers, then that equipment shall be "Listed" as to its compatibility by Underwriters Laboratories (UL), if such compatibility is required by UL standards.

1.4 ACCEPTABLE EQUIPMENT AND SERVICE PROVIDERS

- A. Acceptable Manufacturers:
 - 1) SimplexGrinnell
 - 2) System Sensor
 - 3) Firelite
 - 4) Honeywell
 - 5) Silent Knight
 - 6) Fike
- B. Being listed as an acceptable Manufacturer in no way relieves obligation to provide all equipment and features in accordance with these specifications.
- C. The equipment and service provider shall be a nationally recognized company specializing in fire alarm and detection systems. This provider shall employ factory trained and NICET certified technicians, and shall maintain a service organization within 100 miles of this project location. The equipment and service provider shall have a minimum of 10 years experience in the fire protective signaling systems industry.

PART 2 - PRODUCTS

2.1 Control Panel

- A. The fire alarm control panel (FACP) shall be the IntelliKnight IFP-50 addressable control panel or equivalent. The FACP must have a 2.5 amp power supply and be capable of expansion to a maximum of 40 total amps via bus connected expander modules that supervise low battery, loss of AC and loss of communication.
- B. The FACP must be capable of supporting 50 addressable points. The communication protocol on the SLC loop must be digital. The use of shielded cable or twisted pair is not required.
- C. The panel must have a built in 80 character LCD annunciator with the capability of having an additional eight supervised remote annunciators connected in the field.
- D. The FACP must have Day/Night sensitivity capabilities on detectors and be capable of supporting 125 analog addressable points. The FACP must support a minimum of six programmable notification circuits.

- E. The FACP must have a built in UL approved digital communicator. The communicator must allow local and remote up/downloading of system operating options, event history, and detector sensitivity data. The FACP must automatically test the smoke detectors in compliance with NFPA standards to ensure that they are within listed sensitivity parameters and be listed with Underwriters Laboratories for this purpose.
- F. The FACP must compensate for the accumulation of contaminants that affect detector sensitivity (Drift Compensation). The FACP must have a maintenance alert feature (differentiated from trouble condition). The panel shall indicate a "Maintenance Alert" which means that the detector is still in an operational condition but should be cleaned before it enters a "Trouble" condition in which it will no longer function properly.
- G. The FACP shall have a Jumpstart feature that can automatically enroll all properly connected and addressed accessories into a functional system without further programming. This is required by UL 864. Panels that do not have this feature will not be acceptable.
- H. The main communication bus shall be a class B configuration with a total bus length of 6,000 feet. This communications bus must be fully supervised.
- I. System Wiring
 - 1) The Signaling Line Circuit (SLC) and Data Communication Bus (S-BUS) shall be wired with standard NEC 760 compliant wiring, no twisted, shielded or mid capacitance wiring is required for standard installations. All FACP screw terminals shall be capable of accepting 14-18 AWG wire.
 - 2) Each SLC shall be capable of a wiring distance of 10,000 feet from the SLC driver module and be capable of supporting 50 devices. The communication protocol to SLC devices must be digital. Any SLC loop device, which goes into alarm, must interrupt the polling cycle for priority response from the FACP. The FACP must respond consistently to a device that goes into alarm on an SLC in under 3 seconds. The SLC shall be capable of functioning in a class B configuration.
- J. SLC loop devices: Devices supported must include analog photoelectric, ionization smoke detectors, analog heat detectors, addressable input modules, relay output modules or addressable notification modules. There is to be no limit to the number of any particular device type up to the maximum of 50 that can be connected to the SLC.
- K. Addressable detector functions
 - 1) The products of combustion detectors must communicate analog values using a digital protocol to the control panel for the following functions:
 - 2) Automatic compliance with NFPA 72 standards for detector sensitivity testing
 - 3) Drift compensation to assure detector is operating correctly

- 4) Maintenance alert when a detector nears the trouble condition
 - 5) Trouble alert when a detector is out of tolerance
 - 6) Alert control panel of analog values that indicate fire
- L. Programmable Notification Circuits: The FACP shall support 2 programmable notification circuits that are capable of being programmed as supervised reverse polarity notification circuits or supervised auxiliary power circuits that can be programmed as continuous, resetable or door holder power. These circuits shall be configurable as two Class B outputs
- M. Built-In Annunciators: The main control must have a built in annunciator with an 80 character LCD display and feature LED's for General alarm, Supervisory, System trouble, System silence, and Power. When in the normal condition the LCD shall display time and date based on a 200-year clock which is capable of automatic daylight savings time adjustments. The annunciator must be able to Silence, Acknowledge, and Reset alarms through the use of a keypad-entered code, or by using a firefighter key. The annunciators must be able to program up to 20 levels of user codes that will allow the limitation of operating system programming to authorized individuals.
- N. Digital Communicator: The digital communicator must be an integral part of the control panel and be capable of reporting all zones or points of alarm, supervisory, and trouble conditions as well as all system status information such as loss of AC, low battery, ground fault, and loss of supervision to any remote devices with individual and distinct messages to a receiving point. The communicator must also be capable of up/downloading of all system programming options, Event history and Sensitivity compliance information to a PC on site or at a remote location. The communicator shall have an answering machine bypass feature that will allow the panel to respond to communication even on phone lines that have other communication equipment present. The communicator must be capable of reporting via SIA and Contact ID formats. The communicator shall have a delayed AC loss report function which will provide a programmable report delay plus a 10-25 min random component to help ease traffic to the central station during a power outage.
- O. Test Functions
- 1) A "Lamp Test" mode shall be a standard feature of the fire alarm control panel and shall test all LED's and the LCD display on the main panel and remote annunciators.
 - 2) A "Walk Test" mode shall be a standard feature of the fire alarm control panel. The walk test feature shall function so that each alarm input tested will operate the associated notification appliance for six seconds. The FACP will then automatically perform a reset and confirm normal device operation. The event memory shall contain the information on the point tested. the zone tripped, the zone restore and the individual points return to normal.
 - 3) A "Fire Drill" mode shall allow the manual testing of the fire alarm system notification circuits. The "Fire Drill" shall be capable of being controlled at the main annunciator, remote annunciators and via a remote contact input.

- 4) A "Disable Mode" shall allow for any zone, point, group, or nac circuit to be Disabled without affecting the operation of the total fire system.
- P. Remote Input Capabilities: The control panel shall have provisions for supervised switch inputs for the purpose of Alarm reset and Alarm and trouble silence.
- Q. Notification Appliance Mapping Structure: All notification circuits and modules shall be programmable via a mapping structure that allows for a maximum of 125 output groups. Each of these groups shall have the ability to be triggered by any of the panels 125 Zones. A group may be triggered from zones individually, or may contain a global trigger for manual pull stations, fire drills and two different system alarms. Additionally each Zone will individually control the cadence pattern of each of the Groups that it is "Mapped" to so that sounders can indicate a variety of conditions. The Zone shall be capable of issuing a different cadence pattern for each of the Groups under its control. The mapping structure must also allow a group to be designated to "ignore cadence" for use with strobes and other continuous input devices. Zones shall have eight different output categories; Detector alarm, Trouble, Supervisory, Pre-alarm, Waterflow, Manual pull, Zone auxiliary one and Zone Auxiliary two. Each of the categories shall have the ability to control from 1 to 8 output groups with a cadence pattern.
- R. On board programmer: The FACP shall have an on board programmer which will allow for all system functions and options to be programmed via the on board annunciator keypad. Any panel that does not have this capability will not be accepted.
- S. Facility Management Software: The FACP must support facility management software capable of providing off site access to FACP data that is necessary to manage fire system operation. A software package capable of uploading the detector sensitivity test results and the 1000 event system event buffer to the PC shall be required as part of the bid package. Communication shall take place over a direct connection to the PC and/or via the same telephone lines as the built in digital communicator. The facility management package must be separate from the downloader package and must not be capable of affecting programmed system options.
- T. Accessory Support: The FACP shall support the following devices on the RS-485 data bus:
- 1) Printer Interface Module
 - 2) LCD Remote Annunciator
 - 3) LED Remote Annunciator
 - 4) LED Remote Annunciator with reset and silence switches
 - 5) LED I/O module
 - 6) Intelligent Distributed Power Module
 - 7) Relay Interface Board
- U. The FACP shall support the operation of 127 total devices per SLC loop without regard to device type. The following devices shall be supported:
- 1) Analog Photoelectric Smoke detector

- 2) Analog Heat Sensor
- 3) Addressable Relay Module
- 4) Duct Detector Enclosure
- 5) Addressable Input Module
- 6) Mini Input Module
- 7) Addressable Relay Module
- 8) Duct Detector Housing with Built -In Relay
- 9) Remote Test Switch For Duct Housing
- 10) Addressable Pull Station

V. The FACP shall support these other devices via addressable or conventional inputs.

- 1) Single Action Pull Station - Key Reset
- 2) Double Action Pull Station - Key Reset

2.2 Power Supply and Charger

- A. The entire system shall operate on 24 VDC, filtered switch mode power supply with the rated current available of 2.5 Amps. The FACP must have a battery charging circuit capable of complying with the following requirements:
- 1) Twenty-Four (24) hours of battery standby with fifteen (15) minutes of alarm signaling at the end of the twenty-four (24) hour period using rechargeable batteries with automatic charger to maintain standby gel-cell batteries in a fully charged condition.
 - 2) The power supply shall comply with UL Standard 864 for power limiting.
 - 3) The FACP will indicate a trouble condition if there is a loss of AC power or if the batteries are missing or of insufficient capacity to support proper system operation in the event of AC failure. A "Battery Test" will be performed automatically every minute to check the integrity of the batteries. The test must disconnect the batteries from the charging circuit and place a load on the battery to verify the battery condition.
 - 4) In the event that it is necessary to provide additional power, one or more of the Distributed Power Modules shall be used to accomplish this purpose.

2.3 Manual Fire Alarm Stations

- A. Manual Fire Alarm Stations shall be non-coded, break glass, single or double action type, with a key operated test reset lock in order that they may be tested, and so designed that after actual emergency operation, they cannot be restored to normal except by use of a key. The reset key shall be so designed that it will reset the manual Pull Station and open the FACP cabinet without use of another key. An operated station shall automatically condition itself so as to visually detected, as operated, at a minimum distance of fifty feet, front or side. Manual stations shall be constructed of die cast metal with clearly visible operating instructions on the front of the station in raised letters. Stations shall be suitable for surface mounting on matching back box, or semi-flush mounting on a standard single gang box, and shall be installed within the limits defined by the Americans with Disabilities Act (ADA) dependent on Manual Station accessibility or per local requirements. Manual Stations shall be installed in conjunction with an

Addressable Input Module (AIM or MIM). Manual Stations shall be Underwriters Laboratories listed.

2.4 Remote Power Supplies

- A. The Remote Power Supplies for Notification appliances shall be compatible with the fire alarm control panel. They shall reside on the main S-Bus and be programmed through the control panel control.

2.5 Notification Devices

- A. Audible devices shall be of the horn type.
- B. The visual and audio/visual signaling devices shall be compatible with the control panel as stated in the installation manuals and be Listed with Underwriters Laboratories Inc. per UL 1971 and/or 1638. Each indicating appliance circuit shall be electrically supervised for opens, grounds and short circuit faults, on the circuit wiring, and shall be so arranged that a fault condition on any indicating appliance circuit or group of circuits will not cause an alarm to sound. The occurrence of any fault will light the trouble LED and sound the system trouble sounder, but will not interfere with the proper operation of any circuit which does not have a fault condition. The notification appliance (combination audible/visible units only) shall produce a peak sound output of 90dba or greater as measured in an anechoic chamber. The visible signaling appliance shall maintain a minimum flash rate of 1Hz or greater regardless of power input voltage. The appliance shall also be capable of meeting the candela requirements of the blueprints presented by the Engineer and ADA. The appliance shall be polarized to allow for electrical supervision of the system wiring. The unit shall be provided with terminals with barriers for input/output wiring and be able to mount a single gang or double gang box or double workbox with the use of an adapter plate. The unit shall have an input voltage range of 19-30 volts with either direct current or full wave rectified power.

2.6 Smoke Detectors

- A. All detectors shall be the addressable photoelectric smoke detectors. The smoke detectors shall have a flashing status LED for visual supervision. When the detector is actuated, the flashing LED will latch on steady at full brilliance. The sensitivity of the detector shall be capable of being measured by the control panel without the need for external test apparatus. The detector shall be a double EE-prom technology and be programmed using the internal programming loop located on the FACP or through the use of the hand held programmer.

2.7 Heat Detectors

- A. Furnish and install analog/addressable heat detectors. The combination heat detector and twist lock base shall be U.L. listed compatible with the FACP.
- B. The base shall permit direct interchange with ionization smoke detectors and the

photoelectric smoke detectors. The base shall be appropriate twist lock base.

- C. The heat detector shall have a flashing status LED for visual supervision. When the detector is actuated, the flashing LED will latch on steady at full brilliance. The detector may be reset by actuating the control panel's reset switch. The vandal security-locking feature shall be used in those areas as indicated on the drawings. Electronics of the unit shall be shielded to protect against false alarms from E.M.I. and R.F.I.

2.8 Duct Detectors

- A. All Duct Detectors shall be compatible with the FACP and shall have a remote test switch.

2.9 Remote Annunciators

- A. Provide LED Remote annunciator with individually mapped LED's and reset and silence inputs. The reset and silence inputs must use the same firefighters key as the built in LCD annunciators. Remote annunciators shall be capable of operating at a distance of 6,000 feet from the main control panel on unshielded non-twisted cable.
- B. The fire system shall be able to support up to eight I/O modules on the SBUS that shall be used to drive remote LED graphic style displays and accommodate up to eight dry contact type switch inputs. The I/O modules shall each drive up to 40 LEDs without requiring external power connections. The I/O module inputs shall be supervised and shall be suitable for alarm and trouble circuits as well as reset and silence switches.

PART 3 - SYSTEM OPERATION

3.1 Alarm

- A. When a device indicates an alarm or supervisory condition the control panel must respond within 3 seconds. The General Alarm or Supervisory Alarm LED on the annunciator(s) shall light and the LCD shall prompt the user as to the number of current events. All notification circuits associated with the alarm or supervisory condition shall activate. If the digital dialer is being utilized it shall transmit a signal to the digital alarm receiving unit. The alarm shall also cause the appropriate door holders and air handlers to shut down. If employed all elevators shall return to the main level or an alternate level when required by the elevator specification or building code. The alarm information must be stored in event memory for later review. Event memory shall be available at the main and all remote annunciators. The alarm memory must be capable of storing up to 1000 events.
- B. When the alarmed device is restored to normal, the control panel shall be required to be manually reset to clear the alarm condition, except that the alarms may be silenced as programmed.

- C. An alarm shall be silenced by a code or Firefighter key at the main or remote annunciators. When silenced, this shall not prevent the resounding of subsequent events if another event should occur (subsequent alarm feature). When alarms are silenced the silenced LED on the control panel, and on any remote annunciators shall remain lit, until the alarmed device is returned to normal.

3.2 Troubles

- A. When a device indicates a trouble condition, the control panel System Trouble LED should light and the LCD should prompt the user as to the number of current events. The trouble information must be stored in event memory for later review. Event memory must be available at the main and all remote annunciators.
- B. When the device in trouble is restored to normal, the control panel shall be automatically reset, the trouble restore information must be stored in event memory for later review. Event memory must be available at the main and all remote annunciators. A trouble shall be silenced by a code or Firefighter key at the main or remote annunciators. When silenced, this shall not prevent the resounding of subsequent events if another event should occur.

3.3 Supervision methods

- A. The SLC loop shall be electrically supervised for opens and ground faults in the circuit wiring, and shall be so arranged that a fault condition on any loop will not cause an alarm to sound. Additionally, every addressable device connected to the SLC will be supervised and individually identified if in a fault condition. The occurrence of any fault will light a trouble LED and sound the system trouble sounder, but will not interfere with the proper operation of any circuit which does not have a fault condition.

PART 4 - WIRING

4.1 Installer's Responsibilities

- A. The installer shall coordinate the installation of the fire alarm equipment.
- B. All conductors and wiring shall be installed according to the manufacturer's recommendations.
- C. It shall be the installer's responsibility to coordinate with the supplier, regarding the correct wiring procedures before installing any conduits or conductors.

4.2 Installation of System Components

- A. System components shall be installed in accordance with the latest revisions of the appropriate NFPA pamphlets, the requirements contained herein, National Electrical Code, local and state regulations, the requirements of the fire

department and other applicable authorities having jurisdiction (AHJ).

- B. All wire used on the fire alarm system shall be U.L. Listed as fire alarm protection signaling circuit cable per National Electrical Code, Articles 760.

PART 5 - WARRANTY AND FINAL TEST

5.1 General

- A. The contractor shall warrant all equipment and wiring free from inherent mechanical and electrical defects for 12 months from the date of final acceptance.

5.2 Final Test

- A. Before the installation shall be considered completed and acceptable by the awarding authority, a test of the system shall be performed as follows:
 - 1) The contractor's job foreman, a representative of the owner, and the fire department shall operate every building fire alarm device to ensure proper operation and correct annunciation at the control panel.
 - 2) At least one half of all tests shall be performed on battery standby power.
 - 3) Where application of heat would destroy any detector, it may be manually activated.
 - 4) The communication loops and the indicating appliance circuits shall be opened in at least two (2) locations per circuit to check for the presence of correct supervision circuitry.
 - 5) When the testing has been completed to the satisfaction of both the contractor's job foreman and owner, a notarized letter cosigned by each attesting to the satisfactory completion of said testing shall be forwarded to the owner and the fire department.
 - 6) The contractor shall leave the fire alarm system in proper working order, and, without additional expense to the owner, shall replace any defective materials or equipment provided by him under this contract within one year (365 days) from the date of final acceptance by the awarding authority.
 - 7) Prior to final test the fire department must be notified in accordance with local requirements.

5.3 As Built Drawings

- A. A complete set of reproducible "as-built" drawings showing installed wiring, color coding, and wire tag notations for exact locations of all installed equipment, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of system.
- B. Operating and Instruction Manuals: Operating and instruction manuals shall be submitted prior to testing of the system. Three (3) complete sets of operating and instruction manuals shall be delivered to the owner upon completion. User operating instructions shall be provided prominently displayed on a separate sheet located next to the control unit in accordance with U.L. Standard 864.

END OF SECTION