

ADDRESSABLE FIRE ALARM SYSTEM

CONSULTANT SPECIFICATION

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1 General

1.1 Description of Work

- A. Work shall consist of installing a new analog addressable fire detection and alarm system. Work shall include the installation of new equipment including (but not limited to: alarm initiating devices, alarm notification appliances, fire alarm control panel, auxiliary control devices, annunciators, wiring, system programming, and appropriate commissioning. The equipment, materials, installation, workmanship, examination, inspection and testing shall comply with the requirements of NFPA-72-2019, except as modified herein. The system shall be electrically supervised and monitor the integrity of all conductors. The system shall include all materials, accessories, and equipment inside and outside the building to provide a system complete and ready for use.
- B. The system and its components shall be Underwriters Laboratories listed under the appropriate UL standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing, NFPA-72-2019, NEC-70- 2017 and NFPA-101-2018.

1.2 Applicable Publications

A. NFPA codes

- NFPA-70 National Electrical Code
- NFPA-72 National Fire Alarm Code
- NFPA-101 Life Safety Code

B. Underwriters Laboratories (UL)

- UL-38 Manually Actuated Signalling Boxes
- UL-268 Smoke Detectors for Fire Protective Signalling Systems
- UL-268A Smoke Detectors for Duct Applications
- UL-346 Water-flow Indicators for Fire Protective Signalling Systems
- UL-464 Audible Signalling Appliances
- UL-521 Heat Detectors for Fire Protective Signalling Systems
- UL-864 10th Edition Control Units for Fire Protective Signalling Systems
- UL-1971 Visual Notification Appliances
- Americans with Disabilities Act Guidelines (ADAG)
- ANSI S 3.41 Audible Evacuation Signals

1.3 Regulatory Requirements

- A. All system components to be UL-Listed
- B. All applicable system components to be listed with CSFM (when installed in California)
- C. All applicable system components to be listed with FM-3010
- D. Conform to NFPA 101
- E. Install in accordance with NFPA 72
- F. Conform to ADAG
- G. Comply with requirements of ANSI A17.1

1.4 Submittals

- A. Submit shop drawings and product data sheets that are highlighted with each model being used for this project.
- B. Provide contract size set of reproducible drawings showing the floor plan of the facility, all device locations, conduit size and routing, type and size of wire.
- C. Provide system point to point wiring diagrams showing interconnection of all devices and equipment ratings, and panel layout.
- D. Provide calculations to support battery standby size selection.
- E. Provide voltage drop calculations for the Notification Appliance Circuit from each control panel and remote power supply panel.
- F. Contractor shall submit six (6) sets of all plans and documentation for review prior to commencement of installation work. Shop drawings shall provide layout and system wiring diagram showing each device and wiring connection.
- G. Submit shop drawings and product data to State Fire Marshall or local AHJ for review and approval.

1.5 Qualifications

- A. The installing company shall be an Authorized Dealer of the fire alarm equipment manufacturer.
- B. The installing company must provide central station monitoring when required by the AHJ (Authority having Jurisdiction)
- C. Installing company must employ NICET (minimum Level II Fire Alarm Technology) or equivalent technicians on site to guide final checkout / commissioning and to ensure the system's proper functionality and integrity.
- D. Installing company must have the ability to modify the fire alarm system on site via a pre-designated password. These modifications must include addition and deletion of devices, circuits, zones, and changes to system operation, device relationships, cause & effect relationships, and custom label changes for devices or zones, with the capability of adjusting device sensitivity readings.

1.6 Project Record Documents

- A. At the completion of the project, the Contractor shall provide three (3) complete sets of as-built drawings showing locations of all devices and cable runs.
- B. A copy of the site-specific software configuration shall be stored on-site in non-volatile, non-erasable, non-rewritable memory (per NFPA 72-2019-7.5.7.2)

1.7 Operations & Maintenance Instructions and Manuals

- A. The contractor shall provide the owner's designated facilities maintenance personnel with a two (2)-hour operating instruction class upon completion of the project, prior to system start up. The training shall include basic service instructions for use by site facility management personnel. This shall include replacement of smoke and thermal sensors as required, basic system diagnostic checks.
- B. Maintenance and Instruction Manuals: Provide instruction manuals containing complete operation and maintenance instructions for the specific make and model of equipment furnished. Additional copies shall be made available in electronic format.

1.8 Maintenance Service

- A. Contractor to provide service and maintenance and inspection of fire alarm system for one year from Date of Substantial Completion in accordance with NFPA 72-2019 Chapter 14.

1.9 Extra Materials

- A. Provide four (4) keys of each type.
- B. Provide four (4) of each type of analog smoke sensors with base.
- C. Provide two (2) of each type of analog addressable heat sensors.
- D. Provide one (2) fire alarm horn/strobes of each type used in system.
- E. Provide two (2) fire alarm strobe lights of each type used in system.

2 Products

2.1 Acceptable Manufacturers

The analog addressable fire alarm system shall be listed by KENTEC ELECTRONICS LTD.

2.2 Taktis UL Fire Alarm Control Panel

The fire alarm control panel (FACP) shall be the KENTEC ELECTRONICS Taktis UL Analog Addressable Fire Alarm control panel.

- A. The FACP shall have day/night sensitivity capabilities on sensors and be capable of supporting at least 126 addressable points per SLC loop. The communication protocol on the SLC loop must be digital.
- B. The FACP shall support a minimum of (2) two 'Class A' or four (4) 'Class B' programmable "NAC" circuits. The NAC circuits shall provide synchronization protocols which are also synchronized to each NAC circuit.
- C. The FACP must have a built-in full color resistive touch screen display.
- D. The FACP shall compensate for the accumulation of contaminants that affect detector sensitivity. The FACP shall have day/night sensitivity adjustments, maintenance alert feature (differentiated from trouble condition), detector sensitivity selection, and auto-programming mode (auto-learn).
- E. The FACP shall have a 5.25 Amp power supply with standby battery charger listed by UL to charge up to 60 Ah batteries or a 10.25 Amp power supply with standby battery charger listed by UL to charge up to 100 Ah batteries.
- F. The FACP shall allow for system functions and options to be programmed directly from touch screen.
- G. The FACP shall provide the ability to have an alphanumeric text description containing 80 characters of each system device input zone and output group on the system. The use of individual lights to provide descriptions will not be acceptable.
- H. Up to 16 SLC loops may be supported on a single panel.
- I. A 10,000 event non-volatile event history log will be maintained by the panel.
- J. The FACP will support up to 64 unique login credentials.
- K. Up to 24 unique function keys based upon individual login may be programmed.
- L. The FACP will support Positive Alarm Sequence operation.
- M. The FACP will support Pre-Signal operation
- N. The FACP will support Alarm Verification operation.
- O. The following functions shall be capable from the FACP:
 - Disabling of various devices to include loops, zones, individual addresses, or NAC circuits.
 - Devices can be viewed by loop or by zone. The number of devices per loop or zone and the type of devices shall be readily viewable.

- Zones can be placed on Test. Signals generated during the test shall be transmitted to the monitoring station (if applicable).
- Each test can be conducted with the NAC circuits, in the On or Off condition.
- The General Alarm mode for the NAC circuits shall be configured for Common, or Zonal, Operation.
- Individual device attributes can be edited to include zone, location text, input delay, input latch, input action, input type and editing of the panel name

2.3 Signaling Line Circuits (SLC)

- A. Each SLC circuit shall be capable of supporting at least 126 devices.
- B. The communication protocol to SLC devices must be digital.
- C. Any SLC loop device which goes into alarm must interrupt the polling cycle for priority response from the FACP.
- D. The FACP must respond consistently to a device that goes into alarm on an SLC. Each SLC loop expansion module must be capable of expanding the FACP by increments of 2 Loops up to a maximum of 16. The SLC shall be capable of functioning in a class X, A or B configuration.
- E. SLC loop must support analog photoelectric smoke sensors, analog ionization smoke sensors, analog heat sensors, analog multi-criteria sensors, contact monitoring modules, relay output modules, sounder bases and short circuit isolators. There is to be no limit to the number of particular device types up to the maximum, which can be connected to the SLC.

2.4 Analog Sensors

- A. Smoke Sensors must communicate analog values using a digital protocol to the control panel for the following functions:
 - a. Drift compensation (unless performed directly by detector) to assure detector is operating correctly.
 - b. Maintenance alert when a detector nears the trouble condition.
 - c. Trouble alert when a detector is out of tolerance.
 - d. Alert control panel of analog values that indicate fire.

2.5 Programmable Outputs

- A. Notification Appliance Circuits
 - a. The FACP shall have two (2) Class 'A' or four (4) programmable Class 'B' Notification Appliance Circuits (NAC) circuits that are capable of being programmed individually as Continuous, Temporal, or using synchronization protocols of Wheelock, Gentex, System Sensor or AMSECO.
- B. Dry Contacts
 - a. The FACP shall have at least five fully programmable (5) form "C" dry contacts:
 - b. A contact programmed for trouble shall be normal in an electrically energized state so that any total power loss (AC and Backup) will cause a trouble condition. In the event that the Microprocessor on the FACP fails the trouble contacts shall also indicate a trouble condition.
 - c. A FACP with fewer inputs and outputs shall be acceptable if it can be seamlessly networked with a full-featured FACP.
- B. Interconnection Terminations
 - a. The FACP shall have separate terminations for Fire Routing Input and Output
 - b. The FACP shall have separate terminations for Trouble Routing Input and Output.

2.6 Panel Cause & Effect Capabilities

- A. Input zones and points must be able to program control output functions, including relays and Notification Appliance circuits.
- B. Output points or zones shall be configurable to activate upon:
 - a. Single point activation in the zone.
 - b. Only activates when all points in the zone are off normal.
 - c. Activates when any two (2) input points are off normal.
 - d. When an input zone activates, it may control an individual NAC circuit output.
 - e. If logical control is not required:
 - i. FACP must provide default modes of operation where all NAC circuits can be defined to operate in same manner.
- C. Up to 5000 activation scenarios must be supported by the FACP

2.7 Fire Alarm Control Panel Touch Screen

- A. The main control must have a built in full color resistive touch screen display and feature LED's for General Trouble, Power Trouble, NAC Trouble, Supervisory Alarm, FIRE, AC Power On, Pre-Alarm, On Test, CO Alarm, Delay Active, and General Disablement.
- B. When in the normal condition the LCD shall display time and date. All controls and programming keys are available through full color resistive touch screen. The display must be able to silence and reset alarms through the use of a keypad-entered code, or by using the Enable Access key switch.
- C. The main control must have functions as follows: Re-Sound Alarm, Alarm Silence, Panel Sounder Silence, Lamp Test, Reset, and up to 24 separate Programmable Function buttons including Fire Drill.
- D. The FACP shall be capable of being on a network that supports at least 64 nodes.

2.8 Serial Printer

- A. The fire system shall be capable of supporting a printer.

2.9 Ground Fault Detection and Overcurrent Protection

- A. A ground fault detection circuit shall be provided to detect grounds on all field wiring. The ground fault detector shall operate the general trouble devices as specified but shall not cause an alarm to be sounded.
- B. All low voltage circuits will be protected by microprocessor-controlled power limiting or have self-restoring breakers for the following: smoke sensor power, main power supply, indicating appliance circuits, battery standby power and auxiliary output.

2.10 Remote Communications

- A. The FACP shall have an integrated communications capability, reporting to industry standard DACR equipment, using SIA reporting. Reporting must include Node ID, point, and sub-point data. AC power failure reporting must be selectable, along with the outage delay necessary before reporting.

2.11 Downloading

- A. The FACP must support downloading of configuration data directly from a PC or through a standard USB memory stick.

2.12 System Wiring

A. Conduit:

- a. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
- b. Where required, all wiring shall be installed in 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.
- c. 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, per NEC Article 760-29.
- d. Wiring for 24 V DC control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signalling line circuits. All circuits **shall be provided with transient suppression circuitry in the FACP and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.**
- e. Conduit shall not enter the fire alarm control panel or any other remotely mounted control panel equipment or back boxes, except where conduit entry is specified by the FACP manufacturer.

B. Wire:

- a. All fire alarm system wiring shall be new.
- b. 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 Signalling Line Circuits, and 14 AWG (1.63 mm) for Notification Appliance Circuits.
- c. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signalling system.

- d. 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).
 - e. The SLC shall be wired with standard NEC 760 compliant wiring. SLC wiring shall not require, shielded or mid-capacitance wiring for standard installations. All FACP screw terminals shall be capable of accepting 12-18 AWG wire. The wire resistance on the SLC Loop shall not exceed 50 ohms.
 - f. All field wiring shall be electrically supervised for open circuit and ground fault.
 - g. The fire alarm control panel shall be capable of t-tapping Class B (NFPA Style 4) Signalling Line Circuits (SLC). Systems that do not allow or have restrictions in, for example, the number of t-taps, length of t-taps etc., are not acceptable.
- C. Terminal Boxes, Junction Boxes and Cabinets:
- a. All boxes and cabinets shall be UL-listed for their use and purpose.
- D. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labelled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold-water pipe or grounding rod.

2.13 Installation

- A. Equipment, materials, installation, workmanship, examination, inspection, and testing shall be in accordance with NFPA-70-2017, NFPA-72-2019, local and state codes, except as modified herein. Install in accordance with manufacturer instructions.
- B. The contractor shall be responsible for all coordination of fire detection and alarm devices with other trades.
- C. Smoke sensors shall not be installed until all construction clean-up has been completed by all trades.
- D. Sensors that have been installed prior to final clean up shall be replaced at no cost to the owner.
- E. Contractor shall be responsible for sealing all penetrations produced by their installation actions including but not limited to cable penetrations in walls, floors, and ceilings, and sealing the back of junction boxes.
- F. When monitoring is a requirement, owner to provide two (2) dedicated loop start telephone lines terminated with RJ31X jacks for connection of the Modem – **DACT adjacent to the FACP and or RJ45 connection to internet.**
- G. All materials and tools shall be stored in an area specified by owner's representative. Storage of materials and tools shall not be permitted in public areas outside of working hours.

2.14 Testing / Commissioning

- A. The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all the adjustments and tests for the system. All testing shall be in accordance with NFPA 72-2019, Chapter 14.
- B. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and that wire insulation has not been damaged or cut.
- C. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
- D. Verify activation of all water flow switches.
- E. Open initiating device circuits and verify that the trouble signal actuates.
- F. Open and short signalling line circuits and verify that the trouble signal actuates.
- G. Open and short notification appliance circuits and verify that trouble signal actuates.
- H. Ground all circuits and verify response of trouble signals, as applicable.
- I. Check presence and audibility of tone at all alarm notification devices.
- J. Check installation, supervision, and operation of all intelligent smoke detectors using the 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.
- L. When the system is equipped with optional features, the manufacturer's manual shall 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 items.

2.15 Final Inspection

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

2.16 Instruction

- A. Instruction shall be provided 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.

2.17 Warranty

- A. The installing company shall warrant all equipment and wiring free from inherent mechanical and electrical defects for one year (365 days) from the date of final acceptance.

