Simplex®

Common Code Requirements for Fire Alarm Systems

- **NFPA**
  - **70-1996**
  - **72-1996**
  - **90A-1996**
  - **101-1994**
- **BOCA** **Basic National Building Code**
- **SBCCI** **Standard Building Code**
- **ICBO** **Uniform Building Code**
- **IFCI** **Uniform Fire Code**
- **IMC** **International Mechanical Code**

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For your reference, Simplex has extracted and edited commonly-used sections from NFPA and recognized building codes that are important to life safety and fire alarm systems.

This material is not intended to be used as a substitute for the current, complete codes applicable in your area or the local authorities having jurisdiction. This material is current only as of the date it was compiled.

Contents

Definitions

NFPA 72-1996 National Fire Alarm Code

Local Fire Alarm System

A system which provides alarm notification for evacuation and other system functions only at the protected premises. The primary purpose being life safety, the secondary purpose being property protection.

Auxiliary Fire Alarm System

A system which provides the communication means between the protected premises and the fire department.

Remote Station Fire Alarm System

A system which provides the means of transmitting alarm, trouble, and supervisory signals to a remote supervising station where trained, competent personnel are in constant attendance.

Proprietary Fire Alarm System

An installation of fire alarm systems that serve one property or multiple properties under one ownership from a proprietary supervising station located at the protected property where trained, competent personnel are in constant attendance.

Central Station Fire Alarm System

A system or group of systems which provides competent operators at a supervising station, who upon receipt of a signal from the protected premises takes appropriate action. Central station service is controlled and operated by a person, or corporation whose business is the furnishing, maintaining, or monitoring of supervised fire alarm systems.

Emergency Voice/Alarm Communication

Systems providing dedicated manual and automatic facilities for the origination, control, and transmission of information and instructions pertaining to a fire alarm emergency to the occupants (including fire department personnel) of the building. These systems have minimum requirements for emergency voice/alarm communication.

NFPA 90A — Installation of air conditioning and ventilating systems, 1996 edition.

"One of the purposes of this standard is to provide needed information concerning the proper use of smoke detectors in duct applications."

NFPA 101-1994 — Code for safety to life from fire in building and structures, 1994 edition.

"The purpose of this code is to establish minimum requirements that will provide a reasonable degree of safety from fire in buildings and structures."

BOCA, SBCCI, ICBO — "The National Basic Building Code and National Fire Prevention Code published by the Building Officials and Code Administrators International (BOCA), the Uniform Building and Uniform Fire Code of the International Conference of Building Officials (ICBO), and the Standard Building Code and the Standard Fire Prevention Code of the Southern Building Code Congress International (SBCCI) all have reference to fire alarm requirements."

Many states and cities have adopted these model building codes in full or in part.

"Consult with your local Authority Having Jurisdiction to verify the requirements for your area."

NFPA 70
National Electric Code (NEC)

The following are general wiring guidelines for the installation of Fire Alarm Systems including all circuits controlled and powered by the Fire Alarm System. For further clarification of the statement, refer to the appropriate section that is noted after each statement in the NFPA 70 standard, 1996 edition.

ARTICLE 760

- **General**

- Fire alarm systems are classified as nonpower-limited or power-limited.
    - *Nonpower*-limited circuits must meet the requirements of Article 760, Parts A and B. [760-15(a)]
    - Power-limited circuits must meet the requirements of Article 760, Parts A and C. [760-15(b)]

- **Nonpower-Limited Circuits**
    - Installation wiring is in accordance with Section 300-15(b) and the appropriate articles of Chapter 3, except as provided in Sections 760-26 through 760-30. [760-25]
    - Conductors of different circuits in same enclosure [760-26].
        - Class 1 and nonpower-limited fire alarm circuits may occupy the same enclosure provided all conductors are insulated for the maximum voltage of any conductor. [760-26(a)]
        - Power supply and fire alarm wiring are allowed in the same raceway only when connected to the same equipment. [760-26(b)]
    - Conductor size and uses.
        - Copper conductors of Nos. 18 and 16 are allowed provided they do not exceed the ampacities given in Table 402-5. [760-27(a)]
        - Copper conductors larger that No. 16 must meet the ampacity requirements of Section 310-15 as applicable. [760-27(a)]
    - Insulation [760-27(b)]
        - Insulation for 600 volts
        - No. 16 or greater must comply with Article 310
        - Nos. 16 and 18 of type KF-2, KFF-2, PAFF, PTFF, PF, PFF, PGF, PGFF, RFH-2, RFHH-2, RFHH-3, SF-2, SFF-2, TF, TFF, TFN, TFFN, ZF, ZFF or conductors listed for nonpower-limited fire alarm circuit use.
    - Conductor Material [760-27(c)]
        - Conductors shall be solid or stranded copper.
    - •Multiconductor cable for circuits of 150 volts or less [760-30].
        - Listed for the purpose and marked per Table 760-31(g).

NPLFP – Nonpower-limited cable for use in space used for environmental air. [760-30(d)]

NPLFR – Nonpower-limited riser cable. [760-30(e)]

NPLF – Nonpower-limited (general purpose) cable. [760-30(f)]

- Cable must have two or more No. 18 or larger conductors.
- Installed in raceway or exposed per Chapter 3. [760-30(a)]
- Surface-mounted cable is not permitted within 7 feet of the floor unless installed in such a manner that maximum protection against physical damage is afforded by building construction, baseboards, door frames, ledges, etc. [760-30(a)1]
- Do not install nonpower-limited circuit conductors where exposed in ducts or plenums Ref. 300-22(b). [760-30(b)1]
- Type NPLFP is suitable for other spaces used for environmental air. *Exceptions*: Ref. 300-22 (c). [760-30(b)2]
- Type NPLFR is suitable for use in vertical runs. [760-30(b)3]
- Type NPLF is suitable in locations other than riser, or other spaces used for environmental air. (*Exception*: In raceway). [760-30(b)4]

- **Power-Limited Circuits**
  - Power sources per 760-41.
  - Circuit Marking
    - The circuit must be durably marked where plainly visible to indicate each circuit that is a power-limited circuit. [760-42]
  - Nonpower-limited wiring methods and materials [760-52(a)]
  - Installing power-limited circuits as nonpower-limited is allowed as long as the markings required by Section 760-42 are eliminated and the entire circuit is wired in accordance with part B.
  - Power-limited wiring methods and materials [760-52(b)].
    - Installed in raceway or exposed. (b)1
    - Protected against physical damage. (b)1&2
    - Installed in metallic raceway in hoistways. (b)3
  - Fire resistance of cables in buildings [760-71].
    - List cables per Section 760-71(d) through (f).

- Listings and markings [760-71]
  - Cables listed in accordance with 760-71(a) through (g).
  - Marked in accordance with Table 760-71(h).

    FPLP – Power-limited fire alarm plenum cable [760-71(d)]

    FPLR – Power-limited fire alarm riser cable [760-71(e)]

    FPL – Power-limited (general purpose) fire alarm cable [760-71(f)]
- Separation from Electric Light, Class 1, Power, and Nonpower-Limited fire alarm circuits. [760-52(a)]
  - Separate power-limited circuits at least 2 inches from conductors of electric light, class 1, power, and nonpower-limited fire alarm circuits.
  - Do not place power-limited circuits in any enclosure, raceway, cable, compartment, outlet box or similar fitting containing conductors of electric light, class 1, power, or nonpower-limited circuits. [760-54(a)(1)]

    Exception 1: When conductors of the different circuits are separated by a barrier.

    Exception 2: When conductors are introduced solely to connect to the equipment connected to power-limited circuits to which the other conductors are connected and there is a minimum .25-inch separation maintained between conductors.
  - In hoistways, install conductors or metallic tubing. [760-54(a)(2)]
- Conductors of different power-limited fire alarm circuits, Class 2, Class 3, and communications circuits in same cable, enclosure or raceway. [760-54(b)]
  - Cables and conductors of two or more power-limited fire alarm circuits, communication circuits, or class 3 circuits shall be permitted in the same cable, enclosure, or raceway. [760-54(b)(1)]
  - Conductors of one or more class 2 circuits shall be permitted within the same cable, enclosure, or raceway provided the insulation of the class 2 conductors is at least that required by the power-limited fire alarm circuit. [760-54(b)(2)]
  - Raceways shall not be used to support power-limited fire alarm circuit cables. [760-54(c)]

- Application of power-limited fire alarm circuit cable.
  Cable substitution per Table 760-61(d).

CABLE TYPE	SUBSTITUTION
FPLP	MPP, CMP, CL3P
FPLR	MPP, CMP, FPLP, CL3P, MPR, CMR, CL3R
FPL	MPP, CMP, FPLP, CL3P, MPR, CMR, CL3R, FPLR, MPG, MP, CMG, CM, PLTC, CL3

The following charts represent general and specific requirements of NFPA 72-1996

FEATURE	GENERAL REQUIREMENTS
Monitoring Integrity (Supervision)	Primary and secondary power supplies
	Initiating device circuits
	Notification appliance circuits
	Installation conductors and wiring connections
	Audio amplifiers and tone generators
	Suppression system actuating device and its circuit
	Detection devices used for fire safety control functions
	Detection devices used for door holder release service
	Interconnected fire alarm control units
Distinctive Signals	Fire alarm signals shall be distinctive in sound and used for no other purpose
	Distinctive evacuation signal (temporal pattern) required
	Supervisory signals shall be distinctive in sound from other signals
	Fire alarm, supervisory and trouble signals shall take precedence over other signals
Manual Fire Alarm Boxes	Minimum one per floor
	Operable part of box 3 1/2 to 4 1/2 feet above floor level
	Provide at least one box on automatic detection and waterflow detection systems
Automatic Fire Detectors	Installed per Chapter 5
	Alarm verification shall be permitted
	Positive alarm sequence shall be permitted
	Initiating device trouble contacts wiring shall not impair alarm transmission
Notification Appliances	Installation per Chapter 6
	Audible appliances Clearly heard - Sound level at least 15 dBa above ambient, or 5 dBa above maximum sound level at least 60 seconds
	Visible appliances Light source must not exceed 1000 candela (cd)
Sprinkler Systems	Waterflow alarm is required
	Maximum of 5 waterflow devices on a circuit
	Maximum of 20 supervisory devices on a circuit
	Supervise off-normal conditions. Provide distinctive signals for off-normal and restoration to normal
	Fire pump supervision is required
Certificate of Completion	Complete Parts 1, 2 and 4-10 after system installation and Part 3 after operational and acceptance are completed
Signal Annunciation	Protected premises fire alarm systems must annunciate alarm, supervisory, and trouble conditions

FEATURE	SPECIFIC REQUIREMENT BY SYSTEM				
	Auxiliary	Local	Proprietary	Remote Stat.	Voice Comm.
Battery Standby					
24 hrs. w/5 min. of alm.		X	X		
60 hrs. w/5 min. of alm.	X			X	
4 hrs. w/5 min. of alm. for generator standby system	X	X	X	X	
24 hrs. w/2 hrs. emergency system operation or 15 min. of evac. alm. at max. load					X

NFPA
72-1996 Chapter 3
General Guidelines for Fire Alarm Systems

The following are general guidelines for Fire Alarm Systems. For further clarification of the statement, refer to the appropriate paragraph that is noted after each statement in the NFPA 72-1996 National Fire Alarm Code.

- **Automatic Fire Detection Systems**
  - **Alarm Verification (3-8.2.3)**
    - Alarm verification features are permitted when approved by the Authority Having Jurisdiction (AHJ) provided that a smoke detector, continuously subjected to smoke concentration above alarm threshold, activates a system within one minute.

      Requirement: An alarm initiating device other than a smoke detector must activate the system within 15 seconds.
  - **Positive Alarm Sequence (1-5.4.11)**
    - Automatic detection and alarm systems having positive alarm sequence are permitted as long as they comply with the following:
      - At a control panel, trained personnel must acknowledge the signal from selected detectors within 15 seconds of annunciation so as to initiate an investigation. If the signal is not acknowledged within 15 seconds, all alarm functions must activate automatically.
      - Trained personnel have 180 seconds to investigate and reset the control unit. If the control unit is not reset, all signals must automatically and immediately activate.
      - If a second selected detector is activated during the investigation period, all alarm functions must activate automatically.
      - If any other device is activated, all alarm functions must activate immediately and automatically.
      - The system must provide a way to bypass the positive alarm sequence.
  - **Smoke Detector Applications**
    - The activation of two smoke detectors to produce an alarm is permitted if:
      - Approved by AHJ
      - At least two detectors are present in the protected area
      - Normally required detector spacing is cut by one-half for the protected area
      - Alarm verification is not used (3-8.2.5)
    - When control functions are operated directly from smoke detectors, the control must remain operable even when all devices on the same initiating circuit are in the alarm condition. (3-8.2.4)

- When a remote alarm indicator is provided for an automatic detector located in a concealed location, a permanent placard or other approved method at the remote alarm indicator must identify the detector's location and the area protected by the detector. (3-8.3)
- When automatic drift compensation of sensitivity for a detector is provided, the control unit must identify the detector that has reached its compensation limit. (3-8.4)

- **Combination Systems (3-8.13)**
  - Fire alarm service can share components, equipment, circuitry, and installation wiring with non-fire alarm systems. (3-8.13.1)
  - Short circuits, open circuits, or grounds on equipment or wiring of the non-fire alarm circuits must not interfere with the monitoring integrity of the fire alarm or prevent supervisory or alarm transmission. (3-8.13.2)
  - The removal, replacement, failure, or maintenance procedure on any hardware, software, or circuit not used for fire alarm must not cause loss of any fire alarm functions. (3-8.13.3)
  - Speakers used as fire alarm notification appliances can not be used for non-emergency purposes. (3-8.13.4)
  - Fire alarm signals must be distinctive, clearly recognizable, and take precedence over any other signal. (3-8.13.5)
  - If the information being displayed or annunciated on a combination system is excessive, the AHJ is permitted to require that information for the fire alarm system be separate from and have priority over information from the non-fire alarm systems. (3-8.13.6)

- **Elevator Recall for Fire Fighter s Service (3-8.14)**
  - System-type smoke detectors in the elevator lobby, elevator hoistway, and elevator machine room used to initiate elevator recall must connect to the building fire alarm system. (3-8.14.1)
    - Unless otherwise approved by the AHJ, only the elevator lobby, elevator hoistway and elevator machine room detectors are to recall the elevators. (3-8.14.1)

- Elevator lobby, elevator hoistway, and machine room smoke detectors must still have the capability of elevator recall when all devices on the same circuit are placed into alarm. (3-8.14.2)
- Detectors shall not be located in the hoistway unless protected by automatic sprinklers. (3-8.14.3)
- If ambient conditions preclude the use of smoke detectors in hoistways, other appropriate automatic fire detection is permitted. (3-8.14.4)
- Elevator lobby, elevator hoistway, and machine room smoke detectors must initiate an alarm on the building fire alarm system and annunciate the circuit or zone at the control and remote annunciator. The hoistway and machine room detectors are not required to actuate the building evacuation signals if alarm conditions are indicated at a constantly attended location. (3-8.14.5)
- For each group of elevators within a building, three elevator zone circuits must terminate at the designated elevator controller in the group's elevator machine room. Operation must conform to ANSI/ASME A17.1, rules 211.3 through 211.8. (3-8.14.6)
    - The lobby smoke detector for the designated recall elevator must connect to the first zone.
    - The remaining lobby, elevator hoistway, and machine room smoke detectors must connect to the second zone.
    - The elevator hoistway and machine room smoke detectors shall actuate the third zone. In addition, where the elevator machine room is located at the designated level, that machine room detector shall also actuate the first zone.

- **Elevator Shutdown (3-8.15)**
  - Heat detectors used to shut down elevator power prior to sprinkler operation must have a lower temperature rating and higher sensitivity than the sprinkler. (3-8.15.1)
  - Place heat detectors within 2' of a sprinkler. (3-8.15.2)
  - The use of time delays is not permitted where pressure or waterflow switches are used to shutdown elevator power immediately upon or prior to the discharge of water from sprinklers. (3-8.15.3)

- **Trouble Signals to Supervising Station (3-8.16)**
  - A primary or secondary power failure condition at the control panel of the fire alarm system at the protected premises shall be transmitted to the supervising station. Relays or modules providing the transmission shall provide fail-safe operation. (3-8.16.1 & .2)

- **Fire Safety Control Functions (3-9)**
  - Place an auxiliary relay connected to the fire alarm system within 3' of the controlled circuit or device, and monitor the circuit. (3-9.2.1)

    Exception: When conductors of the different circuits are separated by a barrier.

- Fire safety functions must not interfere with the fire alarm system. (3-9.2.2)
- Requires listing the compatibility of the fire control unit and the fire safety control devices. (3-9.2.4)
- Provide visible status indicators of the control circuits when manual controls are provided for emergency functions. (3-9.2.6)

- **Heating, Ventilation, and Air Conditioning (HVAC) Systems (3-9.3)**
  - Monitor all detection devices used to cause the operation of smoke dampers, fire dampers, fan control, smoke doors, and fire doors. (3-9.3.2)
  - Connections for the purpose of monitoring and control between fire alarm systems and HVAC systems must operate and be monitored in accordance with applicable NFPA standards. (3-9.3.3)
  - When the fire alarm control actuates the HVAC system for smoke management, the fire alarm zones shall be coordinated with the smoke control zones they actuate. (3-9.3.4)

- **Door Release Service (3-9.4)**
  - Monitor all detection devices used for door release, whether integral or stand alone. (3-9.4.2)
  - Monitor all door release and integral door release and closure devices used for release service. (3-9.4.3)
  - Magnetic door holders shall not be required to have a secondary power source. (3-9.4.4)

- **Door Unlocking Devices (3-9.5)**
  - Connect any device intended to effect the locking/unlocking of emergency exits to the fire alarm system. (3-9.5.1)
  - All emergency exits connected to the fire alarm must unlock upon receipt of any fire alarm signal. (3-9.5.2)
  - All emergency exits connected to the fire alarm system must unlock upon loss of primary power. Secondary power must not be used to maintain these doors locked or unlocked. (3-9.5.3)

- **Suppression System Actuation (3-10)**
  - Fire alarm systems listed for releasing service shall be permitted to provide automatic or manual actuation of the suppression systems. (3-10.1)
  - Supervise the integrity of each releasing device. (3-10.2)
  - Monitor the integrity of the wiring. (3-10.3)
  - Fire suppression releasing service must have a disconnect switch for system testing purposes. The operation of the disconnect switch must cause a trouble condition. (3-10.4)
  - Install one or more fire detectors in each space protected by an automatic suppression system actuated by the fire alarm system. (3-10.6)

- Suppression systems shall be controlled by a single control unit and where the protected premises has a separate fire alarm system, the operation of the suppression system control unit shall not be affected by the protected premises system but shall be monitored by it. (3-10.7)

- **Interconnection of Fire Alarm Control Units (3-11)**
  - Fire alarm systems may have all detection, notification, and auxiliary functions in a single system, or a combination of component subsystems. Fire alarm components may share control equipment or be able to operate as a stand alone subsystem, but in each case must be arranged to operate as a single system. All components of subsystems must be capable of simultaneous full load operation.
  - The means of interconnection of control units must use properly rated electrical contacts, have compatible digital data interfaces, or use other listed methods and meet the fire alarm system monitoring requirements. (3-11.1)
  - The Authority Having Jurisdiction (AHJ) may permit a stand alone subsystem to be monitored by the fire alarm system as an initiating device. (3-11.2)
  - Monitor each interconnected control unit separately for alarm, trouble, and supervisory conditions. (3-11.2.1)
  - Interconnected control unit alarm signals must be permitted to be monitored by zone or combined as common signals as appropriate. (3-11.2.2)
  - Unless specifically permitted by the AHJ, control units shall only be capable of being silenced or reset from the protected premises. (3-11.3)

- **Emergency Voice/Alarm Communications (3-12)**
  - **General Service (3-12.1)**
    - Emergency voice/alarm communication service shall be provided by a system with automatic or manual voice capability installed to provide voice instructions to the building occupants where it is intended that only partial or selective evacuation or directed relocation of building occupants occur.

      Exception: Where systems are used to evacuate all occupants during a fire emergency, manual or selective paging shall not be required.
  - **Survivability (3-12.3)**
    - Locate the fire command and central control unit within a minimum 1-hour rated fire resistive area with a minimum of 3’ clearance about the face of the fire command control unit. (3-12.4.1)

      Exception: The fire command center may be located in a lobby when permitted by the AHJ.
    - When the fire command control unit is remote from the central control equipment, the wiring must be in conduit or metal raceway not exceeding 100’ or enclosed in a 2-hour fire rated enclosure. [3-12.4.3 (b)1&2]
    - Route the primary power wiring in areas that are characteristic of limited combustible as defined in NFPA 90A. [3-12.4.3(b)]

- **Voice/Alarm Signaling Service (3-12.6)**
  - Provide an automatic response to a signal indicating a fire emergency, manual control of evacuation and alert tone signals, and voice directions on a selective and all call basis. (3-12.6.1)

    Exception 1: In a command center where trained operators are in constant attendance, capable of signal acknowledgment with in 30 seconds, automatic response is not required.

    Exception 2: Where systems are used to evacuate all occupants during a fire emergency, selective voice instructions shall not be required.
- **Multichannel Capability (3-12.6.2)**
  - Multi-channels allowing an evacuation signal on one zone and paging on other zones is permissible.
- **Functional Sequence (3-12.6.3)**
  - The following must immediately transmit either automatically or after a delay acceptable to the AHJ: (3-12.6.3.1)

    (a) An alert tone of 3 - 10 seconds followed by a message repeated at least three times to inform occupants.

    (b) An evacuation signal to the alarm zone and other zones in accordance with the building fire evacuation plan.

    Exception: Where systems are used to evacuate all occupants during a fire emergency, and the functional sequence in (a) above is provided, selective voice instructions shall not be required.
  - Failure of the message must sound the evacuation signal automatically. Provide provisions for manual operation. (3-12.6.3.2)
  - Live voice instructions must override all previously initiated signals on that channel. (3-12.6.3.3)
  - Arrange to provide visible indication of off/on status for their associated zones, where manual controls are provided. (3-12.6.3.4)
- **Fire Command Station (3-12.6.5)**
  - Place the command station near the entrance of a building or where approved by the AHJ. The fire command center must provide a communication center for the arriving fire department and provide for control and display of the status of detection, alarm, and communications systems. (3-12.6.5.1)
  - Combining the fire command center with other building operations and security centers is permitted. (3-12.6.5.1)
  - The fire command station must control the emergency voice/alarm communications signaling service, and where provided, the two-way telephone communications service. Controls for manual initiation of signals shall be restricted to trained and authorized personnel. (3-12.6.5.2)

- Where there are multiple fire command centers, the center in control shall be identified by a visible indication at that center. (3-12.6.5.3)

- **Loudspeakers (3-12.6.6)**
  - Requires listing loudspeakers and their enclosures for voice/alarm signaling service. (3-12.6.6.1)
  - Locate at least two loudspeakers per paging zone so as to be heard above maximum noise level. (3-12.6.6.2)
  - Each elevator car must have a loudspeaker connected to the paging zone serving the elevator group in which the elevator car is located. (3-12.6.6.3)
  - Each enclosed stairway over two stories in height shall be equipped with loudspeakers connected to a separate paging zone. (3-12.6.6.4)
- **Evacuation Signal Zoning (3-12.7)**
  - Where two or more evacuation zones are provided, arrange these zones to be consistent with fire or smoke barriers. Do not divide undivided areas into evacuation signaling zones. (3-12.7.1)
  - Where multiple notification appliance circuits are provided in a single evacuation zone, all of the notification appliances in the zone must activate simultaneously. (3-12.7.2)
- **Two-Way Telephone Communication Service (3-12.8)**
  - Must be available for use by the fire service. Use by the building fire warden, fire and emergency reporting, and other use is permissible with AHJ approval. Variation of equipment and operation to facilitate operation must not adversely affect fire service performance. (3-12.8.2)
  - Must be capable of simultaneous operation of any five telephone stations in common talk mode. (3-12.8.3)
  - Provide a distinctive off-hook condition at the fire command station. Furnish a distinctive visible indication for each selectable circuit where selective talk is provided. (3-12.8.4)
  - A silencing switch for a call-in signal sounding appliance is permitted only if it is located in a locked cabinet or is equivalently protected from unauthorized use. The switch must operate a visible indication and sound a trouble if in the silenced position and no telephone circuits are off-hook. On a selective system the switch must not prevent subsequent telephones going off-hook from sounding an off-hook signal. (3-12.8.5)
  - A common talk circuit is a minimum requirement. A selective talking system is a minimum requirement for fire warden use. Either system must be capable of operating 5 phones. Provide at least one phone station or jack per floor and at least one per exit stairway. Place at least one telephone station or jack in each fire pump room, where provided. (3-12.8.6)

- When the two-way telephones are used by fire wardens as well as the fire service, the minimum acceptable system is a selective talk system. In additional to locations as required for fire service use, additional stations or jacks shall provide at least one location within each paging zone. Circuits shall be selectable individually, or when approved by the AHJ, by floor or stairway. (3-12.8.7)
- Clearly and permanently label each telephone station in a common talk system. (3-12.8.8)
- Store a sufficient number of portable handsets at the fire command center where jacks are provided. (3-12.8.9)

- **Supervising Station Fire Alarm Systems (Chapter 4)**

- **Communication Methods for Off-Premises Fire Alarm Systems**

- **Active Multiplex Transmission Systems (4-5.3.1)**
  - Maximum operating time parameters. (4-5.3.1.2.3)
  - Initiation of an alarm to time of record at supervising station must not exceed 90 seconds.
  - Record subsequent alarms at a rate no slower than one every ten seconds.
  - Time lapse to record an adverse condition on a transmission channel must not exceed 90 seconds for a Type 1 or Type 2, and 200 seconds for Type 3 systems.
  - A system having 500 or more initiating device circuits must be able to record at least 50 simultaneous status changes in 90 seconds.
  - A system having less than 500 initiating device circuits must be able to record at least 10% of the total simultaneous status changes in 90 seconds.

- **Digital Alarm Communicator Systems (4-5.3.2)**

- **Digital Alarm Communicator Transmitter (DACT) (4-5.3.2.1)**
  - At the protected premises, a DACT must connect upstream of any private telephone system and must have two separate means of transmission. Connect the DACT to a loop start telephone circuit, do not connect to a ground start or party-line telephone circuit.
  - The telephone line that the DACT is connected to shall be under the control of the owner of the protected premises. (4-5.3.2.1.1)
  - DACT's shall use one of the following combinations of transmission channels: (4-5.3.2.1.6.1)
    - Two telephone lines;
    - One telephone line and one cellular telephone connection;
    - One telephone line and a one-way radio system;
    - One telephone line equipped with a derived local channel;
    - One telephone line and a one-way private radio alarm system;
    - One telephone line and a private microwave radio system;
    - One telephone line and a two-way RF multiplex system.

- Until June 1, 1998 it is necessary to test only the primary line every 24 hours and after June 1, 1998 it shall be permitted to alternately test the primary line and the secondary line every 48 hours. *(The primary line one day; the secondary line the next.)* (4-5.3.2.1.6.2 Exception 2)

- **Digital Alarm Communicator Receiver (DACR) (4-5.3.2.2)**
  - Provide spare DACRs in the remote station with switching ability. Switching must occur within 30 seconds. (4-5.3.2.2.1.1)
    - Limit incoming telephone lines to 8. (4-5.3.2.2.1.2)
    - Connect a DACR to a minimum of 2 separate incoming telephone lines. (4-5.3.2.2.2.1)
    - Annunciate visually and audibly at the supervising station a failure of a telephone line due to loss of voltage. (4-5.3.2.2.2.2)
    - A signal must be received at least once every 24 hours, failure of transmission must result in a trouble signal. (4-5.3.2.2.2.4)

- **McCulloh Systems (4-5.3.3)**
  - A coded signal must consist of at least 3 rounds. (4-5.3.3.1.1)
  - A coded fire alarm box must produce not less than 3 signal impulses for each revolution of the code wheel. (4-5.3.3.1.2)
  - A single break or ground fault must not cause a false alarm or prevent transmission of an alarm. (4-5.3.3.2.1 & 4-5.3.3.2.2)
  - One transmission channel must not serve more than 25 plants. (4-5.3.3.3.6)
  - One sprinkler supervisory channel must not serve more than 25 plants. (4-5.3.3.3.7)

- **Two-Way RF Multiplex Systems (4-5.3.4)**
  - The maximum operating time parameters are the same as the Active Multiplex System, except that the time lapse to record an adverse condition on a transmission channel must not exceed 90 seconds for Types 4 and 5. [4-5.3.4.1(b)]
  - Monitor the following at the supervising station: [4-5.3.4.2(a)]

    (a) RF transmitter in use (radiating).

    (b) Failure of AC power.

    (c) RF receiver malfunction.

    (d) Indication of automatic switchover.

- Control the independent deactivation of either RF transmitter at the supervising station. [4-5.3.4.2(b)]
- Two-way RF multiplex systems are divided into Type 4 or Type 5 categories based upon ability to perform under adverse conditions. [4-5.3.4.4(a) & (b)]

- **One-Way Private Radio Alarm Systems (4-5.3.5)**
  - Require a 90% probability of an alarm record within 90 seconds. [4-5.3.5.2(a)]
  - Require a 99% probability of an alarm record within 180 seconds. [4-5.3.5.2(b)]
  - Require a 99.999% probability of an alarm record within 7.5 minutes, and a subsequent alarm record within 10 seconds. [4-5.3.5.2(c)]
  - Monitor the following at the supervising station: (4-5.3.5.3.1)
    (a) Failure of AC power to the radio equipment.
    (b) RF receiver malfunction.
    (c) Indication of automatic switchover.
    (d) Interconnections between elements of the transmitting equipment including the antennas, must be monitored to cause an indication of failure at the protected premises or the supervising station. (4-5.3.5.3.2.1)
  - Non-public one-way radio alarm systems must be classified as Type 6 or Type 7. [4-5.3.5.5(a) & (b)]

- **Directly-Connected Non-Coded Systems (4-5.3.6)**
  - Arrange circuits between the fire alarm control unit or transmitter and the supervising station so that a single open or single ground fault will not prevent an alarm transmission. [4-5.3.6.1(a)]
  - Separate alarm and supervisory circuits. (4-5.3.6.2)
  - A single break or ground fault must not cause a false alarm. (4-5.3.6.3)
  - A single circuit must not serve more than one plant. (4-5.3.6.5.2)

- **Private Microwave Radio Systems (4-5.3.7)**
  - Where more than 5 buildings or 50 initiating or notification circuits are serviced the following must apply: (4-5.3.7.2)
    (a) Provide dual supervised transmitters.
    (b) Transmitters must operate on a 2:1 time ratio.
    (c) Provide dual receivers, failure of one must be annunciated and must not interfere with the operation of the other.
  - Supervise the following at the supervising station: [4-5.3.7.3(a)]
    (a) Transmitter in use.
    (b) Failure of AC power to the radio equipment.
    (c) Receiver malfunction.
    (d) Indication of automatic switch over.

- Either transmitter must be capable of being independently deactivated from the supervising station. [4-5.3.7.3(b)]

- **Display and Recording (4-5.4)**
  - Status change signals must provide the following information: (4-5.4.1)
    (a) Type of signal; alarm, supervisory, delinquency, or trouble signal.
    (b) Condition; Identification of the signal to differentiate between initiation of an alarm, supervisory, delinquency, or trouble signal, and a restoration to normal from one or more of these conditions.
    (c) Location; Identification of the point of origin of each status change signal.
  - Restore normal service with spare parts within 30 minutes if duplicate equipment for receiving, processing, recording, and displaying a signal is not provided. (4-5.4.2)

    Exception: Proprietary and remote station systems.
  - Provided the following terms are met, any method of recording and display is permitted. (4-5.4.3)
    (a) Each change of status requires an audible signal and two methods of identifying the status change.
    (b) Automatic recording of each change.
    (c) Failure to acknowledge a status change must not prevent subsequent alarm signals from being received.
    (d) To differentiate from previously acknowledged status changes, display status changes requiring operator action.
    (e) Each incoming signal to a DACR or DARR must cause an audible signal that must continue until manually acknowledged.

ANY OF THE ABOVE COMMUNICATION METHODS MAY BE USED WITH ANY SUPERVISING STATION.

NFPA
72-1996 Chapter 5
General Guidelines for Heat and Smoke Detectors

The following are general guidelines for installing and locating heat and smoke detectors. For a further clarification of the statement, refer to the appropriate paragraph that is noted after each statement in the NFPA 72-1996 National Fire Alarm Code.

- **Installation**

  - If a mechanical guard is used to protect a smoke detector or heat detector; it shall be listed for use with the detector being used. (5-1.3.1)
  - Install detectors in all areas where required by the appropriate NFPA standard or the Authority Having Jurisdiction. (5-1.3.3)
  - Install heat detectors in all areas where required either by the appropriate NFPA standard or the Authority Having Jurisdiction. (5-2)
  - Support detectors, in all cases, independently of their attachment to the circuit conductors (wiring). (5.1.3.2)

- **Location**

  - Locate heat detectors upon the ceiling not less than 4" from the side wall or on the side walls between 4" and 12" from the ceiling. See Figure 1. (5-2.2.1)

    Exception: In the case of beam construction where beams are less than 12" in depth and less than 8' on center, installing detectors on the bottom of the beams is allowed.

  - Locate smoke detectors on the ceiling not less than 4" from the sidewall to the near edge, or if on a sidewall, between 4" and 12" down from the ceiling to the top of the detector. See Figure 1. (5-3.4.3.1)

  - On smooth ceilings, place smoke detectors on 30' centers as a guide. Use other spacing depending on ceiling height, conditions, or response time requirements. In all cases, follow the manufacturer's recommendations. (5-3.4.5.1.1)

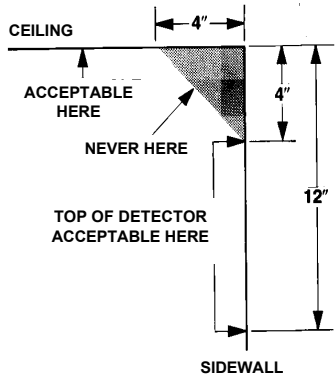


Figure 1

  - If exposed beam construction is used and the beams exceed 18" in depth and are more than 8' on centers, treat each bay as a separate area requiring at least one heat detector. (5-2.4.3)

- If ceiling height is 12 feet or less and beam depths are 1 foot or less, smooth ceiling spacing parallel to the beams shall be used. Spacing, perpendicular to the beams shall be reduced 50 percent. Detectors shall be located on either the ceiling or the bottom of the beams. [5-3.4.6.1(a)]
- If ceiling height exceeds 12 feet or beam depths exceed 1 foot, detectors shall be located in every beam pocket. [5-3.4.6.1(b)]
- If a sloped ceiling has beams parallel to the slope, flat beamed ceiling spacing shall be used. The average ceiling height of the slope shall be used. If the ceiling slope is greater than 10 degrees, the detectors located at ½ the spacing from the low end are not required. [5-3.4.6.2(a)]
- If a sloped ceiling has beams perpendicular to the slope, flat beamed ceiling spacing shall be used. Average ceiling height of the slope shall be used. [5-3.4.6.2(b)]
- A projected beam detector is equivalent to a row of spot-type detectors. (5-3.4.6.3)
- If placing detectors on sloped ceilings, begin by spacing and locating the detectors within 3' of the peak (measured horizontally). The number and spacing of additional detectors, if any, must be based on the horizontal projection of the ceiling. See Figure 2. (5-2.4.4.1 & 5-3.4.7)

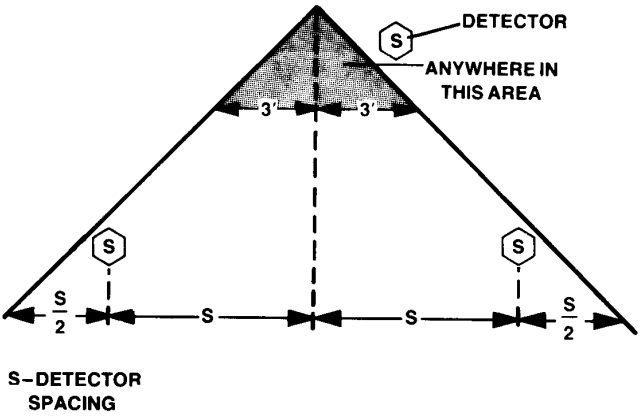


Figure 2

- If placing detectors on a shed-type ceiling, begin by spacing and locating the detectors within 3' of the high side of the ceiling (measured horizontally). See Figure 3. (5-2.4.4.2 & 5-3.4.8)

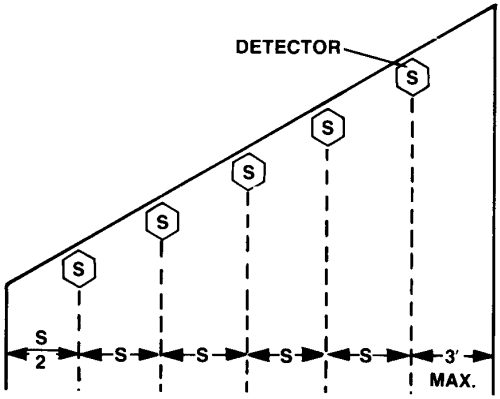


Figure 3

- Spaces below raised floors and above suspended ceilings shall be considered separate rooms for detector spacing. Even if these spaces are used for environmental air, detection shall not be an alternative to providing detection within the room or space. (5-3.4.9)

- For irregular-shaped areas, the spacing between detectors may exceed the selected spacing. Do not allow the furthest point from a wall or corner to be greater than 0.7 times the selected spacing. See Figure 4. (5-2.4.1.1, 5-3.4.5.1.2)

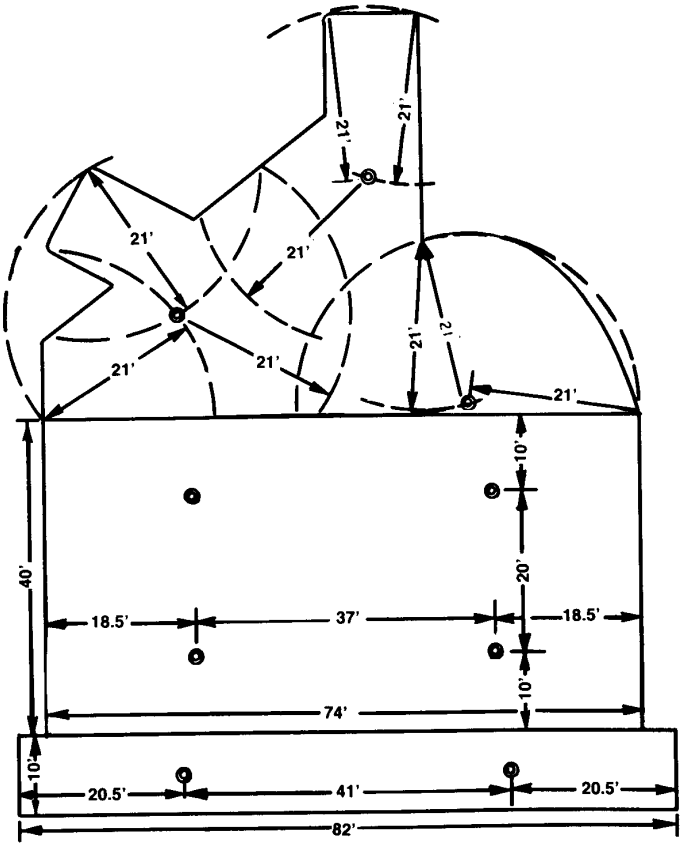
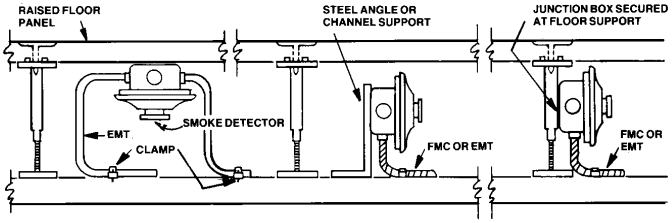
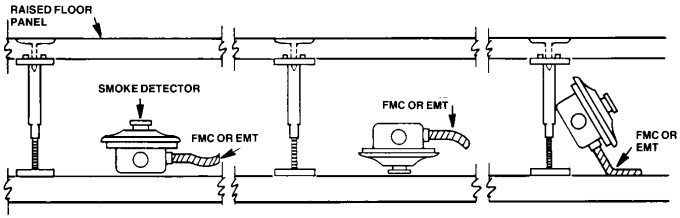


Figure 4

- To minimize dust contamination of smoke detectors installed in raised floor spaces, mount detectors according to their listing and manufacturer's instructions. See Figure 5. (5-3.4.3.2)



MOUNTING INSTALLATIONS - PERMITTED



MOUNTING INSTALLATIONS - NOT PERMITTED

Figure 5

- Do not locate smoke detectors directly in the air stream of supply registers but shall be located to intercept airflow toward return air openings. This is not in lieu of normal spacing requirements and additional detectors may be required for adequate coverage. (5-3.5.1)
- Installing detectors listed for the air velocity present at the opening where the return air enters the common return air system is allowed. See Figures 6, 7, and 8. (5-10.5.2.2)

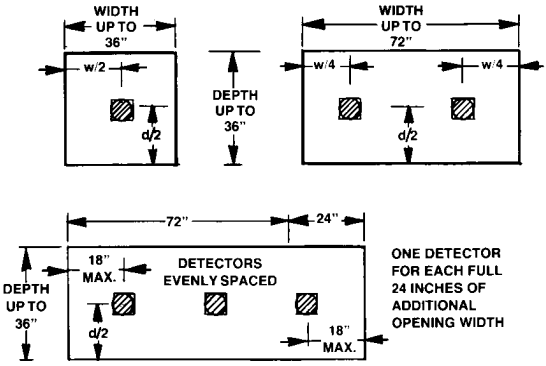


Figure 6

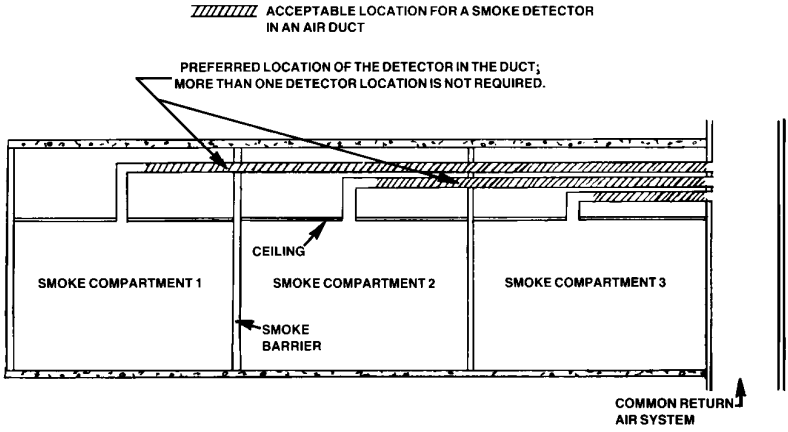


Figure 7

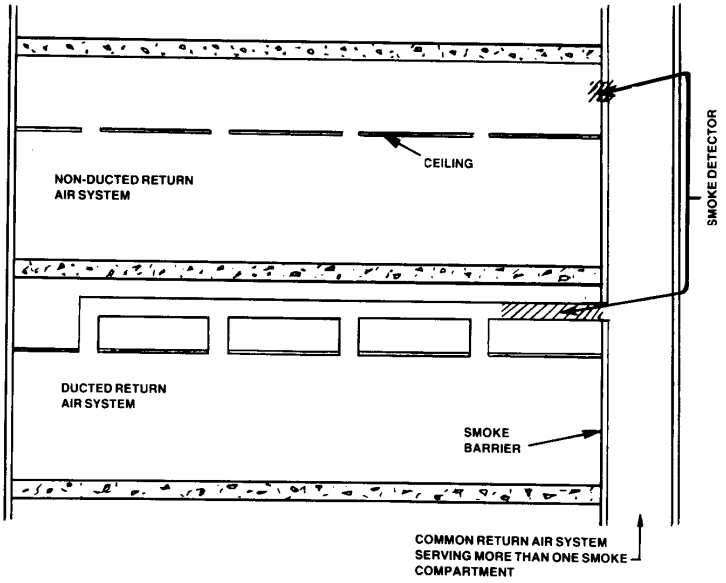


Figure 8

- In-duct smoke detectors installed in concealed locations, more than 10 feet above the floor shall be provided with remote alarm indicators clearly indicating their function and associated air-handling unit or be zoned separately at the fire alarm control unit. (5-10.6.8)

- Where doors are closed in response to smoke flowing in either direction, the following shall apply: (5-10.7.4.1)
  - ***Rule 1:*** Where the depth of the wall section above the door is 24" or less, one ceiling-mounted detector is required on one side of the doorway only. See Figure 9. (5-10.7.4.1.1)
  - ***Rule 2:*** Where the depth of wall section above the door is greater than 24", two ceiling-mounted detectors are required, one on each side of the doorway. See Figure 9. (5-10.7.4.1.2)

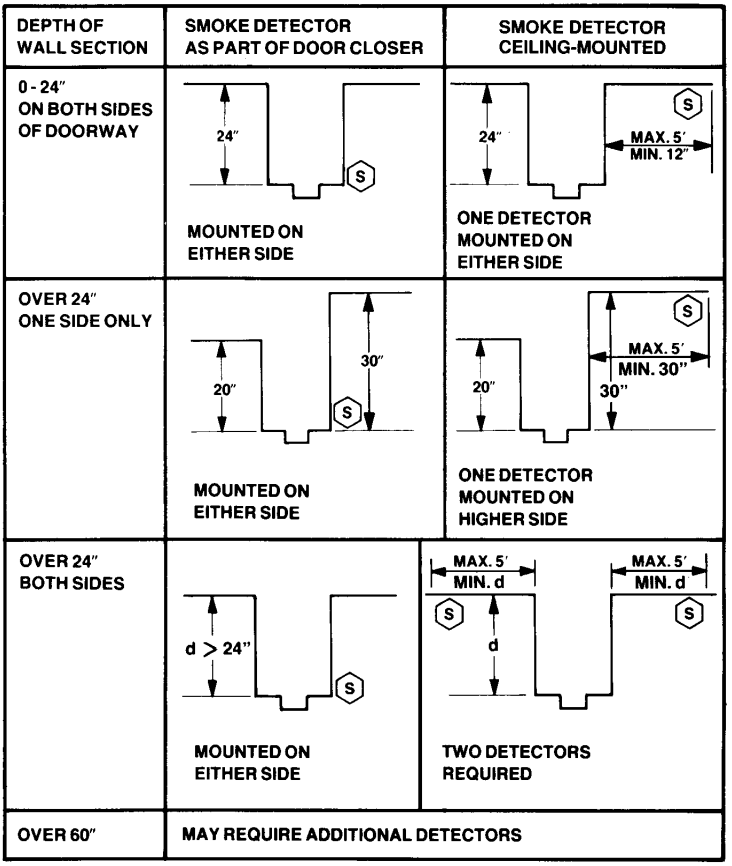
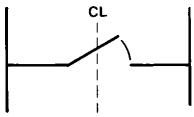
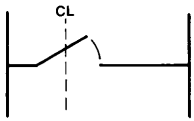
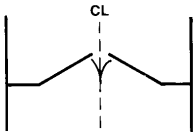
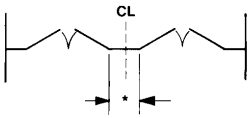
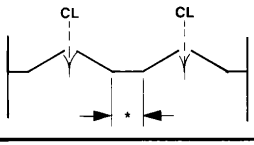


Figure 9

- ***Rule 3:*** Where the separation between doorways exceeds 24", treat each doorway separately. See Figure 10. (5-10.7.4.3.1)

		DETECTOR(S) LOCATION
	SINGLE DOOR	ON CENTER LINE OF DOORWAY
	DOOR OFFSET FROM CENTER LINE OF HALL	ON CENTER LINE OF DOORWAY
	DOUBLE DOOR	ON CENTER LINE OF DOORWAY
	* = 24" OR LESS	ON CENTER LINE OF SEPARATION
	* = MORE THAN 24"	ON CENTER LINE OF EACH DOORWAY

CL = CENTER LINE

Figure 10

- ***Rule 4:*** Treat each group of three doorway openings separately. See Figure 11. (5-10.7.4.3.2)

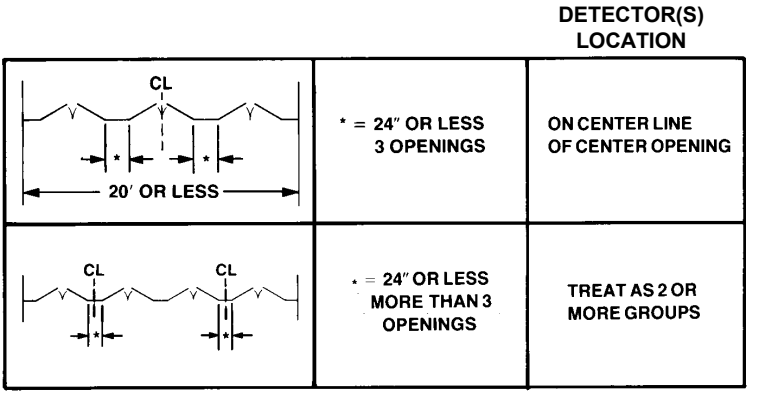


Figure 11

- ***Rule 5:*** Treat each group of doorway openings separately when they exceed 20 ft. in width measured at their overall extremes. See Figure 12. (5-10.7.4.3.3)
- ***Rule 6:*** Mount ceiling-mounted smoke detectors no more than 5’ and no less than the distances shown in Figure 9. (5-10.7.5.1)

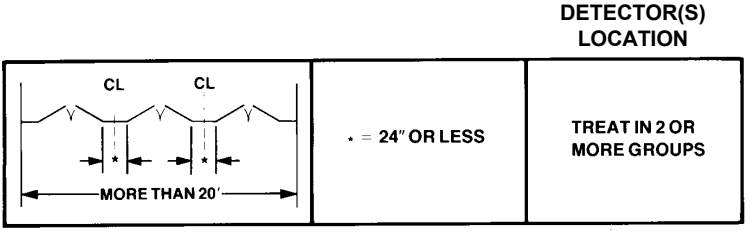


Figure 12

- Electrical and mechanical influences may affect smoke detectors. See Table 1. [5-3.6.1.2(b)]

Table 1

Sources of Electrical and Mechanical Influences on Smoke Detectors

Electrical Noise and Transients	*Airflow*
Vibration or Shock	Gusts
Radiation	Excessive Velocity
Radio Frequency	
Intense Light	
Electrostatic Discharge	
Lightning	
Power Supply	

- Aerosols, particulate matter, moisture, or air flow may affect smoke detectors. See Table 2 [5-3.6.1.2(a)]

Table 2

Common Sources of Aerosols and Particulate Matter Moisture

Moisture	*Engine Exhaust*
Live Steam	Gasoline Forklift Trucks
Steam Tables	Diesel Trucks and Locomotives
Showers	Engines not Vented to the Outside
Humidifiers	
Slop Sink	*Heating Element with Abnormal Conditions*
Humid Outside Air	
Water Spray	Dust Accumulation
	Improper Exhaust
Combustion Products and Fumes	Incomplete Combustion
	Other
Cooking Equipment	
Ovens	Excessive Tobacco Smoke
Dryers	Heat Treating
Fireplaces	Dust and Lint
Exhaust Hoods	Linen/Bedding Handling
Cutting, Welding. And Brazing	Sawing, Drilling, and Grinding
Machining	Pneumatic Transport
Paint Spray	Textile and Agricultural Processing
Curing	
Chemical Fumes	
Cleaning Fluids	

- Various environmental conditions may influence smoke detector performance. See Table 3. (5-3.6.1.1)

Table 3

Environmental Conditions that Influence Detector Response

Detection Principle	Air Velocity >300'/min.	Atm. Pressure >3000' above Sea Level	Humidity >93%	Temp. <32° F >100° F	Color of Smoke
Ion	X	X	X	X	O
Photo	O	O	X	X	X
Beam	O	O	X	X	O
Air Sampling	O	O	X	X	O

X = Detector response may change from factory setting.
O = Detector response unaffected from factory setting.

Note: Consult with your local Authority Having Jurisdiction to verify the requirements for your area.

NFPA
72-1996 Chapter 6
General Guidelines for Notification Appliances

The following are general guidelines for notification appliances of fire alarm systems. For a further clarification of the statement, refer to the appropriate paragraph that is noted after each statement in the NFPA 72-1996 National Fire Alarm Code.

Note: The Advisory Committee to the Architectural Transportation Barriers Compliance Board, ("The Access Board"), has accepted the Visible Notification requirements from the 1996 NFPA Chapter 6 for inclusion in the Americans with Disabilities Act Accessibility Guidelines, (ADAAG). However, because of its timely process, the new ADAGG will not be issued until approximately October 1998.

- **Installation**
  - Notification appliances shall be listed for use in any special environment where they are installed. (6-2.2)
  - Guards or covers used for mechanical protection of notification appliances shall be listed for use with the appliance. Any degradation in performance caused by the guard shall be documented in the installation instructions and their effect on performance be considered. (6-2.3)
  - Support appliances in all cases, independently of their attachments to the circuit wiring. (6-2.4)
  - **Audible Appliances (6-3)**
    - Audible appliances used for public mode applications shall produce no less than 75 dBa or more than 120 dBa at the minimum hearing distance from the appliance. (6-3.2.1)
    - Audible appliances used for private mode applications shall produce no less than 45 dBa or more than 120 dBa. (6-3.3.1)
    - Private mode appliances shall be a minimum of 10 dBa over ambient. (6-3.3.2)
    - Audible appliances used to signal sleeping areas shall be a minimum of 15 dBa over ambient or at least 70 dBa measured at the pillow; whichever is greater. (6-3.4)
    - Where ceiling heights permit, wall-mounted appliances should have their tops at heights above the finished floors of not less than 90" and below the finished ceiling of not less than 6". This does not preclude ceiling-mounted appliances. (6-3.5.1)
    - The above also applies to loudspeakers. (6-7.3)

- **Visual Appliance (6-4)**
  - Visible notification shall be used (to supplement the audible devices) when the average (ambient) sound level exceeds 105 dBa. (6-3.1.2)
  - The flash rate for visible appliances shall be 1 to 2 flashes per second. (6-4.2)
  - The light source color shall be clear or white and shall not exceed 1000 candela (cd) (effective intensity). (6-4.2.2)
  - Wall mounted appliances shall have their bottoms at heights above the finished floor of not less than 80" and no greater than 96". Install ceiling-mounted appliances per Table 4. (6-4.4)

Table 4

Room Spacing Allocation for Ceiling-Mounted Visible Appliances

Minimum Required Light Output, Candela (cd) (Effective Intensity)

Maximum Room Size	Maximum Ceiling Height	One Light (cd)
20' x20'	10'	15
30' x 30'	10'	30
40' x 40'	10'	60
50' x 50'	10'	95
20' x 20'	20'	30
30' x 30'	20'	45
40' x40'	20'	80
50' x 50'	20'	115
20' x 20'	30'	55
30' x 30'	30'	75
40' x 40'	30'	115
50' x 50'	30'	150

  - Spacing must be in accordance with Figure 13 (6-4.4.1.1) and Tables 4 and 5 [6-4.4.1.1 (b) and (a)]. A maximum separation between appliances must not exceed 100'. (6-4.4.1.1)

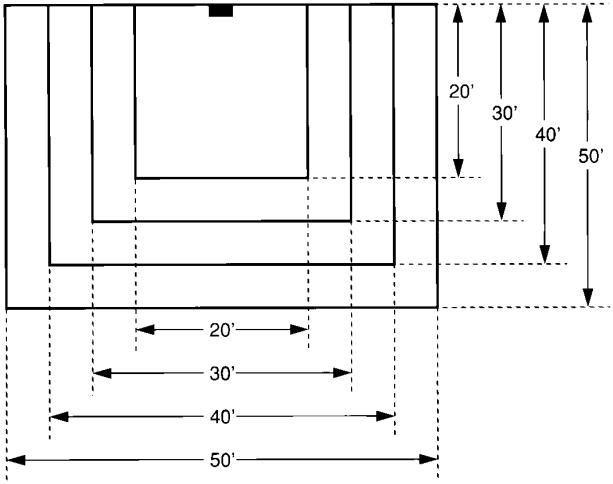


Figure 13

Room spacing allocation for wall-mounted visible appliances.

Note : The above is based on locating the visible signaling appliance at the halfway distance of the longest wall. In square rooms with appliances not centered or nonsquare rooms, the effective intensity (cd) from one visible signaling appliance must be determined by maximum room size dimensions obtained either by the distance to the farthest wall or by double the distance to the farthest adjacent wall, whichever is greater, as shown in Table 5.

Table 5

Room Spacing Allocation for Wall-Mounted Visible Appliances

Minimum Required Light Output, Candela (cd) (Effective Intensity)

Maximum Room Size	One Light per Room (cd)	Two Lights per Room (Located on Opposite Walls) (cd)	Four Lights per Room One Light per Wall) (cd)
20' x 20'	15	—	—
30' x30'	30	15	—
40' x 40'	60	30	—
50' x 50'	95	60	—
60' x 60'	135	95	—
70' x 70'	185	95	—
80' x 80'	240	135	60
90' x 90'	305	185	95
100'x 100'	375	240	95
110'x 110'	455	240	135
120'x 120'	540	305	135
130'x 130'	635	375	185

- In rooms smaller than 20’ x 20’ a single 15 candela device shall suffice. In rooms larger than 20’ x 20’ and smaller than 80’ x 80’ either one higher candela device or two smaller rated appliances installed on opposite walls may be used. In rooms 80’ x 80’ and larger, up to four appliances (one per wall) may be used if the appliances are no closer than 55’ from one another. (They may be closer if the flash rates are synchronized.) [6-4.4.1.1(a) - (d)]
- For corridors less than 20’ use Table 6 (6-4.4.2.1). For corridors wider than 20’ use spacing as indicated in Figure 13 and Tables 4 and 5 [6-4.4.1.1 (b) and (a)].

Table 6

Corridor Spacing Allocation for Wall-Mounted Visible Appliances

Corridor Length (ft)	Minimum Number of 15-cd Visible Appliances Required
0 - 30	1
31 - 130	2
131 - 230	3
231 - 330	4
331 - 430	5
431 - 530	6

- For sleeping areas with no linear dimension greater than 16’ use Table 7 (6-4.4.3.2). For larger rooms, locate the appliance within 16’ of the pillow.
- Supplementary visible signaling appliances (annunciators) located less than 80” above the floor are permitted. (6-6.2)

Table 7

Effective Intensity Requirements for Sleeping Area Visible Notification Appliance

Distance from Ceiling to Top of Lens	Intensity
greater than or equal to 24"	110 cd
less than 24"	177 cd

- **Telephone Appliances (6-7.5)**
  - Wall-mounted telephone appliances or related jacks are allowed at convenient heights not to exceed 66".

    Exception: Where accessible to the general public, one telephone appliance per location shall be no higher than 54" with 30" of clear access to the wall (for wheelchair clearance.)

Note: Consult with your local Authority Having Jurisdiction to verify the requirements for your area.

NFPA
72-1996 Chapter 7
General Guidelines for Inspecting, Testing, and Maintaining Fire Alarm Systems

The following are general guidelines for inspecting, testing, and maintaining fire alarm systems. For further clarification, refer to the appropriate paragraph that is noted in the NFPA 72-1996 National Fire Alarm Code.

- **General (7-1)**
  - Make available the system certificate and information, including specification, wiring diagrams, and floor plans prior to system maintenance or testing. (7-1.4)
  - The owner or his designated representative is responsible for inspection, testing, and maintenance of fire alarm systems. (7-1.2)
  - Service personnel must be qualified and experienced. The following are examples of qualifications: (7-1.2.2)
    - (a) Factory trained and certified.
    - (b) National Institute for Certification in Engineering Technologies Fire Alarm certified (NICET).
    - (c) International Municipal Signaling Association Fire Alarm Certified.
    - (d) Certified by state or local authority.
    - (e) Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.

- **System Initial Acceptance Test (7-1.6.1)**
  - New systems shall be inspected and tested in accordance with Chapter 7.

- **System Reacceptance Testing (7-1.6.2)**
  - Perform system reacceptance testing after system modification, repair or software change. Test 100% all components and circuits known to be affected by the change. Test 10% of the initiating devices, up to a maximum of 50, to verify proper system operation. If any changes have been made to the system a revised record of completion (1-7.2.1) shall be prepared.

- **Tests Methods (7-2)**
  - Test fire alarm systems and associated equipment in accordance with Table 7-2.2

- **Inspection and Testing Frequency (7-3)**
  - Perform visual inspection to ensure that no changes have been made that would affect equipment performance. (7-3.1)
  - Visual inspection frequencies must be in accordance with Table 7-3.1.

- **Testing (7-3.2)**
  - Check detector sensitivity within 1 year after installation and every alternate year thereafter. If the detector sensitivity has not varied outside the UL sensitivity window for that type of detector after the second sensitivity test, the period between tests may be extended to a 5 year interval. (7-3.2.1)
  - Separate sensitivity tests are not required for analog detectors that automatically report when its sensitivity is outside the window.
  - Clean, recalibrate, or replace detectors outside their sensitivity window.
  - Frequency of testing must be in accordance with Table 7-3.2.

- **Maintenance (7-4)**
  - Maintain fire alarm system equipment in accordance with the manufacturer's instructions. (7-4.1)
  - The frequency of maintenance will depend on environmental conditions.

- **Records (7-5)**
  - Records shall be retained until the next test and for one year thereafter. (7-5.2.1) Use of Figure 7-5.2.2 as the permanent record is recommended.
  - A functional test of the sequence of operations of the system is required. [7-5.2.2 (i)]
  - Disposition of problems identified must be recorded. [7-5.2.2 (o)]

Note: Consult with your local Authority Having Jurisdiction to verify the requirements for your area.

NFPA 90A
General Guidelines

The following are general guidelines for installing and locating smoke detectors. For further clarification of the statement, refer to the appropriate paragraph that is noted after each statement in the NFPA 90A standard, 1996 edition. See also 1996 IMC.

- **Automatic Control**
  - Test all shutdown devices at least once a year while giving special care to smoke-sensing devices and fittings for cleanliness and proper calibration. (4-4.1)
  - **Location**
    - Locate smoke detectors listed for use in air distribution systems as follows: (4-4.2)

      (a) Downstream of the air filters and ahead of branch connections in air supply systems of greater than 2,000 cfm capacity.

      (b) At each story prior to the connection to a common return and prior to any recirculation or fresh air inlet connection in an air return system having a capacity of over 15,000 cfm and serving more than one story.

    Exception 1: Return system smoke detectors are not required when the entire space served by the air distribution system is protected by a system of area smoke detectors.

    Exception 2: Fan units whose sole function is to remove air from inside the building to outside the building are not required.
  - **Function**
    - Smoke detectors provided as required in 4-4.2 must automatically stop their respective fans upon detecting the presence of smoke. (4-4.3)

      Exception: When the return air fan is functioning as part of an engineered smoke control system and a different mode is required.
  - **Installation**
    - Install smoke detectors per NFPA 72, Chapter 5
    - When an approved protective signaling system is installed, connect a smoke detector to the signaling system per NFPA 72-1996 so that the activation of any air distribution system smoke detector causes an alarm or a supervisory signal indication at a constantly attended location. (4-4.4.2)

- When a protective signaling system is not provided (4-4.4.3):
  (a) Smoke detector activation must cause a visible and an audible signal in a normally occupied area.
  (b) A visible or audible signal must indicate smoke detector trouble conditions in a normally occupied area and be identified as air duct detector trouble.
- For smoke detectors not powered by the signaling system and used solely for fan shutdown, standby power is not required. (4-4.4.4)

NFPA 101-1994
General Guidelines

The following are guidelines for installing and locating fire alarm systems in occupancies. For further clarification of the statement, refer to the appropriate paragraph that is noted after each statement in NFPA 101-1994 standard.

- **Detection, Alarm, & Communication Systems (7-6.1)**
  - **General**
    - These provisions only apply when required by the occupancy chapter. (7-6.1.1)
    - Install fire alarm systems per NFPA standards 70 and 72. (7-6.1.4)
    - Approval for their application is required of all systems and components. (7-6.1.2)
  - **Signal Initiation**
    - Actuate by means of manual station, automatic detectors or extinguishing systems. (7-6.2.1)
    - Manual Stations
      - Locate in the natural path of escape near each required exit. (7-6.2.3)
      - Traverse not more than 200 ft. horizontally to reach a station. (7-6.2.4)
      - Locate so that each station is accessible, unobstructed and visible. (7-6.2.5)
    - Sprinklers
      - Must provide system operation when the flow of water is equal to or greater than that from a single sprinkler. (7-6.2.6)
    - Detectors
      - Where a “complete smoke detection system” is required by another section of this code, provide detectors in all “occupiable” areas, common areas, and work spaces in those environments suitable for proper smoke detection operation. (7-6.2.7)
      - Where a “partial smoke detection system” is required by another section of this code, provide detectors in all common areas and work spaces such as corridors, lobbies, equipment rooms, and other tenantless spaces in environments suitable for proper smoke detection operation. (7-6.2.8)
      - Where required, install single station detectors per NFPA 72 Chapter 2. In new construction where two or more detectors are required within a living unit, arrange detectors so the activation of any detector causes the operation of an alarm that is audible throughout the living unit with all intervening doors closed. The detectors must operate within a living unit and must not activate the fire alarm system. Remote annunciation is permitted. (7-6.2.9* See Appendix)

- **Occupant Notification (7-6.3)**
  - Notification by an audible general alarm complying with 7-6.3.3 through 7-6.3.10.

    Exception 1: Except where prohibited by an occupancy chapter, presignal is permitted when the initial alarm is transmitted without delay to the fire department.

    Exception 2: Except where prohibited by an occupancy chapter, a delay of up to 180 seconds is permitted for occupant notification from smoke detection alarm per NFPA 72, 3-8.3

    Exception 3: Elevator lobby and associated machine room detectors used for recall are not required to sound the building alarm if they are powered and supervised by the fire alarm system and actuation results in a supervisory alarm.

    Exception 4: Duct detectors used for smoke control are not required to sound the building alarm.

    Exception 5: Door release detectors are not required to sound the building alarm.

    Exception 6: Any smoke detector in new or existing detention or correctional occupancies arranged to alarm at a constantly attended location.

  - When a uniform evacuation signal is required, it must comply with the evacuation signal described in NFPA 72-1993. (7-6.3.3)
  - Use audible and visible signals as notification signals for occupants to evacuate. (7-6.3.4)

    Exception 1: Areas not subject to occupancy by hearing-impaired need not provide visible signals.

    Exception 2: Visible only signals as permitted in health care occupancies.

    Exception 3: In lieu of visible signals, use other means of notification acceptable to the AHJ.

    Exception 4: Existing buildings need not provide visible signals.

  - The general evacuation alarm signal shall operate throughout the entire building. (7-6.3.5)
  - Audible alarms must sound so that they are heard above the average ambient noise level obtained under normal conditions of occupancy. (7-4.3.6)
  - Automatically transmitted or live voice evacuation/relocation instructions are permitted. (7-6.3.8)

- Use fire alarm devices only for fire alarm systems or other emergency purposes. (7-6.3.9)

  Exception 1: Use of voice communication for other purposes when approved by the Authority Having Jurisdiction; however, their use for fire alarm systems always takes precedence over other uses.

  Exception 2: Where permitted by another section of LS-101

- **Emergency Control**
  - *When required,* the following functions are activated by the fire alarm system (7-6.5.2)
    - Door release
    - Stairwell or elevator shaft pressurization
    - Smoke management or smoke control systems
    - Emergency lighting control
    - Unlocking of doors
  - *Monitor the wiring to required control devices to within 3 ft. of the device activated.* (7-6.5.5)
- **Location of Controls**
  - Install operator controls, annunciation, and manual communication in a control center at a location acceptable to the Authority Having Jurisdiction. (7-6.6)
- **Annunciation**
  - Use audible and visible indicators for alarm annunciation at the control center. (7-6.7.2)
  - Each floor is considered to be one zone. (7-6.7.3)

    Exception 1: Unless otherwise permitted by the code.

    Exception 2: Existing buildings.

  - Provide additional zones for floors exceeding 20,000 sq. ft. Each additional zone must not exceed 300 ft. in any direction. (7-6.7.4)

    Exception 1: In sprinklered buildings, zones may coincide with the allowable sprinkler zone.

    Exception 2: Unless otherwise permitted by the code.

  - The control center must indicate an audible and visible system trouble. (7-6.7.5)
  - The control center must indicate an audible and visible system supervisory signal. (7-6.7.6)
  - Consider each building separately. (7-6.7.7)

- **Assembly Occupancies (Chapter 8/9)**
  - **Definition**

    Buildings used to gather 50 or more persons for purposes of deliberation, worship, entertainment, dining, amusement, or awaiting transportation.
  - **Detection, Alarm, and Communication Systems**
    - Where required (8-3.4.1, 9-3.4.1)
      - All Class A & B assembly occupancies.
      - Theaters with more than one audience viewing area.
    - Initiation (8-3.4.2)
      - By manual means per [7-6.2.1 (a)]; (8-3.4.2.1)

        Exception 1: *Automatic detection system throughout.*

        Exception 2: *Automatic sprinkler system throughout.*
      - Provide automatic detection in all hazardous areas that are not normally occupied (8-3.4.2.2)

        Exception: *Areas that are protected throughout by a sprinkler system.*
    - Notification
      - An audible alarm at a constantly attended receiving station within the building. (8-3.4.3.1, 9-3.4.3.1) Presignal or Positive alarm sequence shall be permitted.
      - Notification by voice or pre-recorded message (8-3.4.3.2, 9-3.4.3.2)
      - Announcement by an approved voice communication or public address system *provided with emergency power*. (8-3.4.3.3, 9-3.4.3.3)
      - Where a constantly attended location is not provided, use of a fire alarm system with manual stations or other approved means of initiation, which automatically provides pre-recorded evacuation instructions, is required. (8-3.4.3.4, 9-3.4.3.4)
  - **Windowless or Subterranean Building (8-4)**
    - Detections [8-4.1.3(d)]
      - Each smoke compartment must have an automatic smoke detection system throughout.
      - The activation of two or more smoke detectors must operate the smoke control system and the voice alarm.
    - Notification (8-4.1.5)
      - Provide an approved supervised voice alarm.
      - Provide a pre-recorded evacuation message.

- **Educational Occupancies (Chapter 10/11)**
  - **Definition**

    Buildings used for educational purposes through the twelfth grade by 6 or more persons for 4 hours per day, or for more than 12 hours per week. 10-1.4.1

    - Includes part-day nursery schools and kindergartens – even though the children are of preschool age. 10-1.4.2
  - **Detection, Alarm, and Communication Systems**
    - Educational occupancies are always provided with a fire alarm system (10-3.4.1, 11-3.4.1)

      Exception: A single classroom building, no more than 1000 square feet, and located no closer than 50 feet from another building.
    - Initiation (10-3.4.2)
      - Manual means 10-3.4.2.1, 11-3.4.2.1

        Exception: *Occupancies provided with two-way communication.*
      - In sprinklered buildings, the sprinkler system must also activate the fire alarm system. (10-3.4.2.2, 11-3.4.2.2)
    - Notification
      - Audible alarms per 7-6.3 (10-3.4.3.1, 11-3.4.3.1)
      - Use a fire alarm system to designate class change provided the fire alarm is distinctive in signal and has priority. 10-3.4.3.2
      - Recall signal is separate, distinct and kept locked. 10-3.4.3.5
  - **Windowless or Subterranean Building**
    - Detection (10-4.1.3, New only)
      - Each smoke compartment must have an automatic smoke detection system throughout. (d)
      - The activation of any two detectors shall operate the smoke control system and voice alarm. (d)
    - Notification (10-4.1.6)
      - Provide an approved supervised voice alarm.
      - A pre-recorded evacuation message is permitted.
  - **Day-Care Centers (Chapter 10/11)**
    - Detection Alarm and Communication Systems
      - Provide with a fire alarm system per 7-6. (10-7.3.4.1, 11-7.3.4.1)

        Exception: *Day care centers housed in one room.*
    - Initiation
      - By manual means and by any required smoke detectors. (10-7.3.4.2, 11-7.3.4.2)

        Exception: *Single station detectors.*

- Detection (10-7.3.4.5, 11-7.3.4.5)
  - Smoke detection system per 7-6.
  - Each story in front of doors to stairways.
  - Corridors on all floors.
  - Lounges, recreation areas and sleeping rooms in the center.
- Notification
  - Audible alarm per 7-6.3.(10-7.3.4.3, 11-7.3.4.3)
  - Fire department notification per 7-6.4.(10-7.3.4.4, 11-7.3.4.4)

- **Day-Care Homes: (a) Family, (b) Group. (Chapter 10/11) (See Definitions LS-101, page 102)**
  - Detection
    - Smoke detectors per 7-6.2.9 (single station) (10-8.3.4.1, 11-8.3.4.1)
    - When a group day-care home is located within another occupancy such as an apartment or office building, provide corridor smoke detectors. (10-8.3.4.2, 11-8.3.4.2)
    - Single station smoke detectors in all sleeping rooms (10-8.3.4.3, 11-8.3.4.3)

- **Health Care Occupancies (Chapter 12/13)**
  - **Definition (See 12-1.3)**

    Occupancies used for purposes such as medical or other treatment, or care of persons suffering from physical or mental illness, disease or infirmity, such as hospitals, nursing homes, custodial care or supervisory care facilities.
  - **Detection, Alarm, and Communication Systems**

    Provide a supervised fire alarm system with a secondary power supply per NFPA 72-1993. (12.3.4.1.1, 12-3.4.1.2, 12-3.4.5, 12-6.3.4.1, 13-3.4.1, 13-3.4.5, 13-6.3.4.1)
    - Detection
      - Provide an approved corridor smoke detector system in nursing homes and limited care facilities per 7-6.

        Exception 1: *When a patient sleeping room is protected by a smoke detector system and a local detector is provided at smoke barriers and horizontal exits, a corridor detector system is not required on patient sleeping room floors.*

        Exception 2: *Corridor detection systems are not required within a smoke compartment provided with quick response sprinklers.*
    - Initiation
      - By manual means and by any detection device.

- Sprinkler supervisory equipment. (12-3.4.2, 12-6.3.4.2, 13-3.4.2, 13-6.3.4.2)

- Notification
  - Occupant notification in accordance with 7-6.3 (12-3.4.3.1, 12-6.3.4.3, 13-3.4.3.1)
  - Presignal systems are prohibited.
  - Fire department notification per 7-6.4 (12-3.4.3.2, 12-6.3.4.4, 13-3.4.3.2, 13-6.3.4.4)
  - Alarm annunciation shall be provided. (12-3.4.3.3)
- Emergency Control
  - Any activating device in the fire alarm system must, without delay, cause the control function to operate. [12-3.4.4, 13-3.4.4, (7-6.5)]
  - Door release.
  - Stairwell or elevator shaft pressurization.
  - Smoke management or control systems.
  - Emergency lighting.
- Corridors
  - Separate corridors from all other areas by using partitions complying with 12-3.6.2 through 12-3.6.5. (12-3.6.1, 13-3.6.1)

    Exception 1: Unlimited spaces, open to the corridor, are permitted as long as:
    - A smoke detection system protects the corridor or quick response sprinklers protect the smoke compartment. (b)
    - A smoke detection system protects the open spaces or the location of the spaces permits direct supervision from a nursing station. (c)

    Exception 2: Waiting areas, open to the corridor, are permitted as long as a smoke detection system protects the areas or the areas permit direct supervision from a nursing station. (See b)

    Exception 5: In limited care facilities, group meeting or multipurpose therapeutic spaces are permitted to be open to a corridor as long as a smoke detection system protects the spaces or the spaces permit direct supervision from a nursing station. (b)

- **Detention and Correctional Occupancies (Chapter 14/15)**
  - **Definition (14-1.1.3)**

    Occupancies for purposes such as jails, detention centers, correctional institutions, reformatories, house of correction, or pre-release centers.

- **Detection, Alarm, and Communication Systems**

  Provide a supervised fire alarm system with a secondary power supply per NFPA 72-1993. (14.3.4.1.2, 14-3.4.1.3, 14-3.4.2, 15-3.4.1.2, 15-3.4.1.3, 15-3.4.2)

  - Initiation
    - Initiation by manual means per 7-6.2 and any required detection device. (14-3.4.2, 15-3.4.2)

      Exception 1: *Locked manual boxes are permitted.*

      Exception 2: *Manual boxes placed in staff locations are permitted.*
  - Detection
    - Install an approved smoke detection system throughout all resident housing areas. (14-3.4.4, 15-3.4.4)

      Exception 1: Omit detectors from rooms with 4 or fewer occupants in use (condition II or III).

      Exception 2: Omit detectors from rooms with 4 or fewer occupants in building with an automatic sprinkler system.

      Exception 3: Locate smoke detectors to prevent damage or tampering if they have equivalent performance. This may include detectors in exhaust ducts, behind grills, or in other locations.
  - Notification
    - Occupant notifications are automatic in accordance with Section 7-6.3. Presignal is prohibited. Positive alarm sequence is permitted. (14.3.4.3.1, 15-3.4.3.1)

      Exception: Any smoke detector in new or existing detention or correctional occupancies arranged to alarm at a constantly attended location.
    - Fire department notification per 7-6.4. Positive alarm sequence is permitted. (14-3.4.3.2, 15-3.4.3.2)

      Exception: Any smoke detector required by these chapters shall not be required to transmit an alarm to the fire department.

- **Hotel and Dormitories (Chapter 16/17)**
  - **Definition (16.1.3)**
    - Hotels Buildings or groups of buildings having more than 16 sleeping accommodations for hire. Apartment hotels are classified as hotels.
    - Dormitories: Buildings where group sleeping accommodations are provided for more than 16 persons not of the same family, such as dormitories, fraternities, or military branches.
  - **Detection, Alarm, and Communication Systems**

    Provide a fire alarm system in accordance with 7-6. (16-3.4.1, 17-3.4.1)

- Detection
  - Corridor smoke detection system (16.3.4.4.1)

    Exception: Buildings with sprinklers throughout.

  - Single station smoke detectors in each living unit per 7-6.2.9 (16-3.4.4.2, 17-3.4.4.2)
- Initiation

  (a) Manual means per 7-6.2. and,

  (b) Manual station at hotel desk or other central point under continuous supervision and,

  (c) Automatic sprinkler and,

  (d) Any required automatic detection system

  Exception to (d): Sleeping room smoke detectors (16-3.4.2, 17-3.4.2)
- Notification
  - Provide an annunciator. (16-3.4.3..2)

    Exception: Building no greater than 2 stories or with not more than 50 rooms.

  - Automatic notification by internal alarm per 7-6.3 (16-3.4.3.1, 17-3.4.1) Visible signals installed in guest rooms designated for hearing impaired. (16-3.4.3.1)

    Exception 1: Use a presignal system in a sprinklered building when permitted by the AHJ.

    Exception 2: A delay for positive alarm sequence is permitted.

- **Apartments (Chapter 18/19)**
  - **Definition (18-1.3)**

    Buildings containing 3 or more living units with independent cooking and bathroom facilities.
  - **Detection, Alarm, and Communication Systems**

    Provide a fire alarm system per 7-6 in apartment buildings greater than 3 stories or with more than 11 living units. (18-3.4.1, 19-3.4.1)
    - Detection
      - Single or multiple station smoke detectors per 7-6.2.9 in every living unit. When activated, the detector shall be audible in the sleeping rooms of that unit. (18-3.4.4.1, 19-3.4.4.1).
      - Provide single station detectors in every sleeping room. (18-3.4.4.2)

        Exception: In buildings protected by a sprinkler system.

- Total automatic system in buildings using Option 2 below. (19-3.4.4.2, existing apartments)

- Initiation
  - Manual means per 7-6.2. (18-3.4.2.1, 19-3.4.2.1)
  - From a supervised automatic fire sprinkler system. (18-3.4.2.2)
  - Automatic fire detectors in addition to manual in buildings using Option 2 below. (19-3.4.2.2, existing apts.)
  - Automatic sprinkler in addition to manual in buildings using Option 3 below. (19-3.4.2.3, existing apts.)
- Notification
  - Provide an annunciator (18-3.4.3.2, 19-3.4.3.2)

    Exception 1: Buildings not greater than 2 stories in height and with not more than 50 living units.

    Exception 2: For new apts., buildings protected throughout by automatic sprinklers, not over 4 stories and not more than 16 units.
  - By means of audible signals per 7-6.3. Visible signals shall be installed in units for the hearing impaired. (18-3.4.3.1, 19-3.4.3.1)

- **Options**
  - Option 1: Building without suppression or detection.
  - Option 2: Automatic detection and notification.
  - Option 3: Automatic sprinkler, selected areas.
  - Option 4: Sprinkler system throughout.

- **Lodging or Rooming Houses (Chapter 20)**
  - **Definition**

    Houses providing sleeping accommodations for 16 or fewer persons, without separate cooking facilities. (20-1.1.1)
  - **Detection, Alarm, and Communication Systems**

    Provide a fire alarm system per 7-6. (20-3.3.1)

    Exception: Buildings having a smoke detector system per 20-3.3.4 and at least one manual station per floor.
    - Detection
      - Single station smoke detectors per 7-6.2.9 and in each sleeping room (20-3.3.4)
    - Initiation
      - By manual means per 7-6.2 (20.3.3.2)

        Exception: Building protected by an automatic sprinkler system per 20-3.5

- Notification
  - Internal audible alarm per 7-6.3 (single station detectors). (20-3.3.3) Presignal systems are prohibited.

- **Residential Board and Care Occupancies (Chapter 22/23)**
  - **Definition (22-1.3)**

    Building used for the lodging and boarding of four or more residents not related by blood.
  - **Small Facilities New (22-2) and Existing (23-2)**
    - A manual fire alarm system per 7-6. (22-2.3.4.1, 23-2.3.4.1)

      Exception: If there is a smoke detector system per 22-2.3.4.3, 23-2.3.4.3 and at least one manual station.
    - Occupant Notification

      Notification shall be automatic, without delay, in accordance with 7-6.3.

      Presignal systems are prohibited. (22-2.3.4.2, 23-2.3.4.2)
    - Smoke Detectors

      Smoke detectors per 7-6.2.9 (22-2.3.4.3.1, 23-2.3.4.3). Install additional detectors in living and day care rooms.

      Exception: Detectors are omitted in sprinklered buildings per 22-2.3.5, 23-2.3.5.
    - Provide a single station smoke detector in each sleeping room. (22-2.3.4.3.2 New only)

      Exception: Room protected by a quick response sprinkler system. (However, do not use the exception to 22-2.3.4.3.1 in conjunction with this exception.)
  - **Large Facilities New (22-3) and Existing (23-3)**
    - Fire alarm system per 7-6 (22-3.3.4.1, 23-3.3.4.1)

      Exception for existing only: When each sleeping room has exterior exit access per 5-5.3, and the building is not more than three stories.
    - Smoke Detection System
    - All living areas as defined in 3-2 and corridors per 72 (22-3.3.4.8, 23-3.3.4.6)

      Exception 1: Common spaces provided with sprinklers.

      Exception 2: Unenclosed corridors or open areas where one or more sides is fully open to the exterior at all times.
    - Single station detector in each sleeping room per 7-6.2.9 (22-3.3.4.7, 23-3.3.4.5)

      Exception 1: Existing battery detectors are acceptable.

      Exception 2: Existing board and care with a corridor smoke detection system per 7-6.

- Initiation (22-3.3.4.2, 23-3.3.4.2)

  (a) By manual means per 7-6.2 (see exception for existing), and

  (b) Manual station located at a supervised central control, and

  (c) Automatic sprinkler, and

  (d) Any required detection system

  Exception to (d): Sleeping room detectors.

- Annunciator Panel (22-3.3.4.3) New occupancy only.
  - Provide annunciator
  - Location per AHJ

  Exception: Buildings not more than two stories with not more than 50 sleeping rooms.

- Occupant Notification
  - Internal alarm automatically, without delay per 7-6.3 (presignal prohibited) (22.3.3.4.4, 23-3.3.4.3)
  - Voice communication in high rise (22-3.3.4.5) New occupancy only.

    Exception 1: Buildings with PA systems.

    Exception 2: Existing board and care.

  - Immediate notification to Fire Department by phone or other means (22-3.3.4.6, 23-3.3.4.4)

- **Mercantile Occupancies (Chapter 24/25)**
  - **Definition (4-1.7)**

    Building for the display and sale of merchandise such as supermarkets, department stores, and shopping centers.

  - **Class A Mercantile**
    - Detection, Alarm, and Communication Systems

      A fire alarm system per 7-6 (24-3.4.1, 25-3.4.1)

    - Initiation
      - By manual means per 7-6.2.1 (a) (24-3.4.2, 25-3.4.2).

        Exception 1: An automatic fire detection system is permitted per 7-6.2.1(b).

        Exception 2: An automatic sprinkler system is permitted per 7-6.2.1(c).

- Notification (24-3.4.3.1, 25-3.4.3.1) (by one of the following)
  - General alarm throughout store.
  - Audible alarm in a continuously attended location.
  - Live voice public address system (24-3.4.3.2, 25-3.4.3.2)

    Exception: Use any notification means permitted by 7-6.3 in lieu of live voice public address system announcement.
  - Fire department notification per 7-6.4 and local fire brigade. (24-3.4.3.3), new mercantile only.

- **Covered Mall Buildings (24-4.4 New, 25-4.4 Existing)**
  - Detection, Alarm and Communications Systems
    - A fire alarm system per 7-6 (24-4.4.3.1, 25-4.4.3.1)
  - Initiation
    - By automatic sprinkler system (24-4.4.3.2, 25-4.4.3.2)
  - Notification (24-4.4.3.3, 25-4.4.3.3) (by one of the following)
    - General alarm throughout the covered mall.
    - Audible alarm in a constantly attended location.
    - Fire department notification per 7-6.4, and local fire brigade. (24-4.4.3.5, 25-4.4.3.5)
  - Occupant Notification
    - Live voice public address system (24-4.4.3.4, 25-4.4.3.4)

      Exception: Use any notification means permitted by 7-6.3 in lieu of live voice public address system announcement.
  - Emergency Control
    - The fire alarm system must automatically actuate the smoke management or smoke control system per 7-6.5.2 (c) (24-4.4.3.6, 25-4.4.3.6)

- **Business Occupancies (Chapters 26/27)**
  - **Definition (4-1.8)**

    Building used for the transaction of business such as doctor's office, city halls, general office, colleges and universities, classrooms under 50 persons, and instructional laboratories.
  - **Detection, Alarm, and Communication Systems**
    - A fire alarm system per 7-6 in the following occupancies: (26-3.4.1, 27-3.4.1)
      - Two or more stories in height
      - 50 or more occupants above or below the level of exit
    - Occupancy subject to 300 or more total occupants.

- Initiation
  - Initiation by manual means per 7-6.2.1(a). (26-3.4.2, 27-3.4.2)

    Exception 1: Initiation by a fire detection system per 7-6.2.1(b).

    Exception 2: Initiation by a fire sprinkler system per 7-6.2.1 (c).
- Notification
  - A general alarm throughout the building, or an audible alarm at a nstantly attended location. (26-3.4.3.1, 27-3.4.3.1)
  - Occupant notification by live voice public address system. (26-3.4.3.2, 27-3.4.3.2) A presignal system in accordance with Exception 1 of 7-6.3.2 is permitted.

    Exception: Use any notification per 7-6.3 in lieu of the live voice public address system.

- **High-Rise Buildings (Chapter 30, Section 30-8)**
  - **Definition (3-2)**

    A building more than 75 feet in height; measured from the lowest level of fire department vehicle access to the floor of the highest occupiable floor.
  - **Detection, Alarm, and Communication Systems**
    - Voice communication system per 7-6 (30-8.3.1)
    - Two-way telephone communication system per 72-1996 (30-8.3.2)
    - Central control station (30-8.5)
      - Voice alarm panel.
      - Fire department two-way telephone communication.
      - Fire detection and alarm annunciation.
      - Elevator annunciator.
      - Sprinkler valve and waterflow annunciator.
      - Emergency generator status.
      - Door unlocking system.
      - Fire pump status indicator.
      - Telephone for fire department use accessing public telephone system.

- **Industrial Occupancies (Chapter 28)**
  - **Definition (4-1.9)**

    Properties devoted to operations such as processing, assembling, mixing, packaging, finishing/decorating, and repairing.

- **Detection, Alarm, and Communication Systems**
  - Fire alarm system per 7-6. (28-3.4.1)

    Exception: When total capacity is under 100 persons and fewer than 25 are above or below the exit level.
  - Initiation
    - Manual or automatic means per 7-6.2. (28-3.4.2)
  - Notification (28-3.4.3.1)
    - The fire alarm system shall either:

      (a) Provide occupant notification in accordance with 7-6.3, or

      (b) Sound an audible and visible signal in a constantly attended location.
    - A presignal system in accordance with Exception 1 of 7-6.3.2 is permitted. (28-3.4.3.2)
    - A positive alarm sequence in accordance with Exception 2 of 7-6.3.2 is permitted. (28-3.4.3.3)
    - In high hazard occupancies, automatically initiate an occupant evacuation per 7-6.3. (28-3.4.3.4)

- **Storage Occupancies (Chapter 29)**
  - **Definition (4-1.10)**

    Building used for storage, sheltering of goods, merchandise, products, vehicles, or animals.
  - **Detection, Alarm, and Communication Systems (29.3.4)**
    - Fire alarm system per 7-6. (29-3.4.1)

      Exception 1: Low hazard contents

      Exception 2: Ordinary hazard contents not exceeding an aggregate floor area of 100,000 sq. ft.

      Exception 3: Complete automatic extinguishing protection.
    - Initiation
      - Automatic or manual means per 7-6.2. (29-3.4.2)
    - Notification (29-3.4.3.1)
      - The fire alarm system shall either:

        (a) Provide occupant notification in accordance with 7-6.3, or

        (b) Sound an audible and visible signal in a constantly attended location.
      - A presignal system in accordance with Exception 1 of 7-6.3.2 is permitted. (29-3.4.3.2)

        - A positive alarm sequence in accordance with Exception 2 of 7-6.3.2 is permitted. (29-3.4.3.3)
        - In high hazard occupancies, automatically initiate an occupant evacuation per 7-6.3. (29-3.4.3.4)

- **Special Provisions for Parking Garage (Section 29-8)**
    - Fire alarm system per 7-6 in garages exceeding 100,000 sq. ft. (29-8.3.4.1)
    - Initiation
        - Either manual or automatic per 7-6.2. (29-8.3.4.2)
    - Notification
        - Audible alarm in a continuously attended location. (29-8.3.4.3.1)
        - A presignal system in accordance with Exception 1 of 7-6.3.2 is permitted. (29-8.3.4.3.2)
        - A positive alarm sequence in accordance with Exception 2 of 7-6.3.2 is permitted. (29-8.3.4.3.3)

BOCA
General Guidelines

The following are general guidelines for installing and locating fire alarm systems as required by the BOCA Basic National Building Code, 1996 edition. For a further clarification of the statement, refer to the appropriate paragraph that is noted after each statement in the 1996 edition of the BOCA Basic National Building Code.

- **Use Group Classification**
  - All buildings and structures will fall into one of the following use groups:
    - Use Group "A" = Assembly Buildings
    - Use Group "B" = Business Buildings, Colleges, and Universities
    - Use Group "E" = Educational Buildings (through grade 12)
    - Use Group "F" = Factory and Industrial Buildings
    - Use Group "H" = High Hazard Buildings
    - Use Group "I" = Institutional Buildings
    - Use Group "M" = Mercantile Buildings
    - Use Group "R" = Residential Buildings
    - Use Group "S" = Storage Buildings
    - Use Group "U" = Utility and Miscellaneous Buildings (301.1)

- **Fire Alarm Systems**

- **General (918.1)**
  - Install an approved type of fire alarm system in accordance with NFPA 72.

- **Where Required (918.4)**
  - The following buildings must have an installed fire alarm system:
    - Use Group "A-4" or "E" = All buildings.

      Exception: Sanctuary and nave areas of churches.
    - Use Group "B" = In all buildings of Use Group B when two or more stories in height.
    - Use Group "H" = High Hazard.
    - Use Group "I" = In all buildings of Use Group I.
    - Use Group "R-1" = In all buildings of Use Group R-1.
    - Use Group "R-2" = In all buildings of Use Group R-2 (dormitories, multi-family dwellings, etc.) when any dwelling is three or more stories above the lowest level of exit discharge or more than one story below the highest level of exit discharge.

- **Location (918.5)**
  - Locate a manual fire alarm box within 5’ from the entrance to each exit.

    Exception: Manual fire alarm boxes are not required in Group Use B occupancies that are below 75’ in height and equipped throughout with sprinklers.
  - The height of the manual fire alarm box is a minimum of 42” and a maximum of 54” measured vertically from the floor level of the activating handle or lever of the fire alarm box.
  - Manual fire alarm boxes must be red in color. (918.5.1)

- **Zones (918.7.3)**
  - Zone each floor separately. No zone may exceed 20,000 square feet. The length of any zone must not exceed 300’ in any direction.
  - For the following types of alarm initiating devices, provide a separate zone by floor in buildings over 75’ in height which are occupied for human occupancy, when provided:
    a. Smoke detectors.
    b. Sprinkler waterflow devices.
    c. Manual fire alarm boxes.
    d. Other approved types of automatic detection devices or suppression systems.

- **Alarm Notification Appliances (918.8)**
  - Provide listed type.
  - Provide visible and audible appliances in occupancies housing the hearing-impaired. (918.8.1)
  - Provide audible appliances that are distinct in sound and used for no other purposes. (918.8.2)
  - Provide audible appliances that are 15 dBa above ambient sound level with the following minimum sound levels: 70 dBa in R and I-1 occupancies, 90 dBa in mechanical equipment rooms, and 60 dBa in all other use groups. The maximum level must not exceed 130 dBa at the minimum hearing distance from the device. (918.8.2)
  - Activate by: (918.7.1)
    - Smoke detectors, other than single station, as required by 920.0.
    - Sprinkler waterflow devices.
    - Manual fire alarm boxes.
    - Other approved types of automatic fire detection devices or suppression systems.

- **Voice/Alarm Signaling System (918.9)**
  - Activate the voice alarm system in accordance with Section 918.7.1.
  - The system must automatically sound an alert signal to all occupants on a general or all call basis to the following areas: elevators, elevator lobbies, corridors, exit stairways, rooms and tenant spaces exceeding 1,000 square feet in area; dwelling units in occupancies in Use Group R-2; and guest rooms or suites in occupancies in Use Group R-1.
  - The fire command station must contain manual controls for evacuation signals and voice instructions on a selective and all-call basis.
  - Install the voice/alarm signaling system per NFPA 72.

    Exception: A distinctive signal in lieu of a voice alarm is permitted in Use Group F or S occupancies.

- **Acceptance Tests (918.10)**
  - Test all initiating devices and circuits, notification appliances and circuits, supervisory signal initiating devices and circuits, and primary and secondary power supplies 100% in accordance with NFPA 72.

- **Automatic Fire Detection Systems (919.0)**
  - **General (919.1)**
    - Install an approved type of automatic fire detection system in accordance with NFPA 72.
  - **Approval (919.3)**
    - All devices, combination of devices, appliances, and equipment must be approved for the fire alarm signaling purpose for which it is used.
    - Automatic fire detectors must be smoke detectors. Install an approved alternative type of detector in spaces such as boiler rooms where, during normal operation, products of combustion are present.
  - **Where Required (919.4)**
    - Install an automatic fire detection system in the following occupancies:
      - Use Group I-1: In all occupancies of Use Group I-1. (919.4.1)
      - Use Group I-2: In all occupancies of Use Group I-2. (919.4.2)

        Exception: Occupancies equipped throughout with a sprinkler system.
      - Use Group I-3: Install automatic smoke detectors throughout all resident housing areas.

        Exception: Smoke detectors shall not be required in sleeping rooms with four or less occupants. (919.4.3)
      - Use Group R-1: In all occupancies of Use Group R-1.

Exception 1: System smoke detectors are not required if there are no interior corridors or where guest room doors open directly to an exterior exit access.

Exception 2: System smoke detectors are not required in guest rooms provided the single station smoke detectors are connected to the emergency electrical system and are annunciated by guest room at a constantly attended location from which manual actuation can be initiated.

- **Sprinkled Buildings Exception (919.5)**
  - Automatic fire detection systems are not required in a building containing a sprinkler system, but a fire alarm system is required. (See 918.0)
  - This exception does not apply to Use Group I-2, I-3, high hazard, special amusement buildings, or to single station detectors.
- **Alarm Verification (919.7)**
  - Alarm activation by this section must be by two cross-zoned detectors or a single detector using an alarm verification zone or equivalent.
- **Local Control Functions (919.8)**
  - Automatic fire detectors used for performing local control functions shall be a part of the fire alarm system. In buildings without a fire alarm system, the automatic fire detector shall perform the intended function.
- **Access (919.9)**
  - Provide access to each detector for periodic inspection, maintenance, and testing.

- **Single and Multiple Station Smoke Detectors (920.0)**
  - **General (920.1)**
    - Installed per NFPA 72, Chapter 2.
  - **Where Required (920.3)**
    - Use Group R-1 in all sleeping areas and every room in the path of the means of egress from the guest room or suite. (920.3.1)
    - Use Group R-2 and R-3 in the immediate area of bedrooms and in all bedrooms.

      Exception: In all occupancies equipped throughout with an automatic sprinkler system, smoke detectors are not required in bedrooms if the room is equipped with residential sprinklers. (920.3.2)
    - Use Group I-1 Installed and maintained in all sleeping areas.

      Exception: Where the building is equipped throughout with an automatic detection system. (920.3.3)

- **Interconnection (920.4)**
  - Where more than one detector is required within an individual dwelling unit in Use Group R-1, R-2 or R-3, the detectors shall be interconnected so that actuation of one will actuate all of the alarms in the individual unit.
- **Battery Backup (920.5)**
  - In addition to AC primary power, smoke detectors in occupancies in Use Groups R-2, R-3, and I-1 must receive power from batteries when AC power is interrupted.

    Exception: Where the building is equipped throughout with an automatic sprinkler system.

- **Smoke Control Systems (922.0)**
  - **Activation (922.4)**
    - Automatic sprinkler systems.
    - Smoke detectors that comply with NFPA 72, Chapter 5.
    - Manual controls provided for fire department use.
    - The system must not be activated by a manual fire protective signaling system.
  - **Smoke Detector Activation (922.4.2)**
    - Where the height of the ceiling exceeds 30 feet above the floor of the space, approved smoke detectors must detect smoke above the highest floor level open to the atrium or space.

- **Supervision (924.0)**
  - **Fire Alarm Systems (924.2)**
    - All required fire alarm systems must transmit alarm and trouble signals to an approved central station, proprietary, or remote station system.

      Exception 1: Fire alarm and automatic fire detection systems in Group R buildings less than five stories in height.

      Exception 2: Single and multiple station detectors required by Section 920.0

      Exception 3: Smoke detectors in Group I-3 occupancies (See Section 918.7.1)

      Exception 4: Smoke detectors in Group I-2 patient sleeping rooms (See Section 409.5.1)
    - Fire alarm systems in Group H-2, H-3 and H-4 occupancies (See Section 918.4.3)

- **High Rise Buildings**
  - **Applicability (403.1)**
    - Provisions shall apply to all buildings above 75 feet.

      Exceptions: Airport control towers, open parking structures, Use Group A-5 occupancies, low-hazard occupancies, and Use Groups H-1, H-2, or H-3.
  - **Control Valves and Water-Flow Devices (403.3.1)**
    - Control valves shall include supervisory and water-flow initiating devices for each floor.
  - **Automatic Fire Detection (403.4)**
    - Install smoke detectors in every:
      - Mechanical equipment room
      - Electrical room
      - Transformer room
      - Telephone equipment room
      - Elevator machine or similar room
    - The actuation of any detector must sound an alarm at a continuously attended location.
  - **Voice/Alarm Signaling Systems (403.5)**
    - Install the voice alarm system per Section 918.9 and activate per Section 918.7.1.
    - Location of speakers for the use of the voice alarm system are (common):
      - Elevators
      - Elevator lobbies
      - Corridors
      - Exit stairways
      - Rooms and tenant spaces exceeding 1,000 square feet in area
      - Dwelling units in Use Group R-2
      - Guest rooms and suites in Use Group R-1
  - **Fire Department Communication System (403.6)**
    - Install a two-way fire fighter's telephone system for operation between the central control station and every:
      - Elevator
      - Elevator lobby
      - Enclosed exit stairway
    - Acceptable types of fire department communication shall include:
      - Telephone or fire department radio in lieu of a dedicated system.

        - Intercom or two-way public address system complying with NFPA 72.
    - **Fire Command Station (403.7)**
        - The fire command station shall contain:
            - Voice/alarm system controls
            - Fire department communication system controls
            - Automatic detection and signaling system annunciator
            - Annunciation of elevator status
            - Air-handling status indicators and controls
            - Door unlocking controls
            - Sprinkler valve and water-flow detection display
            - Emergency and standby power status indicators
    - **Stairway Communication System (403.10.1)**
        - Two-way communication between a constantly attended location and not less than every fifth floor stairway near the locked doors in the stairway.

- **Atriums**
    - **Signaling System (404.6)**
        - Provide a fire alarm system in all occupancies with an atrium that connects more than two stories.
        - Install a fire alarm system in all buildings with an atrium. Activate the system per Section 918.7.1.
        - Provide buildings of Use “Group A, E, or M” with voice alarm system per 918.9.

- **Underground Structures**
    - **Fire Alarm System (405.6)**
        - Provide a fire alarm system in accordance with 918.0 in structures more than 60 feet below the lowest level of exit discharge.
        - Provide a voice/alarm system in accordance with 918.9 and activated in accordance with 918.7.1.

Note: Consult with your local Authority Having Jurisdiction to verify the requirements for your area.

SBCCI
General Guidelines

The following are general guidelines for installing and locating fire alarm systems as required by the Standard Building Code, 1994 revisions. For a further clarification of the statement, refer to the appropriate section that is noted after each statement in the 1994 revisions of the Standard Building Code.

- **Occupancy Classification**
  - All buildings and structures will fall into one of the following use groups: (301.1)
    - Use Group "A" = Assembly Buildings
    - Use Group "B" = Business Buildings
    - Use Group "E" = Educational Buildings
    - Use Group "F" = Factory and Industrial Buildings
    - Use Group "H" = High Hazard Buildings
    - Use Group "I" = Institutional Buildings
    - Use Group "M" = Mercantile Buildings
    - Use Group "R" = Residential Buildings
    - Use Group "S" = Storage Buildings

- **Manual Fire Alarm Systems**
  - Install a manual fire alarm system in the following occupancies: (905.1.1)
    - Group "A" — Having a capacity of 1000 persons or more.
    - Group "B" — Having a total occupancy of 500 or more persons or more than 100 persons above or below the street floor level.
    - Group "E" — Schools
    - Group "F" — Two stories or more in height and having a total occupancy of 500 or more persons above or below the street floor level.
    - Group "H"
    - Group "I"
    - Group "M" — Having a total occupancy of 500 or more persons, or more than 100 persons above or below the street floor level.
    - Group "R" — Hotels having accommodations for more than 15 guests, apartment houses four or more stories in height, and dormitories, lodging or rooming houses having more than 15 sleeping accommodations.

Exception: Where each guest room or apartment has a direct exit to the outside of the building and the building is three stories or less in height.

- **Alarm Notification Appliances (905.1.4)**
  - Appliances must be listed for the purpose.
  - Provide visible and audible appliances in occupancies housing the hearing impaired.
  - Provide audible appliances that are distinctive in sound and used for no other purpose.
  - Provide audible appliances that have a sound pressure level of 15 dBa above ambient sound level with the following minimum sound levels; 70 dBa in R occupancies, 90 dBa in mechanical equipment rooms, and 60 dBa in all other occupancies.
  - 130 dBa is the maximum sound pressure level for audible alarm notification appliances at the minimum hearing distance from the appliance.
  - Locate visible alarm notification appliances so as to notify all occupants in every occupied space in the building.
  - Required fire protective signaling system must include visible alarm notification appliances in public and common areas. (905.1.7)

- **Acceptance Tests (905.1.5)**
  - Subject all initiating devices and circuits, alarm notification appliances and circuits, supervisory signal initiating devices and circuits, signaling line circuits, and primary and secondary power supplies upon complete installation to 100% acceptance tests in accordance with NFPA 72 and 72E.

- **Zoning**
  - Zone each floor separately. No zone may exceed 15,000 square feet. (905.1.3)

Note: Except in Group I occupancies, it is permissible to omit all but one manual fire alarm box in buildings equipped with an automatic fire alarm or automatic sprinkler system that covers all areas of the building. (905.1.2)

- **Smoke Detector Systems**
  - In dwelling units, multiple detectors shall be interconnected. (905.2.1)
  - In dwellings and dwelling units, mount a smoke detector on the ceiling or wall at a point centrally located in the corridor or area giving access to each group of rooms used for sleeping purposes. (905.2.2)
  - Install any complete automatic fire alarm system using smoke detectors in accordance with NFPA 72E. (905.2.4)
  - Group I unrestrained occupancy
    - Spaces open to corridors must have system smoke detectors in accordance with 409.1.3.2 and 409.1.3.3.
    - Waiting areas may open to the corridor provided: (409.1.3.2)
      - The waiting area has an automatic smoke detection system.
    - Spaces unlimited in size may open to the corridor provided: (409.1.3.3)
      - The space has an automatic smoke detection system.
    - Install listed quick response sprinklers throughout smoke compartments containing patient rooms. (409.1.1.1)

      Exception: Standard sprinklers may be used when each patient room is protected with a smoke detector meeting the requirements of UL 217 or UL 268 permanently connected to house current. Detectors shall provide a visible alarm outside the patient room and audible/visible at the nursing station. Detectors may be connected to the nurse call system and the total system need not be supervised.

- **Group I Restrained**
  - **Fire Protective Signaling System (409.2.10)**
    - Provide a fire protective signaling system in accordance with NFPA 72.

      Exception 1: Manual fire alarm boxes may be locked provided staff has keys readily available to unlock boxes.

      Exception 2: Manual fire alarm boxes may be located in a staff location provided the location is manned and has direct supervision of the sleeping area.
  - **Fire Department Notification (409.2.11)**
    - The fire protective signaling system must transmit an alarm to the fire department by the following means:
      - Approved central station in accordance with NFPA 71.
      - Approved proprietary, auxiliary, or remote station per NFPA 72.

        Exception: Smoke detectors arranged to alarm locally and at a manned location need not transmit a general alarm or transmit to the fire department.

- **Automatic Fire Detection (409.2.12)**
  - Install an automatic smoke detection system throughout all resident housing areas, including sleeping areas and any contiguous day room, group activity space, or other common spaces for customary access of residents per NFPA 72 and 72E.

    Exception 1: Smoke detectors are not required in sleeping rooms with four or fewer occupants in buildings protected throughout by sprinklers.

    Exception 2: Other arrangements or positioning of smoke detectors may be used to prevent tampering provided the same function and speed of detection is met. This may include installing detectors in exhaust ducts from cells behind grills or other locations.
- **Special Provisions for Group B Business Occupancy and Group R Residential Occupancy, High-Rise Buildings**
  - These requirements apply to all Group "B" and Group "R" buildings used for human occupancy located more than 75 feet above the lowest level of fire department access. (412.1.1)
- **Smoke detection systems (412.2)**
  - Install at least one approved smoke detector in:
    - Every mechanical equipment room
    - Electrical equipment room
    - Transformer equipment room
    - Telephone equipment room
    - Elevator machine or similar room
    - Every elevator lobby
    - In the main return and exhaust air plenum of each air conditioning system serving more than one story and located in a serviceable area downstream of the last duct inlet
    - Each connection to a vertical duct or riser serving two or more stories from return air ducts or plenums of the HVAC system (412.2.1)
    - The actuation of any detector required by 412.2 must activate the voice alarm system and operate the equipment necessary to prevent recirculation of smoke. (412.2.2)
- **Alarm and Communication Systems (412.3)**
  - Provide a voice alarm signaling system and fire department communication system installed in accordance with NFPA 72.
- **Voice alarm system**
  - Install the voice alarm system to be clearly heard by all occupants of the building. (412.3.2.3)

- The operation of any required smoke detector, sprinkler, waterflow device, or manual fire alarm system must automatically activate the voice alarm system. (412.3.2.1)
- Location of speakers for use of the voice alarm system are:
  - Elevators
  - Elevator lobbies
  - Corridors
  - Exit stairways
  - Rooms and tenant spaces exceeding 1,000 square feet in area
  - Dwelling units in apartment houses
  - Hotel guest rooms or suites (412.3.2.3)
- Install a two-way fire fighter's telephone system, and operate it between the central control station and every:
  - Elevator
  - Elevator lobby
  - Entry to every enclosed exit stairway
  - Corridors
    (412.3.3)

- **Fire Command Station (412.4)**
  - A fire command station for fire department operations shall contain:
    - Controls for voice alarm signaling system
    - Controls for fire department communication system
    - Fire protective signaling system annunciator panel
    - Elevator status indicators and controls
    - Air handling status indicators and controls
    - Door unlocking controls
    - Sprinkler valve, waterflow, and fire pump display panel
    - Emergency power, light and emergency system controls, and status indicators
    - A telephone for fire department use with access to the public telephone system
    - Generator supervision devices, manual start, and transfer.
- **Alternates permitted**
  - When a complete and approved automatic sprinkler system is provided, the manually operated fire alarm system required in the compartmented building is not required. (412.11)

Note: Consult with your local Authority Having Jurisdiction to verify the requirements for your area.

ICBO
General Guidelines

The following are general guidelines for installing and locating fire alarm systems as required by the Uniform Building Code, 1994 edition with 1995 supplement. For a further clarification of the statement, refer to the appropriate publication and section that is noted after each statement in either the Uniform Building Code, 1994 edition or the Uniform Fire Code.

- **General (UFC-Sec. 1007)**
  - Equipment requires listing and approval for the purpose for which it was installed. (1007.3.2)
  - After installation, complete an acceptance test of the entire system including all functions. (1007.3.4.1)
  - Provide a certificate that the system has been installed in accordance with the approved plans and specifications. (1007.3.4.2)

- **General Design Requirements (UFC-Sec. 1007.2.1.1)**
  - System Requirements
    - Distribute manual fire alarm boxes throughout, readily accessible, unobstructed, and located in the normal exit path at every exit from every level. Travel distance must not exceed 200'. (1007.3.3.1)
    - Fire alarm initiating devices must activate audible alarm signals throughout the building or designated areas. (1007.3.3.3.1)
    - The alarm signal must be keyed one half to one second "on" and one second "off" for three cycles, followed by a voice message where required. (1007.3.3.3.2)
    - Audibility of the alarm signal shall be a distinctive sound used for no other purpose. Audible devices shall produce 15 decibels above the ambient prevailing sound level and not exceed 120 decibels maximum. (1007.3.3.3.3)
    - Visible alarm devices shall be located in hotel guest rooms in accordance with Building Code Section 1105.4.6; accessible public and common use areas, hallways and lobbies. (1007.3.3.3.4)
  - Manual Fire Alarm System in:
    - Group A, Division 1, 2, and 2.1 occupancies.
      - Activation of the system must immediately initiate an approved prerecorded message announcement using an approved electrically supervised voice communication system. (1007.2.2.1, 1007.2.2.2)
    - Group H occupancies — manufacturer of organic coatings. (1007.2.6.2)
    - Group H, Division 6 occupancies — manual fire alarm system. (1007.2.6.3)

- Automatic smoke detection shall be provided in rooms or areas used for the storage, dispensing, use or handling of certain hazardous materials. See U.F.C. Article 80. (1007.2.6.4)
- Aerosol storage rooms and general purpose warehouses containing aerosols. (1007.2.12.7)

- Automatic Fire Alarm System in:
  - Group B, Division 2, occupancies.
    - Provide an automatic smoke detection system throughout high-pile combustible storage where required by Article 81. (1007.2.12.4)
    - Install an automatic smoke detection system throughout a building where special egress-control devices are installed at exit doors. (1007.2.12.5)
    - Install an automatic smoke detection system in corridors where such corridors in an office use serve an occupant load of 100 or less and are not of one-hour construction. (1007.2.12.6)
    - Install a fire alarm and communication system in high-rise office buildings. (1007.2.12.2.2 through 1007.2.12.2.4)
  - Amusement Buildings
    - Install an approved smoke detection system. (1007.2.12.1.1)
    - Activation of any single smoke detector, the automatic sprinkler, or other automatic fire detection device must immediately sound an alarm at a constantly supervised location where manual systems operation can be initiated. (1007.2.12.1.2)
    - The public address system may also serve as an alarm. (1007.2.12.1.4)
- Manual and Automatic Fire Alarm Systems in: (1007.2.4.1)
  - Group E, Divisions 1 and 3 Occupancies
  - For 50 or more occupants a manual fire alarm system is required.
  - Connect a sprinkler or smoke detection system to the fire alarm system. The system must be both automatic and manual.
  - Smoke detectors are required for increases in travel distance to exits or when the only egress is through an adjoining or intervening room. (1007.2.4.2.1, 1007.2.4.2.2)
- Group I Occupancies, Division 1.1, 1.2 and 2
  - Install smoke detectors at automatic-closing doors in smoke barriers, in ducts penetrating smoke barriers, and in waiting areas open to corridors. (1007.2.7.1.1)

- Install single-station smoke detectors in patient rooms in hospitals and nursing homes. When activated the detector must cause a visual display in the corridor adjacent to the door of the room in which the detector is located and cause an audible and visual signal at the nurse's station. When the system is combined with the nursing call system, the system need not be supervised. (1007.2.7.1.2)

- Group I Occupancies, Division 3
  - Actuation of an automatic fire-extinguishing system, manual fire alarm box, or a smoke detector must initiate a fire alarm signal which automatically notifies staff. (1007.2.7.2.2)
  - Manual boxes need not be located as required by 1007.3.3.1. Manual fire alarm boxes are allowed to be locked, provided staff-attended locations have direct supervision over the area. (1007.2.7.2.3)
  - Install an approved smoke detection system throughout resident housing areas, including sleeping areas and contiguous day rooms, group activity spaces, and other common spaces. (1007.2.7.2.4)

    Exception: Other approved smoke-detection arrangements providing equivalent protection to prevent tampering may be used.
  - Provide annunciation of alarm and trouble at a constantly attended location. (1007.2.7.2.5)
  - Monitor the fire alarm system by an approved central station, proprietary or remote station service, or by transmission of a local alarm at a constantly attended location. (1007.2.7.2.6)

- Group R, Division 1 occupancies specified below:
  - Group R, Division 1 occupancies shall be provided with a manual and automatic fire alarm system in apartment houses three or more stories in height or containing 16 or more dwelling units; in hotels three or more stories in height or containing 20 or more guest rooms, and in congregate residences three or more stories in height or having an occupant load of 20 or more. (1007.2.9.1.1)

    Exception 1: A manual fire alarm system need not be installed in buildings that are two stories or less when dwelling units are separated by one-hour separations and direct exit from each dwelling is available.

    Exception 2: Building protected by a sprinkler system and a local alarm to notify all occupants.

    (UBC Sec. 310.10, UFC Sec. 1007.2.9.1.1)
  - Manual fire alarm boxes for buildings without corridors must be required by the fire chief.
  - Manual fire alarm boxes are not required for interior corridors having smoke detectors. (1007.2.9.1.2)
  - Install smoke detectors in all common areas and interior corridors serving as a required exit for an occupant of 10 or more. (1007.2.9.1.3)

- Install heat detectors in common areas such as recreational rooms, laundry rooms, furnace rooms, and similar areas. (1007.2.9.1.4)
- Install single station smoke detectors in dwelling units, and hotel or lodging house guest rooms. (1007.2.9.2)

- **Special Provisions for Group B, Division 2 Office Buildings and Group R, Division 1 Occupancies**

  This section applies to buildings having floors used for human occupancy located more than 75' above the lowest level of fire department vehicle access. (UBC - Sec. 403.1, UFC - Sec. 1007.2.12.2.1)

  - **Smoke detection**
    - Install at least one approved smoke detector:
      - In every mechanical equipment room
      - Electrical equipment room
      - Transformer equipment room
      - Telephone equipment room
      - Elevator machine or similar room
      - Connect elevator lobby detectors to an alarm verification zone or list them as releasing devices.
      - In the main return and exhaust air plenum of each HVAC system and located downstream of the last duct inlet
      - At each connection to a vertical duct or riser serving two or more stories from a return-air duct or plenum of an air conditioning system.
    - The actuation of any of these detectors must operate the voice alarm system and place into operation all controls necessary to prevent the recirculation of smoke. (1007.2.12.2.2) (UBC - Section 403.3)
  - **Voice alarm system**
    - The operation of any automatic fire detector, sprinkler, waterflow device, or manual fire alarm system must automatically activate the voice alarm system. (1007.2.12.2.3) (UBC - Section 403.5.2)
    - Location of speakers for the use with the voice alarm system are:
      - Elevators
      - Elevator Lobbies
      - Corridors
      - Exit stairways
      - Rooms and tenant spaces exceeding 1,000 square feet in area
      - Dwelling units in apartment houses

        - Hotel guest rooms or suites
          (UBC — Section 403.5.2), (1007.2.12.2.3)
    - Install a two-way fire fighter's telephone system and operate it between the central control station and every:
        - Elevator
        - Elevator lobby
        - Entry to every enclosed exit stairway
        - Emergency and standby power rooms (UBC — Section 403.5.3), (1007.2.12.2.4)
- **Central Control Station**
    - The central control station must contain the following:
        - The voice alarm and public address system panels
        - Fire department communication panel
        - Fire-detection and alarm system annunciator panels
        - Air-handling status indicators and controls
        - Door unlocking controls
        - Sprinkler valve and waterflow detector display panel
        - Emergency and standby power status indicators
        - Telephone for fire department use with controlled access to public telephone system
        - Fire pump status indicator
        - Schematic and detailed plans of the building fire protection systems, exit facilities, fire fighting equipment and fire department access.
        - Work table
          (UBC — Section 403.6.1)
- **Annunciation Identification**
    - Annunciate alarm, supervisory, and trouble conditions by means of an audible and visual indicator. Consider each building and each floor as separate zones. Consider each riser a separate zone when one or more sprinkler risers serve the same floor.
      (UBC — Section 403.6.2)
- **Sprinkler System Monitoring and Alarms**
    - Water supply control valves and water-flow switches shall be electrically monitored when the number of sprinklers is:
        - Twenty or more in I-1.1 and I-1.2 occupancies.
        - One hundred or more in all other occupancies.

- Supervisory, water-flow alarm and trouble signals shall be distinctly different and shall be transmitted to an approved central station, remote station or proprietary monitoring station or, when approved by both the building official and the fire chief, the audible signals shall sound at a constantly attended location. (1003.3.1)
- An approved audible sprinkler flow alarm shall be provided on the exterior and the interior of the building. (1003.3.2)

Note: Consult with your local Authority Having Jurisdiction to verify the requirements for your area.

I M C
General Guidelines

The following are general guidelines for installing and locating smoke detectors, as required by the International Mechanical Code 1996 edition. For further clarification of the statement, refer to the appropriate section that is noted after each statement in the 1996 edition of the International Mechanical Code.

- **Controls Required**
  - Smoke detectors shall be listed and labeled for installation in air distribution systems. (606.1)

- **Location; Return air systems designed greater than 2000 cfm.**
  - In the return air duct or plenum upstream of any filters, exhaust air or outdoor air connections, or decontamination equipment.

    Exception: Detectors are not required where the space served by the air distribution system is protected by a system of smoke detectors which provide operation per Section 606.4. (606.2.1)
  - If multiple air handling systems share common supply or return air ducts or plenums with a combined capacity greater than 2000 cfm, the return air system shall have detection. (606.2.2)
  - When a return air system exceeds 15,000 cfm, smoke detectors shall be installed at each story, upstream of the connection between a return riser serving 2 or more stories and the air ducts or plenums. (606 2 3)

- **Installation**
  - Detectors shall be installed per NFPA 72.
  - Detectors shall be installed to monitor the entire airflow including return air and exhaust or relief air.
  - Location shall provide access for inspection and maintenance. (606.3)

- **Controls Operation**
  - Upon actuation, detectors shall shut down air distribution unless it is part of a smoke-control system at which time it shall go into smoke-control mode. (606.4)

- **Supervision**
  - Detectors shall be connected to a fire alarm system. Actuation shall operate an audible and visible “supervisory” signal. (606.4.1)

    Exceptions:

    1. Supervisory signal is not required if detection initiates the buildings notification appliances.
    2. If there is no fire alarm system, detectors shall operate an audible and visible (actuation) signal at an approved location. Trouble conditions

shall operate an audible or visible “air duct detector trouble” signal.

- **Smoke Dampers**
  - Close upon actuation of smoke detector system, smoke-control system controller, or a spot-type detector listed for releasing service.
  - Close whenever the fan serving the duct system is shut off. (607.2)

Notes

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