

Fire alarm--all types of occupancies.

The following standard specification is intended to be edited according to the specifics of the project. Brackets [ ] and areas shaded in gray [e.g. format] indicate requirements that are optional depending upon the type of system being provided or per instructions associated with the [ ] and project requirements. Consult with University's Representative and campus stakeholders.

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The handling of such items will be decided by consultation between the University's Representative, Design and Construction Management, Facilities Management Alarms Department, and the UCD Fire Prevention Services.

## SECTION 28 31 00 FIRE DETECTION AND ALARM

### PART 1 - GENERAL

#### 1.1 SUMMARY DESCRIPTION

- A. Design, build and provide a NFPA 72, current edition, code compliant complete manual and automatic addressable fire detection system and audible/visual alarm system, complete with connection to the Campus Central Dispatch via connection point indicated on Drawings.
- B. Contractor is advised that the drawings are diagrammatic in nature and are not intended to show all details. Contractor shall provide final design, achieve the University of California, Davis Deputy Campus Fire Marshal approval of the design, and to provide all miscellaneous parts and labor required to install a complete workable system that is approved by the UCD DCFM for building occupancy. The UCD DCFM (State Fire Marshal) is the Authority Having Jurisdiction. University's Representative will receive documents from and coordinate with Contractor to obtain approvals from the UCD DCFM.
- C. Related Sections include the following:
  - 1. Fire-Stopping: Section [XX XX XX section number Title]
  - 2. Painting of Mechanical and Electrical Work: Section [XX XX XX section numbers Title]
  - 3. Conveying Systems/Elevators: Section [XX XX XX section number Title]
  - 4. Fire Protection/Automatic Sprinkler System: Section [XX XX XX section number Title]
  - 5. Conduit: Section [XX XX XX section number Title]
  - 6. Wire and Cable: Section [XX XX XX section number Title]
  - 7. Boxes: Section [XX XX XX section number Title]
  - 8. Cabinets and Enclosures: Section [XX XX XX section number Title]
  - 9. Electrical Identification: Section [XX XX XX section number Title]
  - 10. Building Automation and Control: Section [XX XX XX section number Title]
  - 11. Security Access Systems: Section [XX XX XX section number Title]
  - 12. Intrusion Detection Systems: Section [XX XX XX section number Title]
  - 13. Doors, Roll-Down Doors, Door Hardware: For door closers and holders with associated smoke detectors, electric door locks, and release devices that interface with the fire alarm system. Section [XX XX XX section number Title]
  - 14. Fire Smoke Dampers [XX XX XX section number Title]
  - 15. Telecommunications [XX XX XX section number Title]

#### 1.2 DEFINITIONS

- A. Wherever mentioned in this specification or on the drawings the equipment, devices, and functions shall be as defined in Section 01 42 00 References and supplemented as follows:
  - 1. UCD DCFM: University of California, Deputy Campus Fire Marshal.
  - 2. Emergency: An unsafe or intolerable condition requiring immediate correction.
  - 3. FACP: A Fire Alarm Control Panel, which processes alarm information and controls outputs.

4. Alarm Signal: A signal that indicates a state of emergency requiring immediate notification of the fire department and of the building occupants. These are signals such as the operation of a manual pull station, the activation of a water flow switch in a sprinkler system, the receipt of an alarm signal from a smoke detector that has gone through alarm verification, the receipt of an alarm signal from an elevator smoke detector or a computer room smoke detection panel, , the operation of a heat detector, or the operation of a pressure switch in a fire suppression system caused by the flow of fire extinguishing agent (e.g. kitchen fire extinguishing system, CO2, etc.).
5. Supervisory Signal: A signal that indicates the impairment of a fire protection system, which may prevent its normal use. These are signals from switches, such as a tamper switch; a low air pressure switch; a high air pressure switch; a generator phase reversal switch; a generator power failure switch; a generator running switch; a fire pump phase reversal switch; a fire pump loss of power switch; a fire pump running switch; or a duct smoke detector.
6. Trouble Signal: A signal that indicates that a fault, such as an open circuit or ground, has occurred in the fire alarm system or in a separate sub-system, whose control panel is monitored by the fire alarm system.
7. Multiplex System: A system in which multiple signals are transmitted via the same conduction path to a remote fire alarm control unit and fire alarm control panel, decoded and separated so that each signal will initiate the specified response.
8. Notification Appliance Circuit: A circuit to which notification appliances are connected to visually and audibly indicate an alarm signal.
9. Interface Device: An addressable device which interconnects hard wired systems or devices to a multiplex system.
10. Fire Alarm Power Boosters: Control panels that supply power to the notification appliances devices; and reports to and receives signals from the fire alarm control panel.
11. Master Fire Alarm Control Panel (MFACP): A master control panel having the features of a fire alarm control unit and to which all fire alarm control units are interconnected and report to. The panel has central processing, memory, input and output terminals, video display units (VDUs) and printers.
12. Class A Wiring: A circuit that is monitored for integrity such that a single break, a single wire-to-wire short, or a single loss of carrier condition will be indicated by a trouble signal on the FACP no matter where the break, short or loss of carrier condition occurs and will allow all functions of the affected circuit to remain operational. In accordance with NFPA 72, this would be Style 7 wiring for signaling line circuits.
13. Class B Wiring: A circuit that is monitored for integrity such that a single break, a single wire-to-wire short, or a single loss of carrier condition will be indicated by a trouble signal on the FACP no matter where the break, short or loss of carrier condition occurs, but which would prohibit devices beyond the fault, short or carrier loss from remaining operational. In accordance with NFPA 72, this would be Style 4 wiring for signaling line circuits, Style B for initiating device circuits, and Style Y for notification appliance circuits.
14. Signaling Line Circuit: A circuit to which any combination of circuit interfaces, control units, or transmitters are connected and over which multiple system input signals or output signals, or both, are carried.
15. Manual Pull Station: A fire alarm box as indicated in NFPA 72.
16. Tamper Switch: A valve monitor switch as indicated in NFPA 72.
17. Initiating Device: A system component that originates transmission of a change of state condition, which initiates an appropriate response via the fire alarm system.
18. Terminal Cabinet: A steel cabinet with locking, hinge-mounted door in which terminal strips are securely mounted. Minimum size is 200 mm x 200 mm (12 inch x 12 inch).
19. VAC: Volts Alternating Current.

### 1.3 PERFORMANCE REQUIREMENTS

- A. This specification establishes the requirements for the design and installation of a complete fire detection and alerting system as described in this Section and the Drawings.
- B. Scope of Work

1. The scope of work includes, but is not limited to, provision of the following:
  - a. Detailed design and preparation of shop drawings, to meet the intent of the design as indicated in the Drawings and these Specifications, and to meet the requirements of applicable codes and the UCD DCFM. Drawings indicate preliminary design for the fire detection and alerting system, which must be followed as a guide, but responsibility for achieving a code-compliant and UCD DCFM -approved fire detection and alerting system, including additional items not shown on the drawings or listed in these specifications, rests entirely with the Contractor.
  - b. Installation of the complete fire detection and alerting system after final approval by UCD DCFM of the shop drawings and according to those shop drawings.
  - c. System software, database management utilities, firmware, and programming as required to provide a complete functioning interactive system
  - d. All necessary conduit and wiring associated with the fire detection and alerting system.
  - e. Smoke detectors, heat detectors, duct detectors, test switches, and manual pull stations.
  - f. Horns/speakers, strobes and remote lamps.
  - g. Remote annunciator panel(s).
  - h. Provision of auxiliary controls and switches including interposing control, monitor relays, and interconnection coordination for the operation of the following systems:
    - 1) Fan control, smoke/fire damper interface [Mechanical – Air Distribution]
    - 2) Sprinkler systems [Mechanical – Fire Protection Systems]
    - 3) Elevator recall [Architectural – Conveying Systems]
    - 4) Commissioning [Electrical and Mechanical]
    - 5) Door control [Architectural – Access Control CAAMS]
  - i. [Provision of a one way supervised voice communication system as a part of the audio evacuation system.]
  - j. [Provision of a two way supervised firefighter's telephone system.]
  - k. [Firefighter's fan control system.]
  - l. Permanent signs, labels, and operational instructions.
  - m. Systems and Equipment Startup and Testing
  - n. Commissioning
  - o. Training.
  - p. Record drawings.
2. The furnishing and installation of the following is prescribed in another Section but connection is prescribed in this Section.
  - a. Fire sprinkler alarm system flow switches, valve monitors and indicating valves.
  - b. [Elevator controller for recall.]
  - c. Door hold-open/closure devices without integral smoke detectors (coordinate with Section XX XX XX Hardware Specialties).
  - d. [Electric door locks control panel for override control.]
  - e. [Fire barrier roll down doors and shutters.]
  - f. [Fire pump controller to monitor status.]
  - g. [Fan control system for smoke management.]
3. The installation of the following is prescribed in another Section but the furnishing and connection prescribed under this Section.
  - a. Duct mounted smoke detectors and test switches.
  - b. [Elevator cab mounted life safety system].
  - c. [Elevator cab mounted firefighter's phone jack].

#### C. Codes and Standards

1. Applicable Publications: Provide a system conforming to the requirements of the latest edition of the following publications including all amendments to these publications.
  - a. American Society for Testing and Materials (ASTM)
    - 1) E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
    - 2) E 119 Standard Test Methods for Fire Tests of Building Construction and Materials
  - b. American Society of Mechanical Engineers (ANSI/ASME):

- 1) [A17.1 Safety Code for Elevators and Escalators]
  - 2) C62.41 Guide for Surge Voltages in Low Voltage A.C. Power Circuits
  - c. Building Officials & Code Administrators International Inc. (BOCA): National Building Code.
  - d. National Fire Protection Association (NFPA):
    - 1) 70 National Electric Code (NEC)
    - 2) 72 National Fire Alarm Code
    - 3) 13 Standard for the Installation of Sprinkler Systems
    - 4) 20 Standard for the Installation of Centrifugal Fire Pumps
    - 5) 101 Life Safety Code
    - 6) 90A Standard for the Installation of Air Conditioning and Ventilating Systems
    - 7) 17 Dry Chemical Extinguishing System
  2. State and Local Codes: Perform all work in accordance with the requirements of the latest issue of the following codes and standards, unless specifically directed otherwise in this specification in order to allow designs in excess of the code requirements. Applicable portions of current editions as adopted by the California State Fire Marshal of the publications listed below form a part of this Specification:
    - a. California Code of Regulations, Title 24, Parts 2,3,4,9, and 12 [2007 Edition]
    - b. California Code of Regulations, Title 19
    - c. Safety Code for Elevators and Escalators (ANSI A17.1 [4] [7]) as amended by (DLCU) Director's Rule 21-97 (Revised).
    - d. Americans with Disabilities Act (ADA)
    - e. California Building Code, Part 2
    - f. California Electric Code, Part 3
    - g. California Mechanical Code, Part 4
    - h. California Fire Code, Part 9 [Current Adoption]
    - i.
  3. EIA, IEEE, NEMA and ANSI standards pertaining to fire detection, alarm and communication systems.
  4. Underwriters Laboratories UUKL listing: The fire alarm system shall be listed and meet the requirements for smoke control.
- D. Nameplates and Labeling
1. All fire alarm components shall be labeled. Identification tags shall be red, laminated plastic with engraved white lettering. Labels shall be mounted on panels with screws. Fire Alarm Account numbers will be issued by the University's Representative.
  2. Each FACP shall have a label placed on the front of the control panel indicating with 1/4 inch lettering stating: "ACCT. # # # #". The numbers shall indicate the account number.
  3. Each remote annunciation panel shall have a red laminated plastic identification label with 1/4 inch lettering stating "ACCT. # # # #". The numbers shall indicate the account number.
  4. Each fire alarm terminal box installed in or on a wall shall have a red laminated plastic identification label with 1/4 inch lettering stating "FIRE ALARM TERMINAL" on the front cover.
  5. Where terminal boxes are concealed in the ceiling, the box shall have a red laminated plastic identification label with 1/4 inch lettering stating "FIRE ALARM TERMINAL" attached to the front face of the box. A red laminated plastic identification label with 1/4 inch lettering stating "FIRE ALARM TERMINAL" shall be permanently attached to the ceiling T-bar grid at the access point or next to the access door nearest the terminal box.
  6. Fire/smoke dampers concealed in the ceiling area shall be Identified with a red laminated plastic identification label with 1/4 Inch lettering stating "FIRE/SMOKE DAMPER M:## s:### ZN ##" with the numbers indicating the point and zone number. The label shall be permanently attached to the ceiling T-bar grid at the access point or next to the access door nearest the fire/smoke damper.
  7. Duct detectors concealed in the ceiling shall be Identified with a red laminated plastic identification label with 1/4 inch lettering stating "DUCT DETECTOR M:## s:### ZN ##" with the numbers indicating the module, point and zone number. The label shall be permanently

attached to the ceiling T-bar grid at the access point or next to the access door nearest the duct detector. Attach a similar label next to each remote test switch.

8. Heat, smoke, products of combustion and addressable modules shall have red laminated plastic identification label with 1/4 inch lettering stating "[module, point, zone] M:## s:### ZN ##" with the numbers indicating the device. Label device and/or module in an unobtrusive location where not visible when the device/module is installed.

#### 1.4 SYSTEM OPERATION – GENERAL REQUIREMENT

- A. Fire alarm functions: Activation of a pull station, sprinkler water flow or activation of an automatic sensing device for fire, temperature, flame, or smoke shall result in the following:
  1. The appropriate zone or point will operate and transmit to the UC Davis Dispatch Center or other designated and UCD DCFM approved central station.
  2. An audible and visual evacuation alarm signal will continuously sound a temporal 3-pulse signal until the system is silenced, reset or voice override is utilized.
- B. Auxiliary control functions: The fire alarm system shall, during certain alarm conditions, control the following types of equipment: Doors, fans, dampers, elevators, etc. Direct control from detector output contacts is not permissible unless the contacts are fully programmable from the FACP. As a minimum, the controls shall accomplish the following:
  1. Automatically restore the signal to the controlled systems to normal operation after FACP is reset from alarm posture.
  2. If there are two or more fans of 20 HP or greater controlled directly from the FACP, then the fans shall stagger start with an appropriate delay between each start. The time delay and sequencing shall be incorporated into the ventilation controls or fan motor controllers by way of time-delay relays, etc. A 10-second delay between fan restart is recommended.
  3. [Phase I operation of elevator]
  4. Fan control
    - a. Environmental fans: FACP control shall have priority over all other interlocks and controls.
    - b. Dedicated fire safety fans: Shaft pressurization and other dedicated fire safety fans shall start and be controlled directly from the FACP.
      - (1) Manual override: Provide on-off-auto manual override switches with priority over local Hand-Off-Automatic (HOA), and other automatic control for all dedicated fire safety fans as identified above.
      - (2) Fan status:
        - (a) Provide contact point for positive feedback fan status at the FACP using a current sensor relay (provided in Division 23 ) located at the load side of the disconnect switch for all dedicated fire safety fans.
        - (b) Provide a green LED for run and a red LED for stop indication at FACP.
        - (c) Provide specific wiring diagrams for fan control.
  5. Drop all magnetically held doors.
- A. Supervisory functions
  1. Supervise the 120 VAC circuits supplying the FACP.
  2. Supervise the alarm initiating circuits, building signaling circuits, and auxiliary control circuits, except the door circuits, against grounds, opens, and shorts.
  3. Any equipment trouble or malfunction or activation of a sprinkler system supervisory switch shall transmit a trouble signal.
  4. Upon application or reapplication of 120 VAC power, the fire alarm system shall automatically, without any operator intervention, initialize all circuitry and shall be in a normal operating condition. Systems which require operator intervention to reset manual controls following a 120 VAC restoration are not acceptable.

#### 1.5 SYSTEM SEQUENCE OF OPERATION - DETAILED DESCRIPTION

A. Signal Activation Sequence

1. Standard Responses Upon Activation: For all situations in Alarm Signal Activation Sequence paragraph standard response upon activation shall result in the following:
  - a. The FACP will go into alarm mode and the module, point, zone/deception in alarm will be annunciated at LCD displays.
  - b. The appropriate zone will operate and transmit the alarm signal via two dedicated telephone lines to the UC Davis Dispatch Center [or other designated and UCD DCFM approved central station].
  - c. An audible and visual evacuation alarm signal throughout the building will continuously sound a temporal 3-pulse signal until the system is silenced, reset or voice override is utilized.
  - d. Activate the following control functions:
    - 1) Door holder/releases shall activate on floor of alarm.
    - 2) [For high-rise facilities, initiate the smoke control sequence delineated in smoke report] [Except for high-rise facilities comply with applicable codes]
2. Pull station activation shall result in the following:
  - a. All standard responses upon activation
3. Sprinkler water flow activation shall result in the following:
  - a. All standard responses upon activation
  - b. Activate exterior water flow bell.
  - c. Waterflow bell shuts off when water stops flowing.
4. Duct Smoke Detectors for fan shut down or fire/smoke damper control
  - a. The activation of any duct smoke detector shall cause the following to immediately happen:
    - 1) All actions in standard responses upon activation except [for -rise facilities, do not initiate the smoke control sequence delineated in smoke report] [except for high-rise facilities comply with applicable codes] above, and:
      - a) Shut down associated HVAC fan
      - b) Close associated fire/smoke damper.
      - c) Activate the remote indicator associated with the duct smoke detector.
5. [Area Smoke Detectors]
  - a. [Elevator lobby or elevator] machine room smoke detector activation shall cause the following to immediately happen:
    - 1) All actions in standard responses upon activation except [For high-rise facilities], [except for high-rise facilities comply with applicable codes] do not initiate the smoke control sequence delineated in smoke report] above, and:
      - 2) [Shutdown of the elevator air-handler]
  - b. [Residential]
    - 1) Common Area Smoke Detectors: Activation of smoke detectors in the corridors, lobbies, storage rooms, electrical rooms and common spaces shall result in all actions in. Standard responses upon activation [except for high-rise facilities comply with applicable codes] above.
    - 2) Dwelling Unit Area Smoke Detectors: The detection of smoke by any addressable smoke detector within a dwelling unit shall not cause the fire alarm control panel to go into alarm mode, but shall cause the following to immediately happen:
      - a) Standard dwelling unit (non-handicap)
        - (1) Actuate the horn of all addressable smoke detectors within the dwelling.
        - (2) Annunciate a distinct supervisory signal at the Fire Alarm control panel and at the remote annunciator(s).
        - (3) Transmit the distinct supervisory signal to the UC Davis Dispatch Center.
      - b) Accessible (handicap) dwelling unit

- (1) Actuate the horn of all addressable smoke detectors within the dwelling unit.
  - (2) Activate the strobe in the unit. The strobe(s) in the unit shall be powered and supervised by the building's power booster and controlled through an addressable control module.
  - (3) Annunciate a distinct supervisory signal at the Fire Alarm control panel and at the remote annunciator(s).
  - (4) Transmit the distinct supervisory signal to UC Davis Dispatch Center via telephone lines to the Fire Alarm receivers.]
- c. Area smoke detector, heat detector, or flame detector activation anywhere in the facility shall cause the following to happen:
- (1) Standard responses upon activation [for high-rise facilities comply with applicable codes].
6. Smoke Detector for the Release of Automatic Closing Fire Doors
- a. Fire door release that includes smoke detectors protecting the affected door(s) shall have one or more smoke detectors located within 5 feet of the door opening and shall be in accordance with NFPA 72.
7. Fire suppression systems
- a. The activation of any detection device associated with a fixed fire suppression system in the building shall cause the following to immediately happen:
    - 1) All actions standard responses upon activation above.

#### 1.6 SUBMITTALS

- A. Conform to Section 01 33 23 Shop Drawings, Product Data and Samples and to the requirements of Section 01 78 39 Project Record Documents. All plans, calculations, and product data (including California State Fire Marshal approval sheets) shall be submitted as required by NFPA 72, current edition.
- B. Procedure
1. The University's Representative will forward a copy of the Architectural backgrounds to the Contractor.
  2. Prepare and submit copies of shop drawings, catalog cut sheets, California State Fire Marshal (CSFM) listing sheets, and additional information required in this section, to the University's Representative for approval by UCD DCFM and Alarm Shop.
  3. If the submittals are not approved in the second submittal, the contractor will be required to attend a meeting with the UCD DCFM and Alarm Shop to discuss comments prior to the next submittal.
  4. Contractor shall not start any construction on the fire alarm system prior to approval of related submittals by the UCD DCFM and Alarm Shop.
  5. Conform to Fire Alarm Plan Review Submittal Requirements - January 2008 and UCD Fire Alarm Plan Submittal Intake Checklist at the end of this section and available on the UCD DCFM web page: <http://safetyservices.ucdavis.edu/ps/fp/fn> under Plan Review and Construction Inspections.
- C. Manufacturer's Product Data-Submit the following:
1. Equipment schedule showing exact types, current CSFM listing, and quantity of all fire alarm devices.
  2. Technical data showing exact types of all fire alarm devices. Specific components on catalog cut sheets must be highlighted or otherwise identified. All equipment drawing alarm or supervisory current shall have documentation of the current draw clearly marked and highlighted in the submittal information.
  3. Technical information showing physical dimensions, weight, finish and mounting requirements.
- D. Shop Drawings
1. Submit shop drawings as follows:

- a. Drawn with AUTOCAD (latest version) to the same scale as the architectural drawings, showing device layout, raceway routing, conduit and wire size, wire identification numbers, room and floor identification numbers. These drawings shall be prepared by persons meeting the requirement of Quality Assurance paragraph. The drawings shall be stamped and signed by the contractor's engineer who shall be a licensed fire protection engineer or a licensed professional engineer in the state of California. Include the following:
- b. Title Page
  - 1) Refer to: <http://safetyservices.ucdavis.edu/ps/fp/fn>
  - 2) Title block showing the Installer's name, address, telephone number, license number, and NICET stamp.
  - 3) Title block indicating project site address and University CAAN number, which shall be provided by the University's Representative.
  - 4) Include an accurate legend of symbols for all fire alarm devices being installed. The legend must include the quantity and model number for each device.
  - 5) Wire/circuit legend with circuit identification, color, gauge, wire type, number of conductors, etc.
  - 6) A Materials Submittal cover sheet identifying all FACP equipment, model numbers, and quantities including the California State Fire Marshal listing numbers and expiration date for each component. The listing sheet shall be cross-referenced with and shall match the manufacturer's catalog data sheet.
  - 7) Compliance Statements included on the Title Page:
    - c) "The fire alarm system shall conform to Article 760 of the California Electrical Code. Installation of the fire alarm system shall not be started until detailed drawings and specifications, including current California State Fire Marshal listing sheets for each component of the fire alarm system, have been approved by the California State Fire Marshal and the University Fire Department and the UCD Alarm Shop.
    - d) A set of fire alarm shop drawings that are stamped approved by the UCD DCFM shall be on the job site and used for installation. Any deviation from approved shop drawings, including substitution of devices, shall be submitted to University's Representative in accordance with Section 01 25 00 Substitution Procedures and approved in writing by the UCD DCFM prior to installation.
    - e) Any discrepancies between the drawings and the code or recognized standards shall be brought to the attention of the University's Representative and the UCD DCFM.
    - f) Upon completion of the installation of the fire alarm system, Contractor shall coordinate with other Work to test interconnections of the fire alarm system with other building systems and equipment. Once all functions indicated in the fire alarm system sequence of operations have been verified through testing by the installing contractor, an acceptance test must be performed in the presence of UCD DCFM and UCD Alarm Shop. The acceptance test must successfully demonstrate all functions required in the contract.
  - 8) Fire smoke damper matrix.
    - g) damper location
    - h) area served
    - i) associated air handler unit
- c. Floor Plans
  - 1) The entire project area, room numbers and use for all rooms or spaces.
  - 2) All fire rated walls, clearly identified within the project area.
  - 3) Indicate all (new and existing) final fire alarm device outlet locations.
  - 4) Show size and route of cable and conduits.
  - 5) Wire identification: Information showing conductor types, sizes and quantities for each conduit run.
  - 6) Device address for all addressable devices; [module: point, zone ###.]



- 7) Duct air velocity where each duct smoke detectors employing the use of sampling tubes is installed.
- 8) Air handling systems supplying more than 2,000 cubic feet per minute.
- d. Schematic and Wiring Sheets
  - 1) Riser diagrams with FACP, terminal cabinets, raceway layout, circuit style and identification labels (format and designations in accordance with Performance Requirements – Nameplates and Labeling paragraph), riser conduit size, and all devices; horizontal and vertical lines shall be provided to illustrate floors and zones.
  - 2) Complete interior wiring diagrams for the fire alarm control panel and interior modules, cards and power supplies.
  - 3) Point-to-point wiring diagrams showing interconnections between fire alarm control panels, terminal cabinets, annunciator panels, and fire alarm devices. All installed wiring (not factory wiring harnesses) shall be indicated. All variances from typical shall be illustrated in separate diagrams.
  - 4) Point-to-point wiring indicating interface connections to equipment supplied by other sections including but not limited to all HVAC control panels, fire/smoke dampers, field devices, relays, [elevators,] and other auxiliary control(s).
- e. Calculation Sheets
  - 1) Alarm power requirements for all equipment in accordance with the voltage level conditions of notification devices described in Part 2 of this section.
  - 2) Supervisory power requirements for all equipment.
  - 3) Battery capacity calculations for all fire alarm control panels and auxiliary power supplies. Battery calculations shall include all electrical requirements of the entire fire alarm system, including the power consumption Calculation requirements in accordance with Part 2 of this section.
  - 4) Power supply rating justification showing power requirements for each of the system power supplies. Calculation requirements in accordance with Part 2 of this section.
  - 5) Voltage drop calculations for wiring runs indicating cumulative current draw and voltage drop from the panel to the last device in the loop. Calculation requirements as indicated in Part 2 of this section.
  - 6) Raceway size calculations showing percentage fill in accordance with this specification.
- f. Installation Detail Sheets
  - 1) Detailed mounting installation diagrams of the control panel(s), remote annunciator(s), and audible silencing switch.
  - 2) Elevation drawing showing all fire alarm equipment enclosures and raceways on the walls where they will be installed. Panels must not be higher than 6 feet and system status displays should be at eye level (+60 inches above finished floor). No equipment or raceways may be located under a cabinet containing batteries.
  - 3) Front view of the control panel(s) and all annunciator panels.
  - 4) FACP, labels and labeling schemes for circuits, and field devices; nameplates and messages on the control panel(s) and annunciators shall be provided in actual size (see nameplate and labeling requirements in this section)
  - 5) Elevation details for manual pull stations and visual alarm signaling devices.
  - 6) Duct Smoke Detectors: Performance parameters and installation details for each detector, verifying that each detector is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
  - 7) Ductwork Coordination Drawings: Plans, sections, and elevations of ducts, drawn to scale and coordinating the installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, the detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
  - 8) Voice/Alarm Signaling Service: Equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
  - 9) Details and listing numbers of through penetration fire stop systems.

- 10) Details on support and anchorage of any fire alarm equipment weighing over 20 pounds.
  - 11) Dimensioned drawings of all raceways routing and crossover details showing accurately scaled layouts and spatial relationship to associated equipment and connections. These drawings shall be fully coordinated with other Work prior to submittal. Show relationship to adjacent surrounding structure. At the completion of the work, revise all shop drawings and other documentation to reflect any revisions.
- g. Schedule Sheets
- 1) Schedule of addressable circuits and corresponding circuit lengths
  - 2) Circuit schedules for horns, speakers, strobes, auxiliary controls.
  - 3) Functional response matrix identifying all system responses upon activation of each type of device.
  - 4) Annunciator text messages and device address for each addressable device as delineated in the Annunciation Section.
  - 5) Annunciation requirements: In an addressable system, each initiating device shall annunciate at the FACP [and remote annunciator] as a discrete point on an alphanumeric display. Provide descriptive alphanumeric program labels for each system-initiating device in accordance with the following format:  
Zone/Module/Point/Device Type/Specific Information and/or Location (and special access notes)
  - 6) Examples:
    - a) Zone 107, Module 33, Point 24, MPS, 4th Fl, C-Wing, corridor by Room 432
    - b) Zone 66, Module 1, Point 76, Duct Detector, 7th Fl, SF-2, in Mech Room 711
    - c) Zone 10, Module 33, Point 10, Water flow, 3rd Fl, Tower, in Stair No. 2
- E. Qualification Data: For Installer. Refer to Quality Assurance article.
- F. Testing & Commissioning Procedures:
1. Comply with the submittal requirements of Section 017500 Starting and Adjusting, Section 019100 Commissioning and Section 013323 Shop Drawings, Product Data and Samples.
  2. In addition, prior to installation of any devices, submit the following for review and approval via the University's Representative to the University's Alarm Shop for review and for University's Representative approval:
    - a. A written acceptance test procedure (ATP), which shall include customized check-off sheets.
    - b. An electronic copy of the UC Davis Zone Sheet available from the University's Representative listing all circuits to identify the following:
      - 1) Account Number
      - 2) Building Name and physical address
      - 3) Device address (initiating only)
      - 4) Primary Telephone
      - 5) Secondary Telephone
      - 6) Annunciator Panel Location
      - 7) FACP Location
      - 8) Zone number (zones 000 through 010 reserved for University use.)
      - 9) Zone condition
      - 10) Zone Protected Area
      - 11) Manufacturer fixed labels (device type)
      - 12) Custom labels (conforming to UC Davis standard format)
    - c. A complete copy of panel programming.
    - d. A complete copy of the approved shop drawings with addresses to match the Zone Sheet.
- G. Field quality-control test reports. See Quality Assurance article.
- H. As-built Record Drawings

1. While the system installation is in progress, one additional set of shop drawings will be kept at the job site with the approved Alarm Zone Sheet. This set will be designated as the As-Built Record Drawings and will be updated regularly to reflect current as built information. These drawings shall reflect the following:
    - a. Changes as a result of final installation, testing, or a change to the system design.
    - b. An accurate depiction of risers, raceway, conduit, all wire runs, cable identification, conduit size, location of junction boxes, terminal boxes, sources of power, devices, sensors, equipment, controlled equipment (motor starters, fans, pumps, valves, dampers, etc.)
  2. One set of as-built drawings can be replaced with a fresh updated set of drawings, but there shall never be more than one active set of as-built drawings.
  3. The University's Representative and UCD DCFM shall be given access to this set of as-built drawings at all times so that progress may be reviewed and copies can be made.
- I. Record Documents
1. Comply with the requirements of Section 01 78 39 Project Record Documents. .
- J. Operation and Maintenance Manuals
1. Comply with the requirements of Section 01 78 00 Close-Out Submittals.
  2. Comply with NFPA 72, Appendix A, recommendations for University Representative's manual. Include abbreviated operating instructions for mounting at the FACP.
  3. Submit operation and maintenance manuals including a brief description of the functions of and theory of operation of each system. Provide clear, concise and detailed operating instructions for all control functions giving the information required to properly operate the equipment and systems.
  4. Include technical data sheets, floor plans showing locations of all devices and any other pertinent information such as schematics, parts lists, adjustments and troubleshooting procedures.
  5. Include all working programs on compact disks, as well as a printed program listing with a license issued to the University (for on-site-system use) to modify and reproduce software documentation.
- K. Final Completion Documentation
1. Approval and Acceptance: Provide the Record of Completion form according to NFPA 72 to University's Representative.
  2. Record of Completion Documents: Provide the Permanent Records according to NFPA 72 to University's Representative.
- 1.7 QUALITY ASSURANCE
- A. The Contractor shall design, supervise, program, test, and commission the installed system and provide warranty service in accordance with NFPA 72. The Contractor's design shall complement the design provided by the qualified designer. A qualified designer as defined by NFPA 72 and shall have the proper training, education and experience.
- B. Manufacturer Qualifications: Equipment shall only be provided from firms regularly engaged in design and manufacture of fire detection, alarm and communications systems, components and accessories, of types, sizes, capacities and characteristics required, whose products have been in satisfactory use in similar service for not less than 5 years.
- C. Approved Equipment: Provide fire alarm materials, equipment and devices that have been constructed in accordance with the latest edition of the following publications from Underwriters Laboratories Inc. (UL), or Factory Mutual Engineering Corporation (FM). Materials shall be tested and listed and approved for fire protection service when so required by NFPA 72 or this specification.
1. UL 228 - Door Holding Devices

2. UL 464 - Audible Signal Appliances, Fifth Edition
  3. UL 864 - Control Units for Fire Protective Signaling Systems, Sixth Edition
  4. UL 1638 - Visual Signaling Appliances Standard
  5. UL 1971 - Signaling Devices for the Hearing Impaired
  6. UL Fire Protection Equipment Directory
  7. UL Electrical Construction Materials Directory
  8. FM P7825 Approval Guide
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Qualifications-Contractor shall meet the following qualifications, and shall submit proof within 10 days of the Notice to Proceed as described below:
1. Qualified personnel shall include, but shall not be limited to, individuals with the following qualifications:
    - a. Factory trained and certified.
    - b. National Institute for Certification in Engineering Technologies (NICET) fire alarm certified (Level III minimum or Level IV)
    - c. International Municipal Signal Association (IMSA) fire alarm certified.
    - d. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.
    - e. A professional engineer, registered in the State of California.
  2. Contractor must possess a C-10 Electrical State of California Contractor's License and have a minimum of 5 years experience in the business of installing fire alarm systems.
  3. Contractor shall have successfully completed similar local (Northern California) jobs in scope and nature, using the proposed product line, fire alarm panel, and equipment, in other buildings over the past 3 years. For new product lines, one system shall have been completed and in service for at least 1 year.
  4. Provide a list of at least 3 similar fire alarm projects valued at least at **[\$50,000.00]** performed by Contractor with its own forces within the last 3 years including for each project the following information:
    - a. Name, address and phone number of project representative for person or entity for which project was performed.
    - b. Date project was started.
    - c. Date project was completed.
    - d. The dollar amount for the project contract.
    - e. Description of work performed.
  5. Contractor shall be the manufacturer or a local authorized representative of the manufacturer with a proven track record of being responsive, providing accurate and complete submittals, meeting project schedules, and being prepared for system testing and acceptance.
  6. Contractor shall be able to provide a fully equipped and qualified factory-trained repair technician at the job site for any request for emergency services within the time stipulated under the Guarantee paragraph. This service shall be available 24 hours a day during the term of warranty.
  7. Contractor shall furnish evidence that the fire alarm equipment supplier has an experienced and effective service organization, which carries a stock of repair parts for the system to be furnished. The Contractor must be able to provide any replacement part on site within 48 hours during the warranty period. Should the Contractor fail to comply with the service requirements of this section, the University's Representative will then have the option to make the necessary repairs and back charge the Contractor without any loss of warranty or guarantee as provided by the Contract Documents.
  8. Contractor shall employ the services of a factory-authorized service representative who is factory-trained and certified to supervise the field assembly and connection of components, program, pre-test, test, adjust, and commission the system.

## 1.8 SEQUENCING AND SCHEDULING

- A. Existing Fire Alarm Equipment: Maintain fully operational until the new equipment has been tested and accepted by the University's Representative. As new equipment is installed, it shall be labeled "NOT IN SERVICE" until the new equipment is accepted. Once the new system is completed, tested, and accepted by the University's Representative it shall be placed in service and connected to the existing proprietary central station service. All new equipment shall have tags removed and the existing equipment shall be tagged "NOT IN SERVICE" until removed from the building.
- B. Equipment Removal: All existing equipment, wiring, junction boxes and conduit for the existing fire alarm system shall be removed after the installation of the new system has been accepted by the University Fire Marshal. All existing panels, other panels, manual pull stations, detectors or bells shall be
1. Removed from the site and disposed of by the Contractor.
  2. All areas where existing devices were removed and not replaced shall be restored to match adjacent surfaces or repaired as indicated on the Drawings.
  3. [Smoke detectors designated as hazardous waste shall be disposed of by University. Coordinate disposal with University's Representative.]
- C. Interruption of Existing Fire Alarm Service: Do not interrupt fire alarm service to facilities occupied by University or others unless permitted under the following conditions and then only after arranging to provide temporary fire watch service according to requirements indicated:
1. Notify the University's Representative in writing no fewer than 14 days in advance of proposed interruption of fire alarm service.
  2. Do not proceed with interruption of fire alarm service without the University Representative's written permission.
- D. Fire Watch: Where it is necessary to shut down existing fire alarm systems for switch-over purposes or any other reason that leaves the building unprotected, the Contractor shall provide a continuous UCD DCFM approved fire watch during the shutdown.
1. Fire watch personnel shall be trained in the use and operation of portable fire extinguishers, and instructed in how to contact the UC Davis Dispatch Center by either radio or telephone.
  2. Continuous rounds to cover all areas of the building are required every 30 minutes.
  3. An evacuation plan which includes a method to notify all occupants is required in occupied buildings.
  4. Maintain a log of the rounds and comprehensive notes.
  5. Provide a 30-day notice to the University's Representative and attend coordination meetings for fire watch approval.

## 1.9 GUARANTEE

- A. Refer to 01 78 00 Close-Out Submittals and Exhibit 19 Guarantee/Warranty form.
- B. Response time for emergency service shall be no longer than 2 hours from the time of notification. Response time for non-emergency service shall be no longer than 24 hours from the time of notification. These services shall be available 24 hours a day. University reserves the right to perform emergency service if Contractor does not meet response time and bill Contractor.
- C. Repairs or replacements shall be completed within 48 hours of notification. For all repairs that cannot be completed after the initial response, a written plan of correction shall be submitted to the University prior to leaving the premises.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. The fire alarm control equipment shall consist of a system assembled as an approved unit of regularly manufactured components, by a single manufacturer for the purposes described elsewhere in this specification. The fire alarm control equipment must have a proven track record

of service and reliability in projects of similar scope to this project. Interconnecting equipment that has not been listed for interconnection, or the creation of components or system into a nonstandard unit that is not normally available from the manufacturer, is not acceptable.

B. Provide products by the following:

1. Silent Knight 5820XL, 5820XL-EVS, Farenhyt IFP 1000, IFP 2000, IFP 1000ECS, IFP 2000ECS, or equal.

2.2 EXISTING FIRE ALARM SYSTEM

- A. Compatibility with Existing Equipment: Fire alarm system and components shall operate as an extension of an existing system.

2.3 SYSTEM SOFTWARE

- A. The CPU and Life Safety Software shall be the latest version listed by the CSFM. Time and date information will be included in all output messages.
- B. The fire alarm system shall allow for loading and editing instructions and operating sequences as necessary. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the instructions stored in memory.

2.4 FIRE ALARM CONTROL PANELS (FACP)

A. General Description

1. Modular, power-limited design with electronic modules, UL 864 listed.
2. Equipped with a nonvolatile memory that requires no battery backup.
3. Addressable initiation devices that communicate device identity and status.
  - a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at the FACP.
  - b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
4. Addressable control circuits for operation of mechanical equipment.

B. Circuits

1. Signaling Line Circuits: NFPA 72, Class B.
  - a. System Layout: Install no more than 80 percent of maximum addressable device capacity on each signaling line circuit.
2. Notification-Appliance Circuits: NFPA 72, Class B.
3. Actuation of alarm notification appliances, [emergency voice communications,] annunciation, [smoke control,] [elevator recall,] [and actuation of suppression systems] shall occur within 10 seconds after the activation of an initiating device.
4. Electrical monitoring for the integrity of wiring external to the FACP for mechanical equipment shutdown and magnetic door-holding circuits is not required, provided a break in the circuit will cause doors to close and mechanical equipment to shut down. Locate addressable control module within 5 feet of control panel being controlled.

C. Smoke-Alarm Verification

1. An activated smoke detector shall automatically reset and then recheck the atmosphere following a 60-second waiting period.
2. The fire alarm system will not activate until detection is confirmed following the waiting period.
3. Activation of a second detector during the waiting period shall activate the alarm system immediately.
4. All area and duct smoke detectors shall be enabled with this feature.
5. Provide a disabling feature at the system keypad for system commissioning and University confidence testing.

6. Disabling this feature shall be accomplished via the keypad on a zone, or group of zones, basis.
  7. Enable the feature following University and DCFM approval of the system.
- D. Notification-Appliance Circuit: Operation shall sound in a temporal pattern, complying with ANSI S3.41.
1. The FACP shall support [speaker] horn and visual alarm circuits originating from FACP mounted hardware for each floor of the building.
    - a. Provide a schedule by performing circuit load calculations considering wire length, gauge, number of devices, and FACP specifications.
    - b. Do not use a single circuit for multiple floors; however, a number of circuits may be required for a single floor.
  2. Visual notification circuits shall be synchronized per circuit at each floor's terminal cabinet.
  3. No horn [speaker] or strobe circuit shall exceed 10 percent voltage loss measured at the end-of-line device. No strobe circuit shall exceed a 2.1-volt line loss measured at the end-of-line device with a 21-volt DC input at the fire alarm panel end of the circuit.
  4. Calculate visual alarm (strobe) circuit capacity and line loss using the strobe's 20-volt DC ratings.
  5. The FACP shall support independent door and [corridor damper] control circuits originating from FACP mounted hardware for each floor of the building.
- E. [Elevator Controls]
1. Heat detector operation shuts down elevator power by operating a shunt trip in a circuit breaker feeding the elevator through an addressable control module.
  2. Activation of the heat detector or water flow will operate the building notification appliances and annunciator. Refer to Section 14 20 00 Elevator for additional requirements.]
- F. Power Supply
1. General requirements: The FACP and Power Boosters shall have the following requirements:
    - a. All 24 VDC power supply shall be addressable Silent Knight model # 5895XL or Farenhyt RPS-1000/RPS-2000 power supply powered by 120-volt AC power, with a battery backup system regardless of the building's primary or alternate source of power; or equal (no known equal).
    - b. Power supply shall have a dedicated fused safety switch for this connection at the service entrance equipment. Paint the switch box red and identify it with FIRE ALARM SYSTEM POWER.
    - c. Surge Suppression: Install surge protection on normal ac power for the FACP and its accessories. [Comply with Section XX XX XX Transient Voltage Suppression for auxiliary panel suppressors.]
    - d. Install surge protectors recommended by FACP manufacturer. Install on all system wiring external to the building housing the FACP.
    - e. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module.
    - f. Secondary Power: 24-V dc supply system with batteries and automatic battery charger and an automatic transfer switch.
    - g. Batteries: Sized with 25 percent reserve capacity for future expansion.
    - h. 24-hour system backup capability plus 5 minutes of full alarm operation at the end of a 24-hour period.
    - i. Charger shall be able to restore batteries to full charge within 48 hours after a complete discharge.
    - j. No power supply shall be loaded to greater than 80 percent of its rated capacity. Rated capacity shall be calculated as the total load plus 25 percent future expansion.
  2. Additional Requirements - FACP and Power Boosters
    - a. Fire Alarm Panel Control Panel
      - 1) The FACP shall supervise battery and charging system.

- 2) The FACP shall include trouble annunciation of high/low voltage, shorted cell and open circuits.
- 3) A means of disconnecting the 120 VAC feed to the FACP for maintenance shall be provided within the FACP or in a locked enclosure within 10 feet of the FACP.
- b. Intelligent Power Supply
  - 1) Power supply shall have normally open trouble output contacts for monitoring by an external fire alarm system interface module.
  - 2) Power supply shall have supervised input circuit for external activation of alarm notification appliance circuits from fire alarm system interface module.
  - 3) If panel is not located in a locked or secured room, cabinet shall be provided with tamper switch on the door. Tamper switch shall be supervised by an external fire alarm system interface module. Opening of the door shall result in a trouble condition at the FACP.
3. Door Holder Auxiliary Power Supplies
  - a. All 24 VDC power supply shall be powered by 120-volt AC power system to supply all loads plus 25 percent future capacity.
  - b. Power supply shall only be loaded at 80 percent of its rated capacity. Apply this factor after adding the future capacity to the total load calculated above.
  - c. Door Holder Power Supply shall be configured to be de-energized upon loss of 120 VAC power to minimize 24 VDC battery supply requirements. Clearly indicate this function on the shop drawing battery calculations.
  - d. All door holders shall be on 120 VAC and powered by a 120 VAC electrical panel. The breaker shall be marked red and labeled. The door holder label shall identify the circuit.
- G. Alarm Silencing, Trouble, and Supervisory Alarm Reset: Manual reset at the FACP [and remote annunciators.] after initiating devices are restored to normal.
  1. Silencing-switch operation halts alarm operation of notification appliances and activates an alarm silence light. Display of identity of the alarm zone or device is retained.
  2. Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
  3. When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.
- H. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and control of changes in those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and make a printout of the final adjusted values on the system printer.
- I. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, trouble, and supervisory signals to a remote alarm station through a digital alarm communicator transmitter and telephone lines.
- J. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

## 2.5 [VOICE COMMUNICATION SYSTEM

- A. Voice/Alarm Signaling Service: A central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators provided [in a separate cabinet located in the Fire Command Center] [as a special module that is part of the FACP].
  1. Notification-Appliance Circuits: NFPA 72, Class B.
  2. Status Annunciator: Indicate the status of various voice/alarm speaker zones and the status of firefighters' two-way telephone communication zones.



3. Preamplifiers, amplifiers, and tone generators requirements:
  - a. Audio amplifiers shall be sized to provide 1/2 Watt minimum speaker taps and as indicated on the Drawings.
  - b. Each audio amplifier shall have 50 percent minimum spare capacity when attached to the speakers necessary to meet audio requirements.
  - c. Automatically transfer to backup units, on primary equipment failure. FACP shall incorporate a spare automatic backup audio amplifier equal in size to the largest individual amplifier.]

## 2.6 [FIREFIGHTERS' TWO-WAY TELEPHONE COMMUNICATION SERVICE

- A. Dedicated, two-way, supervised, telephone voice communication links between the FACP, [the Fire Command Center,] and remote firefighters' telephone stations. Supervised telephone lines shall be connected to talk circuits by controls in a control module. Provide the following:
  1. Selective-talk type for use by firefighters.
  2. Controls to disconnect phones from talk circuits if too many phones are in use simultaneously.
  3. Audible Pulse and Tone Generator, and High-Intensity Lamp: When a remote telephone is activated, it causes audible signal to sound and high-intensity lamp to flash.
  4. Selector panel controls simultaneous operation of telephones in selected zones and permits up to six phones to be operated simultaneously. Indicate ground faults and open or shorted telephone lines on the panel front by individual LEDs.
  5. Provide [graphic] [liquid-crystal digital] display to indicate location of caller.
  6. Remote Telephone Cabinet: Flush or surface-mounted cabinet, as indicated, factory-standard red finish, with handset.
    - a. Install one-piece handset to cabinet with vandal-resistant armored cord. Silk-screened or engraved label on cabinet door, designating Fire Emergency Phone.
    - b. With break-glass type door access lock.
  7. Remote Telephone Jack Stations: Single-gang, stainless-steel-plate mounted plug, engraved Fire Emergency Phone.
  8. Handsets: Provide [push-to-talk] type sets [with noise-canceling microphone]. Provide [Insert number] handsets stored in a cabinet [adjacent to the FACP] [in the Fire Command Center.]

## 2.7 MANUAL STATIONS

- A. Description: UL 38 listed; finished in red with molded, raised-letter operating instructions in contrasting color. Station shall show visible indication of operation. Mounted on recessed outlet box; if indicated as surface mounted, provide manufacturer's surface back box.
  1. Single action mechanism, pull lever type. With integral addressable module arranged to communicate status (normal, alarm, or trouble) to the FACP.
  2. Reset shall be accomplished with a lock and key.
  3. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm.

## 2.8 SMOKE DETECTORS/SENSORS

- A. General Description
  1. UL 268 listed, operating at 24-V dc, nominal.
  2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
  3. When exposed back boxes are needed for interior work use round wire mold boxes of the appropriate size.
- B. Beam-Type Smoke Detector: Each detector shall consist of a single-ended transmitter/receiver, and shall have the following features.
  1. Remote test switch.
  2. Integrated sensitivity test.

C. Addressable Duct Smoke Detectors

1. UL 268A listed, operating at 24-V dc, nominal.
2. Integral Addressable Module: Arranged to communicate detector status and sensitivity (normal, alarm, or trouble) to the FACP.
3. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. The fixed base shall be designed for mounting directly to the air duct. Provide terminals in the fixed base for connection to building wiring.
  - a. Weatherproof Duct Housing Enclosure: UL listed for use with the supplied detector. The enclosure shall comply with NEMA 250 requirements for Type 4X.
4. Sampling Tubes: Design and dimensions as recommended by manufacturer for the specific duct size, air velocity, and installation conditions where applied.
5. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.
6. Addressable analog or 2 wire type utilizing addressable component by other manufactures must be approved by the University's "Representative, University's Alarm Shop and UCD DCFM.
7. The devices shall include necessary sampling tube extensions.
8. Install remote indicating light where indicated on the Drawings and where detector indicating lights are not readily visible.
  - a. Mount remote indicator lights adjacent to the unit, 4 to 6 feet above finished floor, the location must not obstruct area served.
  - b. Device shall be flush or semi-flush mounted with identifying nameplate.
  - c. Integral Visual-Indicating Light: LED type. Indicating [detector has operated] [and power-on] status.

2.9 HEAT DETECTORS

A. General: UL 521 listed.

Preferably heat detectors shall be a rate of rise and fixed temperature low profile [addressable] type and shall be ordinary temperature range in all areas except where located in a high ambient temperature area.

B. Heat Detector, Combination Type and Fixed-Temperature Type:

1. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

2.10 NOTIFICATION APPLIANCES

- A. Description: Equipped for mounting as indicated on the Drawings and with screw terminals for system connections.
- B. Bells: Electric vibrating, 120V under-dome type with provision for housing the operating mechanism behind the bell. Bells shall produce a sound-pressure level of 94 dBA, measured 10 feet from the bell. 10-Inch size, unless otherwise indicated. Bells are weatherproof where indicated.
- C. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn in a three pulse temporal pattern. System Sensor, Wheelock, Gentex, or equal.
- D. Visible Alarm Devices: Xenon strobe lights listed under UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word FIRE is engraved in minimum 1-inch-high letters on the lens. System Sensor, Wheelock, Gentex, or equal.
  1. Strobe Leads: Factory connected to screw terminals.
- E. Voice/Tone Speakers
  1. UL 1480 listed.
  2. High-Range Units (in noisy environments): Rated 2 to 15 W.
  3. Low-Range Units (in quiet environments): Rated 1 to 2 W.

4. Mounting: Flush, semi recessed, or surface mounted; bi-directional as indicated.
5. Matching Transformers: Tap range matched to the acoustical environment of the speaker location.
6. Speakers located in rest rooms and similar enclosed areas where alarm threshold may be high should be tapped at 1/4 watt.
7. All settings other than 1/2 watt are identified on the drawings.
8. All systems shall be set at 25 Volt operation.
9. System Sensor, Wheelock, Gentex, or equal.

F. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.

1. Speaker/strobes color shall be as approved by University's Representative and have sealed back, metal grill, with multiple wattage taps including 1/4, 1/2, 1 watt, and 2 watts, and multiple candela taps 15, 30, 75 or 110.
2. Install all speakers at the 1/2 watt setting unless indicated otherwise on the Drawings and with the candela setting as indicated on the Drawings.

#### 2.11 SPRINKLER SYSTEM REMOTE INDICATORS

A. Tamper supervisory valve and water flow switches shall be provided by **Division 21 Section [XX XX XX Name]**. Wiring and raceway from the switches to the fire alarm addressable interface modules and the final connection to the fire alarm system shall be provided and installed by this section.

B. The sprinkler electric bell shall be provided under this section and shall be 120V

#### 2.12 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated on the Drawings and are complete with matching door plate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf (111-N) holding force.
2. Wall-Mounted Units: Flush mounted, unless otherwise indicated.
3. Rating: 120V
4. All new installations shall be 120 VAC powered door holders.

B. Material and Finish: Match door hardware.

#### 2.13 REMOTE ANNUNCIATOR

A. Description: Duplicate annunciator functions of the FACP for alarm, supervisory, and trouble indications. Also duplicate manual switching functions of the FACP, including acknowledging, silencing, resetting, and testing.

1. Mounting: **[Flush] [Surface]** cabinet, NEMA 250, Class 1.

B. Display Type and Functional Performance: Alphanumeric display same as the FACP. Controls with associated LEDs permit acknowledging, silencing, resetting, and testing functions for alarm, supervisory, and trouble signals identical to those in the FACP.

C. Provide alphanumeric type remote annunciator with 80 character LCD display. Mount annunciator(s) at locations determined by University's Representative and UCD DCFM. Schedule Coordination site walk and plan review to determine the exact locations. Refer to plans as approved by UCD DCFM for number and exact locations.

#### 2.14 ADDRESSABLE INTERFACE MODULE

A. Description: Microelectronic monitor module listed for use in providing a system address for listed alarm-initiating devices for wired applications with normally open contacts.

B. Integral Relay: Capable of providing a direct signal **[to the elevator controller to initiate elevator recall] [to a circuit-breaker shunt trip for power shutdown] [Insert other functions]**.

- C. Provide addressable interface modules to interface with non addressable initiating devices, installed in junction box adjacent to water flow, and tamper switches.

#### 2.15 DIGITAL ALARM COMMUNICATOR TRANSMITTER

- A. Listed and labeled according to UL 632.
- B. Functional Performance: Unit receives an alarm, supervisory, or trouble signal from the FACP, and automatically captures one or two telephone lines and dials a preset number for a remote central station. When contact is made with the central station(s), the signal is transmitted. Secondary Power: Integral rechargeable battery and automatic charger. Battery capacity is adequate to comply with NFPA 72 requirements.
- C. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

#### 2.16 FIRE ALARM TERMINAL CABINETS AND AUXILIARY CABINETS

- A. Enclosures shall be NEMA Type 1 or Type 12. All panels shall be [surface or flush] mounted with hinged door and latch with lock. All locks shall match FACP key. Box and front shall be steel, painted to match wall in finished areas.
- B. Fire alarm terminal cabinet shall be labeled with a riveted or screwed laminated plastic nameplate indicating "FIRE ALARM TERMINAL CABINET" in 1/4 inch white letters on a red background.
- C. Provide a wire schematic similar to that specified inside the cabinet door. Also, provide a schedule identifying all end of line resistors for the zone and their respective locations.
- D. All end-of-line (EOL) devices shall be located in the terminal cabinet or the end of the corridor for the area served and labeled on the EOL device.
- E. Provide identified terminal blocks in all terminal cabinets and auxiliary control cabinets. These blocks shall be sized to accommodate wire from 18 gauge to 10 gauge.
- F. Backboards in the terminal cabinets shall be constructed of fire retardant treated 3/4 inch exterior grade plywood, painted white.

#### 2.17 SPARES

- A. Provide FACP spare equipment for 5 percent (at least two each) spare fully operational [speaker], horn/strobe, smoke detectors, heat detectors, addressable input modules, addressable relay modules, manual pull stations, beam detectors, matching bases for each of the initiating devices, duct detector housing with function cards, and auxiliary control circuits.
- B. Provide one spare expansion or isolation module.
- C. Provide 25 percent spare capacity for FACP I/O points.

#### 2.18 SMOKE/FIRE DAMPERS

- A. Dampers shall be as described in Division 21.
- B. Interface relays shall be provided to operate 120VAC AC smoke dampers from the 24VDC fire alarm system.
- C. Fire alarm relay contacts shall be rated at 10 amps; RIB Ribu 1c or equal.
  - 1. For RIB step down relay and relay wired in an energized state, interface relay shall be provided to operate a 120VAC smoke damper from 24 VDC fire alarm system. Fire alarm contacts shall be rated at 10amps. Mount in NEMA 1 enclosure in the proximity of the fire alarm terminal cabinet.
  - 2. The interposing relay shall be normally closed and the damper(s) powered open.
  - 3. Upon alarm, or AC power failure, the dampers shall close.
  - 4. Interposing relays shall be UL cross-listed with the FACP.
  - 5. Multiple fire/smoke dampers in a common area [per floor] shall have separate relay per floor at minimum.

## 2.19 WIRE AND CABLE

- A. Wire and cable for fire alarm systems shall be UL listed and labeled as complying with NFPA 70, Article 760 and manufacturer's recommendations.
- B. Non-Power-Limited Circuits: Stranded-copper conductors with 600-V rated, 75 deg C, color-coded insulation.
  - 1. Low-Voltage Circuits: No. 16 AWG, minimum.
  - 2. Line-Voltage and notification Circuits: No. 12 AWG, minimum.
  - 3. [Multiconductor Armored Cable: NFPA 70 Type MC, copper conductors, TFN/THHN conductor insulation, copper drain wire, copper armor with outer jacket with red identifier stripe, UL listed for fire alarm and cable tray installation, plenum rated, and complying with requirements in UL 2196 for a 2-hour rating.] Saddle grip connectors with lock nut are required. Can only be used in accessible areas. Seek University approval prior to including in design documents.

## PART 3 - EXECUTION

### 3.1 EQUIPMENT INSTALLATION

- A. The existing system shall remain operational at all times. Connecting to Existing Equipment: Verify that existing fire alarm system is operational before making changes or connections.
- B. Smoke or Heat Detector Spacing
  - 1. Smooth ceiling spacing shall not exceed 30 feet.
  - 2. Spacing of heat detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas, shall be determined according to Appendix A in NFPA 72.
  - 3. Spacing of heat detectors shall be determined based on guidelines and recommendations in NFPA 72.
- C. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of the duct.
- D. [Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.]
- E. Remote Status and Alarm Indicators: Install near each smoke detector that is not readily visible from normal viewing position.
- F. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.
- G. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling.
- H. Device Location-Indicating Lights: Locate in public space near the device they monitor.
- I. FACP:
  - 1. Install in a secured and locked room (such as electrical room or fire control room) with an annunciator at building point of entry.
  - 2. Surface mount with tops of cabinets not more than 72 inches above the finished floor.
  - 3. Panels shall be installed in a conditioned space between 60 and 80 degrees F.
- J. Annunciator: Install with top of panel not more than 72 inches above the finished floor.

### 3.2 WIRING INSTALLATION

- A. Wiring Method: Install wiring in metal raceway according to Section [XX XX XX] Raceways and Boxes.

1. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.
2. **[Multi Conductor Armored cable shall be installed in accessible non-concealed locations only.]**  
**SEEK UNIVERSITY APPROVAL PRIOR TO INCLUDING IN DESIGN DOCUMENTS.**

B. Wiring Method

1. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
2. Fire-Rated Cables: Use of 2-hour fire-rated fire alarm cables, NFPA 70 Types MI and CI, is not permitted.
3. Signaling Line Circuits: Power-limited fire alarm cables shall not be installed in the same cable or raceway as signaling line circuits.
4. All wire shall be new, UL approved, marked, and brought to the job site in original packages.
5. Wire insulation shall be one of the types required by NEC. All wires shall be sized per NEC for the load serviced. Field wiring for initiation, supervision, and signal circuits shall be stranded conductor. All wire shall be approved for fire alarm installations.
6. Pig tailing and Tee tapping is prohibited for all system circuits, except door circuits and 120 VAC.
7. Addressable signaling line circuits may be Tee tapped only in the fire alarm terminal cabinet for the floor, which that circuit serves.
8. Fire alarm system shall be wired Class B, device to device, with no splicing unless approved by the University's Representative.
9. End of line resistors shall be located in the terminal cabinet or the end of the corridor or other unassigned (public) space for the zone served.
10. Splicing when approved shall be made with a terminal strip in a labeled fire alarm cabinet, which shall be easily accessible and marked clearly on shop drawings.
11. Colors shall match when possible and the conductors shall be mechanically secured to each other so that no stress is applied to the splice.
12. Aluminum wire and solid wire are not permitted unless recommended by the manufacturer. All wire and cable type to be used must be approved.
13. Wire pulls by powered mechanical means will not be permitted.
14. Conduit shall be thoroughly cleaned of all foreign material just prior to pulling the wire or cable.
15. Lubricants shall be compounds specifically prepared for cable pulling and shall not contain petroleum or other products, which will affect cable insulation.
16. Wire that has scrapes, nicks, gouges, or crushed insulation shall not be used and must be removed.
17. Do not run low voltage energy limited wiring in the same wire-ways with, or closely parallel to, high voltage and/or switched power wiring.
18. Interposing relays shall be used for all switched power loads and shall be located such that the switched power conductors do not run in the same raceway as the interposing relay coil power or any other energy-limited low voltage conductors.
19. All wiring shall be contained in metal conduit or raceways dedicated to fire alarm service.
20. Conduit size shall be 3/4 inch minimum, except conduit up to 30 feet in length, from junction box to an individual device may be 1/2 inch. Surface mounted raceways shall be Wire mold #700 minimum, T&B, or equal (also see Section [XX XX XX, Basic Electrical Requirements]).
21. No raceway shall be filled in excess of 40 percent. Contractor shall demonstrate by performing fill calculations showing that the designs comply with these criteria. **[Exceptions are only allowed when use of existing wire ways is approved.]**
22. Provide 6 inch by 6 inch or larger junction boxes at all junctions where four or more conduits are combined. Use of extension rings to achieve adequate space for a device or junction is not allowed.
23. The raceway system shall resemble a branch and tree configuration where the main run has limited offsets, and branch lines run perpendicular to the main run.

- a. Each device shall be connected from a junction box on the main Fire Alarm (FA) raceway so that the main raceway does not pass through a device back box.
  - b. Branches shall be provided with sufficient junction boxes so that not more than three unassociated circuits pass through a device back box.
24. All raceways shall run parallel or perpendicular to walls, floors, and ceilings.
  25. Raceways between FACP and terminal cabinets shall not be larger than 2-1/2 inches in diameter. Where additional capacity is needed, provide a second, third, or more raceways.
  26. As a minimum, provide a single 1-1/2 inch diameter raceway between the FACP and terminal cabinets, regardless of the wire fill.
  27. For surface-mounted raceway, runs shall be routed on walls out of visual sight, with vertical drops to wall-mounted devices. Submit routing proposal to University's Representative for approval prior to installation.
  28. Do not encase raceway in concrete unless specifically called for.
  29. No wire run or circuit shall be longer than 80 percent of the maximum allowable length and power consumption for the wire size and application. No output circuit shall exceed 80 percent of the maximum load capacity specified by the manufacturer.
  30. Terminate all wiring for each floor in a terminal cabinet as indicated on the contract drawings prior to running the wires to the fire alarm panel. Provide at least one terminal cabinet for each floor. Prior to cutting wires to length, obtain approval by the UCD Fire Alarm Shop on conductor termination plan of action.
  31. All solid wire terminations shall be made bare to screw terminals specifically designed for bare wire connection. Make cable shield terminations with T&B Sta-Kon, Scotchloc, or equal self-insulated spade lugs where connected to screw type terminals.
  32. Wiring in all cabinets and terminal boxes shall be neatly arranged and bundled with tie wraps or equivalent; subject to UCD Fire Alarm Shop approval.
  33. Paint all junction box covers for the fire alarm system red. Paint J Box covers in finished areas to match the wall or ceiling and put a 1/2 inch minimum red dot on the cover.
  34. All conduit and raceways shall be color-coded by a 3/4 inch red band at 10 foot intervals. All inductive loads (door holders, interface relays) without integral reverse Electromagnetic Field (EMF) suppression must have suppression on those circuits.
- C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with pressure-type terminal blocks.
- D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- E. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.
- F. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum 1-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors.
- G. Wiring to Remote Alarm Transmitting Device: 1 inch conduit between the FACP and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.
- ### 3.3 IDENTIFICATION
- A. Identify system components, wiring, cabling, and terminals according to Section [XX XX XX] nameplate and Labeling, and Section [XX XX XX] Basic Electrical Materials and Methods.

- B. Install instructions frame in a location visible from the FACP.
- C. Paint power supply disconnect switch red and label FIRE ALARM.

### 3.4 GROUNDING

- A. Ground the FACP and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to the FACP.

### 3.5 FIELD QUALITY CONTROL

- A. The fire alarm testing requirements consist of a 4-part series. Pre-testing by Contractor, pre-testing by University to be coordinated with the University's Representative by UCD Electrical Inspector then pre-testing by UCD O&M Alarm Shop and final acceptance testing by the UCD DCFM.
- B. General: Comply with the following requirements:
  - 1. Engage a factory authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing. The manufacturer's recommended testing devices shall be used.
  - 2. Comply with the requirements of Section 01 75 00 Starting and Adjusting.
  - 3. Comply with the requirements of Section 01 91 00 Commissioning.
  - 4. Perform the following field tests and inspections and prepare test reports:
    - a. Before requesting final approval of the installation, submit a written statement using the form for Record of Completion shown in NFPA 72.
    - b. Perform each electrical test and visual and mechanical inspection listed in NFPA 72. Certify compliance with test parameters. All tests shall be conducted under the direct supervision of a NICET technician certified under the Fire Alarm Systems program at Level III.
    - c. Include the existing system in tests and inspections.
    - d. Visual Inspection: Conduct a visual inspection before any testing. Use as-built drawings and system documentation for the inspection. Identify improperly located, damaged, or nonfunctional equipment, and correct before beginning tests.
    - e. Testing: Follow procedure and record results complying with requirements in NFPA 72. In addition, perform procedures described in this article.
      - 1) Detectors that are outside their marked sensitivity range shall be replaced.
    - f. Test and Inspection Records: Prepare according to NFPA 72, including demonstration of sequences of operation by using the matrix-style form in Appendix A in NFPA 70.
- C. Perform a preliminary test, which will be conducted by Contractor and witnessed by the University's Representative.
  - 1. This test shall be completed after the system is complete and clear of troubles.
  - 2. Should the results not be satisfactory to the University's Representative, then corrections shall be made by Contractor and a re-test will be required at Contractor's expense. Installer and a factory trained technician for the FACP shall be present for all testing.
  - 3. The preliminary test shall be in accordance with a written Acceptance Test Procedure (ATP) to demonstrate and certify proper system operation. See Testing and Commissioning Procedures paragraph of this Section.
  - 4. All detectors shall be removed from their base and checked for trouble.
  - 5. Remove one device per signaling circuit from its box and lift a wire to test for supervision and ground. Failure due to improper system wiring will require a comprehensive test of the circuit.
  - 6. All control switches shall be operated to indicate proper supervision of the switch.
  - 7. All valve and sprinkler supervision switches shall be operated to verify proper response.
  - 8. All valve and sprinkler supervision switches shall have one wire removed to verify proper supervision.
  - 9. Each alarm output, detection, or supervision zone may be tested for proper response to ground conditions.



10. All local remote annunciators shall be tested for proper operation. AC power shall be interrupted for [4] [24] hours and followed by a [5] [15] minute alarm test.
  11. Remove all critical fuses to check for proper supervision (if applicable).
  12. Test the firefighter's telephone system for supervision of the wiring and for quality of voice transmission.
  13. Test all detectors for alarm operation.
  14. Test all signaling devices for proper operation. Devices that fail and are replaced will require a retest.
  15. Test all alarm sounding devices for proper operation.
  16. Audibility tests will be conducted by the Contractor to determine compliance with the dB requirements. [For replacement systems in occupied buildings, the audibility test shall be conducted after normal working hours.] Ambient readings conducted during working hour.
  17. All [elevator,] [fan], [door holder], [damper] and other control functions and circuits shall be tested for proper operation. Test for proper operation of the Public Address portion of the FACP.
  18. Test fan and damper control, including manual override and priorities. Coordinate with other Work.
  19. Test magnetic door closers, holders, locking mechanisms. Verify appropriate priority with security and access control systems.
  20. [Test elevator recall, Phase I and II as required.]
  21. Test transfer to emergency power, where provided.
  22. Test alarm verification function. Confirm no delay occurs if two detectors are activated.
  23. Demonstrate history log functions.
  24. Confirm signal reports to UC Davis Dispatch Center.
- D. After satisfactory completion of the preliminary testing, the University's Representative will arrange for the UCD DCFM to witness a final Contractor-executed acceptance test of the system.
1. Final acceptance will be granted by the UCD DCFM.
  2. Approval from the UCD DCFM shall be evidenced in writing and a copy forwarded to the University's Representative.
  3. The requirements for final testing shall be the same as listed under preliminary test above.

### 3.6 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project outside normal occupancy hours for this purpose.
- B. Follow-Up Tests and Inspections: After date of Substantial Completion, test the fire alarm system complying with testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed.

### 3.7 DEMONSTRATION AND TRAINING

- A. General: Engage a factory-authorized service representative to train University's maintenance personnel to operate, and maintain the fire alarm system, appliances, and devices.
- B. Comply with the requirements of Section 01 79 00 Demonstration and Training.
- C. Contractor shall, after 2 weeks (minimum) written notification to the University's Representative, conduct a training session during which all maintenance and operational aspects of the system will be described and demonstrated to personnel selected by the University. This will include O & M Alarm personnel, and training for 3 firefighter shifts. The sessions shall be conducted by a manufacturer's representative thoroughly familiar with the characteristics of the installed system and building layout. Each individual session will be a minimum of 4 hours of instruction: 2 hrs. Classroom and 2 hrs. hands-on training at project site prior to occupancy.

END OF SECTION 28 31 00

## Fire Alarm Plan Review Submittal Requirements

### Introduction

This Fire Net is intended to provide a model plan review checklist to serve the needs of groups both inside and outside of UC Davis in preparing a complete initial submittal package for review and approval of fire alarm projects.

Much of the information contained in this Fire Net has been taken from the Fire Alarm System Plan Review Guide produced by the Office of the State Fire Marshal.

### Basis for Requirements

The 2007 California Fire Code (CFC), Chapter 9, Section 907 - Fire Alarm and Detection Systems requires complete construction documents for fire alarm systems shall be submitted for review and approval prior to system installation.

CFC Chapter 9, Section 907.1.1 also states plans and specifications for fire alarm systems shall include, but not be limited to, a floor plan indicating use of all rooms; location of all alarm-initiating and notification devices; alarm control and trouble-signaling equipment; annunciation; power connection; battery calculations; conductor type and sizes; voltage drop calculations and manufacturer model numbers and listing information for all equipment, devices and materials; details of ceiling height and construction; interface of fire safety control functions, and state fire marshal listing numbers of all equipment, devices and materials requiring listing.

### Complete vs. Correct

While correctness will speed along the review/approval process in requiring fewer resubmission cycles, lack of completeness will prevent a review. The submittal package must be complete for a complete review/approval process to take place.

### Installation Codes and Standards (including edition)

The codes and standards applicable to fire alarm installation and design requirements typically include references to specific sections of Title 24, 2007 Edition; Part 2, California Building Code; Part 3, California Electric Code; Part 4, California Mechanical Code and Part 9, California Fire Code. References are also made to NFPA 72 (the National Fire Alarm Code), 2002 Edition as well as to the current UC Davis Campus Design Guide. Applicable code references must be identified on the plan cover sheet.

### Checklist

The following link will take you to a Microsoft Word version of the [Fire Alarm Submittal Checklist](#). Each item on the checklist must be provided for a complete submittal. The submittal requirements for modifications to existing systems are the same as for new systems. The required submittal information for existing systems must come from as-built drawings or from field investigation.

All Fire Alarm Shop Drawings submitted to the UC Davis Fire Prevention Unit for approval must include the checklist with each item checked off to confirm that the submittal was checked for completeness.

Use Current Version:

<http://safetyservices.ucdavis.edu/programs-and-services/fire-prevention/fire-prevention-services-1>

UC Davis Fire Prevention Services

UCD FIRE ALARM PLAN SUBMITTAL INTAKE CHECKLIST

UC Project Number: \_\_\_\_\_ Date: \_\_\_\_\_

Project Name: \_\_\_\_\_ Project Manager: \_\_\_\_\_

All fire alarm submittals must be complete, as incomplete submittals will delay the review process. The following checklist must be used to verify that your submittal is complete:

- Title block includes the contractor's name, address, telephone number and stamp of the contractor's C-16 license number.
- Title block includes project site address and University CAAN number.
- Title page includes an accurate legend of symbols for all fire alarm devices being installed. The legend must include the quantity and model number for each device.
- Title page includes the following statements:
  - The fire alarm system shall conform to Article 760 of the California Electrical Code. Installation of the fire alarm system shall not be started until detailed drawings and specifications, including current California State Fire Marshal listing sheets for each component of the fire alarm system, have been approved by the California State Fire Marshal and the University Fire Prevention Services.
  - A stamped set of approved fire alarm shop drawings shall be on the job site and used for installation. Any deviation from approved shop drawings, including substitution of devices, shall be approved by the State Fire Marshal and the University Fire Department prior to installation.
  - Any discrepancies between the drawings and the code or recognized standards shall be brought to the attention of the University Fire Prevention Services.
  - Upon completion of the installation of the fire alarm system, the contractor shall coordinate with other trades to test interconnection of the fire alarm system with other building systems and equipment. Once all functions indicated in the fire alarm system sequence of operations have been verified through testing by the installing contractor, an acceptance test must be performed in the presence of the University Fire Department. The acceptance test must successfully demonstrate all functions required in the contract.
- The drawings are stamped and signed by the design professional of record.
- Floor plans show the entire project area, all fire alarm devices (new and existing) and conduit and wire runs.
- Room number and use is indicated for all rooms or spaces.
- Device address is shown for all addressable devices.

- Conductor type, size and quantity are indicated for each conduit run.
- All fire rated walls within the project area are shown and identified.
- Point to point wiring details that indicate the interconnections between the items of equipment including interfaces to equipment supplied by others.
- Single line riser diagram with the circuit style indicated for all circuits.
- Complete interior wiring diagrams for the fire alarm control panel and interior modules, cards and power supplies.
- Technical data showing exact types and quantity of all fire alarm devices. Specific components on catalog cut sheets must be highlighted or otherwise identified. All equipment drawing alarm or supervisory current shall have documentation of the current draw highlighted in the submittal information.
- California State Fire Marshal listing sheet with current expiration date for each component.
- Battery calculation sheets for all fire alarm control panels and auxiliary power supplies. Battery calculation shall include all electrical requirements of the entire fire alarm system, including power consumption of the individual devices, both in alarm and supervisory modes.
- Voltage-drop calculations for all notification appliance circuits. Maximum voltage drop shall not exceed 10% of the system supply voltage.
- Annunciator text message and device address for each addressable device.
- Elevation drawing showing all fire alarm equipment enclosures and raceways on the wall where they will be installed. Panels must not be higher than 6 feet and system status displays should be at eye level (+60" AFF). No equipment or raceways may be located under a cabinet containing batteries.
- Wire list showing the wire type, gauge and conductor count for all wires and cables.
- Elevation details for manual pull stations and visual alarm signaling devices.
- Details and listing numbers of through penetration fire stop systems.
- Sequence of operations matrix showing how system will react to the activation of each type of device.
- Duct air velocity is indicated where each duct smoke detector employing the use of sampling tubes is installed.
- Air handling systems supplying more than 2,000 cubic feet per minute are shown on the drawings.

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<http://safetyservices.ucdavis.edu/programs-and-services/fire-prevention/fire-prevention-services-1>