

SECTION 264721 – FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. This specification document provides the requirements for the Fire Alarm Systems throughout the facility. These systems shall include, but not be limited to, system terminal cabinets, signal power boosters, backboards, terminal strips, devices with termination, wire/cabling, testing and verification and other relevant components. The contractor shall include all costs for devices, wire, cable, panels, installation labor, tests, approvals and as-built documentation. Additionally, the contractor will be required to provide the necessary interfaces (control modules, etc.) to the monitoring system in which audio is incorporated. All conduits for the fire alarm systems and associated wiring shall be included. The fire alarm contractor shall provide “shop” drawing layouts to owner showing device locations mounting heights and conduit size requirements.

1.2 WORK INCLUDED

- A. General Requirements:
 - 1. The contractor shall furnish and install a complete building automatic addressable fire alarm evacuation system comprising of fire alarm panels, signal booster panels, Manual Pull Stations, Smoke Detectors, Heat Detectors, system alarm connections, connection to building Speakers, Alarm Strobes, Alarm Speaker/Strobes, Alarm Speakers as required by code and as specified herein.
 - 2. Labeling: All system equipment shall be labeled with the manufacturer's name and logotype to assure the integrity of the complete system.

1.3 RELATED WORK DOCUMENTS

- A. Submittals.
- B. Coordination
- C. Electrical General Requirements
- D. Electrical Raceway
- E. Electrical Conduit
- F. Electrical Outlet and Junction Boxes
- G. Fire Alarm Evacuation System
- H. Electrical Interior Pull boxes and wireways
- I. Electrical Grounding systems
- J. Mechanical Plans (connections to heating and air conditioning units)
- K. Plumbing Plans (sprinkler flow, tamper and Post Indicator Valve locations)
- L. Systems Plans (monitoring systems)
- M. Electrical Plans

1.4 DESCRIPTION:

- A. This section of the specification 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, auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.
- B. The fire alarm system shall comply with requirements of CBC/CFC/Title 19 NFPA Standards for protected premises signaling systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.
- C. The FACP and peripheral initiation devices shall be manufactured 100% by a single manufacturer (or division thereof).
- D. The installing company shall employ only factory-trained technicians on site to install and perform the final checkout and to ensure the systems integrity. No “parts & smarts” installation will be acceptable.

1.5 SCOPE

- A. A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance to the project specifications and drawings.
- B. Basic Performance:
 - 1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on a two wire Signaling Line Circuit (SLC).
 - 2. Initiation Device Circuits (IDC) shall be a two-wire circuit.
 - 3. Notification Appliance Circuits (NAC) shall be a two-wire circuit.
 - 4. Digitized electronic signals shall employ check digits or multiple polling.
 - 5. A single ground or open on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
 - 6. 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.
 - 7. The Alarm System shall perform the following functions:
 - a) Provide automatic fire alarm detection in all building spaces as dictated by local code requirements.
 - b) Provide evacuation signals for employees and guests as dictated by local code requirements.
 - c) Connect all buildings local fire alarm panels into a seamless network incorporating a central control console located in the administration building and remote console in the guard gatehouse.
 - d) Perform any added functions as specified or required by local codes or AHJ.
- C. Basic System Functional Operation:
 - 1. When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:
 - a) The system alarm LED shall flash.
 - b) A local piezo electric signal in the control panel shall sound.
 - c) A backlit 80 character 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.
 - d) Printing and history storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.
 - e) 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.

1.6 SUBMITTALS

- A. General:
 - 1. 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 from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
 - 2. 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.
- B. Software Modifications:
 - 1. 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.
 - 2. 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 modification on site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.
- C. Certifications: Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract

maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

- D. Owner's designated representative shall approve all equipment submittals.
- E. In addition to the General requirements, submit all materials for approval arranged in the same order as Specifications, Individually referenced to Specification paragraph and drawing number Submit number required In Division I plus three (3) copies of A4 material and 2 prints plus one reproducible of drawings in A0, minimum. Submit A4 items bound in volumes and A0 drawings in edgebound sets.
- F. Progress Schedule: Include duration and milestones for the following:
 - 1. All submittals specified.
 - 2. Shipment to site.
 - 3. Installation.
 - 4. Field testing.
 - 5. Training.
 - 6. First beneficial use date.
- G. Manufacturer's Product Data:
 - 1. List of Materials: For each item, Include:
 - a) Manufacturer.
 - b) Model number.
 - c) Listing: CSFM.
 - d) Quantity.
 - 2. Manufacturer's Product Data: In sequence of List of Materials, Data sheet for each item, including all accessories, marked for proposed product. Photo copies will not be accepted. Original manufacturer specifications sheets only.
- H. Field/Shop Drawings:
 - 1. Resubmit: for coordination reference complete with corrections from previous submittal:
 - a) List of Materials.
 - b) Manufacturer's Product Data.
 - 2. Field (installation) Drawings: Collate in sequence:
 - a) Drawing Index/symbol sheet.
 - b) Floor plans. At scale of Contract Documents. Show:
 - (1) Devices with circuit number.
 - (2) Rough-in.
 - (3) Mounting height.
 - (4) Conduit size.
 - (5) Wire type.
 - (6) Wire fill.
 - c) Sections/Elevations. At scale of Contract Documents.
 - (1) Mounting location reference.
 - d) Enlarged Plans. At scale of Contract Documents or larger as required for trade coordination. Show:
 - (1) Refer to "floor plans".
 - (2) Architectural features.
 - (3) Clearances.
 - e) System conduit riser drawing, show:
 - (1) Terminal cabinets.
 - (2) Coordination with floor plans.

- (3) Wire runs not shown on floor plans.
- (4) Wire type.
- (5) Wire fill.
- f) Mounting details
 - (1) Stamped and signed by Structural Engineer licensed in jurisdiction for work of this type.
 - (2) Show loads, strength of connections, etc.
 - (3) Show calculations - on drawings or in bound volume for review by authorities having jurisdiction.
 - (4) Provide details for:
 - (a) Racks/cabinets/panels
- g) Installation details as required.
 - (1) Terminal cabinets: terminations.
- h) Wire run sheets (if used) Show:
 - (1) Wire Number.
 - (2) Source.
 - (3) Designation
 - (4) Signal Type.
 - (5) Wire type.
 - (6) Operating level or voltage (if applies).
- 3. Shop (Fabrication) Drawings: Collate In sequence:
 - a) Drawing Index/symbol sheet (if separate set from Field Drawings).
 - b) System functional drawings. Submit separate drawing for each system/subsystem. Show:
 - (1) Equipment: Function, make, model.
 - (2) Wire number.
 - (3) Wire Type.
 - c) Fabrication details submit for:
 - (1) Receptacles.
 - (2) Panels.
 - (3) Special mounting provisions.
 - (4) Legends/engraving details. Half or full size:
 - (a) Receptacles.
 - (b) Panels.
 - (c) Equipment.
- 4. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
- 5. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
- 6. Show annunciator layout, configurations, and terminations.
- I. Shop and Field Test Reports:
 - 1. Schedule: Submit test reports in timely manner relative to Project schedule such that owner may conduct Verification of submitted Test Data at owner's option, without delay of progress.
 - a) Shop test report: Submit prior to shipping completed system to project site.
 - b) Field test report: Submit following system completion and prior to and as condition precedent to owner's acceptance of the Work of this Section.
 - 2. Test Reports: Include:

- a) Time and date of test.
 - b) Personnel conducting test. Provide with 24 hour notice for test. (Provide per CFC 901.2.1)
 - c) Test Object.
 - d) Procedure used. (Per Chapter 9 CFC)
 - e) Test equipment, Including serial and date of calibration.
 - f) Results of test - numerical or graphical presentation.
3. Verification of Submitted Test Data: owner may elect to verify some or all test data submitted. Provide with written request for 24 hour notice for test per CFC 901.2.1. Retest In presence of designated observer(s) at reasonable convenience of owner. Provide technician familiar with work of this Section. Provide all test equipment.
- J. Reference Data for Operation, Maintenance and Repair
1. In addition to the requirements of Division 1, submit one (1) additional set. Submit in three post binders (not ring binder) with Tabs.
 2. Index.
 3. Systems operating Instructions.
 4. Reduced set of system Record Drawings.
 5. Key schedule.
 6. Maintenance and spare parts schedules.
 7. Shop and Field Test Reports.
 8. Equipment manuals. Collate alphabetically by manufacturer. Provide manufacturer's original operation, Instruction and service manuals for each equipment item. For each set, provide manufacturer's original printed copies only. Photocopies not acceptable.
- K. Record Drawings in AutoCAD R2014 format min.
1. Quantity:
 - a) Review sets: as for Shop and Field Drawings.
 - b) Record set:
 - (1) Three (3) D size or larger size prints.
 - (2) One CD disk with applicable .DWG files
 - (3) Retain on premises minimum 5 years. CFC 901.6.2.1
 2. Content: All drawings required under “Field and Shop Drawings”. Show “as Installed” condition.
- L. Other than Specified Equipment
1. Equipment other than specified shall be considered for approval provided the following is submitted in writing by the contractor to the Consultant ten (3) days before the bid date:
 2. Complete lists, descriptions and drawings of materials to be used.
 3. A complete list of current drain requirements during normal supervisory conditions, trouble conditions, and alarm conditions
 4. Battery standby calculations showing total standby power needed to meet the system requirements as specified
- M. Substituted Equipment:
1. If equipment other than that specified is supplied, it shall be the contractor's obligation to submit the appropriate documentation and allow the specifying Consultant sufficient time to consider the equality of the substituted items.
- N. Satisfying the Entire Intent of these Specifications
1. It is the contractor's responsibility to meet the entire intent of these specifications. Deviations from the specified items shall be at the risk of the contractor until the date of final acceptance by the Consultant and owner’s representative.
 2. All costs for removal, relocation, or replacement of a substituted item shall be at the risk of the contractor.

1.7 GUARANTEE/WARRANTY

- A. 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.

1.8 POST CONTRACT MAINTENANCE:

- A. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.
- B. As part of the submittal, include a quote for a maintenance contract to provide all maintenance, test, and repair described below. Include also a quote of unscheduled maintenance/repair, including hourly rates for technicians trained on this equipment, and response travel costs. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.
- C. Maintenance and testing shall be on a semiannual basis or as required by the AHJ. A preventive maintenance schedule shall be provided by the contractor that shall describe the protocol for preventive maintenance. The schedule shall include:
 1. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, waterflow switches and all accessories of the fire alarm system.
 2. Each circuit in the fire alarm system shall be tested semiannually.
 3. Each smoke detector shall be tested in accordance with the requirements of CSFM & NFPA Standards.

1.9 POST CONTRACT EXPANSIONS:

- A. The contractor shall provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.
- B. As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent or addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable monitor modules and addressable control modules equal (list actual quantity of each type).
- C. Quotation shall include installation and test labor and labor to reprogram the system for this 10% expansion. If additional FACP hardware would be required, include the material and labor necessary to install this hardware.
- D. Do not include cost of conduit or wire or the cost to install conduit or wire except for labor to make final connections at the FACP and at each intelligent addressable device. Do not include cost of conventional peripherals or the cost of initiating devices or Notification appliances connected to the addressable monitor/control modules.
- E. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

1.10 APPLICABLE STANDARDS AND SPECIFICATIONS: (2016 CBC/CFC/NFPA72 & Title 19)

- A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards.
 1. DSA Requirements
 2. County of Ventura Fire Code
 3. All requirements of the Authority Having Jurisdiction (AHJ).

1.11 APPROVALS

- A. The system shall have proper listing and/or approval from internationally recognized agencies.
- B. The system shall be listed by the international agencies as suitable for extinguishing release applications.

PART 2 - PRODUCTS

2.1 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 protective signaling system, meeting the Fire Alarm Code.
- B. 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.
- 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.

2.2 CONDUIT AND WIRE

A. Conduit:

1. Conduit shall be red & installed in accordance with the DSA & fire marshal requirements.
2. 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.
3. Cable must be separated from any open conductors of Power, or Class circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors.
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. 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.
6. Conduit shall be 3/4 inch (19.1 mm) minimum and red in color.

B. Wire:

1. All fire alarm system wiring shall be new.
2. Wiring shall be in accordance with DSA codes and approved by CSFM 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 14 AWG (1.63 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.
5. Wiring used for the multiplex communication loop shall be twisted and shielded and support a minimum wiring distance of 10,000 feet. The system shall support up to 1,000 ft. of untwisted, unshielded wire. The system shall permit use of IDC and NAC wiring in the same conduit with the communication loop.
6. All field wiring shall be completely supervised.
7. The Fire Alarm Control panel shall be capable of T-Tapping two wire type. Signaling Line Circuits (SLC's) Systems, which do not allow or have restrictions in, for example, the amount of T-Taps, length of T-Taps etc., are not acceptable.
8. All wire/cable used in underground or below grade, applications shall be rated by the manufacturer for the intended use and be gel filled.

C. Terminal Boxes, Junction Boxes and Cabinets:

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

D. 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.

E. The Fire Alarm Control Panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled 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.

2.3 MAIN FIRE ALARM CONTROL PANEL

- A. The FACP shall be an FCI and 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.
- B. System Capacity and General Operation:
1. The control panel shall provide, or be capable of expansion to 2000 intelligent/addressable devices.
 2. The system shall include Form-C alarm and trouble relays rated at a minimum of 2.0 amps @ 30 VDC. It shall also include four Class B (Style Y) programmable Notification Appliance Circuits.
 3. The system shall support programmable driven relays.
 4. 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.
 5. 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.
 6. The FACP shall provide the following features:
 - a) Drift Compensation to extend detector accuracy over life.
 - b) Sensitivity Test
 - c) Maintenance Alert to warn of excessive smoke detector dirt or dust accumulation.
 - d) System Status Reports to display or printer.
 - e) Alarm Verification, with verification counters.
 - f) PAS presignal.
 - g) Rapid manual station reporting (under 2 seconds).
 - h) Non-Alarm points for general (non-fire) control.
 - i) Periodic Detector Test, conducted automatically by software.
 - j) Pre-alarm for advanced fire warning.
 - k) Cross Zoning with the capability of: counting two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.
 - l) March time and temporal coding options.
 - m) Walk Test, with check for two detectors set to same address.
 - n) Security Monitor Points.
 - o) Control-By-Time for non-fire operations, with holiday schedules.
 - p) Day/Night automatic adjustment of detector sensitivity.
 - q) Device Blink Control for sleeping areas.
- C. Central Microprocessor:
1. The Microprocessor 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.
 2. The microprocessor shall contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Control-by-event equations shall be held in non-volatile programmable memory and shall not be lost even if system primary and secondary power failure occurs.
 3. The microprocessor 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.
- D. Display:

1. The display shall provide all the controls and indicators used by the system operator and may be used to program all system operational parameters.
 2. The display shall include status information and custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.
 3. The display shall provide an 80-character back-lit alphanumeric Liquid Crystal Display (LCD). It shall also provide Light-Emitting-Diodes (LEDs), that will indicate the status of the following system parameters: AC POWER, SYSTEM ALARM, SYSTEM TROUBLE, SIGNAL SILENCED, SUPERVISORY, and PRE-ALARM.
 4. The Display shall provide a key touch key-pad with control capability to command all system functions, entry of alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.
 5. The Display shall include the following operator functions: SIGNAL SILENCE, RESET, DRILL, and ACKNOWLEDGE.
- E. Signaling Line Circuit (SLC):
1. The SLC interface shall provide power to and communicate with intelligent detectors (Ionization, Photoelectric, or Thermal) and intelligent modules (monitor or control). This shall be accomplished over a single SLC loop and shall be capable of Style 4 or Style 6 wiring.
 2. The loop interface 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.
 3. The detector software shall meet all local VDE and VdS requirements and be certified by VdS as a calibrated sensitivity test instrument.
 4. The detector software shall allow manual or automatic sensitivity adjustment.
- F. Serial Interfaces:
1. An EIA-232 interface between the Fire Alarm Control Panel and Listed Electronic Data Processing (EDP) peripherals shall be provided.
 2. The EIA-232 interface shall allow the use of printers, CRT monitors, and PC compatible computers.
 3. The EIA-232 interface shall include special protocol methods that allow off-site monitoring of the FACP over standard dial-up phone lines. This ancillary capability shall allow remote readout of all status information, including analog values, and shall not interfere with or degrade FACP operations when used. It shall allow remote FACP Acknowledge, Reset, or Signal Silence in this mode. It shall also allow adjustment of detector sensitivity and readout of the history file.
 4. An EIA-485 interface shall be available for the serial connection of remote annunciators and LCD displays.
 5. The EIA-485 interface may be used for network connection to a Proprietary Receiving Unit.
- G. Enclosures:
1. The control panel shall be housed in a DIN listed cabinet suitable for surface or semi-flush mounting. Cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
 2. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators.
- H. All interfaces and associated equipment are to be protected so that they will not be affected by voltage surges or line transients, consistent with DIN standards.
- I. An optional module shall be available which provides Form-C relays rated at 5.0. The relays shall track programmable software zones.
- J. Power Supply:
1. The Power Supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP.

2. It shall provide a battery charger for 30 hours of standby using dual-rate charging techniques for fast battery recharge.
 3. It shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.
 4. It shall provide 5.0 amps of usable Notification appliance power, using a switching 24 VDC regulator. A 3.0 amp notification expansion power supply shall be available for the demanding requirements visual devices, for a total system capacity of 8 amps.
 5. It shall be power-limited.
 6. It shall provide optional meters to indicate battery voltage and charging current.
- K. Field Charging Power Supply: The FCPS is a device designed for use as either a remote 24 volt power supply or used to power Notification Appliances.
1. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24 volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries and to support 30 hour standby.
 2. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (two Style Y or Z and two style Y) shall be available for connection to the Notification devices.
 3. The FCPS shall include an attractive surface mount backbox.
 4. The Field Charging Power Supply shall include the ability to delay the AC fail delay requirements.
 5. The FCPS include power limited circuitry.
- L. Field Wiring Terminal Blocks:
1. For ease of service all panel I/O wiring terminal blocks shall be a removable, plug-in type and have sufficient capacity for 18 to 12 AWG wire. Terminal blocks, which are permanently fixed, are not acceptable.
- M. Operators Controls:
1. Acknowledge Switch:
 - a) Activation of the control panel Acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and Trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the 80-character LCD display to the next alarm or trouble condition.
 - b) Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.
 2. 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.
 3. System Reset Switch: 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) Holding the system RESET switch shall perform a lamp test function.
 4. Drill (Evacuate) Switch:
 - a) The drill switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.
- N. Field Programming:
1. 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.
 2. All programming may be accomplished through the standard FACP keypad.
 3. All field defined programs shall be stored in non-volatile memory.

4. The programming function shall be enabled with a password that may be defined specifically for the system when it is installed. Two levels of password protection shall be provided in addition to a key-lock cabinet. One level is used for status level changes such as zone disable or manual on/off commands. A second (higher-level) is used for actual change of program information.
5. 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.
6. A special program check function shall be provided to detect common operator errors.
7. An Auto-Program (self-learn) function shall be provided to quickly install initial functions and make the system operational.
8. For flexibility, an off-line programming function, with batch upload/download, shall also be available.

O. Specific System Operations:

1. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all analog intelligent smoke detectors in the system from the control panel. Sensitivity range shall be within the allowed window.
2. Alarm Verification: Each intelligent addressable smoke detector in the system shall be independently selected and enabled to be alarm verified. The alarm verification delay shall be programmable from 5 to 30 seconds. 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.
3. Point Disable: Any device in the system may be enabled or disabled through the system keypad.
4. Point Read: The system shall be able to display or print the following point status diagnostic functions:
 - a) Device status.
 - b) Device types.
 - c) Custom device labels.
 - d) View analog detector values.
 - e) Device zone assignments.
 - f) All program Parameters.
5. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing system status.
6. System History Recording and Reporting: The Fire Alarm Control Panel shall contain a History Buffer that will be capable of storing up to 800 system alarms/troubles/operator actions. Each of these activation's 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.
 - a) Although the foreground history buffer may be cleared for user convenience, a background, non-erasable buffer shall be maintained which provides the last 800 system events.
 - b) The History Buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable.
7. 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.
 - a) 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.
8. Pre-alarm Function: The system shall 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.

9. Software Zones: The FACP shall provide 99 software zones. All addressable devices may be field programmed to be grouped into software zones for control activation and annunciation purposes.

2.4 SYSTEM COMPONENTS

A. Signaling Devices:

1. STROBES (as required by Code):

- a) Strobes shall be provided as required and indicated on the contract drawings and shall have a flash rate not to exceed 60 times per minute.
- b) The word "Fire" shall appear on the lens or lens plate.
- c) Strobes shall be a 15cd, 1Hz minimum for restrooms and 75cd, 1Hz for large rooms (i.e., library, multi-use, meeting, etc.).
- d) Strobes shall mount to 2 gang box, flush or surface as shown on drawings.

2. SPEAKERS (as required by Code): (Speakers are recommended for means of notification)

- a) Alarm Speakers shall be provided as required and as indicated on the contract drawings.
- b) Speakers shall mount to a 4 sq. box. for interior use and a cast weatherproof, gasketed box for exterior use.
- c) Speakers shall be red in color.
- d) Sound pressure level shall be 85dBA at 10 feet
- e) Screw terminals shall be provided for field connections.
- f) Unit may be configured with optional Strobe for interior Speaker/Strobe applications.

3. SPEAKER/STROBES (as required by Code):

- a) Speaker/Strobe combination units shall be supplied as required and as indicated on the contract drawings.
- b) Strobes shall not to exceed 60 flashes per minute.
- c) The word "Fire" shall appear on the lens or lens plate.
- d) Strobes shall be a 15cd, 1Hz minimum restrooms and 75cd, 1Hz for large rooms (i.e., library, multi-use)
- e) Wiring for Strobes shall be separate from Speaker Circuits. Strobes shall mount to face of Speaker unit.
- f) Wiring for Speakers shall be separate from Strobe Circuits. Speakers shall mount to a 4 sq. box. for interior use.
- g) Speakers shall be red in color.
- h) Sound pressure level shall be 85dBA at 10 feet
- i) Screw terminals shall be provided for field connections.

4. SPEAKERS (as required by Code):

- a) Speaker units shall be supplied as required and as indicated on the contract drawings.
- b) Speakers shall mount to a single gang or double gang box for interior use.
- c) Speakers shall be red in color.
- d) Sound pressure level shall be 90dBA at 10 feet
- e) Screw terminals shall be provided for field connections.

B. 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 1 to 10) type address switches. Devices, which use a binary address setting method, such as a dip switch, are not an allowable substitute.
3. Detectors shall be intelligent and addressable, and shall connect with two wires to the Fire Alarm Control Panel Signaling Line Circuits.
4. Addressable smoke and thermal detectors shall provide dual alarm and power 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 shall be optional through the system field program. An output connection shall also be provided in the base to connect an external remote alarm LED.

5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity shall 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 DIN, VDE and/or VdS as meeting the calibrated sensitivity test requirements.
7. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. An optional base shall be available with a built-in (local) sounder rated at 85 DBA minimum.
8. 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.
9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).

C. Addressable Pull Box (manual station as required by Code):

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 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.

D. Intelligent Photoelectric Smoke Detector:

1. 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.

E. Intelligent Thermal Detectors:

1. 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.

F. Intelligent Duct Smoke Detector:

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.

G. Addressable Dry Contact Monitor Module

1. 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 SLC loops.
2. The monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box.
3. The IDC zone shall be suitable for Style D or Style 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.
4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch x 1-1/4 inch x 1/2 inch. This version need not include Style D or an LED.

H. Two Wire Detector Monitor Module:

1. 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).
2. The two-wire monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box or with an optional surface backbox.
3. The IDC zone may be wired for Class A or B (Style D or Style 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.

I. Addressable Control Module:

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 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.

2.5 BATTERIES:

- A. Shall be 24 volt, Gell-Cell type (two required).
- B. Battery shall have sufficient capacity to power the fire alarm system for not less than thirty hours (30) plus thirty minutes (30) of alarm upon a normal AC power failure.
- C. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be in accordance with the VDE, DIN, EN, VdS Standards, along with local codes, as shown on the drawings, and as recommended by the equipment manufacturer.
- B. 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.
- 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.

PART 4 - GUARANTEE AND TEST

4.1 GENERAL

- A. The contractor shall guarantee all equipment and wiring free from inherent mechanical and electrical defects for one year from the date of final acceptance by consultant.
- B. Acceptance shall consist of the following:
 1. Burn-in period.

- a) The system shall be accepted for start of warranty upon successful completion and testing of AHJ and Consultant.
- b) Burn-In period shall be a 30 day time frame to allow the system to operate free of defects, grounds, programming faults, etc.
- c) The 30 day Burn-In shall begin the day of acceptance by AHJ.
- d) The Burn-In period shall be 30 days of continuous use without system trouble, false alarm, open, short or ground condition present.
- e) Should the system fail for any reason during the burn-in period, the contractor shall respond immediately upon notification by owner's personnel and correct said deficiencies.
- f) Upon correction and restoration, the "Burn-In" period shall be re-set to "0" and the 30 day count shall begin again.
- g) Start of Warranty shall commence upon day 31 of successful "Burn-In" period.

4.2 FINAL TEST (as applicable for project devices)

- 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. All testing shall be in accordance with VDE, VdS and DIN Standards.
 1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
 2. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
 3. Verify activation of all flow switches.
 4. Open initiating device circuits and verify that the trouble signal actuates.
 5. Open and short signaling line circuits and verify that the trouble signal actuates.
 6. Open and short Notification Appliance Circuits and verify that trouble signal actuates.
 7. Ground all circuits and verify response of trouble signals.
 8. Check presence and audibility of tone at all alarm notification devices.
 9. Check installation, supervision, and operation of all intelligent smoke detectors using the Walk Test.
 10. 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.
 11. 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.
- B. Before the installation shall be considered completed and acceptable by the awarding authority, a test on the system shall be performed as follows:
 1. The contractor's job foreman, in the presence of a representative of the manufacturer, a representative of the owner, the inspector of record (IOR) and the fire department shall operate every building fire alarm device to ensure proper operation and correct annunciation at the control panel.
 2. Audibility tests shall be performed utilizing a calibrated Decibel Meter. The system shall be capable of supplying 15dB over ambient noise levels. Tests shall be conducted in the presence of the Consultant and AHJ at selected locations by Consultant/AHJ. Prior to acceptance, testing the contractor shall have verified signal levels in each area as to meeting the above criteria.
 3. Where application of heat would destroy any detector, it may be manually activated.
 4. The initiation circuits and the indicating appliance circuits shall be opened in at least two (2) locations per zone to check for the presence of correct supervisory circuitry.
 5. When the testing has been completed to the satisfaction of both the contractor's job foreman and the representatives of the manufacturer and owner, a notarized letter co-signed 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 and successful burn in period.

7. Prior to final test, the fire department must be notified in accordance with local requirements.
8. Submit completed Certification form. The form shall be submitted in type written format. Hand written forms will not be accepted.

4.3 As-Built Drawings, Testing, and Maintenance Instructions

- A. A complete set of reproducible "as-built" drawings in AutoCAD R2015 format (CDs and sheets) 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 acceptance.
- B. Operating and Instruction Manuals:
 1. Operating and instruction manuals shall be submitted prior to testing of the system. Four (4) complete sets of operating and instruction manuals shall be delivered to the owner upon completion.
 2. The owner shall be furnished with all programming disks for each installation as well as hard copy printouts. Provide necessary training and/or schooling to designated owner personnel at no additional cost to owner. Training shall be at the owner's designated location, by factory trained personnel. Provide all necessary interconnection cables for remote programming via "laptop" computer.
- C. Testing Frequency Instructions:
 1. Complete, accurate, step-by-step testing instructions giving recommended and required testing frequency of all equipment, methods for testing each individual piece of equipment, and a complete trouble-shooting manual explaining how to test the primary internal parts of each piece of equipment shall be delivered to the owner upon completion of the system.
- D. Maintenance instructions shall be complete, easy to read, understandable, and shall provide the following information:
 1. Instruction on replacing any components of the system, including internal parts.
 2. Instructions on periodic cleaning and adjustment of equipment with a schedule of these functions
 3. A complete list of all equipment and components with information as to the address and phone number of both the manufacturer and local supplier of each item.
 4. User operating instructions, shall be provided prominently displayed on a separate sheet located next to the control unit.
 5. Administrative staff of the school shall be thoroughly instructed in the use of system by authorized distributor. Such service shall be provided in conjunction with the Fire Alarm equipment.
 6. Staff of the Park as well as owner maintenance staff shall be thoroughly instructed in the use of the System. Training shall include a minimum of three (1) hour sessions, to be scheduled at the Owner's designated time.
 7. Maintenance instruction shall be performed in the same manner as described above. Training shall include a minimum of three (1) hour sessions, to be scheduled at the owner's designated time.

END OF SECTION 264721