FIRE LIFE SAFETY
CAMPUS STANDARDS
June 1, 2009

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CSUF Fire Alarm Standards and Specifications

California State University, Fullerton (CSUF) has developed standardized specifications for all new building construction, tenant improvements and remodels. Fire Life Safety standards shall not be “value engineered” or removed from any current and future new construction, tenant improvement, and remodel projects.

Fire Alarm System

SimplexGrinnell 4100U (or comparable SimplexGrinnell fire alarm system) shall be installed using the CSUF Fire Alarm System Modification Guideline as written by TRC (included) and accepted by CSUF Physical Plant.

CSU Fullerton Fire Life Safety Standards Construction Documents Specifications

All new construction and construction modifications for fire alarm systems to existing structures.

Abbreviations

All abbreviations will conform to those listed on the Campus Fire Life Safety Standards. See Attachment B

Fire Alarm System’s Sequence of Operations

The sequence of operations will match the matrix shown on the Campus Fire Life Safety Standards plans. See Attachment C

Fire Alarm Devices

All devices used in the future will match those described in the SimplexGrinnell Fire Detection & Alarm Products Engineer’s Technical Reference ETR579344F. Contact SimplexGrinnell for the ETR. Physical Plant also has a copy.

Magnetic Door Hold Open Devices

These devices are required on all faculty, department, and conference room doors that open onto a fire rated exit corridor. See Attachment E
Emergency Notification System

All new construction will include an Emergency Notification Exterior Paging System as detailed in the Campus Emergency Paging Systems. The area of coverage will be determined by the CSUF Campus Chief of Police. See Attachment F

Device Symbols

All fire alarm device symbols used on plans and specs will conform to the Fire Alarm Equipment Symbols List of Campus Fire Life Safety Standards. See Attachment D
CSUF Fire Alarm System Modification Guideline

1 - Background

In April 2008, California State University, Fullerton (CSUF) completed a $7,000,000 Fire Life Safety upgrade project. This project has provided CSUF with the most state of the art fire alarm system of all campuses in the CSU system. To protect and insure standardization of their investment in the campus fire alarm system, all future projects require strict compliance to the CSUF Fire Life Safety Standards.

2 - Campus Fire Alarm Standards

The new campus wide fire alarm system follows specific designs standards that can be referenced in the “Campus Wide Fire Alarm Guideline”. Architects and General contractors (Design/Build) shall download and revise the campus Fire Life Safety and Emergency Paging System on a project by project basis to fit the specific project or building renovation.

3- Document Scope

This document outlines the procedures to assist CSUF Physical Plant and Design & Construction Project Managers to implement the necessary steps for maintaining, expanding and general modifications related to the campus wide networked Fire Alarm System. Procedures are established based on the scale of the project from small tenant improvements to significant remodels and new construction.
4 – New Building Construction

Definition

For new building construction projects an outside architect is selected by CSUF for the project. TRC as part of the design team will provide fire alarm and emergency paging systems engineering/design services. TRC works with the design team on design development, construction documentation, construction administration, commissioning and record drawing review. Fire alarm tasks for new building construction are listed below.

Fire Alarm Tasks for New building Construction Projects:

- CSUF provides to TRC contact information to proposing architects.
- TRC provides a proposal, based on scope of project, to proposing Architectural firms for Fire Alarm and Emergency Paging engineering services (schematic design, design development, construction documentation, construction administration, system commission and update campus record drawings).
- TRC will be under contract with the architect of record.
- TRC will provide schematic design, design development and construction documentation deliverables to the architect of record.
- SimplexGrinnell will provide a proposal for the project to bidding contractors.
- SimplexGrinnell to provide selected contractor with a product data submittal and shop drawings.
- SimplexGrinnell shall provide shop drawings for approval by TRC, CSUF and CSFM.
- TRC reviews SimplexGrinnell material submittal and shop drawings.
- SimplexGrinnell or contractor acquires necessary FA permit.
- SimplexGrinnell or authorized installer provides installation.
- SimplexGrinnell updates the campus Network program, and IMS Graphics in campus police and electrical shop.
- Testing by SimplexGrinnell, CSUF, CSFM and witnessed by TRC.
- TRC provides fire alarm “punch list”.
- CSUF to survey project with contractor for completion of punch list items.
- CSFM provides Certificate of Occupancy.
- SimplexGrinnell provides TRC with project “as-builds” for review.
- SimplexGrinnell updates campus record drawings.
5 – Tenant Improvements

Definition

Typical campus tenant improvements are small in scope, generally do not have outside architectural services and may or may not have a General Contractor.

Modifications to the campus fire alarm system may not have to be made depending on the specific tenant improvement. The CSUF Project Manager (PM) must ascertain whether fire alarm modifications are necessary. TRC can assist the PM with the decision if the decision is beyond the PM’s internal campus resources. If the answer is yes, modifications will be made to the fire alarm system. TRC (consulting engineer) and SimplexGrinnell (fire alarm supplier) should be brought into the project if CSUF PM requires assistance. Please refer to the flow chart and subsequent task assignments on page 5.

Fire Alarm Tasks for Tenant Improvement Projects:

- TRC to provide to CSUF Project Manager with engineered drawings (as required).
- SimplexGrinnell provides to CSUF/GC with price proposal.
- SimplexGrinnell provides to CSUF/GC with material submittal and shop drawings.
- SimplexGrinnell shall provide shop drawings for approval by TRC, CSUF and CSFM.
- TRC reviews SimplexGrinnell material submittal and shop drawings.
- SimplexGrinnell or contractor acquires FA permit (if necessary).
- SimplexGrinnell or authorized installer provides installation.
- SimplexGrinnell updates Campus Network Fire Alarm system program and IMS graphics in campus police and electrical shop.
- Testing by SimplexGrinnell, CSUF, CSFM, and witnessed by TRC (when necessary).
- CSUF to survey project with contractor for completion of punch list items.
- CSFM provides Certificate of Occupancy.
- SimplexGrinnell provides TRC with project “as-builds” for review.
- SimplexGrinnell updates campus record drawings.
6 - Remodels

Definition
Remodels can involve large areas of a building, several floors or reconfiguration of an area to a different type of occupancy classification. For those projects the CSUF staff generally hires an outside Architect and the project goes out to bid. In most scenarios the building fire alarm system is affected. CSUF directs the Architect to consult with TRC for fire alarm design modifications. The task assignments for fire alarm design modifications are as follows:

Fire Alarm Tasks for Remodel Projects:

- The CSUF PM provides to TRC contact information to architect of record.
- TRC provides a proposal, based on scope of project, to Architect for fire alarm engineering services to include (engineered specifications & drawings, shop drawing review, presence at systems test, punch list documentation and as-built drawing review).
- TRC contracts through the architect of record.
- TRC will interface engineered drawings into construction drawing set developed by the architect of record.
- SimplexGrinnell provides cost proposal to CSUF/GC.
- SimplexGrinnell to provide CSUF/GC with material data submittal and shop drawing.
- SimplexGrinnell shall provide shop drawings for approval by TRC, CSUF and CSFM.
- TRC reviews SimplexGrinnell material submittal and shop drawings.
- SimplexGrinnell or contractor acquires necessary FA permit.
- SimplexGrinnell or authorized installer provides installation.
- SimplexGrinnell updates the campus Network program, and graphic displays at the IMS in campus police and electrical shop.
- Testing by SimplexGrinnell, CSUF, CSFM and witnessed by TRC.
- TRC provides fire alarm “punch list”.
- CSUF to survey project with contractor for completion of punch list items.
- CSFM provides Certificate of Occupancy.
- SimplexGrinnell provides TRC with project “as-builds” for review.
- SimplexGrinnell updates campus record drawings.
Tenant Improvement Project Start

Is the Fire Alarm system involved?

Doesn’t Know

Project Manager contacts TRC for Y/N decision on Fire Alarm

Is there a GC on the project?

Yes

 GC issues service ticket to TRC for Fire Alarm engineering services.

No

CSUF issues contract to TRC for FA engineering services.

Fire Alarm Services - See Tasks Below

Project Proceeds to Completion

Tenant Improvement Decision Flow Chart
SECTION 16721

FIRE ALARM SYSTEM EQUIPMENT

PART 1 – GENERAL

1.1 DESCRIPTION

A. General Description: This specification covers the furnishing and installation of a complete Fire Alarm System that will provide smoke detection, manual alarm capability, audible and visual signaling, and centralized reporting, for the entire facility.

B. Contractor shall furnish and install all fire alarm hardware devices, power supplies, switches, controls, software, programming and other components of the system as shown and specified and as required for a complete and operable system.

C. In addition, furnish and install outlets, junction boxes, conduit, connectors, wiring, and other accessories necessary to complete the system installation. Requirements shall be in accordance with Division 16, Electrical.

D. General Conditions: Provide the work in accordance with Division 1.

1.2 WARRANTY

A. In accordance with Division 1, Product Warrantees and Bonds.

1.3 QUALITY ASSURANCE

A. In accordance with Section 16050, Electrical General Requirements.

1.4 Owner’s RIGHT TO USE EQUIPMENT

A. The Owner reserves the right to use equipment, material and services provided as part of this work prior to Acceptance of the Work, without incurring additional charges and without commencement of the Warranty period.

1.5 FIRE ALARM SYSTEM TECHNICAL REQUIREMENTS

A. General

1. Complete System: Contractor shall provide a complete and operable system, approved by the Authority Having Jurisdiction, and complying with the specifications and drawings. Auxiliary and incidental equipment necessary for the operation and protection of the systems specified herein shall be furnished and installed as if specified in full.

2. Single Manufacturer: All fire alarm control panels, cross-listed (CSFM) devices, and central reporting systems shall be of the same manufacturer, and shall be tested and approved for the intended purpose of centralized fire alarm system management.

B. Fire Alarm Equipment
1. Purpose: The Fire Alarm system is designed to detect the presence of fire related smoke and heat in specific areas, allow a manual means of initiating a fire alarm, and control the distribution of audible and visual alarm indications.

2. Environment
   a. The system will encompass the California State University, Fullerton (CSUF) Site, including buildings and areas shown on the drawings.
   b. The system will communicate, via a computer data network, with other Fire Alarm control Panels (FACP) located in Communications and Electrical rooms, as shown on the drawings. Fire alarm control panels shall contain appropriate display, monitor, signal and control modules to perform functions specified herein, for its applicable building(s).
   c. Primary Campus Monitoring (existing): The Master Fire Alarm Control Panel (MFACP), including the printer and graphic display monitor, is located in the campus police building. The existing MFACP elements include, but are not limited to:
      1) Detection and Alarm Control Panel w/ Liquid Crystal Display (LCD)
      2) Voice Communication System Control Panel w/Microphone and Digital Recorder
      3) Firefighters Phone System Control Panel
      4) Alarm Printer
      5) Graphical Alarm Display and Information Management System (IMS)
   d. Secondary Campus Monitoring (existing): A secondary Fire Alarm Annunciator is located in the Campus Electrical Shop building. Fire Alarm Annunciator elements shall include but not limited to:
      1) Alarm Printer
      2) Graphical Alarm Display/Information Management System
   e. Site Buildings:
      1) Detection and Alarm Control Panel w/Liquid Crystal Display (LCD)
      2) Fire Alarm Annunciator, w/Liquid Crystal Display (LCD)
      3) Voice Communication System Control Panel w/Microphone
      4) Firefighters Phone System Control Panel (where shown)

3. Attributes
   a. General
      1) The system shall be a complete, electrically supervised, peer-to-peer multiplex-style fire detection and signal system, with intelligent analog alarm initiation to be device addressable and annunciated as described and shown on the drawings.
      2) The system shall support the ability to download all system applications programs and “firmware” from a laptop or other type of computer, through a single point in the system.
      3) The system shall support intelligent analog smoke detection, conventional smoke detection, manual station, water flow, supervisory, building system control and status monitoring devices.
      4) The system shall also support audible and visual indicating (signal) circuits, to provide evacuation alarms in the event of an emergency.
   b. Basic Subsystem Components: The Fire Alarm System will consist of the following basic subsystems:
      1) Master Fire Alarm Control Panel (Existing)
2) Fire Alarm/Smoke Detection System
3) Voice Communication System
4) Firefighters Phone System
5) Visual Notification System
6) Alarm Printers (Existing)
7) Graphical Alarm Display/Information Management Systems (Existing)
8) Building Fire Alarm Annunciators
9) Door release devices
10) Initiating devices
11) Notification Appliances
12) HVAC and Damper control devices
13) Emergency Paging System Interface

c. System operational software is to be stored in FLASH memory. Control Panel disassembly, and replacement of electronic components of any kind shall not be required in order to upgrade the operations of the installed system to conform to future application code and operating system changes.

d. The system shall annunciate a trouble condition when any smoke detector approaches 80% of its alarm threshold due to gradual contamination, signaling the need for service and eliminating unwanted alarms.
   1) The trouble report shall annunciate the specific location of the smoke detector requiring service. Analog smoke detectors installed in the system shall include this feature.

e. Any intelligent analog smoke detector or conventional smoke detector zone shall support alarm verification capability. This feature shall provide automatic verification of smoke detector alarms as described by NFPA 72.

f. Power Limited Circuits
   1) Signaling line, initiating, and notification circuits shall be listed as power limited circuits per article 760 of the National Electric Code.
   2) Power limiting shall be accomplished using on-board self restoring solid-state thermal devices. Units using fuses for this purpose and requiring board replacement or exchange are not considered equal.

g. Fire Alarm Control Panel (FACP), Degraded Mode
   1) In the event of central processor failure or the loss of system communications to Fire Alarm Control Panels, the FACP shall continue operating in a degraded mode utilizing its own distributed processor, memory, and control circuits to recognize alarm initiation and perform local signal and control operations.
   2) Each FACP shall be capable of operation in a degraded mode. The FACP shall sense an alarm from any connected intelligent analog or conventional initiating device and shall activate locally connected indicating appliances and auxiliary circuits.
   3) The system headend shall indicate a trouble condition during degraded mode operation and display the FACP’s operating in degraded mode.
   4) Detectors communicating with an FACP in the degrade mode shall continue operating at the alarm threshold previously
programmed. Systems returning detectors to a common default value in degraded mode shall not be acceptable.

h. Default Software Capabilities
   1) The system shall include default operation software that will activate installed alarm devices prior to the installation of custom operating software.
   2) The system shall support the reporting of alarms from devices installed but not yet programmed into the custom operating software. Alarm initiation from these devices shall activate indicating appliance circuits.

i. Software Programming
   1) The system shall be programmed in the field via a laptop computer. Programmed information shall be stored in nonvolatile memory after downloading into the control panel. No special programming terminal or prom burning shall be required. Systems that require on-line programming will not be considered equal.
   2) During program upload or download the system shall retain the capability for alarm reporting.
   3) The system shall support data communication to a Personal Computer to allow software uploads and downloads for program editing. System program shall be stored on a compact disk. Software shall be multi-level password protected.
   4) Contractor shall provide the Owner with a copy of the latest custom software program on a compact disk at the completion of the project.

j. System Architecture
   1) The system shall consist of a distributed processing architecture using a centrally located Fire Alarm Control Panel (existing), with Data Network interconnection to Fire Alarm Control Panels, in other buildings containing the appropriate number of intelligent relays, notification, signaling line circuit modules, batteries, power supplies, and appurtenances to provide the specified operation.
   2) The FACP’s shall incorporate a power supply, microprocessor controller, battery charger, batteries and communication link to the main Master Fire Alarm Control Panel (MFACP), through a high speed 19.2K baud RS-485 network.
   3) The analog signaling line circuits shall be installed in the Fire Alarm control Panel enclosure or in remote circuit interface panel enclosures.

k. Network Communication
   1) Network node communication shall be through a token ring configuration.
   2) A single open, ground or short on the network communication loop shall not degrade network communications. Token shall be passed in opposite direction to maintain communications throughout all network nodes. At the same time the status of the communication link shall be reported.
   3) If a group of nodes becomes isolated from the rest of the network due to multiple fault conditions, that group shall automatically form a sub-network with all common interaction of
monitoring and control remaining intact. The network shall be notified with the exact details of the lost communications.

4) The communication method shall be NFPA 72 style 7.

l. System Zoning

1) Each intelligent addressable device or conventional zone on the system shall be displayed at the existing Master Fire Alarm Control Panel by a unique English Language alpha-numeric label identifying its location.

2) Devices attached to the signaling line circuit shall be individually identifiable at the control panel for alarm and trouble indication. Smoke detectors shall be interrogated for sensitivity settings from the control panel, logged for sensitivity changes indicating the requirement for cleaning, and tested by a single technician using the panel field test routine.

m. Analog Smoke Sensors

1) Monitoring: FACP shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity. The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values.

2) Environmental Compensation: The FACP shall maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations.

3) Programmable Sensitivity: Photoelectric Smoke Sensors shall have 7 selectable sensitivity levels ranging from 0.2% to 3.7%, programmed and monitored from the FACP.

4) Sensitivity Testing Reports: The FACP shall provide sensor reports that meet NFPA 72 calibrated test method requirements. The reports shall be viewed on a System Display Panel or printed for annual recording and logging of the calibration maintenance schedule.

5) The FACP shall automatically indicate when an individual sensor needs cleaning. The system shall provide a means to automatically indicate when a sensor requires cleaning. When a sensor's average value reaches a predetermined value, (3) progressive levels of reporting are provided. The first level shall indicate if a sensor is close to a trouble reporting condition and will be indicated on the FACP as “ALMOST DIRTY.” This condition provides a means to alert maintenance staff of a sensor approaching dirty without creating a trouble in the system. If this indicator is ignored and the second level is reached, a “DIRTY SENSOR” condition shall be indicated at the FACP and subsequently a system trouble is reported. The sensor based LED shall glow steady giving a visible indication at the sensor location. The “DIRTY SENSOR” condition shall not affect the sensitivity level required to alarm the sensor. If a “DIRTY SENSOR” is left unattended, and its average value increases to a third predetermined value, an “EXCESSIVELY DIRTY SENSOR” trouble condition shall be indicated at the control unit.

6) The FACP shall continuously perform an automatic self-test on each sensor that will check sensor electronics and ensure the
accuracy of the values being transmitted. Any sensor that fails this test shall indicate a "SELF TEST ABNORMAL" trouble condition.

7) Multi-Sensors shall combine photoelectric smoke sensing and heat sensing technologies. An alarm shall be determined by either smoke detection, with selectable sensitivity from 0.2 to 3.7%/ft obscuration; or heat detection, selectable as fixed temperature or fixed with selectable rate-of-rise; or based on an analysis of the combination of smoke and heat activity.

8) Programmable bases; It shall be possible to program relay and sounder bases to operate independently of their associated sensor.

9) Magnet test activation of smoke sensors shall be distinguished by its label and history log as being activated by a magnet.

n. Voice Communication System

1) The Fire Alarm System shall be provided with fully integrated Voice Communications System. The Voice Communications System shall include a paging microphone, digital message playback unit, and a minimum of 4 fully digitized and multiplexed Audio Channels.

2) The system shall have paging control switches and LEDs to support specific zone selection. The zone control / displays shall confirm amplifier selection and annunciate amplifier and amplifier circuit trouble.

3) The system shall automatically deliver a preannounce tone of 1000 Hz for three seconds when the emergency operator presses the microphone talk key. A 'ready to page' Led shall flash during the pre-announce and turn steady when the system is ready for the user's page delivery.

4) The system shall include a page deactivation timer that activates for 3 seconds when the emergency user releases the microphone talk key. Should the user subsequently press the microphone key during the deactivation period a page can be delivered immediately. Should the timer complete its cycle the system should automatically restore emergency signaling and any subsequent paging will be preceded by the pre-announce tone.

5) A VU display shall display voice level to the emergency operator.

6) Each audio power amplifier shall have integral audio signal demultiplexers, allowing the amplifier to select any one of four digitized audio channels. The channel selection shall be directed by the system software. Up to 4 multiple and different audio signals must be able to be broadcast simultaneously from the same system network node.

7) Each amplifier output shall include a dedicated, supervised 25/70 Vrms speaker circuit that is suitable for connection of emergency speaker appliances.

8) Each amplified shall also include a notification appliance circuit rated at 24Vdc @ 3.5A for connection of visible (strobe) appliances. This circuit shall be fully programmable and it shall be possible to define the circuit for the support of audible, visible, or ancillary devices.
9) Standby Audio amplifiers shall be provided that automatically sense the failure of a primary amplifier, and automatically program themselves to select and de-multiplex the same audio information channel of the failed primary amplifier, and fully replace the function of the failed amplifier.

10) In the event of total loss of audio data communications, all amplifiers will default to the local “EVAC” tone generator channel. If the local panel has an alarm condition, then all amplifiers will sound the EVAC signal on their connected speaker circuit.

11) In the event of a loss of the fully digitized, multiplexed audio buss, the audio amplifiers shall automatically default to an internally generated alarm tone that shall be operated at a 3-3-3 temporal pattern.

12) Audio amplifiers shall automatically detect a short circuit condition on the connected speaker circuit wiring, and shall inhibit itself from driving into that short circuit condition.

13) Zoning shall include an exterior zone for notification to the area outside of each audio capable building.

14) The system shall utilize a custom digital message as approved by CSUF.

o. Firefighters Phone System

1) The Master Telephone handset shall support independent, 2-way communications between the Master Fire Alarm Control Panel and any of the Fire Fighters’ Telephone Stations or Portable Telephone jacks.

2) The Fire Fighters’ Telephone System shall include an 8-line LCD to show the operator the identity and location of up to 20 waiting lines.

3) The LCD will display call-in information in English language text, without the need for individual LEDs and switches per telephone station or jack. The user shall connect a call by pressing the ‘connect’ switch.

4) The LCD shall display up to 5 connected calls simultaneously. Up to 5 telephones may be connected on a conference type call.

5) To terminate a call, the operator shall scroll the display cursor over the connected callers’ ID message, and press the ‘disconnect’ switch.

4. Functions

a. Alarm Devices: Activation of any fire alarm initiating device shall cause the following actions and indications:

1) Display a custom text and visual message describing the device originating the alarm condition at the existing Master Fire Alarm Control Panels’ Alphanumeric Display, and existing System Printer at both locations in campus police and electrical shop.

2) Display an alarm map, and flashing icon, showing the device type and location of the trouble, on the Graphical Alarm Displays.

3) Display a custom message describing the device originating the alarm condition at the FACP Alphanumeric Display, System Printer, and IMS.

4) Sound an audible tone, approved by the local authority having jurisdiction, on the speaker circuits and activate the visual signals throughout the building, or in zones as described herein.
a) Sound an Audible/Visual signals shall be silence able from the existing Master Fire Alarm Control Panel by an alarm silence switch. The alarm indication shall be transferred to a visual indicator on the control panel. The alarm signals shall resound for a subsequent alarm condition, reported by a different device.

b) A signal dedicated to sprinkler system water flow alarm shall not be silence able while the sprinkler system is flowing at a rate of flow equal to a single head.

5) Shut down air handler units within the smoke zone of alarm origin, or as described herein or shown on the drawings.

6) Operate (close) fire smoke dampers within the smoke zone of alarm origin, or as described herein or shown on the drawings.

7) Record within the non-volatile system historical memory the occurrence of the event, the time and date of occurrence and the device initiating the event.

8) Release all door hold open devices within the building of alarm.

9) Duct Smoke Detectors: In addition to the above operations, initiation of an alarm from a smoke detector installed in the supply air stream of any air-handling unit not operating as part of an engineered smoke removal system shall cause the shutdown of that fan.

10) Elevator Lobby Smoke Detectors: Upon activation of a designated elevator smoke detector, return the affected elevators to the ground floor or alternate floor as directed by the AHJ.

b. Supervisory Devices: The activation of any supervisory circuit, including any standpipe or sprinkler valve temper switch, air pressure, or fire pump trouble status shall cause the following actions and indications:

1) Display the unique origin of the supervisory condition on the Alphanumeric Display and existing System Printer at the existing Master Fire Alarm Control Panel. Differentiation between valve tamper activation and opens and/or grounds on its fire alarm initiation circuit wiring shall be provided.

2) Display an alarm map, and flashing icon, showing the device type and location of the supervisory condition, on the existing Graphical Alarm Displays.

3) Display a custom message describing the device originating the supervisory condition at the FACP Alphanumeric Display, and System Printer.

4) Sound the common supervisory service audible signal.

5) Activating the Supervisory Acknowledge Switch at the existing MFACP will silence the supervisory audible signal while maintaining the Supervisory Service LED on indicating the tamper contact is still in the off-normal state.

6) Restoring the valve to the normal position shall cause the supervisory service audible signal to pulse thus indicating restoration to normal position. Activating the Supervisory Service Acknowledge Switch will silence the audible signal and restore the system to normal.

7) Record the occurrence of the event, the time of occurrence and the device initiating the event.
c. Trouble Indication: Receipt of a trouble report (primary power loss, open or grounded initiating or signaling circuit wiring, open, grounded or shorted indication system wiring, device communication failure, battery disconnect) at the existing Master Fire Alarm Control Panel shall cause the following actions and indications:

1) Display the unique origin of the trouble signal on the existing Master Fire Alarm Control Panel Alphanumeric Display, the System Printer, and display the device icon on the existing Graphical Alarm Displays.

2) Display a custom message describing the device originating the trouble condition at the FACP Alphanumeric Display, and existing System Printer.

3) Display an alarm map, and flashing icon, showing the device type and location of the trouble, on the existing Graphical Alarm Displays.

4) Activate trouble audible and visual signals at the control panel and as indicated on the drawings.
   a) Audible signals shall be silence able from the existing Master Fire Alarm Control Panel by a trouble acknowledge switch. The trouble indication shall be transferred to a visual indicator on the control panel and the trouble signals shall resound for a subsequent trouble condition reported by a different device.
   b) Record the occurrence of the event, the time of occurrence and the device initiating the event.

1.6 FIBER OPTIC COMMUNICATIONS

A. Provide point-to-point data transmission system links between Communication and Electrical rooms housing Fire Alarm Control Panels, and the existing Master Fire Alarm Control, and as shown on the plans.

B. The fiber optic interfaces shall be approved by the fire alarm manufacturer and the California State Fire Marshal, for the intended purpose, and shall be an integral part of the FACP and existing MFACP.

C. The fiber optic interfaces shall be capable of simultaneously transmitting and receiving fire alarm data, in accordance with the manufacturer’s requirements, and shall provide the inter-panel data connection to support specified system functions.

D. Utilizing existing campus fiber optic cable where shown on plans, and as specified herein.

E. Provide new fiber optic cable where shown on plans, and as specified herein or as required for a complete campus networked system.

F. Calculate expected optical losses including fiber loss, splices, and connectors for equipment shown on drawings, and include a minimum of 3dB margin to allow for system aging and provide hard copy fiber reading documentation. Verify expected losses will not exceed optical budgets for all fiber optic equipment. Provide line amplifier, if necessary to achieve required system performance.

1.7 COORDINATION
A. Coordinate all Fire Watch requirements with CSUF police and the AHJ.

B. Coordinate all integration requirements between the fire Alarm System and the HVAC system.

C. Coordinate all installation requirements with CSUF class schedules and campus activities.

PART 2 – PRODUCTS

2.1 PRODUCT SPECIFICATION

A. Where a specific material, device, equipment or systems are specified directly, the current manufacturer’s specification for the same becomes a part of these specifications, as if completely elaborated herein.

B. Equipment provided shall be new and shall be the latest version of the model offered by the manufacturer.

C. Panels and peripheral devices shall be the standard product of a single manufacturer and shall display the manufacturer’s name on each component.

D. The devices specified under this section constitute the type, product quality, material, and desired operating features. Devices shall be compatible with manufacturers control equipment matching the desired functionality and operation.

2.2 EQUIPMENT

A. General: The CSUF campus has been modernized with a campus wide networked fire alarm system. To maintain compatibility and a seamless operation with all existing networked fire alarm panels, the acceptable manufacturer is SimplexGrinnell. There are no acceptable equals and there will be no substitutions.

B. Control Panels

   1. Master Fire Alarm Control Panel MFACP-(Existing)
      a. A Microprocessor Based Monitoring and Control System with CPU, LCD Display, Local Area Network, and RS-232 Ports to support printers and graphic annunciator drivers, as specified herein is existing.
      b. This System is UL listed under Standards 864 (Control Units for Fire-Protection Signaling Systems) under categories UOJZ and APOU.
      c. The fire alarm network, with network and media modules for Style 7 fiber optic connectivity, to support the number of network loops required by the campus fire alarm network architecture shall be provided to interface into this existing site wide network.
      d. The MFACP provides an integral Voice Communications subsystem, with fully digitized and multiplexed audio, to distribute and control audio evacuation signals throughout the campus.
         1) System shall support a maximum of 32 minutes of pre-recorded, digitally stored message, transmitted over up to 8 digitally multiplexed audio channels over a single pair of wires. Provide a minimum of four audio channels for this project.
         2) System shall provide an auxiliary output at each FACP, for connection to the emergency Outdoor Paging System.
3) Amplifiers comply with UL 1711, “Amplifiers for Fire Protective Signaling Systems.” Amplifiers shall provide an onboard local mode temporal coded horn tone as a default backup tone. Test switches on the amplifier shall be provided to test and observe amplifier backup switchover. Each amplifier shall communicate to the host panel amplifier and NAC circuit voltage and current levels for display on the user interface.

4) Provide one spare amplifier for each five (5) amplifiers, or a minimum of one (1) spare amplifier at each MFACP, FACP and Transponder containing amplifiers.

5) Dual alarm channels permit simultaneous transmission of different announcements to different zones or floors automatically or by use of the central control microphone. All announcements are made over dedicated, supervised communication lines. All audio distribution busses and risers shall be wired for Class A operation, for each audio channel.

6) Provide supervised connections for a master microphone and up to 5 remote microphones.

7) Provide status Annunciator indicating the status of the various voice alarm speaker zones and the status of fire fighter telephone two-way communication zones.

8) Provide two manual audio signals switches for each building, to select the audio source and initiate an “all-call” for that building.

9) There is existing one manual audio “All Call” switch for the campus, to initiate a voice alarm to all buildings (single circuits) simultaneously at the VCC.

e. Provide an integral Fire Fighters’ Telephone subsystem as required to include:

1) A dedicated back-lit Liquid Crystal Display (LCD) which indicates, in plain English text, the Call-In Status of remote telephones.

2) Selection of any remote telephone for two-way communications shall be accomplished with the pressing of a single switch.

3) Systems not providing a dedicated LCD shall provide individual selection switches, call-in trouble indicators for each telephone circuit.

4) Telephone Hand Sets: High-impact plastic handset, heavy-duty coil cord, and hook switch; connected to the FACP by means of dedicated, supervised communication lines. Handsets have a dynamic receiver and a carbon transmitter, operating on 24VDC.

5) A black master telephone handset with a push to talk button and a flexible-coiled self-winding five (5) foot cord shall be provided and recessed within a protective unit-mounted enclosure at the command center.

6) Cabinet: Flush-or surface-mounted as indicated, 18-gage, minimum, painted steel with a latched hinged door with trim labeled “Fire Fighters’ Phone.” Size to accommodate handset and cord.

f. System response to any alarm condition shall occur within 3 seconds, regardless of the size and the complexity of the installed system.

g. The existing MFACP shall be connected to the site-wide fire alarm network, to support fire alarm central reporting to the FACP’s and facility monitoring stations.
2. Fire Alarm Control Panels (FACP)
   a. Fire Alarm Control Panels are located within the building, where shown on plans. They drive peripheral devices, and shall operate as specified herein. FACP's comprise the following components:
      1) Microprocessor Based Monitoring and Control System, or equal, with CPU, and appropriate MFACP communication module (fiber optic connectivity).
      2) Sufficient initiation, signal, and control modules to support functions defined herein and on the drawings.
      3) System shall provide an auxiliary output at each FACP, for connection to the Emergency Outdoor Paging System.
   b. Provide an integral Voice Communications subsystem, with fully digitized and multiplexed audio, to distribute and control audio evacuation signals throughout the applicable building.
      1) System shall support a maximum of 32 minutes of pre-recorded, digitally stored message, transmitted over up to 8 digitally multiplexed audio channels over a single pair of wires. Provide a minimum of four audio channels for this project.
      2) System shall provide an auxiliary output at each FACP, and shall be connected to an audio input of the Emergency Outdoor Paging System, in each building.
      3) Amplifiers comply with UL 1711, “Amplifiers for Fire Protective Signaling Systems.” Amplifiers shall provide an onboard local mode temporal coded horn tone as a default backup tone. Test switches on the amplifier shall be provided to test and observe amplifier backup switchover. Each amplifier shall communicate to the host panel amplifier and NAC circuit voltage and current levels for display on the user interface.
      4) Quantity of amplifiers provided in each building shall be sufficient to power all speakers installed in the building at the completion of the project, at sufficient audio levels to satisfy the requirements of the code and the Authority Having Jurisdiction.
      5) Provide an additional 20% audio power (amplifier) capacity in each building, at the completion of the project.
      6) Provide one spare amplifier for each five (5) amplifiers, or a minimum of one (1) spare amplifier at each FACP and Transponder containing amplifiers.
      7) Dual alarm channels permit simultaneous transmission of different announcements to different zones or floors automatically or by use of the central control microphone. All announcements made over dedicated, supervised communication lines. All risers shall support Class A wiring for each audio channel.
      8) Provide supervised connections for master microphone and up to 5 remote microphones.
      9) Provide two manual switches for each floor of the building, to initiate a voice alarm and select the appropriate audio channel, individually.
      10) Status annunciator indicating the status of the various voice alarm speaker zones.
      11) Provide a custom digitized message as approved by CSUF and the AHJ.
c. Where required by code, and where shown on the plans, provide an integral Fire Fighters’ Telephone subsystem in each building, to include:
   1) A dedicated back-lit Liquid Crystal Display (LCD) which indicates, in plain English text, the Call-In Status of remote telephones.
   2) Selection of any remote telephone for two-way communications shall be accomplished with the pressing of a single switch.
   3) Systems not provide a dedicated LCD shall provide individual selection switches, call-in and trouble indicators for each telephone circuit.
   4) Telephone Hand Sets: High-impact plastic handset, heavy-duty coil cord, and hook switch; connected to the FACP by means of dedicated, supervised communication lines. Handsets have a dynamic receiver and a carbon transmitter, operating 24VDC.
   5) A black master telephone handset with a push to talk button and a flexible-coiled self-winding five (5) foot cord shall be provided and recessed within a protective unit-mounted enclosure at the command center.
   6) Cabinet: Flush-or surface-mounted as indicated, 18-gage, minimum, painted steel with a latched hinged door with trim labeled “Fire Fighters’ Phone.” Size to accommodate handset and cord.

d. FACP’s may be connected to Transponders distributed throughout the associated building, for the connection of initiation devices, control devices, remote amplifiers, and notification appliances. Transponders are for local signal distribution only, and may only be used within buildings, connected to FACP’s, or where otherwise shown on drawings.

e. FACP’s shall be connected to the existing MFACP to support peripheral devices and central reporting for outlying areas.

3. Building Fire Alarm Annunciator
   a. In each building, and where shown on plans, provide an alphanumeric Fire Alarm Annunciator, to annunciate alarm, supervisory and trouble conditions by zone, and provide system acknowledge, silence, and reset functions.
   b. Provide LCD Annunciator with the same “look and feel” as the FACP operator interface. The Remote LCD Annunciator shall use the same Primary Acknowledge, Silence, and Reset Keys, Status LEDs and LCD Display as the FACP.
   c. Annunciator shall have super-twist LCD display with two lines of 40 characters each. Annunciator shall be provided with four (4) programmable control switches and associated LEDs.
   d. Under normal conditions the LCD shall display a “SYSTEM OS NORMAL” message and the current time and date.
   e. Should an abnormal condition be detected the appropriate LED (Alarm, Supervisory or Trouble) shall flash. The unit audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.
   f. The LCD shall display the following information relative to the abnormal condition of a point in the system:
      1) 40 character custom location label.
      2) Type of device (e.g., smoke, pull station, water flow).
      3) Point status (e.g., alarm, trouble).
g. Operator keys shall be key switch enabled to prevent unauthorized use. The key shall only be removable in the disabled position. Acknowledge, Silence and Reset operation shall be the same as the FACP.

h. Provide an approved weatherproof enclosure with a clear window to view annunciator display for annunciators mounted on the exterior.

4. The Existing Graphical Alarm Display (GAD)/Information Management System

a. The existing Graphical Workstations consist of:

1) UL 864 Listed for Annunciation and Control use
2) Industrial grade Pentium 4, 2.8GHZ (minimum) Personal Computer with detachable keyboard and mouse
3) CPU Mother Board with 8 expansion Slots (7 PCI, 1 ISA)
4) Hard Drive greater than 40 Gigabyte (minimum) capacity
5) 3 ½ inch 1.44 Megabyte Floppy Drive
6) 17-inch high-resolution color LCD monitor
7) CR Read/Write
8) 1GB RAM (minimum)
9) SVGA Graphics Controller with 16 Megabyte VRAM
10) USB Port for Security Key
11) Parallel Port Serial Port for Event Printer
12) Parallel Port Serial Port for Graphics and Reports Printer
13) UPS Secondary Standby Power Supply, UL Listed for Fire Alarm use
14) Pre-programmed functions
15) Field editor for graphics representations with ability to Import and Export graphic files to AutoCAD
16) Capability to interface to Legacy 2120 Multiplex Systems
17) A fully functional Network Node communicating on the network Capability to interface with up to four (4) Network Loops
18) The Graphical workstation shall be capable of the following operations:
   a) Dynamic pan-and-zoom operation
   b) Ability to create predefined zoom levels for rapid zoom into predefined areas within a graphic screen
   c) Ability to automatically jump to a graphic screen or a predefined zoom level within a screen for each device upon an abnormal status change
   d) Dual Screen operation with floatable/dockable windows allowing one screen to display a text-based list of event activity and an alternate screen to display graphical maps simultaneously
   e) Information displayed for Point Status, Control, Alarm Lists, Historical Logs, and Reports shall be capable of being sorted by individual categories of information; e.g., Number, time, Date, Event, Detail, Status, etc.
   f) Screen resolution up to 1280 x 1024
   g) Ability to assign operator preferences on a per operator basis. The selectable operator preferences shall be:
      i. Font size: Small or Large
      ii. Toolbar Size: Small or Large
      iii. User Interface Theme: MS Office 2003 or System Theme
      iv. Menu Bar and Toolbar Options: Show/Hide Menu bar, Show/Hide Toolbar
v. Operating Mode: Captive (other applications disabled).

h) Graphic files shall be modified in the graphical workstation editor or exported back to AutoCAD file formats where files can be edited in AutoCAD and re-imported for system changes and upgrades.

i) It shall be possible to import a custom site-specific system banner bitmap used to display a corporate logo or other user performed system banner background.

j) It shall be possible to import a custom site-specific main screen bitmap used to display a corporate logo, facility photograph and layout, or other user preferred main screen background image.

k) The Graphical Workstation shall have an option for a configurable inactivity timer that automatically logs out inactive users based on a pre-defined inactivity time limit. When no user is logged in, the graphical workstation shall provide view access to additional control operations.

b. The Graphical Workstations operate by receiving system events and displaying specified graphic representations of the building(s), and system devices.

1) The Contractor shall be responsible for all graphic modifications to the TrueSite systems.

2) The Contractor shall contact the local Simplex/Grinnell office prior to submitting any bid requiring graphic modifications to the TrueSite Workstations.

c. The workstation monitors serve as the interactive interface between the operator and the network system. From the mouse the operator shall be able to perform the following tasks:

1) Silence signals
2) Acknowledge all alarm and return to normal conditions
3) Reset system
4) Display list menus
5) Select the individual message screens
6) Perform manual operation of system(s) control points
7) Request the “HELP” menu
8) Perform operator login / logout
9) Connect (Set Host) to other nodes
10) Perform graphic editing functions
11) Set the system time and date
12) Activate the Audio outputs by building

d. The unit shall be equipped with at least seven (7) levels of password-protected access.

e. Graphical Workstation Operating Modes:

1) When no alarms or troubles are present, the workstation monitor shall display a graphics screen menu used to access other graphic screens. Each screen shall also display current time and date, system status, and present operator name and access level.

2) Upon activation of any alarm and on request by the operator, the workstation monitor shall display the floor plan of the floor in alarm with all devices shown. The device in alarm shall flash until
acknowledged. The device in alarm shall then become steady until cleared.

3) If a second alarm is registered prior to the first being cleared, the second shall be identified by flashing, pending alarm indication. Touching the pending alarm area shall transfer the display to the second alarm point graphic screen. All subsequent alarms shall be displayed as indicated above.

4) The Graphical Workstation shall cause a “Trouble” condition on all other Network Nodes to indicate an off-line condition.

5) The Graphical Workstation shall have the capacity to annunciate 50,000 network point and/or point lists.

6) Historical event logs shall maintain up to 500,000 system events.

7) Built-in diagnostics shall provide graphical views of the network topology and status. Network communication breaks or inactive nodes shall be clearly indicated as a guide in returning the system to normal.

8) Individual point access shall display “real-time” analog sensor point information.

f. The Graphical Workstation shall have the following editing functions:

1) Message Editor - System shall have the following editing functions:

2) List Editor – System shall have the capability of on-site editing of customer user lists.

3) Graphics Editor – System shall have the capability of on-site editing of graphics screens. Graphics editor shall have the capability of changing background graphics and adding or deleting point symbols. Capacity to create and edit up to 25,000 Graphics Screens.

8) Pre-programmed functions shall be fully programmed by the Contractor.

h. Provide Graphics Field Editor, for revising, updating and editing graphics representations.

i. Capability to interface to existing Simplex Systems.

j. Map Database: Contractor shall research (with the Owner or Engineer), design, develop and provide all maps described herein in complete operating condition including graphic representations, icons, alarm and control interfaces.

1) Site: Site and facility maps shall include the entire site showing all perimeters, buildings, structures and other significant architectural features, vehicle and foot traffic features (including exits and entries), and street frontage.

2) Building Maps: Building Maps shall include each building, interior floor plan, a floor stacking plan and all stairwell risers.

3) Floor Map Plans: Floor plan maps shall include rooms, corridors, elevators, door and room designations (number and usage), column supports, location of fire alarm control equipment and any other details necessary to clearly depict the protected environment.

4) Maps shall show text and icons for all devices monitored or controlled by the fire alarm system.

C. Expansion Modules
1. General: Expansion modules must be seamlessly compatible with the campus fire alarm control panels, and must be specifically listed with the submitted fire alarm control panels and peripheral devices.

2. Addressable Initiation and Control Circuits: To provide monitoring, control and communication functions for addressable devices. Provide Single Controller, or equal, as required by system configuration and as specified herein.

3. Single Circuits: To provide monitoring and control of visual and audible signals. Provide Signal Modules, or equal, as required by system configuration and as specified herein.

4. Relay Circuits: To provide control of peripheral devices such as air handling units, magnetically held doors, and elevators. Provide Control Relay Module, or equal, as required by system configuration and as specified herein.

5. Monitor Circuits: To provide monitoring of standard contact outputs and contact closure devices such as water flow and tamper switches. Provide Monitor Module, or equal, as required by system configuration and as specified herein.

6. Network Interface Module/Fiber Optics Line Driver: To provide the communication network between the Master Fire Alarm Control Panel and Fire Alarm Control Panels.

D. Printers (existing)

1. To provide permanent record of alarm, supervisory and trouble conditions by zone (one in campus police and one in electrical shop).

2. The event and status printer is a 9 pin, impact, dot-matrix printer with a minimum print speed of 200 characters per second at 10 characters per inch. Printer parameters shall be set with a menu drive program in the printer.

3. The serial cable connecting the Fire Alarm system to the Printer shall be supervised. The serial printer shall support short haul modems or Fiber-Optics modules.

4. The printer(s) lists the time, date, type, and user defined message for each event printed. It shall be possible to support multiple printers per CPU. It shall be possible to define which event types are sent to the printer(s) including alarm, supervisory, trouble, monitor, and service groups.

5. The printer is powered from 115 VAC, and shall use standard 9 ½” x 11” fan fold paper.

E. Remote Booster Power Supplies (For Notification Appliance Circuits)

1. The remote booster power supply shall incorporate control electronics, relays, and necessary modules and components.

2. The panel shall be supervised, site programmable, modular design with expansion modules to support connection to notification appliance circuits (NAC).

3. Initiating, notification, and low voltage power source circuits shall be power limited.

4. The booster power supply shall be provided with battery back-up. The batteries shall be of the sealed, lead-acid type and provide twenty-four (24) hours of normal standby operation and fifteen (15) minutes of full alarm operation at maximum connected load, at the end of the standby period. The batteries shall be supervised for placement and low voltage. It shall be possible to mount the batteries remote from the panel.

5. The power supply shall provide a central processor with a watchdog circuit. It shall provide 2 initiating circuits, 4 notification appliance circuits (NAC), rated at 24 Vdc at 2.5A, form ‘C’ alarm and trouble contacts, and auxiliary power at 24Vdc at 500 mA.
6. The power supply shall be a high efficiency switch mode type, proving 10 Amps total to the NACs, 500 mA of auxiliary power at 24 Vdc, and an automatic battery charger capable of supporting up to 40 AH of sealed lead acid batteries.

7. Site programming shall enable or disable the local trouble buzzer, allow the following of existing signal rates or select internally generated evacuation signal rates or continuous, 120 SPM, or temporal 3-3-3.

8. It shall be possible to activate the BPS via dry contact or by connection to an existing NAC circuit. It shall be possible to convert the BPS circuits ICs and NACs to Class ‘A’ operation.

F. Intelligent Initiating Devices
   1. General
      a. The System Intelligent Detectors shall be capable of full digital communications using both broadcast and polling protocol. Each detector shall be capable of performing independent fire detection algorithms. The fire detection algorithm shall measure sensor signal dimensions, time patterns and combine different fire parameters to increase reliability and distinguish real fire conditions from unwanted deceptive nuisance alarms. Signal patterns that are not typical of fires shall be eliminated by digital filters. Devices not capable of combining different fire parameters or employing digital filters shall not be acceptable.
      b. Each detector shall have an integral microprocessor capable of making alarm decisions based on fire parameter information stored in the detector head. Detectors not capable of making independent alarm decisions shall not be acceptable.
      c. Maximum total Analog loop response time for detectors changing state shall be 0.5 seconds.
      d. Each detector shall have a separate means of displaying communication and alarm status. A green LED shall flash to confirm communication with the Analog loop controller. A Red LED shall flash to display alarm status. Both LEDs on steady shall indicate alarm-standalone mode status. Both LEDs shall be visible through a full 360 degree viewing angle.
      e. The detector shall be capable of identifying up to 32 diagnostic codes. This information shall be available for system maintenance. The diagnostic code shall be stored at the detector.
      f. Each smoke detector shall be capable of transmitting pre-alarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity settings.
      g. Each detector microprocessor shall contain an environmental compensation algorithm that identifies and sets ambient “Environmental Thresholds” approximately six times an hour. The microprocessor shall continually monitor the environmental impact of temperature, humidity, other contaminate as well as detector aging. The process shall employ digital compensation to adjust the detector to both 24 hour long term and 4 hour short term environmental changes. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 80% and 100% of the allowable environmental compensation value. Differential sensing algorithms shall maintain a constant differential between selected detector sensitivity and the “learned” base line sensitivity. The base line sensitivity information
shall be updated and permanently stored at the detector approximately once every hour.

h. The device shall automatically change to standalone conventional device operation in the event of a loop controller polling communications failure. In the Analog standalone detector mode, the Analog detector shall continue to operate using sensitivity and environmental compensation information stored in its microprocessor at the time of communications failure. The Analog loop controller shall monitor the loop and activate a loop alarm if any detector reaches its alarm sensitivity threshold.

i. Each device shall be capable of automatic electronic addressing and/or custom addressing without the use of DIP or rotary switches. Devices using DIP or rotary switches for addressing, either in the base or on the detector shall not be acceptable.

2. Fixed Temperature/Rate of Rise Heat Detector:
   a. Thermal Sensor: Combination fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp; 135-deg F fixed-temperature setting except as indicated.
   b. Thermal sensor shall be of the epoxy encapsulated electronic design. It shall be thermistor-based, rate-compensated, self-restoring and shall not be affected by thermal lag.
   c. Sensor fixed temperature sensing shall be independent of rate-of-rise sensing and programmable to operate at 135-deg F or 155-deg F. Sensor rate-of-rise temperature detection shall be selectable at the FACP for either 15-deg F or 20-deg F per minute.
   d. Sensor shall have the capability to be programmed as a utility monitoring device to monitor for temperature extremes in the range from 32-deg F to 155-deg F.

3. Photoelectric Smoke detector
   a. Provide intelligent Photoelectric Smoke Sensor. The analog photoelectric detector shall utilize a light scattering type photoelectric smoke sensor to sense changes in air samples from its surroundings.
   b. The integral microprocessor shall dynamically examine values from the sensor and initiate an alarm based on the analysis of data. Systems using central intelligence for alarm decisions shall not be acceptable.
   c. The detector shall continually monitor any changes in sensitivity due to the environmental effects of dirt, smoke, temperature, aging and humidity. The information shall be stored in the integral processor and transferred to the analog loop controller for retrieval using a laptop PC or a portable Program/Service Tool.
   d. The photo detector shall be rated for ceiling installation at a minimum of 30 ft (9.1m) centers and be suitable for wall mount applications. The photoelectric smoke detector shall be suitable for direct insertion into air ducts up to 3 ft (0.91m) high and 3 ft (0.91m) wide with air velocities up to 5,000 ft/min. (0-25.39 m/sec) without requiring specific duct detector housings or supply tubes.
   e. The percent smoke obscuration per foot alarm set point shall be field selectable to any of five sensitivity settings ranging from 1.0% to 3.5%.

4. Standard Detector Mounting Base
   a. Provide standard detector mounting bases with the appropriate trim rings, suitable for mounting on 1-gang, 3/12" or 4" octagon box and 4" square boxes. The base shall contain no electronics, support all applicable detector types, and have the following minimum requirements:
1) Removal of the respective detector shall not affect communications with other detectors.

2) Terminal conditions shall be made on the room side of the base. Bases that must be removed to gain access to the terminals shall not be acceptable.

3) The base shall be capable of supporting one (1) Remote Alarm LED Indicator. Provide remote LED alarm indicators where shown on the plans.

5. Detector Mounting Base, with Relay
   a. Provide relay detector mounting base with appropriate trim rings, suitable for mounting on 1-gang, 3/12” or 4” octagon box and 4” square boxed. The relay base shall support applicable detector types and having the following minimum requirements:
      1) The relay shall be a bi-stable type and selectable for normally open or normally closed operation.
      2) The position of the contact shall be supervised.
      3) The relay operation shall be exercised by the detector processor upon power up.
      4) The relay shall automatically de-energize when a detector is removed.
      5) The operation of the relay base shall be controlled by its respective detector processor. Detectors operating standalone mode shall operate the relay upon changing to alarm state. Relay bases not controlled by the detector microprocessor shall not be acceptable.
      6) Form “C” Relay contacts shall have a minimum rating of 1 amp @ 30 Vdc and be listed for “pilot duty”.
      7) Removal of the respective detector shall not affect communications with other detectors.
      8) Terminal connections shall be made on the room side of the base. Bases that must be removed to gain access to the terminals shall not be acceptable.

6. Duct Smoke Sensor Housing:
   a. Provide smoke detector duct housing assemblies, or equal, to facilitate mounting an intelligent analog Photoelectric Detector, along with a standard, relay or isolator detector mounting base.
   b. Detector shall be rated to operate with duct air velocity between 300 and 4,000 feet per minute.
   c. Provide an air exhaust tube and an air sampling inlet tube that extends into the duct air stream up to ten feet.
   d. Provide drilling templates and gaskets to facilitate locating and mounting the housing.
   e. Provide Remote Alarm LED Indicators, and Remote Test Stations, or equal, where duct smoke detector assembly is not visible or easily accessible, and where shown on the plans.

7. Addressable Manual Fire Alarm Station:
   a. Provide intelligent single action, single stage fire alarm stations.
   b. The fire alarm station shall be of metal construction with an internal toggle switch. Provide a locked test feature.
   c. Finish the station in red with silver “PULL IN CASE OF FIRE” lettering. The station shall be marked “LOCAL ALARM”.

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d. The manual station shall be suitable for mounting on 2 ½” (64mm) deep 1-gang boxes and 1 ½” (38mm) deep 4” square box with 1-gang covers. Provide weatherproof back box, where required.

e. Protective Shield:
   1) Manual Fire Alarm Stations shall be supplied with protective covers to prevent accidental alarm initiation.
   2) Provide a tamperproof, clear LEXAN shield and red frame that easily fits over manual pull stations. When shield is lifted to gain access to the station, cable holds the shield in place, and allows access to the station.
   4) Surface Mounted Stations: Safety Technology International Inc., Fire Stopper II, Model STI-1230

8. Intelligent Modules
   a. General
      1) Provide intelligent modules, as required, to monitor and control conventional initiation and signaling devices, throughout the facility.
      2) The personality of multifunction modules shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop controller.
      3) The modules shall have diagnostic LEDs mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status.
      4) The module shall be capable of storing up to 24 diagnostic codes that can be retrieved for troubleshooting assistance.
      5) Input and output circuit wiring shall be supervised for open and ground faults.

   b. Single Input Module
      1) Provide intelligent single input modules. The Single Input Module shall provide one (1) supervised Class B input circuit capable of a minimum of 4 personalities, each with a distinct operation.
      2) The module shall be suitable for mounting on a 2 ½” (64mm) deep 1-gang boxes and 1 ½” (38mm) deep 4” square boxes with 1-gang covers.
      3) The single input module shall support the following circuit types:
         a) Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.)
         b) Normally-Open Alarm Delayed Latching (Water flow Switches)
         c) Normally-Open active Non-Latching (Monitor, Fans, Dampers, Doors, etc.)
         d) Normally-Open Active Latching (Supervisory, Tamper Switches)

   c. Dual Input Modules
      1) Provide intelligent dual input modules.
      2) The Dual Input Module shall provide two (2) supervised Class B input circuits each capable of a minimum of 4 personalities, each with a distinct operation.
3) The module shall be suitable for mounting on 2 ½” (64mm) deep 1-gang boxes and 1 ½” (38mm) deep 4” square boxes with 1-gang covers.

4) The dual input module shall support the following circuit types:
   a) Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.)
   b) Normally-Open Alarm Delayed Latching (Water flow Switches)
   c) Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.)
   d) Normally-Open Active Latching (supervisory, Tamper Switches)

d. Monitor Module
   1) Provide intelligent monitor modules.
   2) The Monitor Module shall be factory set to support one (1) supervised Class B Normally-Open Active Non-Latching Monitor circuit.
   3) The monitor module shall be suitable for mounting on 2 ½” (64mm) deep 1-gang boxes and 1 ½” (38mm) deep 4” square boxes with 1-gang covers.

e. Water flow/Tamper Monitor Module
   1) Provide intelligent water flow/tamper modules.
   2) The Water flow/Tamper Module shall be factory set to support two (2) supervised Class B input circuits. Channel A shall support a Normally-Open Alarm delayed Latching Water flow Switch circuit. Channel B shall support a Normally-Open Active Latching Tamper Switch.
   3) The water flow/tamper module shall be suitable for mounting on a 2 ½” (64mm) deep 1-gang boxes and 1 ½” (38mm) deep 4” square boxes with 1-gang covers.

f. Single Input Signal Module
   1) Provide intelligent single input signal modules.
   2) The Single Input (single audio buss) Signal Module shall provide one (1) supervised Class B output circuit capable of a minimum of 2 personalities, each with a distinct operation.
   3) When selected as a telephone power selector, the module shall be capable of generating its own “ring tone”.
   4) The module shall be suitable for mounting on a 2 ½” (64mm) deep 2-gang boxes and 1 ½” (38mm) deep 4” square box with 2-gang covers.
   5) The single input signal module shall support the following operations:
      a) Audible/Visible Signal Power Selector (Polarized 24 Vdc @ 2A, 25Vrms @ 50w or 70 Vrms @ 35 Watts of Audio)
      b) Telephone Power Selector with Ring Tone (Fire Fighter’s Telephone)

g. Dual Input Signal Module
   1) Provide intelligent dual-input signal modules.
   2) The Dual Input (dual audio buss) Signal Module shall provide a means to selectively connect one of two (2) signaling circuit power risers to one (1) supervised output circuit.
3) The module shall be suitable for mounting on 2 ½” (64mm) deep 2-gang boxes and 1 ½” (38mm) deep 4” square boxes with 2-gang covers.
4) The dual input signal module shall support Audible/Visible Signal Power Selector (Polarized 24 Vdc @ 2A, 25 Vrms @ 50w or 70 Vrms @ 35w of Audio) operations.

h. Control Relay Module
1) Provide intelligent control relay modules.
2) The Control Relay Module shall provide one form “C” dry relay contact rated at 2 amps @ 24 Vdc to control external appliances or equipment shutdown.
3) The control relay shall be rated for pilot duty and releasing systems.
4) The position of the relay contact shall be confirmed by the system firmware.

G. Emergency Paging System Interface (For Future Use)
1. Provide four (4) addressable control relays in each building, to control the output of the emergency paging amplifier.
2. Connect the EPS speakers and amplifier so that each corner of the building can be selected as an individual paging zone.
3. Provide four (4) paging circuits switches on the FACP at each building to activate these EPS control circuits.
4. Provide an EPS paging circuit switch per building, on the MFACP, to activate these EPS control circuits.
5. Connect the EPS amplified to the Aux output of the Fire Alarm Voice Communication System.

H. Indicating Devices (Alarm Notification Appliances)
1. Addressable Alarm Notification Appliances
   a. Addressable Notification Appliances: The Contractor shall furnish and install Addressable Notification Appliances and accessories to operate on compatible signaling line circuits (SLC).
      1) Addressable Notification appliance operation shall provide power, supervision and separate control of horns and strobes over a single pair of wires. The controlling channel (SLC) digitally communicates with each appliance and receives a response to verify the appliance’s presence on the channel. The channel provides a digital command to control appliance operation. SLC channel wiring shall be unshielded twisted pair (UTP), with a capacitance rating of less than 60pf/ft and a minimum 3 twists (turns) per foot.
      2) Class B (Style 4) notification appliances shall be wired without requiring traditional in/out wiring methods; addressable “T” Tapping shall be permitted. Up to 63 appliances can be supported on a single channel.
      3) Each Addressable notification appliance shall contain an electronic module and a selectable address setting to allow it to occupy a unique location on the channel. This on-board module shall also allow the channel to perform appliance diagnostics that assist with installation and subsequent test operations. A visible LED on each appliance shall provide verification of
communications and shall flash with the appliances address setting when locally requested using a magnetic test tool.

b. Addressable controller: Addressable Controller shall supervise Channel (SLC) wiring, communicate with and control addressable notification appliances. It shall be possible to program the High/Lo setting of the audible (horn) appliances by channel from the addressable controller.

2. Visible Appliances (Strobes):
   a. Provide Visible Appliances, as shown on plans. Visible appliances shall be ADA type devices, listed under UL 1917 for compliance with the ADA.
   b. In – Out screw terminals shall be provided for wiring.
   c. The strobes shall have a white plastic face plate.
   d. They shall provide 15, 15/75, or 110 candela synchronized flash outputs, as shown on the plans and be field adjustable.
   e. Strobes shall mount on a 1-gang box.
   f. The strobe shall have lens markings oriented for wall or ceiling mounting, as required by mounting location. Ceiling mounted strobes shall have lens markings with correctly oriented lettering.
   g. Provide weatherproof wall boxes for parking and other exterior mounting locations.

3. Speaker/Strobe, 4" Square, Surface or Flush Mounted
   a. Provide speaker/strobes, with a 4" square speaker housing and integral strobe device.
   b. Appliances shall be listed under UL 1917 and UL 1480.
   c. In – Out screw terminals shall be provided for wiring.
   d. Speakers shall provide power taps at 1/4w, 1/2w, 1w, 2w. Strobes shall provide 15, 15/75 and 110 candela, synchronized flash outputs.
   e. The strobe shall have lens markings oriented for wall or ceiling mounting, based upon mounting location. It shall be possible to replace the lens markings with LKW series or LKC series lens marking kits. Ceiling mounted Speaker/Strobes shall have lens markings with correctly oriented lettering.
   f. Provide weatherproof back box, where required.

4. Speaker/Strobe, 8" round, Flush Mounted
   a. Provide speaker/strobes, with an 8" cone and integral strobe device.
   b. Appliances shall be listed under UL 1917 and UL 1480.
   c. In – Out screw terminals shall be provided for wiring.
   d. Speaker baffles shall be round steel with white finish, to match existing speakers.
   e. Speakers shall provide power taps at 1/2w, 1w, 2w, and 4w. Strobes shall provide 15, 15/75, and 110 candela, synchronized flash outputs.
   f. The strobe shall have lens markings oriented for wall or ceiling mounting, based upon mounting location. Ceiling mounted Speaker/Strobes shall have lens markings with correctly oriented lettering.

5. Isolator Module: Isolator module provides short circuit isolation for addressable notification appliance SLC wiring. Isolator shall be listed to UL 864. The Isolator shall mount directly to a minimum 2 1/8" deep, standard 4" square electrical box, without the use of special adapter or trim rings. Power and communications shall be supplied by the Addressable Controller channel SLC; dual port design shall accept communications and power from either port and shall automatically isolate one port from the other when a short circuit occurs. The following functionality shall be included in the Isolator module:
   a. Reports faults to the host FACP.
   b. On-board Yellow LED provides module status.
c. After the wiring fault is repaired, the Isolator modules shall test the lines and automatically restore the connection.

I. Door Hold Open Release Devices
   1. Door Hold Open, Electromagnetic
      a. Provide Low Voltage Electromagnetic door hold open devices.
      b. Low Profile recessed wall mount.
      c. Standard profile recessed wall mount.
      d. Custom stand-off armatures where required by installation.
      e. Door support bracket and mounting hardware.
   2. Door Hold Open, Closer / Holder
      a. Dual handed for right or left swinging door.
      b. Single lever arm closer for interior door.
      c. Low Voltage operation.
      d. Concealed electrical connection.
      e. UL listed for smoke barrier or labeled fire door.
   3. Future Door Holder Wiring: contractor shall install 4#14 THHN spare wires in the main corridors of all buildings, in addition to all other required door holder cabling, to support future door holders.

J. Firefighters Telephone Instruments
   1. General
      a. Firefighters Telephone instruments shall be UL Listed for fire Protective Service.
      b. Telephone instruments shall be of the same manufacturer as the Master Fire Alarm Control Panel, to assure absolute compatibility between the telephone instruments and the control panels.
   2. Firefighters Phone in Cabinet:
      a. Enclosure: Provide remote “break-glass” telephone enclosure. Provide a red finish. Clearly mark the housing with “FIRE FIGHTERS TELEPHONE” in large letters for easy identification. Provide flush or surface mounting, as shown on the plans.
      b. Telephone: Provide red, Telephone Handset Assembly, to be mounted in the Enclosure. Telephone shall include 60” armored cord, and push-to-talk button.
   3. Telephone Jacks:
      a. Provide stainless steel telephone jack receptacles, clearly identified with “FIRE FIGHTERS TELEPHONE” for use with portable fire fighter telephone handsets.
      b. Provide moisture proof, spring-loaded cover over each jack, to prevent the entry of moisture or other foreign materials, when not in use.
   4. Portable Telephone Handset: Provide Telephone Handset, black, with 60” coiled cord.

K. Control Relays
   1. Remote Relay: Provide remote control relays connected to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be DPDT and rated for 10 amperes at 115 Vac. A single relay may be energized from a voltage source of 24 Vdc, 24 Vac, 115 Vac or 230 Vac. A red LED shall indicate the relay is energized. A metal enclosure shall be provided.
   2. Remote Relay w/ Override: Provide remote control relays with manual override, connected to supervise ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be DPT and rated for 10 amperes at
24Vdc or 115 Vac. A single relay may be energized from a voltage source of 24 Vdc, 24 Vac. A red LED shall indicate the relay is energized. A metal enclosure shall be provided.

L. Reflective infra-red Beam Smoke Detector
   1. Provide a reflective infra-red beam smoke detector as indicated.
   2. The range shall be 16 to 328 feet.
   3. It shall be capable of self check, automatic compensation and selectable sensitivity.
   4. It shall be suitable for both conventional and addressable systems.
   5. The reflective beam type smoke detector shall include one transmitter connected to the FACP, and the reflecting receiving unit.
   6. The unit shall have four selectable standard sensitivity settings along with 2 climate settings.
   7. The unit shall be equipped with an internal sensitivity test feature capable of testing the servo motor.

M. Emergency Standby Power
   1. Fire Alarm components, including but not limited to MFACP, FACP’s, GAD computers, transponders, and peripheral devices shall be protected from primary power failure by being connected to the building’s Emergency Power source, where it exists.
   2. Fire Alarm components, including but not limited to MFACP, FACP’s, GAD computers, transponders, and peripheral devices, shall also be protected from primary power failure with their own battery back-up systems.
      a. Power back-up may be in the form of direct DC battery power back-up or by 120VAC Uninterruptible Power Supplies (UPS), depending upon equipment requirements.
      b. Battery back-up systems may be distributed throughout the facility to provide the required emergency power to individual components.
      c. Battery back-up systems shall include battery chargers to keep storage batteries at their peak charge.
   3. GAD/IMS Workstations: GAD/IMS workstations and displays shall be supported by their own 24-hour, 120VAC Uninterruptible Power Supplies (UPS). UPS Systems shall include battery chargers to keep storage batteries at their peak charge.
   4. Voice Communications and Firefighters Telephone Systems: Provide battery charger and batteries of the sealed, lead-acid type. Provide twenty-four (24) hours of normal standby operation and fifteen (15) minutes of full alarm operation at maximum connected load, at the end of the standby period. The batteries shall be supervised for placement and low voltage. It shall be possible to mount the batteries remote from the panel.
   5. Other Fire Alarm Equipment, (MFACP, FACP, Annunciators, Strobe Circuits, Door Holders, etc.): Provide battery charger and batteries of the sealed, lead-acid type. Provide twenty-four (24) hours of normal standby operation and five (5) minutes of full alarm operation at maximum connected load, at the end of the standby period. The batteries shall be supervised for placement and low voltage. It shall be possible to mount the batteries remote from the panel.
   6. Door Holders: Provide sufficient “floating” standby power to keep door holders under power during a power switchover.
with a battery charger and batteries of the sealed, lead-acid type, providing four (4) hours of normal standby operation and five (5) minutes of full alarm operation at maximum connected load, at the end of the standby period. The batteries shall be supervised for placement and low voltage. It shall be possible to mount the batteries remote from the panel.

2.3 WIRING AND CABLE

A. General: Cables that are not installed in conduit shall be rated for plenum use.

B. Wiring shall be as recommended by the Manufacturer.

C. Use of existing cable may be allowed, provided that,
   1. It is approved by the manufacturer for the intended use; and
   2. It is approved by the Authority Having Jurisdiction for the intended use; and
   3. It is approved by CSUF; and
   4. It has been tested, metered, and guaranteed by the Contractor, as noted in the specifications.

2.4 FIBER OPTIC EQUIPMENT

A. General
   1. Contractor may use existing fiber optic cable and appurtenances, where possible.
   2. Coordinate with the Owner on the location and availability of existing fiber optic cable and services.
   3. Where fiber optic cable does not exist, Contractor shall provide the cable, based on the specifications herein.

B. Termination Hardware
   1. Closure, Re-enterable Encapsulant (where required): Corning Model 2604001-01, or equal by AT&T or AMP.
   2. Splice Closure Canister, (where required): Corning Model SCF series, or equal by AT&T or AMP.
   3. Buffer Tube Fan-Out Kit, 25 inches (as needed): Corning Series FAN-BT25-XX, SFK-P-XX-900-M, or equal by AT&T or AMP, to provide protection of cable ends and buffer tube at termination points.
   4. Closet Connector Housing: Corning Model CCH-04U, or equal by AT&T or AMP, with jumper management panel and ancillary equipment required for a complete installation. Provide wall-mount kit, where required.
   5. Closet Splice Housing: Corning Model CSH-0XU sized as required for the number of splices used. Provide accessories including, but not limited to, splice trays and jumper management panels to provide a complete installation.
   6. Splice Tray, Fusion: corning Model M67-041, or equal by AT&T or AMP.
   7. Connector Housing Models (SM):
      a. Single Mode 6 connector Module: CCH-CM06-6C-P03RH or equal by AT&T or AMP.
      b. Single Mode 8 connector Module: CCH-CM08-6C-P03RH or equal by AT&T or AMP.
   8. Connector Housing Panels (MM)
      a. Multi-mode 6 connector: CCH-CP06-15T or equal by AT&T or AMP.
      b. Multi-mode 8 Connector: CCH-CP08-15T or equal by AT&T or AMP.
   9. Connectors
a. General: SC connectors shall be polished for Angled Physical Contact (APC). ST connectors shall be polished for Ultra Physical Contact (UPC).

b. Single Mode: Single mode connectors shall be factory installed in the connector housing modules. The connector housing module shall be supplied with a pigtail that shall be fusion spliced to the incoming fiber cable.

c. Multimode: corning Model 95-000-51 or equal by AT&T or AMP.

10. Patch Cables Assemblies

a. General: SC patch cable assemblies shall angled physical contact (APC) with less than or equal to -70 dB reflectance. ST patch cable assemblies shall ultra physical contact (UPC) with less than or equal to -55 dB reflectance.

11. Miscellaneous: Connectors, jumpers, couplers, and hardware as required to provide a complete and operable system.

C. Fiber Optic Cable

1. Fiber Optic Cable, Tight-Buffered, and Heavy Duty: In indoor applications, provide multi-strand fiber optic cable, tight-buffered, with Kevlar strength member:

   a. Single Mode: corning Model XXXXR88-61101-29, or equal by Brand-Rex or AT&T.


   c. All fibers in the cable must be usable fibers and meet required specifications.

   d. Each optical fiber shall consist of a doped silica core surrounded by a concentric silica cladding. The fiber shall be matched clad design.

2. Fiber Optic Cable, Loose-Tube, and Medium duty: In exterior areas, or in underground ducts, provide multi-strand fiber optic hybrid cable, loose-tube, dry water-blocking agent with Kevlar braid:

   a. Hybrid (48sm/72mm): Corning Model XXXXW4-T41XXXA20 (Altos), or equal by Brand-Rex or AT&T.

   b. Single Mode: Corning Model XXXXRWF-T4101A20 (Freedom), or equal by Brand-Rex or AT&T.

   c. All fibers in the cable must be usable fibers and meet required specifications.

   d. Each multi-strand cable shall include a central strength member as well as Kevlar braids.

   e. Each optical fiber shall consist of a doped silica core surrounded by a concentric silica cladding. The fiber shall be matched clad design.

3. Use Buffer Tube and Buffer Tube Furcation Kit to provide protection of cable ends and buffer tube at termination points.

4. Ensure compatibility with fiber optic transceivers and video processing equipment.

5. Pull fiber optic cable in a continuous run, from point-to-point with no splices.

6. If splices are necessary due to installation conditions, contractor shall submit splice locations to the Owner for approval. Where approved, splices shall be made in protected splice enclosures.

7. Provide protected splice enclosures in all underground pull and terminal boxes for cable tap-offs.

8. Provide jumper and panel interconnection cables of the same type and terminal boxes for cable tap-offs.
9. Calculate expected optical losses including fiber loss, splices, and connectors for existing and future equipment shown on drawings, and include a minimum of 3dB margin to allow for system aging. Verify expected losses will not exceed optical budgets for all fiber optic equipment. Provide line amplifier, if necessary to achieve required system performance.

PART 3 – EXECUTION

3.1 GENERAL
   A. In accordance with General Requirements.

3.2 EQUIPMENT, RACK AND CONSOLE INSTALLATION
   A. In accordance with Section 16050, Electrical General Requirements.

3.3 GROUNDING PROCEDURES
   A. Provide grounding of all systems and equipment in accordance with Section 16050, Electrical General Requirements.

3.4 WIRE AND CABLE INSTALLATION PRACTICES
   A. Provide wire and cable installation in accordance with Section 16050, Electrical General Requirements.

3.5 FIBER OPTIC CABLE INSTALLATION PRACTICES
   A. The maximum pulling tension shall be 2700 N (608 lbf) during installation (short term) and 890 N (200 lbf) long term installed.

   B. The shipping, storage and operating temperature range of the cable shall be -40ºC to +70ºC. The installation temperature range of the cable shall be -30ºC to +70ºC.

   C. Ensure the provision of fiber optic cable routing and termination slack at each pull-box, equipment location, and transition and termination points. Provide a minimum of 6 feet of slack, wrapped and secured in each area.

   D. Provide continuous optical cables with a minimum of splices. At no time shall fiber optic cable be spliced within conduit or underground duct.

   E. Conform to cable manufacturer ratings for minimum bend radius of all cables. Do not exceed bend radius in any case.

   F. Terminate all fiber optic cable strands from field cable and fiber optic link equipment, at patch panels, using recommended connectors. Provide jumper cables between patch panel connectors to interconnect field cables and link devices. Do not use patch panels as bulk-head connector points.

   G. Use Loose Tube Cable Furcation hardware to dress and protect fiber optic cables at termination points.

   H. Unused fiber strand shall be connected to patch panels, for future use.
3.6 IDENTIFICATION AND TAGGING OF DEVICES
A. Intelligent and addressable initiating and control devices shall each be identified by permanent labels, clearly visible by an observer without disturbing or disassembling the device. The markings shall clearly indicate the complete system address of the device, including, but not limited to the node (FACP), loop and device number. The address format contained in the shop drawings shall be utilized for these labels.
B. Devices wiring terminations shall be tagged in accordance with Section 16050. Terminations shall include initiation loop, audio or visual loop circuit number and device number.
C. Provide uniform, machine-printed labels throughout, for this purpose. Hand written labels are not acceptable.
D. Adhesive labels are acceptable for this purpose.

3.7 DATABASE PREPARATION, CHECKING AND ACTIVATION
A. Provide database preparation, checking and activation for systems and equipment in accordance with Section 16050, Electrical General requirements.

3.8 START-UP RESPONSIBILITY
A. Provide start-up services for all systems and equipment in accordance with Section 16050, electrical General Requirements.

3.9 SYSTEM PERFORMANCE TESTING AND ADJUSTING PROCEDURES
A. Provide performance testing and adjusting of all systems and equipment in accordance with Section 16050, electrical General Requirements. In addition, perform the following specific test.
B. Fiber Optic Media Testing
   1. Use Fiber Optic Test Standards EIA-455-171 and EIA 526-14.
   2. Measure and provide test reports verifying the following:
      a. Optical Power Loss (using an Optical Source and Optical Power Meter): On each cable, at each device termination point, measure the actual optical power loss and verify it is less than the manufacturers rated “optical budget loss” for the associated fiber optic device plus a minimum of 3dB margin to allow for system aging.
      b. Length/Defects: Using an Optical Time Domain Reflectometer (OTDR) measure the length of each cable at its termination points and verify the cable is free of defects.
C. Fire Alarm System testing
   1. Test and verify the normal operation of every alarm, supervisory and trouble point in applicable states at each alarm panel.
   2. Test each point for the alarm function by normal operation of the alarm point, i.e., smoke for a smoke detector, heat for a heat detector, water release for a water flow switch, etc.
3. Verify that each device is properly annunciated on the appropriate annunciation devices, with accurate alphanumeric descriptors and correctly located graphical icons.
4. Record the sensitivity settings for analog detection devices.
5. Test and verify the normal operation of the Fire Alarm System, including local reporting, central reporting, and graphic annunciator indication.
6. Verify that peripheral systems work correctly, including HVAC shutdown, door holder release, fire/smoke damper closing, audible signaling, and visual signaling.
7. Test interfaces to other systems.

3.10 FINAL PROCEDURES

A. Perform final procedures in accordance with the General Requirements.

END OF SECTION
| AC  | ALTERNATING CURRENT POWER CONNECTION | K  | KEY OPERATED |
| AFC | ABOVE FINISHED CEILING              | LA | LOCAL ALARM (HORN AND STROBE) |
| AFF | ABOVE FINISHED FLOOR                | LAN | LOCAL AREA NETWORK |
| AFG | ABOVE FINISHED GRADE                | LPS | LOCK POWER SUPPLY |
| AFR | ABOVE FINISHED ROADWAY              | MD | MOTION DETECTOR |
| AHJ | AUTHORITY HAVING JURISDICTION        | MH | MANHOLE |
| AHU | AIR HANDLER UNIT                    | MM | MILLIMETER |
| AWG | AMERICAN WIRE GAUGE                 | MS-X | INDICATES AIR HANDLING UNIT NUMBER |
| BAS | BUILDING AUTOMATION SYSTEM          | N/A | NOT APPLICABLE |
| BFC | BELOW FINISHED CEILING              | NC | NORMALLY CLOSED |
| BFG | BELOW FINISHED GRADE                | NC | NOT IN CONTRACT |
| C   | CONDUIT                              | NFPA | NATIONAL FIRE PROTECTION ASSOCIATION |
| CBC | CALIFORNIA BUILDING CODE            | ND | NORMALLY OPEN |
| CFC | CALIFORNIA FIRE CODE                | NTS | NOT TO SCALE |
| CNTLR | CONTROLLER                        | PB | FULLBOX |
| COC | COMMAND AND OPERATIONS CENTER       | OPP | OPPOSITE |
| CPU | CENTRAL PROCESSING UNIT             | REQ'D | REQUIRED |
| DC  | DIRECT CURRENT                      | SM | SIMILAR |
| E   | EXISTING                            | TYP | TYPICAL |
| EC  | ELECTRICAL CONTRACTOR               | UBC | UNIFORM BUILDING CODE |
| ELVC | ELEVATOR CONTRACTOR                 | UFC | UNIFORM FIRE CODE |
| EOC | EMERGENCY OPERATIONS CENTER         | UON | UNLESS OTHERWISE NOTED |
| EOL | END-OF-LINE RESISTOR                | V  | VOLTS |
| EPB | EMERGENCY POWER BOOSTER             | VAC | VOLTS ALTERNATING CURRENT |
| EXT | EXTERNAL                            | VDC | VOLTS DIRECT CURRENT |
| F   | FUTURE                               | W/O | WITHOUT |
| U   | UART, SERIAL, AND MILITARY SECURITY | WP | WRIA/HUMPS6 = UL7103L |
| GND | GROUND                               | XFMR | TRANSFORMER |
| H   | HAI ON SYSTEM, NOT CONNECTED TO BUILDING FIRE ALARM SYSTEM | (F) | EXISTING FW/AFS |
| HH  | HANDHOLE                            | (N) | NEW DEVICE |
| J   | JUNCTION BOX                        | (R) | EXISTING TO BE REPLACED |
|     |                                     | (X) | EXISTING TO BE REMOVED |
## FIRE ALARM SYSTEM - SEQUENCE OF OPERATION

<table>
<thead>
<tr>
<th>Device Activation</th>
<th>Manual Pull Station</th>
<th>Area Smoke-Heat Detector</th>
<th>Duct Smoke Detector</th>
<th>Sprinkler Waterflow Switch (Alarm)</th>
<th>Sprinkler Tamper Switch (Trouble)</th>
<th>120V AC Power Failure</th>
<th>Elevator Lobby Smoke Detector</th>
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<tr>
<td>Annunicate at Local Fire Alarm Control Panel (FACP)</td>
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<td>Activate Audible and Visuals Throughout Building of Alarm</td>
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<td>Release Smoke Doors &amp; Door Holders in Building of Alarm</td>
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### FIRE ALARM EQUIPMENT SYMBOLS LIST

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<tr>
<th>Symbol</th>
<th>Description</th>
<th>Remarks</th>
<th>Rough-In</th>
<th>Mounting</th>
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<td>⚡️</td>
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<td><strong>NEW SURF TRAY PATHWAY</strong></td>
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<td><strong>ACCESS PANELS, MODULES, SHEET, ETHERNET, TERMINATIONS</strong></td>
<td>SHEET REFERENCE</td>
<td>SHEET REFERENCE</td>
<td>SHEET REFERENCE</td>
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SECTION 16821

EMERGENCY PAGING SYSTEM

PART 1 – GENERAL

1.1 DESCRIPTION

A. General Description: This specification section covers the furnishing and installation of complete outdoor emergency paging systems, in location shown on the drawings. The emergency paging system shall be used to distribute emergency voice communication tones and voice signals to outdoor areas of the campus.

B. Contractor shall furnish and install all hardware, devices, mounting brackets, power supplies, switches, controls, consoles and other components of the system as shown and specified.

C. In addition, furnish and install outlets, junction boxes, conduit, connectors, wiring, and other accessories necessary to complete the system installation, whether or not shown or described herein. Requirements shall be in accordance with Division 16, Electrical.

1.2 RELATED WORK

A. Provide the work in accordance with Section 16050, Electrical General Requirements, “Related Work”.

1.3 WARRANTY

A. In accordance with Division 1, Product Warrantees and Bonds.

1.4 QUALITY ASSURANCE

A. In accordance with Section 16050, Electrical General Requirements.

1.5 APPLICABLE PUBLICATIONS

A. In accordance with Section 16050, Electrical Requirements.

1.6 Owner’s RIGHT TO USE EQUIPMENT

A. The Owner reserves the right to use equipment, material and services provided as part of this work prior to Acceptance of the Work, without incurring additional charges and without commencement of the Warranty period.

PART 2 – PRODUCTS

2.1 General

A. The emergency Paging System shall be a UL listed, NFPA compliant general purpose audio emergency evacuation system. The system shall supervise the audio circuits, incoming power and have 24 VDC battery back-up. The panel shall have power limited circuitry with an internal battery charger and power supply. The system shall have power limited circuitry and class B wiring utilizing and EOL for supervision.
B. Coordinate speaker locations with the A/E team or with the CSUF campus representative.

C. The Emergency Paging system shall be designed with the capability such that sound generated from the system shall be clear, audible, and intelligible with 70dB at a distance of 150 feet from the installed building. Amplifier capacity, speaker type, speaker locations, speaker wattage shall be considered in achieving this requirement.

2.2 EMERGENCY PAGING SYSTEM

A. General:

1. Where shown on drawings, provide Emergency Paging system to support distribution of evacuation tones, voice instructions and programming in designated exterior areas of the campus.

2. The system shall allow simultaneous distribution of multiple input sources to selected areas of the campus, independently.

3. The sound pressure level at 150 feet from the building shall be 15dB above ambient or 70 dB whichever is greater.

B. Power Amplifiers:

1. General:
   a. Provide one or more power amplifiers with sufficient power, in each building, to drive the type and number of exterior speakers shown on the plans.
   b. Include an additional 20% spare power above calculated power needs at the time of project completion, at each building.
   c. Amplifiers and control relays shall be rack-mounted in equipment locked cabinets, located where shown on the plans.

2. Provide a Simplex 4003EC Voice Evacuation amplifier control panel in each building, and where shown on drawings, to amplify source audio signals from the campus Fire Alarm Voice Communications System. There are no acceptable equals and there will be no substitutions.
   a. Provide 80 watts, 160 watts or 320 watts or more as required to achieve system requirements.
   b. Inputs: Provide appropriate input module and related impedance matching circuits to enable connection to Fire Alarm Voice Communication System auxiliary audio output.
   c. Frequency Response: 275 to 6.5kHz ±3dB
   d. Total harmonic distortion shall be less than 2%.
   e. The signal to noise ration shall be better than 65 dB, dynamic range shall be better than 65 dB.
   f. Audio output voltage shall be selectable for 25V or 70.7V.
   g. Muting Function: Amplifier signal shall be muted, when not in use.
   h. Provide Class B speaker splitters as necessary to enable a single supervised speaker output to drive up to two Class A supervised speaker audio outputs or four Class B supervised audio speaker circuits.
   i. The voice evacuation shall be mounted in a beige, wall mounted, lockable cabinet sized to accommodate the required watts required.
j. System can be expanded to a total of 5280 watts with additional modules and power boosters.

k. System shall interface with the Simplex 4100u fire alarm panel for Emergency Paging.

C. Loudspeakers:
   1. General:
      a. Provide loudspeakers with sufficient capacity to perform the emergency paging function to obtain a sound level at a minimum of 70dBa at 150 feet from the building or 15dB whichever is greater, with clear, audible and intelligible sound.
      b. Loudspeakers shall be weatherproof and suited for outdoor applications.
      c. Exterior loudspeakers shall have internal transformers with an adjustable wattage tap.
      d. The following types of exterior shall be selected and utilized depending on the application of the speaker and ability to generate required decibels.

   2. Provide the following types of exterior loudspeakers as required on a project by project basis.
      a. Provide One Systems 108IM or 208CIM all weather exterior loudspeakers
         1) The 108IM shall have an interchangeable high frequency horn.
         2) The speaker shall have a single 8” woofer and ETS driver coupled to a fully rotatable high frequency horn.
         3) The transformer can be either 100V or 70.7V primary.
         4) The speaker shall be optimized for high intelligibility and vocal articulation.
         5) The speaker shall utilize an ETS titanium/neodymium compression driver.
         6) Gland nut and Speakon inputs for termination of cable to speaker shall be used.
         7) Provide PT-35 or PT-70 mounting accessories or others as required to perform proper mounting techniques.
         8) Provide the speaker with taps at 75, 37.5 and 18.75 watts.
         9) Frequency range shall be 65Hz to 16 kHz with a 70 degree conical coverage pattern.
         10) The speaker shall be available in white or black or a custom color to match architectural features.
      b. Provide Tannoy All Weather loudspeaker, with transformer, Model Di5DC, where shown on the drawings.
         1) The speaker shall provide smooth frequency response, high power handling capacity, and wide high frequency dispersion.
         2) Speakers shall be rated for exterior use. Speaker, housing and grille shall be completely weatherproof.
         3) Provide loudspeaker mounting bracket, for mounting on the exterior of each building.
         4) Average power shall be 60 watts, with peak Power at 240 watts.
         5) Nominal frequency response of the speaker shall be 80Hz – 54 kHz.
         6) The speaker shall have adjustable taps of 30, 15, 7.5, 3.75 watts using a top rotary switch.
7) The enclosure shall be of high impact polystyrene rated IP64.
8) The speaker shall be available in white or black.

   c. Provide Tannoy All Weather loudspeaker, with transformer, Model Di8DC, where shown on the drawings.
      1) The speaker shall provide smooth frequency response, high power handling capacity, and wide high frequency dispersion.
      2) Speakers shall be rated for exterior use. Speaker, housing and grille shall be completely weatherproof.
      3) Provide loudspeaker mounting bracket, for mounting on the exterior of each building.
      4) Average power shall be 90 watts, with Peak Power at 360 watts.
      5) Nominal frequency response of the speaker shall be 53Hz – 35 kHz.
      6) The speaker shall have adjustable taps of 60, 30, 15, 7.5 watts using a top rotary switch.
      7) The enclosure shall be of high impact polystyrene rated to IP64.
      8) The speaker shall be available in white or black.

2.3 EQUIPMENT ENCLOSURES

   A. Indoor Enclosures:
      1. Provide Simplex 4003-9001 lockable wall mounted cabinet, beige.
      2. Provide terminal strips as required for speaker circuits in enclosure.
      3. Contractor shall size the height of the cabinet to house applicable equipment, terminals, wire and devices in a neat and workmanlike manner.

2.4 SHOP DRAWINGS

   A. Provide shop drawings for approval by CSUF or the designated CSUF consultant.
      1. Shop drawings shall indicate details of equipment and device mounting and termination.
      2. Provide shop drawing depicting a site plan indicating location and mounting height of all exterior speakers.
      3. Provide elevation drawings indicating the room and location of the Emergency Paging system enclosure and its relationship to the building Fire Alarm control Panel.
      4. Shop drawings shall be reviewed and accepted by the CSUF Chief of Police.
      5. Shop drawings shall be acceptable to CSUF construction representative and the CSUF designated consultant.

PART 3 – EXECUTION

3.1 GENERAL

   A. In accordance with Section 16050, Electrical General Requirements.

3.2 EQUIPMENT, RACK AND CONSOLE INSTALLATION

   A. In accordance with Section 16050, Electrical General Requirements.

3.3 GROUNDING PROCEDURES
A. Provide grounding of all systems and equipment in accordance with Section 16050, Electrical General Requirements.

3.4 FIRE ALARM SYSTEM INTERFACE

A. Refer to the Fire Alarm specifications for coordination.

B. Connect the EPS speakers and amplifier to the building FACP so that the building is configured as a zone.

C. Provide at the Police Station Master Fire Alarm Control Panel a switch(s) for building speaker activation with proper labeling. In addition provide graphic virtual switches on the existing IMS.

3.5 WIRE AND CABLE INSTALLATION PRACTICES

A. Provide wire and cable installation in accordance with Section 16050, Electrical General Requirements.

B. In addition, comply with the following:
   1. Splice cable only in accessible junction boxes or at terminal block units.
   2. Make cable shields continuous at splices and connect circuit shield to equipment ground only at source end.
   3. Install input circuits in separate cables and raceways from output circuits.
   4. Leave 18-inches excess cable at each termination at device and other system outlet.
   5. Leave 6 feet excess cable at each termination at system cabinet.
   6. Provide protection for exposed cables where subject to damage.
   7. Install armored cable for outside circuits.
   8. Use suitable cable fittings and connectors.
   9. Ground and bond circuits in accordance with the manufacturer’s recommendations and acceptable practice.

3.6 DATABASE PREPARATION, CHECKING, AND ACTIVATION

A. Provide database preparation, checking and activation for systems and equipment in accordance with Section 16050, Electrical General Requirements.

3.7 START-UP RESPONSIBILITY

A. Provide start-up services for all systems and equipment in accordance with Section 16050, Electrical General Requirements.

3.8 ADJUSTING

A. Adjust transformer taps for appropriate sound level.

B. Adjust devices and wall plates to be flush and level.

3.9 SYSTEM PERFORMANCE TESTING AND ADJUSTING PROCEDURES
A. Provide performance testing and adjusting of all systems and equipment in accordance with Section 16050, Electrical General Requirements.

B. Measure and record sound power levels at designated locations around each building. Provide the documented sound levels to the Owner.

C. Demonstrate by activating the microphone in the Police station that all speakers on the exterior are audible and intelligible.

D. Demonstrate and provide documentation that a minimum of 65dB is achieved at a minimum of 150 feet from the building, using a live microphone voice from the MFACP in the Police Station. Provide testing that indicates the supervision of the speaker circuits by lifting one wire from each circuit. Select several locations (a minimum of 4) around the exterior of the building to measure and record the sound levels indicated. Coordinate with CSUF for appropriate testing times so as not to disrupt classes.

3.10 FINAL PROCEDURES

A. Perform final procedures in accordance with the General Requirements.

END OF SECTION