

<p><b>July 1, 2010</b></p>	<p align="center"><b>SANTA ROSA FIRE DEPARTMENT FIRE PREVENTION BUREAU STANDARD</b></p>
	<p align="center"><b>FIRE AND LIFE SAFETY SYSTEMS FOR HIGH RISE STRUCTURES EXCEEDING 75 FEET IN HEIGHT.</b></p>

**PURPOSE**

This standard outlines the general requirements for fire and life safety systems for high rise structures exceeding 75 feet in height from the point of fire department access to the highest inhabited floor level. Information contained herein applies to typical instances and may not address all circumstances.

**CODE REFERENCES**

2007 California Fire Code (CFC), Chapter 3; Santa Rosa City Code 18-44

**PERMIT(S) REQUIRED**

- Fire Sprinkler System Installation
- Fire Alarm System Installation
- Standpipe System Installation
- Fire Pump Installation

**\*Additional permits that may be required based on project design:**

- Fire Service Underground
- Fixed Fire Extinguishing System
- Aboveground or Underground Storage Tank Installation (for Fire Pump)

Categories and fee amounts are found at:  
<http://ci.santa-rosa.ca.us/doclib/Documents/IB%20018.pdf>

**ATTACHMENTS**

- 1) Plan Review Checklist - Fire and Life Safety Systems for High Rise Structures Exceeding 75 Feet in Height.
- 2) Inspection Checklist – Fire and Life Safety Systems for High Rise Structures Exceeding 75 Feet in Height.

**REQUIRED INSPECTIONS**

Fire Sprinkler System Installation

- Rough and Hydrostatic Inspection(s)
- Sprinkler Final

Fire Alarm System

- Rough In Inspection
- Fire Alarm Final (including all components tied into the Fire Alarm)

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Standpipe System(s) Installation

- Rough and Hydrostatic Inspection(s)
- Sprinkler Final Inspection (including flow test)

Fire Pump Installation

- Fire Sprinkler Final (Including flow test)

Fire Department Final

**\* Additional inspections may be required based on project design.**

Inspections shall be scheduled a minimum of 48 hours in advance. Directions for scheduling are found at: <http://ci.santa-rosa.ca.us/news/Pages/AutomatedFireInspectionRequestSystem.aspx>

### **APPLICATION**

Group B office buildings, Group H, Division 8, and Group R, Division 1 Occupancies, each having floors used for human occupancy located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access.

*For the purpose of this subsection, "building access" shall mean an exterior door opening conforming to all of the following:*

*Suitable and available for fire department use.*

*Located not more than 2 feet (610 mm) above the adjacent ground level.*

*Leading to a space, room or area having foot traffic communication capabilities with the remainder of the building.*

*Designed to permit penetration through the use of fire department forcible-entry tools and equipment unless other approved arrangements have been made with the fire authority having jurisdiction. (SFM amendment)*

### **PLAN REVIEW**

The Applicant shall fund the services of a plan review and inspection consultant skilled in the plan review and inspection of High Rise structures and Fire and Life Safety Systems. The Fire Department shall select the consultant(s).

### **FIRE DEPARTMENT ACCESS**

Fire Department access shall have include an all-weather driving surface capable of supporting seventy thousand (70,000) pounds and shall have a minimum unobstructed width of twenty (28) feet and shall not be less than ten (10) feet from the building. Access ways shall have adequate turning radius for fire department apparatus and shall have a minimum of thirteen (13) feet, six inches vertical clearance. The maximum grade shall not exceed four percent. .

### **Automatic Fire Sprinkler System (CBC Section 403.1)**

The automatic sprinkler system shall be provided throughout the building as specified by UBC Standard 9-1 and

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NFPA 13. The City of Santa Rosa amended the California Fire Code section 18-44.1414.3 to require buildings in excess of three or stories in height or having a first story in excess of 100,000 square feet in area to provide an approved operating fire sprinkler system on each floor during construction prior to continuing construction on upper stories.

1. Shutoff valves and a water-flow device shall be provided for each floor. The sprinkler riser may be combined with the standpipe riser.
2. Sprinkler control valves, shutoff valves and a water-flow detecting device shall be provided at the lateral connection to the riser for each floor. Such valves and devices shall be electrically supervised to automatically sound an appropriate signal transmitted to locations in accordance with Section 403.5.
3. In Seismic Zones 2, 3 and 4, in addition to the main water supply, a secondary on-site supply of water equal to the hydraulically calculated sprinkler design demand plus 100 gallons per minute (378.5 L/m) additional for the total standpipe system shall be provided. This supply shall be provided. This supply shall be automatically available if the principal supply fails and shall have a duration of 30 minutes.

Locations of auxiliary water tanks and controls shall be approved by the authority having jurisdiction. A fill device shall be installed to automatically maintain the required water supply. Approved corrosion resistant type tanks shall be utilized. The on-site water supply shall be provided with a low level indicator and shall be interconnected to the life safety control panel. The low water level indicator shall be a separate zone and shall transmit a trouble signal only, when the total volume has been reduced to the minimum required amount.

### **FIRE DEPARTMENT STANDPIPE SYSTEM**

A minimum of two separate fire department standpipe connections shall be provided for every high rise building. Each shall be interconnected and have the required number of inlets. Sizing of piping shall not be diminished and shall meet the provisions of U.B.C. Standard 38-2.

#### **System Connection Locations:**

Fire department standpipe connections shall be approved by the Fire Department and located not less than fifteen (15) feet or more than fifty (50) feet from a fire hydrant and not more than thirty (30) feet from a paved roadway.

#### **Temporary Standpipes:**

During the construction, when standpipes exceed twenty (20) floors (or two hundred seventy-five (275) feet) a temporary or permanent pump shall be installed and connected at that level and be available for fire department use. A manual switch shall be provided at the ground level at an approved location for manual control of the pump. The standpipe shall have the required number of inlets.

### **FIRE PROTECTION PUMP SYSTEM**

Buildings shall be equipped with two primary fire pumps, one electric and one diesel. Each pump shall be capable of supplying five hundred (500) gpm for the first standpipe and two hundred fifty (250) gpm for each additional required standpipe, not to exceed two thousand five hundred (2500) gpm at a minimum of one hundred (100) psi at the top most outlet, plus fire sprinkler demand.

Secondary fire pumps shall be required in two hundred seventy-five (275) foot high intervals. When secondary fire pumps are required they shall be so placed as to divide the upper portion of the building into equal

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sections. Under no condition shall any fire pump be required to pump more than two hundred seventy-five (275) feet vertically.

Piping systems shall not be subjected to pressures greater than those for which the system has been designed and tested. Piping tests shall be at pressure at least fifty (50) pounds more than the maximum pressure that will be required to deliver the required water throughout the building. (N.F.P.A. 13, 1-11.2.1) Where it is necessary to install a fire pump above the ground level, the fire pump shall be electrically driven and have its feeder conductors installed in rigid metal conduit that is located in a totally protected area, or shaft that has a minimum fire resistant rating of two hours.

Fire pumps and associated equipment shall be located in a separate two-hour fire resistive room. There shall be no other equipment in the room.

Location of the fire pumps, diesel fuel tanks, and controls shall be approved by the authority having jurisdiction prior to installation.

When a fire pump is located in a basement or other areas subjected to flooding, sump pump(s) shall be installed. Sump pumps shall be connected to the standby power system. The sump water level shall be monitored in the fire control room. A "trouble" signal shall be transmitted when water level rises above normal.

Fuel supply for diesel fire pumps shall be of sufficient size for at least four hours operation at full power. Fuel tanks shall comply with U.F.C. Article 79.

Filling of fuel tanks shall be accomplished from the exterior of the building.

**Fire Alarm and Communication Systems (CBC 403.3 and 403.4)**

*General (CBC 403.5.1) The fire alarm, emergency voice/alarm signaling system and fire department communication systems shall be designed and installed as set forth in the CBC and Fire Code.*

Buildings shall be provided with a fire alarm and communication system that is electrically supervised, meets the provisions of UBC Standard 18.1, N.F.P.A. Standards, and is approved and listed by the state fire marshal and shall consist of the following:

The systems shall be designed and installed so that damage to any terminal unit or speaker will not render more than one zone of the system inoperative. The local alarm and public address systems may be a combined system. When approved, the fire department communication system may be combined with the local alarm system and the public address system.

The local alarm system shall employ approved sounding devices. The sounding devices shall have a distinctive tone and shall be arranged to emit intermittent, prolonged or continuous sound signals for a full period of ten (10) seconds, to be immediately followed by an intermission, or period of silence, of five seconds before the signal is repeated. Such signal shall continue to sound until manually terminated in the fire control room, but in no case shall such manual operation be arranged to cause termination in less than three minutes.

Devices for the hearing impaired (strobes) shall be installed, at a minimum, in all public restrooms and adjacent to all illuminated exit signs.

*Emergency voice alarm signaling system (CBC 403.5.2) Speakers or signaling devices used to sound the voice or fire alarm shall be so located as to be clearly heard on the floor one floor above, and one floor below where activated, except as may be otherwise found necessary or acceptable by the enforcing agency. The operation of any automatic fire detector, sprinkler or water-flow device shall automatically sound an alert tone followed by voice instructions giving appropriate information and direction on a general or selective basis to the following terminal areas:*

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1. Elevators.
2. Elevator lobbies.
3. Corridors.
4. Exit stairways.
5. Rooms and tenant spaces exceeding 1,000 square feet (93 m<sup>2</sup>) in area.
6. Dwelling units in apartment houses.
7. Hotel guest rooms or suites.
8. Areas of refuge

Upon activation of the automatic sprinkler system, any automatic fire-detection device required by this section or any special hazard fire-protection or extinguishing system, an automatic voice alarm signal shall sound on the floor where activated and an audible and visual signal shall be transmitted to the central control station. The content of the voice alarm in each instance shall be determined by the fire authority having jurisdiction in cooperation with the building owner or manager.

A manual override for emergency voice communication shall be provided for all paging zones.

**FIRE DEPARTMENT COMMUNICATION SYSTEM. (CBC 403.5.3)**

A two-way, approved fire department communication system shall be provided for fire department use.

An operator's telephone headset, with one earpiece, shall be permanently connected to the console with an approved cord of sufficient length to reach all controls and annunciating devices within the fire control room. It shall operate between the fire control room and every connection device(s) at the following locations:

1. On each side of exit stairway doors;
2. Elevators
3. Elevator Lobbies
4. Emergency and standby power rooms
5. Mechanical equipment rooms;
6. On the exterior of the emergency generator room door;
7. Fire pump room;
8. When travel distance to a phone jack exceeds two hundred (200) feet, an outlet shall be placed midway between the two points at an approved location.

**FIRE ALARM SYSTEM (CBC 403.5.3)**

**Annunciation (CBC 403.5.3.1)** Alarm, water-flow and trouble signals shall be annunciated in the central control station by means of an audible signal and a visual display, which indicates the building, floor, zone or other designated area from which the alarm, water-flow or trouble signal originated. For purposes of

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annunciation, zoning shall be in accordance with the following, unless otherwise deemed necessary by the enforcing agency:

When the system serves more than one building, each building shall be considered as a separate zone. Each floor shall be considered as a separate zone.

Each section of floor separated by area separation walls or by horizontal exits shall be considered as a separate zone.

Upon activation of the automatic sprinkler system, manual fire alarm sending station, any automatic fire alarm detecting or other initiating device required by this chapter or any special hazard fire protection or extinguishing system, an automatic local alarm signal shall sound on the floor where activated, one floor above and one floor below, and shall transmit an audible and visual signal to the fire control room. This shall include all public areas, kitchens, mechanical rooms, roof areas, attached parking structures and all remote areas not normally occupied.

The actuation of any device required by this chapter shall place into operation all equipment necessary to prevent the recirculation of smoke.

**Exception:** Manual fire alarm sending stations.

Minimum required zones.

A. Each fire sprinkler control valve and water flow detecting device shall be considered separate zones.

**Exception:** Control valves in fire pump room.

B. Smoke detection zones and manual pull station zones shall be annunciated separately.

C. Smoke detectors located in ducts or plenums shall be annunciated separately from ceiling detectors.

D. Parking garages shall have each floor zoned separately.

**Fire alarm annunciator panel**

The fire alarm annunciator panel shall be a graphic illustration of the building elevation, and shall be of sufficient size to accommodate any control switches, visual displays, lettering and be clearly legible, and indicate the following:

1. All floor levels to include below grade and helistop;
2. All stairways to include upper and lower terminus of each stair;
3. All elevator banks and floors served;
4. Fire equipment storage rooms;
5. Fire pump(s);
6. Generator(s).

In addition to the graphic illustration, the fire alarm annunciator panel shall visually display alarm, trouble and supervisory signals immediately adjacent to the floor, area or zone the devices are serving. When zones are divided, they shall be displayed separately.

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Each zone shall display, but not be limited, to the following:

1. Smoke detection zones;
2. Duct detection zones;
3. Water flow alarm/tamper zones;
4. Manual pull station zones;
5. Heat detection zones;
6. Other fire extinguishing system.

**Additional annunciation panel graphics.**

In addition to the graphic illustration (elevation) an illustration of the ground floor shall be provided. The panel shall be of sufficient size to accommodate any control switches, visual displays, lettering and be clearly legible. The illustration shall indicate the following:

- A. Location of stairway and/or corridor systems to the exterior of the building;
- B. Elevator lobbies;
- C. Location of the fire control room;
- D. Hydrant locations within the area of the building;
- E. Fire department standpipe connection locations;
- F. Other extinguishing systems;
- G. Piped air system inlet location;
- H. Emergency generator and fire pump fuel fill location(s).

**Auxiliary supervised annunciation.**

An auxiliary supervised annunciation system shall be installed in the fire control room. A "trouble condition" in these systems shall be indicated by an audible signal and a visual display that clearly indicates the following:

- A. Low fuel status (when fuel level falls below minimum required amount) for:
- B. Standby and emergency generator(s), and
  1. Fire pump(s);
  2. Low water status of the auxiliary water supply (below minimum required amount);
- C. Fire pump(s) running;
- D. Generator(s) running;

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E. Fire department breathing air system.

(Note: Where a trouble condition exists on any of the above items a system trouble shall be transmitted.) This may be integrated within the main fire alarm annunciator panel.

The fire-detection devices specified in Section 310.9.1 need not be interconnected to the fire alarm system required by this section.

**Smoke Detection (CBC 403.3).** *Smoke detectors shall be provided in accordance with this section. Smoke detectors shall be connected to an automatic fire alarm system installed in accordance with the Fire Code. The actuation of any detector required by this section shall operate the emergency voice alarm signaling system and shall place into operation all equipment necessary to prevent the re-circulation of smoke.*

*Smoke detectors shall be located as follows.*

*In every mechanical equipment, electrical, transformer, telephone equipment, elevator machine or similar room and in elevator lobbies. Elevator lobby detectors shall be connected to an alarm verification zone or be listed as releasing devices.*

*In the main return-air and exhaust-air plenum of each air-conditioning system. Such detector shall be located in a serviceable area downstream of the last duct inlet.*

*At each connection to a vertical duct or plenum of an air-conditioning system. In Group R, Division 1 Occupancies, an approved smoke detector may be used in each return-air riser carrying not more than 5,000 cubic feet per minute (2360 L/s) and serving not more than 10 air inlet openings.*

*For Group R, Division 1 Occupancies in all interior corridors serving as a means of egress for an occupant load of 10 or more.*

**Remote Detector Indicators.**

Duct or area detectors used for plenum detection, when located in areas which are not readily visible, shall have a remote visual indicator installed in the ceiling visible from the floor area and adjacent to the detector. This shall include all duct smoke detectors. Alternate locations for remote indicators shall be approved by the authority having jurisdiction prior to installation.

**Group R, Division 1, Room Detectors.**

Individual room detectors of Group R, Division 1 occupancies shall be monitored with an approved annunciator panel. This panel shall be located in an area that is supervised twenty-four (24) hours per day by competent and experienced personnel.

This system may be interconnected to the building's fire alarm system but shall not cause a signal retransmission of alarm and shall not initiate the building's evacuation signals.

Exception: When the annunciator panel is not monitored twenty-four (24) hours a day by personnel, an approved central station shall be used to notify an authorized person(s) of the owner's choice as approved by the fire department.

**Alarm transmission.** Unless the central control station is constantly staffed by competent and experienced operating personnel conforming to NFPA 72, National Fire Alarm Code, voice or fire alarm and trouble signals shall be automatically retransmitted to one of the following:



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An approved central station conforming to NFPA 72, National Fire Alarm Code.

A supervisory station or an approved remote station conforming to NFPA 72, National Fire Alarm Code.

When approved by the enforcing agency having jurisdiction, such signals may be retransmitted directly to the fire department.

**SMOKE CONTROL (CBC 403.4)**

*A smoke-control system meeting the requirements of Chapter 9 shall be provided.*

**Smoke removal control panel.**

A graphic illustrated control panel for the smoke removal system shall be installed with the following controls and indicate the location of the following items:

A. Controls.

1. Fan control switches and indicator lights;
2. Damper control switches and indicator lights;
3. Stair pressurization fan controls and indicator lights.

B. Locations.

1. All smoke removal fans, duct work and area(s) served;
2. Stair pressurization fan(s) locations.

**Smoke removal.**

Natural or mechanical ventilation for the removal of products of combustion shall be provided on every story and shall consist of one of the following methods:

- A. Easily identifiable windows or panels which are manually operable shall be provided in the exterior walls. When operable windows or panels are used, all windows/panels in the building above the first floor shall be operable.
- B. The interior air circulation system may be used provided such system, under fire conditions, exhausts at a minimum of six complete air changes per hour. Such systems shall be exhausted directly to the outside of the building. System shall be so designed that the maximum required change can be achieved in two separate smoke removal zones at the same time during normal and emergency standby power conditions.

**Smoke removal openings.**

*Smoke removal systems shall be designed to remove smoke directly out of the building. All exhausted smoke openings shall be located so that smoke will not be recirculated into that building or any other building. Systems shall be so designed and installed to eliminate smoke entering any main air duct, plenum, or shaft not used for smoke removal.*

**Designed by licensed mechanical engineer.**

*Smoke removal systems shall be designed by a licensed mechanical engineer registered in the State of California.*

**Mechanical ventilation testing.**

Smoke removal systems shall be tested with a suitable product to verify the capability of the system to perform its intended design. The acceptance test will be performed by pressure and velocity testing, using chemical smoke, tracer gas or various combinations of these methods. All chemical smoke products used shall be approved by the authority having jurisdiction.

**Test criteria for smoke removal systems.**

The test criteria for removal of smoke shall be as follows:

- A. Test area(s) shall be selected by the authority having jurisdiction.
- B. The heating ventilation air conditioning (H.V.A.C.) system(s) shall be in the "OFF" mode.
- C. Chemical smoke shall be introduced to the test area until a density of smoke is equal to one cubic foot of smoke per cubic foot of floor area.
- D. The H.V.A.C. system(s) shall be placed in the "ON" position.
- E. All devices shall be checked for proper function.
- F. Smoke density shall be reduced to make exit signs and the paths of egress clearly visible within ten (10) minutes.
- G. All adjacent areas shall be inspected to assure that smoke has not migrated.
- H. Systems shall also be tested to assure compliance in the automatic mode.

**Fire-damper temperature rating.**

Selection of fire damper temperature ratings and other damper control temperature ratings shall be so that smoke removal is not impaired.

- A. Dampers shall have a minimum smoke rating of Class II as per U.B.C. Standard 43-12.
- B. Where equipment is used for smoke removal and located in the air stream, such as air ducts, shafts, or plenum ceiling areas, the devices used shall have a temperature rating equal to, or greater than, the maximum working temperature that could be encountered under removal conditions. These devices shall include, but not be limited to, motorized dampers, air-volume controls, pneumatic piping and wiring.

**Stairway pressurization.**

Stairway pressurization shall be installed as required by T-24 C.C.R., Chapter 10 and designed in accordance with N.F.P.A. Standard 92-A. Stairway pressurization shall also be designed that all exit doors into stairways, at all levels, shall be opened by exerting between eight pounds and thirty (30) pounds force in

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the direction of exit travel. Such systems shall not work against the smoke removal systems. Positive pressure shall be maintained with a minimum of three doors in the fully open position.

**Smoke removal actuation.**

Smoke removal systems shall be activated by all initiating devices except manual pull stations.

- A. Stairway pressurization shall be activated by any initiating device.
- B. Individual guest room smoke detectors of R-1 occupancies shall not activate smoke removal systems.

**Smoke system controls.**

A control panel shall be provided for the control of all fans and dampers associated with the life safety system and be located in the fire control room. Control shall be achieved by three position switches (on, off, and automatic). The on position shall be the manual on position, the off position shall be the manual off position and the automatic position will put into operation, automatically, all necessary fans and dampers necessary for the smoke removal system. These switches shall control the following:

- A. Supply fan systems;
- B. Return/exhaust fan systems;
- C. Supply damper zones;
- D. Return/exhaust damper zone.

No other control switches are permitted with these fans or dampers. Switches shall be kept in the automatic position to allow automatic operation of the engineered smoke management system. No switches or devices shall be capable of overriding the controls for the fans or dampers, while in emergency mode, except those located in the fire control room. The foregoing notwithstanding, the disconnect switches required by the National Electric Code shall be installed.

**Fan override controls.**

Each supply and return fan associated with the smoke removal system shall be provided with its own control switch. This switch shall be a three position switch located in the fire control room and capable of providing the following functions:

- A. Automatic start or stop of all fans;
- B. Manual start or stop of all fans.

Each control switch and its indicating lights shall be clearly labeled as required in Section 15.100.590 of this chapter. Systems shall be installed so that the override control switches can be manually taken out of the automatic position and put in any other position or back into automatic without requiring any portion of the life safety system to be reset.

**Damper override controls.**

Each supply and exhaust damper shall be provided with a re-openable fire/smoke damper operator control switch. This switch shall be a three position switch located in the fire control room and capable of providing the following functions:

- A. Automatic positioning of all dampers required to achieve the desired smoke removal system;
- B. Manually opening and closing of any desired damper;
- C. Each control switch and its indicating lights shall be clearly labeled as required in Section 15.100.590 of this chapter;
- D. Dampers shall fully open and/or close within sixty (60) seconds of activation;
- E. Fire stats shall be overridden in emergency conditions and shall not hinder the operation or cause premature closure of the damper.

The system shall be installed so that the override control switches can be manually taken out of the automatic position and put in any other position or back into automatic without requiring any portion of the life safety system to be reset.

**Visual display.**

Each control switch shall be provided with a visual indicator to verify the position or function of that unit or device. Damper indicators shall indicate damper position. This shall be accomplished by a positive contact on the damper blade. Indicate shall be grouped with the switch.

All fan indicators shall indicate fan mode. This shall be accomplished by a device(s) located in the air stream that will positively sense the presence or lack of air in the air stream.

**Fans, dampers and controls.**

All fans, dampers and their controls, associated with the smoke removal system, shall be on the emergency standby power systems. This shall include the compressor(s) that supply air for the variable air volume control.

**Panel arrangement.**

The control panel for this system shall be arranged so that fan control and damper control switches are not intermixed with each other or any other control or annunciating device within the fire alarm control panel(s).

**Smoke removal plans.**

A graphic illustration of the smoke removal system for the building shall be provided and posted adjacent to the control panel that shows the following:

- A. Location of all fans, their function and areas served;
- B. Location of all dampers, their function and areas served;
- C. All fans and dampers shall be labeled on the riser detail so that they correspond directly to the labeling of the control switches;

D. Controls for fan operation in atriums shall comply with this section.

**CENTRAL CONTROL STATION (CBC 403.5)**

General (CBC 403.6.1) A central control station room for fire department operations shall be provided.

The control room location shall be approved by the fire department and shall be located on the ground floor adjacent to Fire Department access. The fire control room shall be separated from the remainder of the building by not less than two-hour fire resistive construction with all openings protected by assemblies having a minimum fire resistive rating of one and one-half hours. Fire control rooms shall be so constructed to limit water from entering due to leakage or fire suppression activity.

The fire control room shall not be less than one hundred (100) square feet of floor area with no dimension less than eight feet. The ceiling height shall be a minimum of eight feet.

The room shall contain the following as a minimum:

1. The voice alarm and public address system panels.
2. The fire department communications panel.
3. Fire-detection and fire alarm system annunciator panels.
4. Annunciator visually indicating the location of the elevators and whether they are operational.
5. Status indicators and controls for air-handling systems.
6. Controls for unlocking all stairway doors simultaneously.
7. Sprinkler valve and water-flow detector display panels.
8. Emergency and standby power status indicators.
9. A telephone for fire department use with controlled access to the public telephone system.
10. Fire pump status indicators.
11. Schematic building plans indicating the typical floor plan and detailing the building core, means of egress, fire-protection systems, firefighting equipment and fire department access.
12. Work table.
13. Elevator control switches for switching of emergency power.
14. Other fire-protection equipment and systems controls as required by the enforcing agency having jurisdiction.
15. Air-handling system control switches and status indicator lights that clearly show that the system is operational. Status indicators shall be connected to devices that positively sense the movement of the required air flow;
16. Standby and emergency power system indicators. These shall include, but not be limited to the following:

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1. Low fuel indication,
  2. Generator status,
  3. A generator control switch shall be so wired as to allow the generator to be manually started from the fire control room when the building is in the alarm mode;
17. Controls necessary to automatically notify the fire alarm monitoring company in the event of a fire alarm or trouble condition. The interconnections required shall also comply with the raceway requirements;
  18. A labeled cabinet containing spare fire sprinkler heads (of all types used in the building) and the proper tool(s) needed for their removal and installation. The number of spare fire sprinkler heads shall be determined by N.F.P.A. 13;
  19. Clear instructions for the operation of all equipment located in the fire control room;
  20. Indicators showing the status of the fire pump. This shall include, but not be limited to: power available, pump operating, low fuel, low auxiliary water supply, or other condition as required by the authority having jurisdiction;
  21. Three spare fuses for all life safety equipment located in the fire control room shall be provided. Fuse holders shall be labeled with the size and type of fuse required;
  22. Data processing equipment required for the life safety systems;
  23. Trouble indicator for pressure drop in cascade system;
  24. Protective explosive shield for air filling stations;
  25. Hand truck for subsections J and K of this section.
  26. A minimum working clearance shall be provided and will comply with the requirements of N.F.P.A. 70 (National Electrical Code) 110-16.
  27. A non-toll, non-restricted telephone shall be installed in the fire control room. This shall be a private line connected directly to the public telephone system.
  28. A dry marker board a minimum of three feet by four feet with all necessary accessories shall be installed and maintained.
  29. A work surface that is a minimum of thirty (30) inches wide by sixty (60) inches long and thirty-six (36) inches high shall be located in the fire control room. The work surface may be hinged from the wall.

The fire control room shall be permanently identified with an approved sign with red letters and a contrasting background. Letters shall be at least two inches high with a minimum of one-quarter inch stroke. This sign shall be permanently fixed to the entry door or attached to the wall adjacent to the door and state "fire control room."

The required supply circuits for the equipment in the fire control room shall be supplied from the building's emergency standby power system and these circuits shall supply no other outlets, devices, or equipment.

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The fire control room shall be provided with permanent lighting, adequate to see all life safety equipment. The fire control room lighting shall be supplied from the building's emergency standby power system, and these circuits shall supply no other outlets, devices, or equipment.

Remote status indication shall be required at ground floor entrances into all enclosed stairways. Status may be indicated by a remote annunciator panel showing the alarm floor(s) or by an electronic audio system that automatically indicates the alarm floor(s) through its own voice communication system. Speakers for this voice communication system may be combined with the building's local or public address speakers but shall only transmit a signal to the stairway speakers at their entry levels.

The fire control room shall be used for no other purpose and the complete layout of the fire control room shall be approved prior to installation of any equipment. Layout shall include dimensions of equipment, their placement and cabinet door configurations. Complete details of plans, graphics, marker board, table, log book, and fuse holders shall be submitted to the authority having jurisdiction for approval.

Identification of all cabinets, controls, and devices shall be clearly and legibly marked and visible at all times.

The fire control room shall be conditioned to maintain a temperature between seventy (70) degrees Fahrenheit and seventy-eight (78) degrees Fahrenheit under normal and emergency conditions.

All equipment supplied by the building's emergency standby power system shall be permanently labeled. Labels shall include the origin of their supply circuits.

The building owner shall maintain a log book in the fire control room. All alarms, trouble conditions, maintenance and repairs shall be recorded with the date, time, and location from which the signal originated. Maintenance and repairs shall be logged showing reason for, date, time, name, and time the system was restored.

A complete set of building plans shall be kept in the fire control room. The plans shall include: architectural sheets showing exit systems, mechanical plans showing smoke removal systems, and electrical plans showing life safety systems.

Annunciation identification (CBC 403.6.2) Control panels in the central control station shall be permanently identified as to function. Alarm, supervisory and trouble signals as required by Items 3 and 7 above shall be annunciated in compliance with the Fire Code in the central control station by means of audible and visual indicator. For purposes of annunciation, zoning shall be in accordance with the following:

When the system serves more than one building, each building shall be considered separately.

Each floor shall be considered a separate zone. When one or more sprinkler risers serve the same floor, each riser shall be considered a separate zone.

**Exception:** When more than one riser serves the same system on the floor.

Central control stations shall not be used for the housing of any boiler, heating unit, generator, combustible storage, or similar hazardous equipment or storage.

## **ELEVATORS (CBC 403.5)**

Elevators and elevator lobbies shall comply with the provisions of Chapter 30 and the following:

**NOTE:** A bank of elevators is a group of elevators or a single elevator controlled by a common operating system; that is, all those elevators that respond to a single call button constitute a bank of elevators. There is

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no limit on the number of cars that may be in a bank or group, but there may not be more than four cars within a common hoist way.

**Each elevator lobby shall be provided with approved smoke detector(s) installed in accordance with their listings. When the detector is activated, elevator doors shall not open and all cars serving that lobby are to return to the main floor and be under manual control only. If the main floor detector or a transfer floor detector is activated, all cars serving the main floor or transfer floor shall return to a location approved by the fire department and building official and be under manual control only.**

Elevator hoist ways shall not be vented through an elevator machine room. Each elevator machine room shall be treated as a separate smoke-control zone.

**Elevator car identification.**

All cars in elevator banks shall be permanently numbered on the exterior of the elevator.

**Elevator/lobby separation.**

Only the elevator lobby separation doors and any other automatic closing doors serving the floors affected by the alarm shall automatically close.

**Call buttons and telephones.**

Automatic passenger elevators shall have call and car operation buttons within forty-eight (48) inches of the floor. Emergency telephones shall be within forty-eight (48) inches of the floor. The following shall be clearly posted in each car:

- A. Address of building;
- B. Car number.

**Recall.**

When a smoke detector is activated in an elevator lobby, all cars in all banks shall transfer to elevator recall status and shall return to the ground or pre-determined alternate floor and park.

**STANDBY POWER, LIGHT AND EMERGENCY SYSTEMS (CBC 403.8)**

**Standby power (CBC 403.8.1)** A standby power-generator set conforming to the Electrical Code shall be provided on the premises. The set shall supply all functions required by this section at full power. Set supervisions with manual start and transfer override features shall be provided at the central control station.

An on-premises fuel supply sufficient for not less than six hours at full-demand operation of the system shall be provided. Where fire pumps are required, an eight-hour fuel supply shall be provided.

The standby system shall have a capacity and rating that would supply all equipment required to be operational at the same time. The generating capacity need not be sized to operate all the connected electrical equipment simultaneously.

All power, lighting, signal and communication facilities specified in Sections 403.3, 403.4, 403.5, 403.6, 403.7, and 403.8, as applicable; fire pumps required to maintain pressure, standby lighting and normal



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Circuits supplying exit signs and means of egress illumination shall be transferable to the standby source.

The installation of any combustion engine and gas turbines associated with such power-generating systems shall be in accordance with the California Electrical Code.

**Standby Lighting (CBC 403.8.2).** Standby lighting shall be provided as follows:

1. Separate lighting circuits and fixtures sufficient to provide light with an intensity of not less than 1 foot-candle (10.761x) measured at floor level in all corridors, stairways, pressurized enclosures, elevator cars and lobbies and other areas that are clearly a part of the escape route.
2. All circuits supply lighting for the central control station and mechanical equipment room.

**Emergency systems (CBC 403.8.2)** The following are classified as emergency systems and shall operate within 10 seconds of failure of the normal power supply:

Exit sign and means of egress illumination as required by Sections 1003.2.8 and 1003.2.9.

Elevator car lighting.

Fire alarm system.

Fire-detection system.

Sprinkler alarm system.

Installation of emergency electrical systems shall be in accordance with the provisions of the California Electrical Code.

When the standby power-operation system reaches full operating capacity, the emergency electrical systems and equipment shall be transferred thereto.

**INSTALLATION.**

An on-site emergency standby power generating system consisting of one or more approved generators for every high-rise building shall be installed in one or more of the following locations:

- A. Indoors. Every room or area in which a combustion engine or gas turbine is installed for generating standby and emergency power shall be separated from the remainder of the building by a minimum of two-hour fire resistive construction.
  1. Openings. Windows, louvered openings and any other openings shall be located on exterior walls only. When such openings are located below openings in another story or less than ten (10) feet from any opening on the same building, they shall be protected by a fire assembly having a minimum of one and one-half hour fire resistive rating. Such fire assemblies shall be fixed, automatic or self-closing.
  2. The generator shall not be located above the first floor.
  3. The generator may be placed in an underground vault provided provisions are made to prevent flooding from surface and/or ground water. Drains within the vault shall be designed to prevent any backflow into the vault.

***Exception:*** Generators may be permitted in above ground parking structures with proper vehicle access.

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- B. Outdoors. When combustion engines and gas turbine generators are located outdoors, they shall be a minimum of ten (10) feet from the building and a minimum of ten (10) feet from the property.
- C. Exception: The distance from the building may be reduced to five feet where there are no openings on the building within ten (10) feet of the generator.
- D. Generators shall be located for easy access of load bank test equipment.
- E. Rooms or areas used for power generating systems shall not be used for any other purpose. Where locations are available to vehicle access, they shall be suitably protected.
- F. Power-generating systems shall not be located within fifty (50) feet of the fire control room.

**Transfer time.**

The system shall be equipped with suitable means for automatically starting the generator set upon failure of the normal electrical supply system(s). The system shall automatically transfer all functions required by this title at full power in the required time. All transfer switches shall be of the approved four wire, four pole type when used to transfer a four wire system.

A. Emergency electrical systems shall be automatically transferred and be at full power within ten (10) seconds, and include the following loads:

1. Lighting circuits as follows:

- a. In the fire control room;
- b. Main electrical switchboard or distribution room or area;
- c. Fire pump room;
- d. Fire equipment storage rooms;
- e. Any other area as deemed necessary by the authority having jurisdiction.

2. Emergency receptacles shall be installed in exit corridors. In addition to the locations listed above, emergency power supplied one hundred twenty (120) volt, twenty (20) amp receptacles shall be located in corridors within ten (10) feet of entry to exit stairways (not over one hundred (100) feet apart), and areas where smoke removal machinery and controls are located. These receptacles shall be red in color, and shall meet the fire department's specifications.

**Fuel supply.**

An on-site fuel supply for the standby and emergency generator(s) shall be of sufficient size for at least an eight hour full operation demand. It shall be contained in an approved tank that is located in an area approved by the authority having jurisdiction. When fuel supply falls below the required amount, a supervised trouble signal shall be initiated in the fire control room.

The type of fuel shall be labeled at the fill stem. Overfill alarms are required when fill stem is remote from tank location. Filling of fuel supplies shall be done from the exterior of the building only.

**Manual starting.**

Controls shall be established in the fire control room which will enable the generator to be manually started when the control switch, at the generator, is left in other than "REMOTE" or "AUTOMATIC" mode.

**Sizing.**

The standby and emergency power generating systems(s) shall be of ample capacity to provide full power to all required loads at the same time. There shall be no load diversities permitted. Possible future tenant improvement loads shall also be included.

Load demands shall be figured at one hundred twenty-five (125) percent of all required elevator motors (one each bank);

- A. One hundred twenty-five (125) percent of the largest required motor load;
- B. One hundred twenty-five (125) percent of all lighting load and one hundred (100) percent of all other required loads.

**Energy management system.**

Energy management or load shedding control systems shall be so wired that in the event that a building is in the alarm mode these systems shall be automatically switched to their full operating capacity. These controls shall not be capable of turning off or overriding any required life safety systems.

**Seismic consideration.**

The anchorage of all equipment required by this section shall be designed in accordance with Section 2312 of the Uniform Building Code, for a lateral force based on a Cp value of 0.75, unless data substantiating a lesser value is furnished. Verification of such conformance shall be substantiated by a licensed structural engineer for the following equipment:

- A. Elevator drive and suspension systems;
- B. Standby and emergency power including lighting facilities;
- C. Fire pumps, automatic fire extinguishing system, including piping and other fire protection equipment;
- D. Air-handling equipment regulated by this title;
- E. Fire alarm equipment;
- F. Helistops.

**Sump pump.**

Where electrical switchboards or any life safety emergency equipment is located below normal grade level, an approved sump pump shall be installed which is supplied from the building's emergency standby system. There shall be an indicator in the fire control room that indicates if the water has risen above a normal level and shall also transmit a trouble signal in the fire alarm system.

**Metal raceways required.**

All wiring used for life safety and fire alarm systems of high-rise buildings shall be installed in approved metal raceways. No other conductors shall be installed in the same raceway or enclosure with the life safety conductors.

**Exception:** High rise listed and approved "integrated" systems when installed at the same time as the life safety systems.

- A. Approved schedule forty (40) PVC may be permitted to be used underground where covered by a minimum of four inch nominal concrete. This applies to interior building slabs only.
- B. When conduit is installed underground on the exterior of the building, it shall be at least thirty (30) inches below grade

**MEANS OF EGRESS (CBC 403.8).**

Means of egress shall comply with other requirements of this code and the following:

All stairway doors that are locked from the stairway side shall have the capability of being unlocked simultaneously without unlatching upon a signal from the central control station. Upon failure of electrical power, the locking mechanisms shall be retracted to the unlocked position.

**Stairway locking devices.**

Stairway locking devices shall be so wired that when it is desired to de-energize these devices it shall not affect any other devices in the building, such as automatic door holders, nor shall a trouble signal be initiated in the fire alarm system. Doors shall automatically unlock when the fire alarm system is in the alarm mode or whenever there is a loss of power.

**Stairway telephones.**

Where it is elected to lock the stairway doors from the stairway side, it is required to place a telephone at every fifth floor. Each telephone shall be clearly labeled as to its use. At all other levels in the stairway, there shall be signs indicating where the telephones are located. The telephones shall be located adjacent to the stairway identification signs, following the same requirements as to size and nature as required in U.B.C. Standard 33.203.

The telephones shall connect directly to a guard station, P.B.X. or any other location which is manned on a twenty-four (24) hour basis. In the event that the operator is unable to answer the phone within thirty (30) seconds, the call shall be transferred to an approved monitoring company who shall immediately call the appropriate personnel to respond.

**SEISMIC CONSIDERATIONS (CBC 403.10)**

In Seismic Zones 2, 3 and 4, the anchorage of mechanical and electrical equipment required for life-safety systems, including fire pumps and elevator drive and suspension systems, shall be designed in accordance with the requirements of Section 1626.

**HELISTOP**

An emergency helistop, in compliance with helistop requirements of U.F.C., Article 24 shall be provided for every high rise building in which there are habitable floors above one hundred fifty (150) feet in height.

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All helistops shall be designed as required by the Department of Transportation, Federal Aviation Administration, Helicopter Design Advisory Circular 150/5390-2, and Title 21, Division of Aeronautics. Helistops shall be designed to support a minimum ten thousand (10,000) pounds.

Helistops for other than emergency use shall be provided with a fuel containment system capable of holding two hundred (200) gallons and shall be designed so that no fuel shall enter the building drain system.

**Exception #1:** Helistops may be omitted when a permanent enclosed stairway is provided for fire department use. This stairway shall access all floors of the building. The stairway shall be a minimum of thirty-six (36) inches wide. Stair landings shall be a minimum of forty-eight (48) inches at the head and bottom of stair flights. Access to this stairway shall be by fire department personnel only. The fire department stairway shall meet all of the requirements of U.B.C., Section 1807, except manual pull stations, public telephones and exit signs will not be required. The locking of stairway doors shall be on a separate switch located in the fire control room and not tied into the fire alarm system.

**Exception #2:** Helistop may be omitted when the building is equipped with a freight elevator that serves all floors and is separated from all other elevators. This elevator shaft and its lobbies shall be protected by a minimum of two hour fire-resistive construction with all openings protected by a minimum of one and one-half hour fire-resistive construction and the elevator shall meet the requirements of an emergency elevator.

### **LIFE SAFETY SYSTEM REPAIR--FIRE DEPARTMENT NOTIFICATION.**

When any portion of the life safety system or fire sprinkler system is required to be disconnected, in whole or part, for testing or repair, the fire department shall be notified prior to disconnection and commencement of any work performed.

### **FIREFIGHTER BREATHING AIR REPLENISHMENT SYSTEMS**

Buildings shall be equipped with an air rescue replenishment system, approved by the Fire Chief, or designee. The system shall provide an adequate pressurized air supply through a permanent piping system with access stations for replenishment of portable breathing air equipment used by Fire Department personnel:

Breathing air replenishment access stations shall be located no more than one hundred fifty feet apart, and on at least every third floor in multi-story buildings and structures.

Where a breathing air replenishment system is required, an annual test shall be performed as described in the administrative regulations issued by the Fire Chief, and a copy of such test shall be kept on record by the property owner and available for inspection at any time by Fire Department representatives.

System design shall be submitted to the Fire Department for review and approval as a separate installation permit.

### **PUBLIC SAFETY RADIO COVERAGE**

Buildings shall provide a system which provides for internal and external radio communications within, from and to the building by public safety personnel. A study shall be performed to establish the required system based on the building construction and features.

A radio communications plan shall be submitted to the Fire Department for review as a separate permit. The study and plan shall be performed by a person in possession of a current FCC license, a current technician certification issued by the Associated Public Safety Communications Officials International (APCO), or the Personal Communications Industry Association (PCIA).

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A performance test shall occur and be approved by the Police and Fire Department prior to issuance of the Certificate of Occupancy.

No existing or future wireless communications facilities shall interfere with any public safety radio communications systems. Wireless communications facilities, as referred to herein, include, but are not limited to, satellite dish, antenna, cellular phone facility and similar wireless communication structure or system.

Any building or structure that cannot meet the required level of radio coverage shall be equipped with a Radio Signal Booster System consisting of an exterior antenna, a FCC Type Accepted Bi-Directional amplifier system with a backup power supply mounted in a suitable location in the building and an in-building antenna or radiating cable system.

The Signal Booster System shall be designed to operate in the VHF, UHF, 700 and 800 megahertz (MHz) bands and shall be capable of operating on an independent battery and/or generator system for a period of at least twelve (12) hours without external power input. The battery system shall automatically charge in the presence of external power input.

There shall be no connectivity between the amplification system and fire alarm system. Where signal booster equipment is located in an equipment room that may become water soaked or sprayed with fire retardants during a fire, the installations will require the use of a watertight case, typically "NEMA-4", which is an industry standard specification for a sealed wall mounted cabinet.

**Example**

A typical means to provide the required radio communication might consist of the following components:

1. Inbound into the building:

A minimum average in-building field strength of 811V (-88 dBm) throughout 90% of the area of each floor of the building when transmitted from the nearest police/fire radio site. If the field strength outside the building where the receiving antenna system for the in-building system is located is less than the -88 dBm, then the minimum required in-building field strength shall equal the field strength being delivered to the receiving antenna of the building.

2. Outbound from the building:

Minimum average signal strength of 41.1V(-95dBm)measured at the nearest police/fire receiver site. (Voting receiver or Repeater.)

**Acceptance Testing**

A plan for acceptance testing shall be provided to and approved by the Fire Department. A typical means to conduct the performance test is as follows:

1. Upon completion of installation the radio system, and prior to issuance of certificate of occupancy, the property owner shall provide for testing to ensure that two-way coverage on each floor of the building is a minimum of ninety (90) percent. Each floor of the building shall be divided into a grid of approximately twenty (20) equal areas. A maximum of two (2) of the areas will be allowed to fail the test.
2. In the event that three (3) of the areas fail the test, in order to be more statistically accurate, the floor may be divided into forty (40) equal areas. A maximum of four (4) areas will be allowed to fail the test. After the forty (40) area test, if the .system continues to fail, it will be the building owner's responsibility to have the system altered to meet the ninety (90) percent coverage requirement.

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3. The voice test shall be conducted using a portable radio with specifications equivalent to the fire/police personnel portable radios, talking through the city public safety communication system.
4. The data system test shall be conducted using a laptop computer communicating with the computer aided dispatch system. A spot approximately in the center of the grid area will be selected for the test, then the radio will be keyed to verify two-way communications to and from the outside of the building through the city public safety communications system. Once the spot has been selected prospecting for a better spot in the grid area will not be permitted.
5. The gain values of all amplifiers shall be measured and the test measurement results shall be kept on file with the building owner so that the measurements can be verified each year during the annual tests. In the event that the measurement results become lost, the building owner will be required to rerun the acceptance test to reestablish the gain values. Copies of all tests shall be forwarded to the Fire and Police Departments.

On-going testing will be required every five years or in the event a failure is determined. A copy of such test shall be kept on record by the property owner and available for inspection at any time by Fire Department representatives.

Personnel conducting acceptance and annual radio system tests shall be qualified to perform the work. All tests shall be documented and signed by a person in possession of a current FCC license, a current technician certification issued by the Associated Public Safety Communications Officials International (APCO), or the Personal Communications Industry Association (PCIA).

**ADMINISTRATIVE REGULATIONS:**

The Fire Chief is authorized to, from time to time as necessary, issue, review and revise administrative regulations to implement this Section, including but not limited to the specification of standards for installation and maintenance of firefighter breathing air replenishment systems and operation and maintenance of radio retransmission equipment.

**BUILDING ACCEPTANCE TESTING**

- A. A certificate of compliance, as described herein, shall be issued prior to a certificate of occupancy being issued.
- B. The following elements of the life safety system shall be installed in accordance with approved plans and specifications and shall be tested, certified and proved to be in proper working condition to the satisfaction of the Building Division and Fire Department before issuance of the certificate of compliance:
  - 1.\* Standby and emergency electrical power systems;
  - 2.\* Fire alarm and related equipment;
  - 3.\* Firefighters phone and voice communication systems;
  - 4.\* Enclosed stairway pressurization system;
  - 5.\* Smoke evacuation and control systems (mechanical equipment);
  - 6.\* Other fire protection and extinguishing systems;
  - 7.\* Fire department breathing air system;

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8. Fire hydrant system;
9. Automatic fire sprinkler system;
10. Fire apparatus access roadways;
11. Elevators and controls;
12. All equipment and their rooms required by Article II of this chapter;
13. All applicable requirements in Titles 19 and 24, California Code of Regulations and the Uniform Building Code, Uniform Fire Code and N.F.P.A. codes and standards shall apply;
14. Systems required by this title, including building, mechanical and electrical equipment;
15. Complete exit systems.

**\*Note:** The items indicated by asterisk (\*) shall be certified in writing to the Fire Department by the engineer/installer to be in proper working condition and installed in accordance with the approved plans before a certificate of compliance will be issued.

*No building, floor or area shall be used or occupied by the building owner(s) or representative(s) for the purpose of tours, parties, conferences or similar functions which guests (public or private) will attend prior to the issuance of a certificate of occupancy, unless approved in writing in advance by the Building Division and Fire Department.*