

SECTION 30

HIGH OCCUPANCY BUILDING FIRE

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Section 30 - HIGH OCCUPANCY BUILDING FIRE

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HAZARD IDENTIFICATION

Structure Fires in the United States

According to figures published by the National Fire Protection Association, in 2002, there were more than 519,000 structure fires reported in the United States, resulting in 2,695 civilian deaths. The vast majority of deaths resulted from fires in one-and two family dwellings or apartments. There were 25 deaths in "other residential," which includes hotels, motels, college dormitories, and other high-occupancy residential structures. Approximately 5% of structure fires occur in high rise structures. The number of reported structure fires and civilian deaths from structure fires has been trending downward since 1977.

High-rise structures are defined as structures exceeding the reach aerial reach of local fire department equipment, usually 75 feet (7 to 8 stories). High rise structures are generally classified as residential, hotel/motel, office, hospital, and other. The vast majority of reported high rise fires occur in residential structures. This assessment addresses fire hazard in high rise occupied structures only.

Characteristics of High Rise Fire Suppression and Occupant Safety

High rise fires pose significant problems for both fire suppression and occupant safety. The following analysis of the unique fire safety issues related to high rise buildings are excerpted from the September/October 2000 issue of Fire Command and Control, authored by Vincent Dunn:

When buildings are constructed beyond the reach of a fire department's highest ladder, two important firefighting strategies are taken away from firefighters. First, life-saving victim removals using ladders are eliminated. Searches and rescues can be accomplished only from inside stairways. The second firefighting strategy in a high rise is the ability to extinguish a fire with an outside master stream. Firefighters must extinguish the fire using handheld hose streams advanced through heat and smoke from an inside stairway.

The response time in a high rise building fire may be 15 minutes or longer. At a high rise building, unlike a low rise building, firefighters, after they arrive, may have to walk 100 to 200 feet through an open space or large lobby. They then have to

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question building employees about the fire location, check an alarm panel, etc.

Firefighters battling a fire in a high rise building depend on the building systems for success in extinguishment. The elevator system must take them, tools, and equipment up to the fire. The standpipe system must provide water pressure and volume to the upper floors. A building communication system must allow fire department firefighting radio transmission. The structural steel framework of a high rise building interferes with fire department radios.

High rise buildings have sealed or locked windows. Venting by breaking thick glass windows is extremely dangerous. Falling glass can injure people on the sidewalk and cut supply hoses. Because these buildings are sealed, large volumes of heat and smoke generated by the fire become trapped in the structure. The so-called “stack effect” (the result of temperature difference between the inside and outside of a sealed high-rise building) causes smoke to spread up or down many floors during a fire. Large volumes of smoke and heat move uncontrollably during a high rise fire.

Lastly, firefighters cannot order all the people in a high rise building to leave during a fire. It is not possible for thousands of people to leave a burning building quickly. It would take several hours.

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HAZARD PROFILE

History and Background

The first four-story wood frame building was constructed in Los Angeles in 1882. By 1888, seven-story buildings with brick bearing walls were permitted and fire escapes were required for buildings four stories or more in height. With the advent of elevators and minimal masonry reinforcement, the City in 1903 allowed the construction of its first 13-story office building. In 1905, the fire escape ordinance was made retroactive and enforcement was delegated to the Building Department. Subsequently, water connections were required in new multi-story buildings to facilitate fire fighting. In 1910, the height limit was set at 150 feet (13 stories) for steel frame office buildings, the maximum possible under then available engineering techniques, and five stories for residential buildings, including hotels. After building technological advances enabled construction of taller buildings, the height limit was retained to assure that the proposed City Hall would be the City's tallest building.

City Hall was dedicated in 1928 and at 452 feet in height (over 28 stories) it remained the tallest building until the 1957 floor area ratio ordinance replaced the height ordinance. The 1957 ordinance allowed unlimited height with a maximum floor area in order to encourage provision of open space and more imaginative building design. In 1962 the 32-story Occidental Tower (later TransAmerica Building) was constructed in the Central City community. It became the first building to exceed the height of City Hall. Hundreds of high rise buildings have since been constructed in the City. This has necessitated entirely new techniques for fire mitigation, suppression and rescue.

The Los Angeles Experience

In 1964, Operation High Rise was instituted. It used empty buildings to study the propagation, effects and spread of fires and to develop systematic response and suppression procedures for high rise fires. Procedures developed by this unique program and subsequent programs have been used by emergency response agencies throughout the world. The first significant local test of Operation High Rise was in 1968 for a fire in the 9-story U.S. Borax and Chemical Corporation building in the Westlake area. Heat activated elevator buttons caused elevators to be called to and to remain at the fire involved floor, resulting in the death of one fire fighter. Emergency alarm systems failed to work and hand held walkie talkies proved ineffective inside the building.

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Out of this tragedy came new building construction requirements and fire fighting procedures, including banning of heat activated elevator buttons by Los Angeles and establishment of a new Department procedure requiring fire fighters to use stairs instead of elevators to gain access to a fire involved floor.

The first major high rise fire in the nation, the One New York Plaza fire of 1970, triggered a national review of hazards associated with high rise buildings. The California State Legislature in 1974 adopted high rise fire safety regulations which included requirements for automatic sprinkler systems in any new buildings which were 75 or more feet in height. Revised procedures were successfully used in the 1971 Westwood Center Building (Glendon Avenue, Westwood community) fire. The Department quickly contained the fire and suppressed it within half an hour. In 1976 the new Incident Command System (ICS) was instituted. It was designed to improve operations and coordinate fire suppression resources. Its first major test was the 1976 fire on the 20th floor of the Occidental Tower building. The success of ICS resulted in adoption of the ICS methodology by other emergency response agencies around the world.

The 1979 fire on the 11th floor of the Bunker Hill West Tower (Hope and Third Streets, Central City) was the City's first major fire in a residential high rise building. Residents were phoned and urged to remain in their rooms so that opening of doors would not spread the fire and so that residents would not become victims of smoke inhalation. One couple died when they were literally blown off a balcony ledge when the fire burned from the open room across the hall, through the door to their unit, causing a blast of heated air. Following this tragedy, rescue procedures were improved and, in 1980, smoke detectors were required in all new residential high rise buildings and any high rise buildings which were issued remodeling permits.

In 1984, the Department's improved ICS procedures were successfully used in responding to the 12-story Fickett Towers (Van Nuys community) senior citizen building fire. The fire was knocked down in 71 minutes and all 230 of the elderly and infirm tenants were successfully evacuated. The most materially damaging high rise fire in City history occurred in 1988 in the 62-story First Interstate Bank Building fire (Wilshire Boulevard at Hope Street, Central City) which claimed the life of one civilian. The fire began on the 12th floor and moved upwards to the 16th floor before it was contained and suppressed. Following the Interstate fire, the City Council required fire sprinklers in the 363 existing commercial and office buildings constructed before the State sprinkler regulations became effective. The fire also underscored to private industry the need for private back-up systems and facilities to enable continuance of business operations following a fire.

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One of the most complex and difficult fires ever fought by the Department was the 1986 Central Library fire (5th Street at Grand Avenue, Central City). The open book stacks, narrow corridors, circuitous stairways, interference of the thick walls with the walkie-talkies, lack of windows and ventilation, dense smoke, intense heat (estimated as high as 2500 degrees in some areas), limited access and fire fighter exhaustion due to heat and exertion made the fire difficult to attack. Extensive pre-planning for a potential fire in the historic structure resulted in an orderly evacuation of library staff and patrons and invaluable familiarity of the fire commanders with the building and its unique fire suppression demands. Salvage units quickly instituted procedures to protect the 1.2 million books and documents from smoke and water damage. Ingenious methods were devised to direct smoke from the building and relay fire fighters in and out of the fire areas. After seven hours and thirty-eight minutes the fire was brought under control. It took another five days to mop up the hot spots and for the building to cool down. The 350 fire fighters saved over a million books. Only 350,000 books were fire or water damaged and only 4% of the \$500 million value of the structure was lost.

Major Structure Fires in Los Angeles

The following list includes the major structure fires occurring within the City of Los Angeles since 1887:

- Belmont Hotel Fire, December 16, 1887
- Los Angeles Times Building Explosion and Fire, October 1, 1910
- Brennan Hotel Fire, January 24, 1913
- Shrine Auditorium Fire, January 11, 1920
- Gray Building Fire, November 6, 1939
- O'Connor Electro-Plating Co. Explosion and Fire, February 20, 1947
- Ponet Square Hotel Fire, September 13, 1970
- Dorothy Mae Apartment Fire, September 9, 1982
- Los Angeles Central Library Fire, April 29, 1986
- First Interstate Bank Fire, May 4, 1988
- Pan Pacific Auditorium Fire, May 24, 1989

Los Angeles High Rise Fire Code

In addition to building, plumbing, and electrical codes which apply to all structures in Los Angeles, the City has adopted a High Rise Fire Code specifically designed to reduce the occurrence of high rise fires, as well as to reduce the resulting injuries, loss of life, and

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property damage (Section 57.118 *et seq*, City of Los Angeles Fire Code).

This section of the Fire Code promulgates specific and detailed regulations related to Fire Control Rooms, Building Communication Systems, Fire Department Voice Communication Systems, Elevator Systems, Fire Protective Signaling Systems, Emergency Smoke Control Systems, Standby Emergency Power Systems, Stair shaft Doors, and Automatic Sprinkler Systems. In addition to requirements for new buildings the City has taken an aggressive stance to require sprinkler system retrofit of existing older buildings.

Probability of Future Occurrences

There are more than 420 high rise structures in the City of Los Angeles. Despite vigorous code enforcement, building inspection, and training for owners and occupants, the potential for a disastrous event still exists. There is no way to predict when, or where such an event will occur.

VULNERABILITY ASSESSMENT

General

For the purposes of this assessment, high rise buildings in Los Angeles are divided into three categories according to date of construction: pre-1960, 1960 -1974, and post 1974. The reason for this categorization is based upon the code requirements in effect at the time of construction. Pre-1960 buildings were required to have a “dry” standpipe for firefighting and a “wet” standpipe for occupants. A “dry” standpipe does not have water or water pressure; water must be pumped through the system by firefighters from street level. After 1960 all high rise buildings were required to have a combo system, i.e., wet standpipes for both occupants and firefighters. This allowed firefighters to attack fires more quickly at higher floors, since water and water pressure is available on all floors. All buildings constructed after 1974 are required to be equipped with automatic sprinkler systems, considered to be the most effective tool for fighting high rise fires.

According to information published on the Emporis web site (Emporis is a private real estate data and information company), there are more than 420 high rise buildings located in the City of Los Angeles. While high rise structures are located in almost all parts of the city, they are concentrated in a few areas: the Central City (173), the Wilshire District (70), Westwood (52), West Los Angeles - Century City (43) and Hollywood (20).

Analysis of data on the Emporis web site indicates that approximately 38% of total high rise structures are pre-1960; approximately 28% were constructed between 1960 and 1974; and 34% were constructed from 1975 to the present. This means that only about one-third of the high rise buildings in the City were constructed with automatic sprinkler systems. This does not take into account, however, the number of older buildings that may have been retrofitted with sprinkler systems.

Telecommunications Buildings Within the Central City

In most cases, damage, injuries, and loss of life from a high rise building fire is limited to the building itself and the immediate surroundings. The concentration of telecommunications facilities in the Central City area, most within high rise buildings, presents a special case.

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Since the late 1990's there has been a significant concentration of telecommunications facilities within a ten square block area in downtown Los Angeles.

Most of the major, and many smaller telecommunications firms serving the greater Los Angeles Area have located facilities in the area. The per cent of space devoted to telecommunications in buildings within this area varies from about 10% to 100%. In total, it is estimated that more than 2.4 million square feet of floor space is devoted to telecommunications and related uses. Instead of housing office workers, these buildings house routers, switching equipment, servers, and associated support equipment.

The National Fire Prevention Association web site indicates that 23% of fires in office structures are caused by electrical distribution equipment. Therefore, this high concentration of telecommunications infrastructure not only poses a significant fire hazard, the results of a catastrophic fire in a major telecommunications structure could cause major disruption to communications within the City, as well as nationally and internationally.

Identifying Assets

Critical Response Facilities:

The LHMP Advisory Task Force considers the following facilities “critical” in response to any disaster:

- Fire Stations
- Police Stations
- 911 Call Centers
- Hospitals
- City Emergency Operations Center (EOC)¹
- Evacuation Centers (LAUSD schools and Rec & Park Facilities)

Two of these facilities are located in high rise structures subject to the High Rise Fire Hazard. These are the City Emergency Operations Center (EOC), which is located in City Hall East, and the Los Angeles County/USC Medical Center.

Critical Infrastructure Facilities

Critical infrastructure facilities consist of the following facilities:

Utility Infrastructure:

- Potable Water System (Treatment plants, dams & reservoirs)
- Electric Power Systems
- Wastewater System
- Oil Refineries
- Natural Gas System

¹Note: The EOC Facility is located in City Hall East (CHE) and is found under "Big Nine" Facilities (Critical Operating Facilities).

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- Communication System

Transportation Infrastructure:

- Freeways
- Streets
- Bridges
- Railroads (Light Rail)
- Airports
- Harbor Facilities

Among Critical Infrastructure Facilities, only Communications Systems are considered directly vulnerable to significant damage from the High Rise Fire Hazard. However, administrative and executive offices of both privately owned and publically owned infrastructure facilities are subject to potential damage from high rise structure fires. Notable among these are the Los Angeles County Metropolitan Transportation Authority (MTA), the Metropolitan Water District, the California Department of Transportation (Caltrans) and the City's Department of Water and Power. Catastrophic fires occurring in the high rise structures housing these administrative, and command-and-control facilities could cause major disruption to water supply and transportation systems.

Critical Operating Facilities

Critical operating facilities in the City of Los Angeles are identified as the "Big Nine" buildings, Phase II facilities, and information Technology Department, that are critical for continuity of government following a major disaster. These facilities house City Departments and staff critical in continuing government operations. "Big Nine" facilities contain the largest number of departments and staff within them. "Big Nine," Phase II and ITA City facilities do not contain staff from proprietary departments such as the Department of Water and Power, Harbor Department, or the Los Angeles World Airports. Proprietary departments generate their own revenue but are still owned by the City. These facilities are included under Critical Utility and Critical Transportation Facilities sections (previous section). "Big Nine," Phase II and ITA facilities are considered general fund departments. For the purpose of this report, only "Bib Nine" buildings and proprietary department facilities are considered critical operating facilities. "Big Nine" facilities are listed below:

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Big Nine Facilities

LA City Hall
City Hall South
City Hall East
City Commercial Offices (Personnel)
Piper Tech
Parker Center
San Pedro Municipal Building
Marvin Braude Building
West L.A. Municipal Building

Of “Big Nine” facilities, LA City Hall and City Hall East fall into the High Rise category, and would be subject to the High Occupancy Building Fire Hazard.

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Estimating Potential Losses

Critical Response Facilities Located in High Occupancy Structures - Asset Values

POLICE STATIONS

None

FIRE STATIONS

None

MEDICAL FACILITIES

County/USC Medical Center

RECREATIONS AND PARKS FACILITIES

None

LA UNIFIED SCHOOL DISTRICT FACILITIES

None

Hospital in High Occupancy Structures

Hospitals are considered the responsibility of the County of Los Angeles. The City of Los Angeles does not have jurisdiction over hospitals located in the City; however, the City does have a mutual understanding with the County that victims can be treated at these facilities. Specific asset value information related to hospitals may be available in the County of Los Angeles Hazard Mitigation Plan.

Critical Infrastructure Located in High Occupancy Buildings - Asset Values

There are no Critical Infrastructure Facilities located in High Occupancy Structures.

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Critical Operating Facilities Located in High Occupancy Structures - Asset Values

Name and Description of Asset	Structure Replacement Value (\$1,000's)	Content Replacement Value (\$1,000's)	Total Replacement Value (\$1,000's)
LA CITY HALL	359,699	359,699	719,398
CITY HALL EAST	35,644	35,644	71,888
TOTAL	395,543	395,543	791,086

Analysis of Future Development

According to the data compiled by the Emporis Company, there are currently (September 2004) a total of 11 high rise buildings proposed for construction in the City of Los Angeles, and 3 under construction. These 14 structures represent an increase of slightly more than 3% in the total number of high rise structures in the City. Thirteen of the proposed/under construction buildings are in areas that already have significant numbers of such structures (Central City, Westwood, Wilshire Corridor, and West LA/Century City). Only one building under construction is in an area of few existing high rise structures (North Hollywood/Valley Village).

Given the small number and distribution of proposed/under construction high rise structures, these additional structures are not considered to constitute a significant increase in the High Occupancy Building Fire Hazard.