Orange County Fire Authority

Community Risk Reduction

1 Fire Authority Road, Building A, Irvine, CA. 92602 www.ocfa.org 714-573-6100

High-Rise Buildings
Plan Review

Guideline H-01

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High-Rise Buildings: Plan Review

PURPOSE

1.1 Purpose – This document is intended to provide developers, building owners, property managers, and businesses with a comprehensive outline of the requirements for high-rise buildings as they pertain to plan submittal, inspection, emergency pre-fire planning, and maintenance of high-rise buildings.

This guideline describes the submittal and plan review requirements for high-rise buildings (HRB), which are buildings where the highest occupied floor is more than 75 feet above the lowest floor level having building access.

SCOPE

2.1 Scope – This guideline applies to all newly proposed HRB within the jurisdiction of OCFA.

SUBMITTAL REQUIREMENTS

3.1 Number of Plans Required – Refer to OCFA Guideline A-02 for submittal process and requirements.

PLAN REQUIREMENTS

4.1 General Plan Information – Plans will need the following information and items:

- Complete address of the project, including the tract and lot numbers
- Architect name, address and phone number with a wet signature
- Occupancy classification(s)
- Type of construction
- Total square footage
- Number of floors
- Regulating codes and their edition, e.g., 2022 CBC, 2022 CFC, etc.
- Deferred submittals, e.g., fire sprinklers, fire alarm, etc.
- Architectural, mechanical, plumbing, and electrical sheets
- Door schedule that identifies hardware and fire resistive ratings
- OCFA architectural notes, which can be found at www.ocfa.org under the Planning and Development section (click Resources, then Standard OCFA Plan Notes) in Fire Prevention

4.2. Fire Department Access – Basic fire department access and hydrant requirements can be found in OCFA Guideline B-01. However, tactics for emergency response at high-rise buildings focus more on aerial suppression and interior attack via the stairwells as opposed to ground-level operations. The site design for high-rise buildings shall incorporate the specific provisions listed below to facilitate emergency vehicle staging, aerial operations, and roof access. Where unique site or building conditions or restrictions prohibit compliance

with these access and hydrant provisions, the fire code official may modify or exempt individual provisions provided that an acceptable level of alternative access, water availability, and safety is provided. Regarding hose pull, portions of the high-rise building's perimeter that do not contain building entry points may be located up to 300 feet from a fire lane.

4.2.1. Vehicle laddering and staging areas – shall be provided as follows:

- A *minimum* of 2 laddering areas shall be provided for a high-rise building. The laddering areas shall meet the criteria in Section 4.2.2, Section 4.2.3, Section 4.2.4.1 - 4.2.4.5, and Section 4.2.5.3. Buildings meeting the exception in 4.2.4.1 or 4.2.4.2 shall meet the criteria in 4.2.2.2 – 4.2.2.4, Section 4.2.4.3 and Section 4.2.4.5.
- A staging area shall be provided for the FDC serving a high-rise building. The FDC staging area shall meet the criteria in Section 4.2.2, Section 4.2.4.3 - 4.2.4.4, Section 4.2.4.6, Section 4.2.5.1 and Section 4.2.5.3.
- A staging area shall be provided for the fire command center. This staging area shall meet the criteria in Section 4.2.2, Section 4.2.4.3 – 4.2.4.4, and Section 4.2.4.7.

4.2.2. Design – Laddering and staging areas shall be designed as follows:

4.2.2.1 Laddering and FDC staging areas shall be rectangular with a length of at least 50 feet and a width of at least 16 feet; for buildings higher than 120', the laddering area shall be at least 75 feet long. The staging area for the fire command center shall be at least 50 feet by 10 feet.

4.2.2.2 Laddering/staging areas and fire lanes leading to them shall be a permanent, hard-surfaced material such as concrete, asphalt, or decorative pavers.

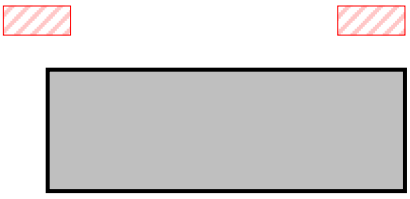
4.2.2.3 Laddering/staging areas are a part of the fire lane and shall meet all standard fire lane criteria. They shall not be used for any purpose that may potentially delay or hinder emergency response by the fire department including, but not limited to parking, loading/unloading zone, waiting/drop-off area, valet services, or other similar activities.

4.2.2.4 Laddering/staging areas shall be flat and provide with only enough slope/cross-slope to facilitate drainage (~2%).

4.2.3. Location of laddering areas – Laddering and staging areas shall be located as follows:

4.2.3.1. Laddering areas shall be located near opposing corners of the high-rise building or near adjacent corners of one or more of the longest sides of the building in a manner that optimizes access to the building façades and roof areas.

4.2.3.1. Laddering areas at opposing corners.

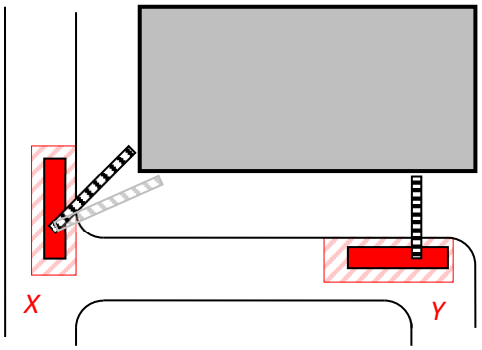


4.2.3.1. Laddering areas at adjacent corners of the longest side of the building.

4.2.3.2. At least one laddering area shall provide ladder access to two adjoining façades of the structure.

4.2.3.3. Where a high-rise structure has multiple roof levels that are not accessible from each other, all such independent roof areas shall be served by at least one laddering area.

Exception: roof levels higher than 90' to the top of the parapet or railing.

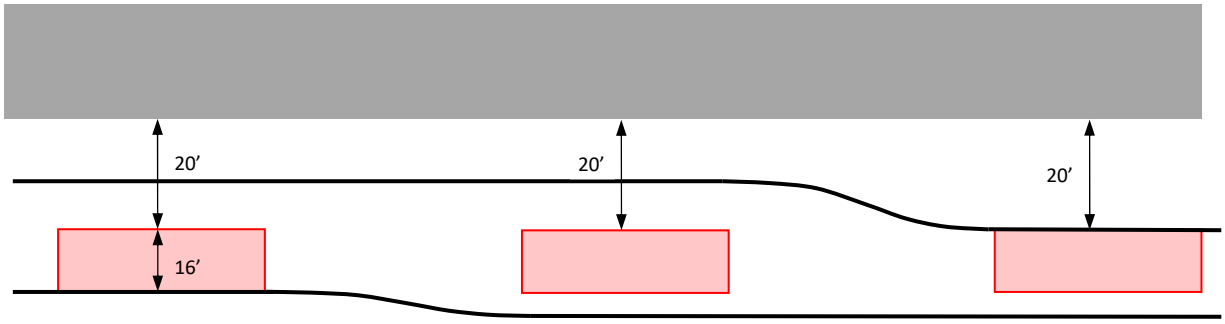


4.2.3.2. Laddering area X provides ladder access to two façades; laddering area Y provides access to one façade.

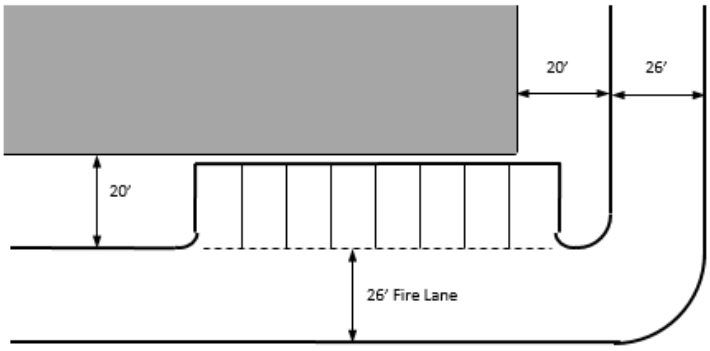
4.2.4. Setbacks – Access to and setbacks from buildings for laddering and staging areas shall be as follows:

4.2.4.1. **Buildings up to 90 feet tall** – for buildings 90 feet tall or shorter, as measured from the fire lane to the top of the roof parapet or railing, laddering areas shall be provided 20 feet from the façade as measured from the nearest edge of the laddering area.

Exception: When approved by the fire code official, designated laddering areas are not required provided that the nearest edge of the fire lane is located 20 feet from the structure along the entire length of at least 2 sides of the building, 1 of which is the longest side of the structure, or along at least 50% of the perimeter of the structure, whichever is greater. An unobstructed minimum 26-foot-wide fire lane shall be provided; parking and other obstructions shall not intrude into this clear width.



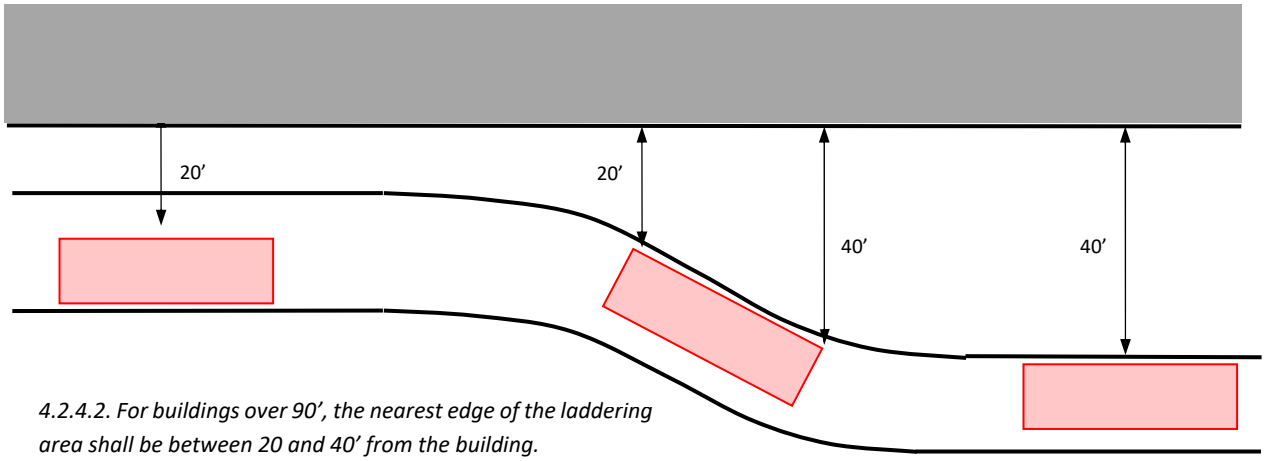
4.2.4.1. For buildings up to 90' tall, the nearest edge of the laddering area shall be 20' from the building.



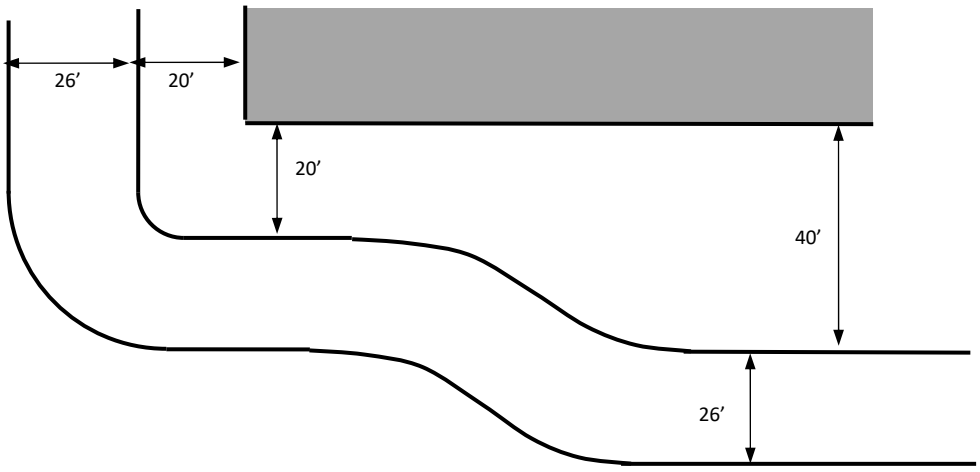
Exception:

Designated laddering areas are not required where the design of the fire lane facilitates laddering from any location along the majority of the perimeter.

4.2.4.2. **Buildings over 90 feet tall** – The laddering areas shall be no less than 20 and no more than 40 feet from the façade.
Exception: When approved by the fire code official, designated laddering areas are not required provided that the nearest edge of the fire lane is located between 20 and 40 feet from the structure along the entire length of at least 2 sides of the building, 1 of which is the longest side of the structure, or for at least 50% of the perimeter of the structure, whichever is greater. An unobstructed minimum 26-foot-wide fire lane shall be provided; parking and other obstructions shall not intrude into this clear width.



4.2.4.2. For buildings over 90’, the nearest edge of the laddering area shall be between 20 and 40’ from the building.

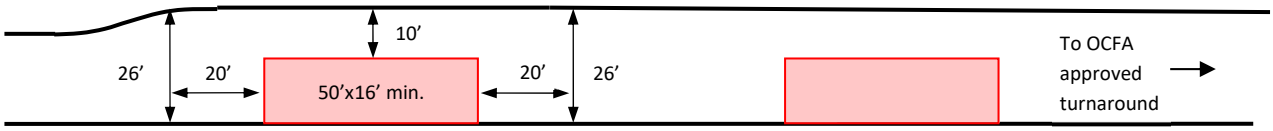


Exception:

Designated laddering areas are not required where the design of the fire lane facilitates laddering from any location along the majority of the building perimeter.

4.2.4.3. **Clearance from Structure** – Apparatus shall not be required to travel within 20 feet of the structure to reach any required laddering/staging area.

4.2.4.4. **Passing lane** – Where only a single path of vehicle travel to a laddering/staging area is available, apparatus shall not have to pass one laddering/staging area to reach another laddering/staging area unless the roadway within 20 feet of the intervening laddering/staging area has a clear width of 10 feet to allow vehicles to pass. The intervening laddering area shall be located adjacent to the curb closest to the structure to permit apparatus to pass fire trucks laddering the building.



4.2.4.4. Additional width is required to bypass the first laddering area as this part of the fire lane provides the only access route to the second laddering area to the right.

4.2.4.5. **Obstructions to laddering** – Vegetation and other potential obstructions in the area between the building and any portion of the fire department access roadway within 40 feet from the structure shall not impede laddering operations and shall be restricted to 20 feet in height at maturity.

4.2.4.6. **Distance from FDC** – Where the dimensions and topography of the site permit, the FDC staging area shall be located at least 40 feet from the building and within 100 feet of the FDC. When it is necessary to place it closer than 40 feet, it shall be located in such a way as to minimize the potential for exposure to falling debris and heat/flame impingement, such as adjacent to a wall without windows or other openings or diagonally from a corner of the building.

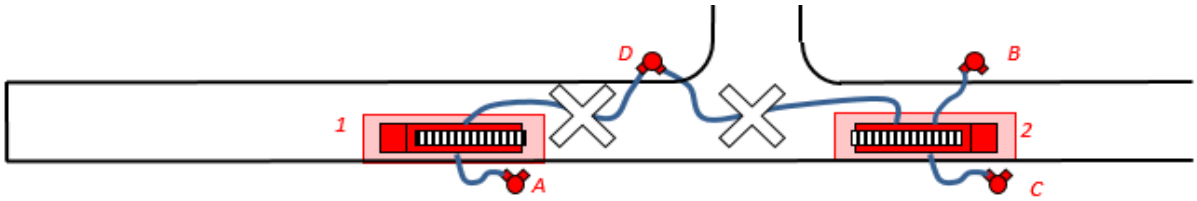
4.2.4.7. **Distance from Fire Command Center –** A staging area shall be provided at least 20 but not more than 50 feet from the fire command center in a position that is clearly visible from the door providing access to that space.

4.2.5. Water – Hydrants and Fire Department Connections shall meet these criteria:

4.2.5.1. Where the dimensions and topography of the site permit, the FDC and hydrant serving it shall be located at least 40 feet from the building. They may be located closer if they are placed where exposure to falling debris or direct flame impingement is minimized.

4.2.5.2. At least half, but not less than 2, of the hydrants required by CFC Appendix C to serve the high-rise building shall be located at least 40 feet from the structure. Where the dimensions and topography of the site do not permit this and with approval of OCFA, they may be placed closer if they are in a location where exposure to falling debris or direct flame impingement is minimized, such as a wall without windows or other openings or diagonally from the corner of the building.

4.2.5.3. A hydrant shall be located adjacent to or within 100 feet of each laddering area and within 100 feet of an FDC staging area. Hydrants and FDCs shall be located so that a hose line run between the device and fire apparatus in a laddering/staging area does not obstruct the only means of vehicle access to the remainder of the fire lane(s) on either side of that hose line.



4.2.5.3 "A" would be an acceptable location for a hydrant serving laddering area 1. A hydrant could be located at either "B" or "C" to serve laddering area 2 since the roadway on either side of the hose line would remain accessible from at least one direction of travel. "D" would not be an acceptable hydrant location for either laddering area 1 or 2 as a hose line crossing the fire lane would block the only vehicle access route to a significant portion of the fire lane.

4.2.6. Fire Command Center (FCC) – A fire command center shall be provided for all high-rise structures.

Design – A FCC is required and shall be separated from the building by a 1-hour fire barrier constructed in accordance with CFC Section 508. The FCC shall be located so that it is accessible directly from the exterior door adjacent to the fire department access roadway. The size of the room shall be a minimum of 200 square feet with the minimum dimensions of 10 feet.

Equipment and Contents – The FCC shall contain the following equipment at a minimum:

- Emergency voice/alarm communications
- Fire alarm control panel (FACP)
- Fire alarm/detection system annunciator unit
- Elevator annunciator showing location and status
- Status indicators and controls for air handling systems
- Smoke control panel
- Sprinkler valve and water-flow detector display panel
- Emergency and standby power status indicators
- Generator status panel with manual start and transfer features
- Fire pump status panel
- Controls for unlocking all stairway doors simultaneously
- One worktable (3' x 5') with 2 folding chairs
- Knox key locker
- Battery powered emergency lighting device (bug eyes)
- Emergency contact information (building engineer, maintenance, property management, security, alarm company, elevator company, major tenants point of contact)
- Schematic building plans in clearly labeled approved containers, indicating the typical floor plan and detailing the building core, fire resistive separations, exit facilities, on-site water supply, fire protection systems, firefighting equipment, and fire department access.
- The entry door shall be provided with a Schlage lock with a "C" cylinder openable with an OCFA master key. Once it has been installed, a licensed locksmith shall key the

cylinder. The locksmith shall contact OCFA fire prevention staff for the keying sequence.

Arrangement – The panels/equipment shall be arranged on the wall in the following order starting left of the entry door and proceeding in a clockwise direction.

4.2.6.1. Knox box
4.2.6.2. Controls for unlocking all stairway doors
4.2.6.3. Fire alarm annunciator (graphic display)
4.2.6.4. Fire alarm control panel (FACP)
4.2.6.5. Voice evacuation panel
4.2.6.6. Elevator status panel
4.2.6.7. Emergency and standby power status
4.2.6.8. Generator status panel
4.2.6.9. Fire pump status panel
4.2.6.10. Smoke control panel
4.2.6.11. Air handling unit status panel
4.2.6.12. Emergency contact information adjacent to telephone

4.2.7. Emergency Responder Radio Coverage System – 800 MHZ radio coverage shall be provided in the building. The owner is responsible to coordinate with the Orange County Sheriff's Department, Technology Division and retain a certificate before an issuance of a Certification of Occupancy (may contact at errcs@ocsheriff.gov or service desk at 714-704-7999).

4.2.8. Fire Alarm System – HRBs shall be provided with an approved automatic fire alarm system meeting the requirements of 2022 CBC, 2022 CFC, 2022 NFPA 72 and 2021 NFPA 4. The alarm plans may be submitted separately from other submittals. Prior to submitting the alarm plans to OCFA, they shall be reviewed by the smoke control design engineer for compliance of the smoke control design. The design engineer shall provide a letter indicating compliance with the Smoke Control Rational Analysis.

Sequence of Operation – The sequence of operation for alarm systems and interfaces with other building systems shall be as follows:

4.2.8.1. **General Alarm:** Activation of a water flow switch, manual fire alarm box (if any), smoke detector, or other fire protection or extinguishing system shall activate the following:

- Activation of all audible/visual devices and automatic voice evacuation on the floor above, floor below, and the floor the initiating device is located
- Activation of the stair pressurization fans
- Activation of the smoke control system (if active system is provided) for the floor involved, the floor above, and the floor below the floor involved
- Stairwell doors to unlock (as applicable)
- Release of all door hold open devices
- Shut down heating ventilation air conditioning (HVAC) system
- Closure of all fire and smoke dampers

- Alarm to display on the FACP
- Alarm to display on the graphic annunciator panel
- Alarm signal to be sent to the central station

4.2.8.2. **Elevator Recall:** Smoke/heat detector activation in any elevator lobby, elevator machine room, or elevator shaft shall recall all elevators to the first floor. If the alarm initiates from the first floor, the elevator(s) shall recall to an alternate floor approved by OCFA. Refer to 2022 CBC Sections 3003 and 3005 for elevator Phase I & II recall operation detail.

4.2.8.3. **Duct Detectors:** Activation of HVAC smoke detectors shall initiate the following:

- Shut down associated air handler system
- Release all door hold open devices
- Close all smoke dampers
- Show supervisory signal on the FACP
- Show supervisory signal type on the graphic annunciator panel
- Send supervisory signal to the central station

4.2.9. Smoke Detectors – Smoke detectors shall be provided in the following locations:

4.2.9.1. Elevator machine rooms
4.2.9.2. Elevator lobbies
4.2.9.3. Telephone equipment rooms when not provided with sprinklers
4.2.9.4. Air handler systems with ≥ 2,000 CFM:

- In the main return air
- Exhaust air plenum
- At each connection to a vertical duct or riser serving 2 or more stories from a return air duct or plenum of an air conditioning system

4.2.10. Audible Alarm & Voice Evacuation System – Activation of the audible fire alarm and voice evacuation system shall be as follows:

4.2.10.1. Cycle: 3 slow-whoop tones (temporal pattern), electrically generated, and followed by a taped voice message.
4.2.10.2. The above cycle shall continue to sound until manually terminated by fire department personnel. If the voice message fails to operate, the temporal pattern shall continue to sound until terminated.
4.2.10.3. Unless an alternative message is approved by the OCFA, the voice message recording shall state, “Attention, attention: An emergency has been reported in the building. Please leave the building immediately through the marked exits. Do not use the elevators, use only the exit stairwells.”
4.2.10.4. Speakers shall be provided throughout the structure and set up in paging zones. At a minimum, the paging zones shall consist of:

- Elevator groups
- Exit stairways
- Each floor
- Areas of refuge

4.2.10.5. The system shall have a “live voice message” feature that allows broadcasting of live voice messages through the paging zones on a selective and all-call basis.

4.2.11. Secondary Electrical Power Supply – A secondary electrical power supply shall be provided. The plan shall show the total load calculations for both emergency and standby power. If more than 1 generator is provided, calculations shall be provided for each. An on-site fuel supply for not less than 6 hours at the full rated power of the generated shall be provided. For a HRB that utilizes electric fire pump(s), sufficient fuel not less than 8 hours of fuel supply at 100 percent of the rated pump capacity shall be provided. The design shall be in accordance with 2022 CFC, 2019 NFPA 110, and Section 9.6 of 2019 NFPA 20.

4.2.12. Emergency Power – Emergency power shall be provided within 10 seconds after primary power loss and be provided to the following system:

- Exit signs and means of egress illumination
- Emergency voice/alarm communication systems
- Elevator car lighting
- Automatic fire detection systems
- Fire alarm systems
- Electrically powered fire pumps
- Power and lighting for the fire command center

4.2.13. Standby Power Standby power shall be provided within 60 seconds after primary power loss and be provided to the following system:

- Ventilation and automatic fire detection equipment for smoke-proof enclosures
- Elevators
- Where elevators are provided in a high-rise building for accessible means of egress, fire service access or occupied self-evacuation, the standby power system shall also comply with Sections 1009.4, 3007 or 3008, or 2022 CBC as applicable.
- Smoke control systems

4.2.14. Signage and Stairway Floor Number Signs – Stairway identification signs shall be located in all enclosed stairways in HRBs as required per CBC 1023.9. The requirements for sign details shall be as follows:

4.2.14.1. A detail of the sign shall be provided on the plans for review.
4.2.14.2. The size shall be a minimum of 12”x 12” and constructed of durable material.
4.2.14.3. Font size shall be 5” with ¾” stroke for the floor level and 1” with ¼” stroke for the remaining information.
4.2.14.4. All lettering to be in sharp contrast to the background.
4.2.14.5. The following items shall be provided on stairway identification signs:

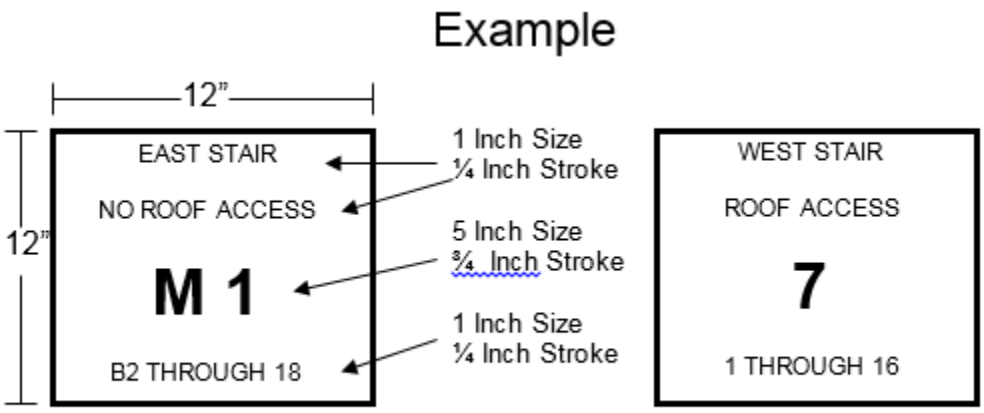
- Stairway location – such as STAIR NO.1 or WEST STAIR
- Each stair landing – such as upper termination and lower termination of the stairway

- The stairway upper terminus – such as ROOF ACCESS or NO ROOF ACCESS
- The stairway lower terminus – such as STAIR 3 ROOF ACCESS 1 THROUGH 12
- Floor level number – such as the mezzanine levels shall have the letter "M" preceding the floor number and/or Basement levels shall have the letter "B" preceding the floor number

4.2.15. Sign Location - The plan shall specify that the Stairway Identification signs shall be located at every stairway landing in buildings 4 or more stories in height.

4.2.15.1. Specify all signs shall be posted at a height no greater than 60" above the floor level

4.2.15.2. Tactile signage shall comply with the CBC 1023.11



4.2.16. Evacuation Signs – Evacuation signs are required per California Health and Safety Code, Chapter 4, Section 13220. Sign details shall be as follows:

4.2.16.1. Provide a detail of the signs for each floor-level

4.2.16.2. Specify that all signs shall include the following features:

- Minimum lettering size 3/16 inch non decorative lettering
- All lettering shall be in sharp contrast to the background
- Constructed of durable material

4.2.16.3. Emergency exit routes, and map legend, including:

- The pathway of the means of egress that indicates the evacuation routes
- Exit doors
- Locations of manual fire alarm stations
- Schematic of manual fire alarm stations
- Statements describing both audible and visual fire alarm systems
- Fire Department emergency telephone number 911
- Statement prohibiting the use of elevators in case of emergency
- Procedures for handicapped and non-ambulatory persons

4.2.17. Evacuation Signs - Sign Location

4.2.17.1. Identify the location of all evacuation signs for each floor. If the floor layout is identical for multiple stories, the plan can be so indicated. A separate floor plan for each subsequent identical floor-level will not be required.

4.2.17.2. Specify all signs shall be posed at a height no greater than 48” above the floor level measured to the top of the sign.

4.2.17.3. The floor plan diagram on the evacuation sign shall be oriented directionally as it is seen from the viewer’s perspective.

4.2.17.4. The following locations must be provided with an emergency evacuation sign:

- All elevator landings
- Every stairway landing (on the corridor side)
- Immediately inside all public entrances to a public building

4.2.18. Fire Sprinkler System – All HRBs shall be protected by an automatic fire sprinkler system. The sprinkler system design shall conform to 2022 NFPA 13, CBC Chapter 4 and Chapter 9, and CFC Chapter 9. In the shell building, only quick response sprinklers shall be used.

4.2.19. Fire Pump – A fire pump shall be provided and rated to provide the demands of the sprinkler or standpipe system whichever is greater. If the fire pump is electric, it shall be connected to the emergency power system. The fire pump shall be designed and installed in accordance to 2019 NFPA 20. In HRBs having an occupied floor more than 200 feet above the lowest level of fire department vehicular access, 2 fire pumps shall be provided (2022 CBC 403.3.2.1) and arranged in such a configuration to minimize the number of pressure reducing valves or create multiple standpipe zones. Where a hose valve is provided with a pressure reducing valve, the minimum size of the express drain shall be 3” with a capped groove outlet to test the pressure reducing valve.

4.2.20. Pressure Reducing Valves – The sprinkler system design shall be designed to minimize the use of pressure regulating/reducing devices.

4.2.21. Standpipe System – The standpipe system shall be combined with the sprinkler system risers and shall be installed according to CFC Chapter 9 and 2019 NFPA 14. The combined systems shall be interconnected at the bottom between risers. Fire department standpipe connections and valves serving the floor shall be located within the vestibule unless otherwise approved by the fire code official, in accordance with 2022 CBC Section 905.

4.2.22. Roof outlets – 2 outlets (2 ½ inch each) shall be provided at the roof. If all portions of the roof cannot be reached within 150 feet from the roof outlets, additional outlets shall be provided.

4.2.23. Flow – The system shall be designed so that the system is automatically capable of providing a minimum of 500 GPM from the outlets at the roof and a minimum of 250 GPM for all subsequent standpipe outlets, to a maximum of 1250 GPM. The residual pressure shall be 100 psi with full flow. A typical 2 stair HRB will have a total standpipe

demand of 750 GPM. A listed pressure gauge shall be provided at the top of each standpipe.

4.2.24. Drain – A 3-inch express drain shall be provided adjacent to each standpipe. The express drain shall contain a 2 ½ inch inlet at each floor level. The drain shall be clearly marked "Drain" at each level. The drain is intended to allow testing of the standpipe system. The inspector's test valve shall be connected to the express drain.

4.2.25. On-Site Water Supply – An automatic secondary on-site water supply having a usable capacity of not less than the hydraulically calculated sprinkler demand, including 100 GPM of the hose stream requirement, shall be provided for HRBs. The secondary on-site water supply shall be a minimum of 15,000 gallons.

4.2.26. Smoke Control System – HRMs shall be provided with a smoke control system compliant with CFC 909. A Smoke Control/Rational Analysis Report shall be submitted with the architectural plan for OCFA review and approval. The report shall include but not be limited to the following:

4.2.26.1. Design method
4.2.26.2. Stack effect
4.2.26.3. Temperature effect of fire
4.2.26.4. Climate/wind effect
4.2.26.5. HVAC system operation
4.2.26.6. Duration of operation
4.2.26.7. Design fire
- Factor considerations
- Separation distance
- Heat release assumptions
- Sprinkler effectiveness assumptions

4.2.26.8. Detailed system test matrix

OCFA requires the use of a third-party inspector for all smoke control systems. OCFA will complete the final inspections in conjunction with the third-party inspector.

4.2.27. Photoluminescent Markings – Add photoluminescent egress path markings in Group A, B, E, M or R-1 occupancies in accordance with CFC 1025. Self-luminous and photoluminescent marking materials shall comply with UL 1994 or ASTM E2072 and shall be provided with not less than 1 footcandle (11 lux) of illumination for not less than 60 minutes prior to periods when the building is occupied and continuously during building occupancy.

ATTACHMENT 1
Definitions

For the purposes of this guideline, certain terms are as follows:

CBC: 2022 California Building Code

CFC: 2022 California Fire Code

High-Rise Building or Structure: A building where the highest occupied floor is more than 75 feet above the lowest floor level that provides access to the interior of the building.

Fire Command Center (FCC): The principal attended or unattended location where the status of the detection, alarm communications and control systems is displayed, and from which the system(s) can be manually controlled. Also known as a Fire Control Room.

NFPA 13*:* 2022 Edition of the National Fire Protection Association 13: Standard for the installation of Sprinkler Systems.

NFPA 14*:* 2019 Edition of the National Fire Protection Association 14: Standard for the installation of Standpipe, Private Hydrant, and Hose Systems

NFPA 20: 2019 Edition of the National Fire Protection Association 20: Standard for Stationary Pumps for Fire Protection.

NFPA 72: 2022 Edition of the National Fire Protection Association 72: National Fire Alarm Code.