

## Fire Alarm Systems

These guidelines are developed in cooperation with the Fire Protection Equipment Committee, Fire Prevention Officers Section of the California Fire Chiefs Association, and the State Fire Marshal's Fire Alarm Advisory Committee. They were established under various editions of the Uniform Fire Code, the California Fire Code, and National Fire Protection Standard 72.

Please submit four (4) sets of plans and all applicable fees to the [Fire Prevention Division](#).

## Listed Equipment Applications

Provide information which clearly identifies the purpose of equipment or devices are listed. This information may be provided by State Fire Marshal listing sheets and supplemented by manufacturer specification sheet.

## Installation Codes and Standards

Codes and standards applicable to the specific installation and design requirements. These typically include references to specific sections of:

- Title 24, Part 2
- California Building Code, Part 3
- California Electrical Code, Part 4
- California Mechanical Code and
- California Fire Code. Part 9.

References should also be made to legally adopted editions of applicable nationally recognized standards, such as NFPA 72 and local ordinances.

## Type of NFPA System Provided

NFPA 72 standard defines fire alarm systems as Local, Auxiliary, Remote Station, Proprietary or Central Station. All life safety evacuation systems are classified as local with unique characteristics and specific design and installation requirements. The type of system shall be identified to enable the plan checker to verify it is appropriate for the installation.

## Voice Message Content and Languages

When voice message evacuation systems are required, as for high-rise and assembly occupancies, the content of these messages must be submitted for approval. Voice messages in languages other than English must also be identified. Describe any alert tones preceding or following the voice message and number of times the message repeats.

## Sequence of Operation

A written description or matrix chart to define the events, which occur when various initiating devices are activated. Description should include details relating to annunciation, evacuation warning, remote signaling, and activation of fire safety control functions, as applicable.

For example, the activation of a lobby smoke detector might recall elevators, shut down air handling systems, close fire doors, sound a general evacuation alarm, transmit an alarm signal to a central station, and announce the location at the fire alarm control panel. A smoke detector in another location may cause a different sequence of events to occur.

## Combination Systems

Stockton Fire Department does not permit combinations (burglar and fire for example).

## **Identification of Air Handling Systems Exceeding 2000 CFM**

To determine whether the provisions of the California Mechanical Code are applicable.

## **Description of Special System Features and Operations**

Detailed information relating to special features such as pre-signal alarm or positive alarm sequence for evacuation warning delay, cross zoning of detectors, alarm verification feature for smoke detectors, and activation of special extinguishing systems.

## **Request for UL Certificate**

For fire alarm system classified as Central Station Service with a UL certificate issued as evidence the installation is in compliance with applicable NFPA standards and a maintenance contract is in effect. By local ordinance ALL required fire alarm systems must be UL Certified.

## **Symbol Legend**

The symbols used on plans and drawings to indicate various fire alarm components and devices shall be clearly identified in a legend, which indicates quantities of devices along with manufacturer's names and model numbers. The symbols should be distinctive and clearly understood by the plan reviewer. NFPA, NEMA and others have developed recommended sets of standard fire alarm symbols, which are commonly used.

## **Identification of Off-Premises Signaling Methods and On-Premises Circuit Styles**

Number and types of circuits used for transmission of signals to a remote monitoring facility should be provided, along with the type of transmission used.

Examples:

- Two digital communicator (dial-up) phone lines.
- One digital communicator phone line with one-way RF backup. Dedicated leased telephone line with two-way multiplex signal communication.
- Two-way RF System
- Style designations as identified in NFPA 72 for on-premises initiating, signaling line and notification appliance circuits.

## **Attic, Ceiling, and Building Cross-Section Details for Areas with Automatic Detection**

Cross-section diagrams or elevation drawings for areas in which heat, smoke or flame detectors are provided, to verify that mounting locations and spacing of detectors for the type of ceiling or roof construction and height are in accordance with NFPA 72 standards.

## **Specifications and Details on Through-Penetration Fire Stopping**

Locations of all penetrations of fire-rated walls, ceilings or assemblies and the type of construction.

- Provide sizes, description and number of cables, conduits or raceways penetrating fire-rated assemblies.
- Provide details on the fire stopping systems used, including the F and T fire-resistive ratings.

## Secondary Power Calculations

Provide calculations to verify standby batteries or other approved secondary power source is adequate for the specified standby requirements of the system, in the event of loss of primary power, as specified by NFPA standards. Base calculations on the sum of two calculations: One for supervisory non-alarm condition and one for the alarm load condition.

The alarm load is generally based on the assumption that 10% of the alarm inputs and 100% of the alarm outputs are in alarm condition.

Current requirements for individual components in both supervisory and alarm conditions verified with the manufacturer specification sheet.

A summary of standby (supervisory) and alarm times as specified by NFPA standards, to be included in the calculations, are listed below. The calculations will determine the minimum ampere-hour capacity of the standby battery or minimum requirements for an equivalent secondary source.

## System Type Normal Stand-by Operation Alarm Operation

- Local 24 Hours - 5 Minutes
- Auxiliary 60 Hours - 5 Minutes
- Remote Station 60 Hours - 5 Minutes
- Proprietary 24 Hours - 5 Minutes
- Central Station 24 Hours - 5 Minutes
- Emergency Voice Alarm 24 Hours - 15 Minutes at full load

## Voltage Drop Calculations

Provide calculations to verify voltage drop in alarm notification appliance circuits is not excessive. Calculations are based on the length and size (wire gauge) of the circuit conductors and the maximum alarm current required. Generally, when the same size conductors are used for multiple notification appliance circuits, calculation should only be necessary for the longest or worst case circuit.

The Ohm's law point to point formula is recommended for these calculations, to determine the voltage drop in each segment of the circuit based upon the current required, times the wire resistance. The sum of the drop in all segments determines the total voltage drop.

As an alternate simpler method, voltage drop calculations can be based upon the total circuit resistance times the total circuit load. The calculated drop in this instance will always be substantially higher than the actual voltage drop. In either case, recommend the maximum permissible voltage drop not exceed 10% of the system supply voltage unless local codes specify otherwise.

Voltage (pressure) drop in a circuit is the result of wire resistance, which is determined by both the size (diameter) and length. It can be compared with the drop in water pressure in a hose line resulting from friction loss, with identical factors involved: the size and length of the hose.

Excessive pressure drop in a hose line can reduce the flow in GPM to an unacceptable level. Similarly, excessive voltage drop in a circuit can reduce current flow (amperes) that it may be inadequate to properly operate power-consuming electrical devices.

## Single Line Wiring Diagram

The single line or riser diagram indicates system components connected to individual circuits in the system. Components connected to a common circuit are shown as being connected by a single line, regardless of the number of conductors used for the circuit. Indicate the number of conductors in each wiring segment by right angle marks

across the single line at that point or by other appropriate means. The term "riser diagram" frequently used to describe this drawing does not refer to a sprinkler riser.

## **Conduit Fill Percentages**

Part 3 of Title 24 CCR, the California Electrical Code (CEC) limits the amount of conduit fill to a maximum of 40%. Chapter 9 of Part 3 provides tables indicating the maximum number of conductors of various sizes, to be used in various sizes of conduit to comply with the 40% limitations.

## **Fire Alarm System Submittal Checklists**

These lists may help with the process. Please review each before sending in plans and documents.

### **Administrative Items**

- Permit application
- Payment for plan review and inspection fees
- Installing contractors name, address, phone number
- Contractors license & local business license numbers
- Copy of workers compensation insurance certificate
- Site address
- Basis for system installation Building Code occupancy classification
- Building owner and/or tenant

### **Fire Alarm Equipment**

- Manufacturer's specification sheets
- Equipment application per SFM listing and UL/FM approvals
- CSFM building materials SFM listing numbers

### **General Information**

- Appropriate codes & standards, including edition
- Type of system or service involved
- Voice evacuation message and language(s)
- Written sequence of operation or matrix table
- Combination systems specific additional uses
- HVAC system locations greater than 2000 CFM. ○ California Mechanical Code is not referring to individual units over 2000 CFM. For a room or area served by 3 units each 700 CFM, you must comply with codes that require duct detectors.
- Special system features operating instructions
- Required certifications and placarding

## **Plans and Drawings**

- Scaled floor plan, including north reference
- Completed tide block with site address
- Include contractor's business address, phone, and fax
- Identification of each room's use
- Location of all components, included-of-line devices, if applicable
- Symbol legend, including quantities, manufacturer's name, model
- Identification of circuit styles, designations and methods
- Description of zone assignments & device addresses
- Complete budding cross section, include attic, soffit, or ceiling
- Location of sprinkler system test valve
- Specifications and details of through-penetration fire stopping. UL Fire Resistance Directories
- Device mounting heights for manual boxes
- Device mounting heights for audible devices
- Device mounting heights for visible notification appliances
- Primary power supply details
- Secondary power supply calculations
- Voltage drop calculations

## **Single Line Riser Diagram**

- Conductor information, including size, stranding, insulation
- Conduit fill calculations or NEC reference
- Location of end-of-line devices

For questions about or ready for inspection, please contact the [Fire Prevention Division](#).