FIRE COMMAND 2C
High Rise Fire Tactics
Student Manual

accredited by

OFFICE OF
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for the

CALIFORNIA FIRE SERVICE
TRAINING AND EDUCATION SYSTEM

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High Rise Fire Tactics
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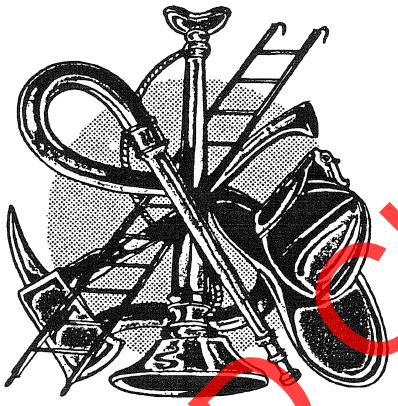

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FIRE COMMAND 2C HANDOUTS

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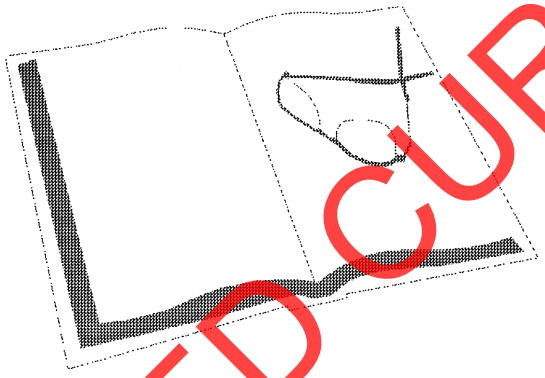

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Investigation Report on the MGM Grand Hotel Fire: Abstract

A fire at the MGM Grand Hotel on November 21, 1980, resulted in the deaths of 85 guests and hotel employees. About 600 others were injured and approximately 35 fire fighters sought medical attention during and after the fire.

The high rise building, constructed in the early 1970's, consisted of twenty-one stories of guest rooms situated above a large ground-level complex comprised of a casino, showrooms, convention facilities, jai alai fronton, and mercantile complex. The hotel was partially sprinklered but major areas including the Main Casino and The Deli, the area of fire origin, were not sprinklered. About 3,400 registered guests were in the hotel at the time of the fire.

As reported by the Clark County Fire Department, the most probable cause of the fire was heat produced by an electrical ground-fault within a combustible concealed space in a waitresses' serving station of The Deli.

Following full involvement of The Deli, a flame front moved through the Casino. Smoke spread to the high-rise tower through stairways, seismic joints, elevator hoistways and air handling systems. The means of egress from the high-rise tower was impaired due to smoke spread into stairways, exit passageways and through corridors.

The high-rise tower evacuation alarm system apparently did not sound and most guests in the high-rise were alerted to the fire when they heard or saw fire apparatus, saw or smelled smoke, or heard people yelling or knocking on doors. Many occupants were able to exit unassisted down stairs. Others were turned back by smoke and sought refuge in rooms. Many broke windows to signal rescuers or to get fresh air. The fire department confined the fire to the Casino level in a little over one hour. It was approximately four hours before all guests were evacuated.

Of the 85 fatalities, 61 victims were located in the high-rise tower, and 18 were on the Casino level. Five victims were moved before their locations were documented. The 85th victim died weeks after the fire. Of the 61 victims found in the high-rise tower, 25 were located in rooms, 22 were in corridors, 9 in stairways and 5 were found in elevators. One person died when she jumped or fell from the high-rise tower.

The major factors that contributed to the loss of life that occurred as a result of this fire incident are the following:

- Rapid fire and smoke development on the Casino level due to available fuels, building arrangement, and the lack of adequate fire barriers.

- Lack of fire extinguishment in the incipient stage of fire.

- Unprotected vertical openings contributed to smoke spread to the high-rise tower.

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- Substandard enclosure of interior stairs, smokeproof towers and exit passageways contributed to heat and smoke spread and impaired the means of egress from the high-rise tower.

- Distribution of smoke throughout the high-rise tower through the heating ventilating and air conditioning equipment.

- Smoke spread through elevators hoistways to the high-rise tower.

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Scope of Work Comparisons

1976 TITLE 19 RETROFIT
Total Occupancies: 394
Staffing: 6 Insp. II
Compliance time: 6 years

1. Enclose stairshafts
   A. Partitions & Doors

2. Fire Warning Systems
   A. Manual Pull Stations
   B. Elevator Smoke Detectors-Recall
   C. Water flow devices

3. Certify Second exit

4. Openable Windows

Radio test

6. Evacuation Manuals Required

7. Key Box w/Keys

8. N/A

9. Battery powered lighting/Corridors, stairwells

10. N/A

11. N/A

12. N/A

13. N/A

14. N/A

15. N/A

N/A

1988 RETROFIT ORDINANCE
Total Occupancies: 394
Staffing: 2 Insp. II
Compliance Time: 3 years (with extensions)

1. Elevator vestibules
   A. Enclosures & Doors
   B. Recall smoke detectors
   C. Area Smoke Detectors

2. Fire Warning systems
   A. Manual Pull Stations
   B. Area Smoke Detectors
   C. Duct Detectors
   D. Water Flow Switches
   E. Tamper Switches
   F. Special Ext. Systems

3. Provide Unobstructed Access to Second Exits

4. Provide Stair Shaft Ventilation (Manual Roof Hatch or Door)

5. Radio Test

6. Evacuation Manuals Required

7. Key Box W/Keys

8. Fire Sprinkler Systems

9. Emergency Power

10. Fire Pump & Standpipes

11. Asbestos Abatement Procedures

12. Life/Safety Maintenance & Change Over Procedures

13. On Site Water Supply

14. Fuel Storage Tank

15. Fire Control Room

16. Smoke Control Systems (Breakable Windows)

NEW CONSTRUCTION
Total Occupancies: 49
Staffing: 3 Insp.II
Compliance Time: Pending Completion

1. Elevator Vestibules
   A. Enclosures & Doors
   B. Recall smoke Detectors
   C. Area Smoke Detectors

2. Fire Warning System
   A. Manual Pull Stations
   B. Area Smoke Detectors
   C. Duct Detectors
   D. Water Flow Switches
   E. Tamper Switches
   F. Special Extinguishing Systems

3. Provide 2 Exterior Exit Stairways

4. Pressurized Stair Shafts

5. Building Comm. System, F.D. Voice Comm. System

6. Evacuation Manuals Required

7. Lock Box W/Keys

8. Fire Sprinkler System

9. Emergency Power

10. Fire Pumps & Standpipes

11. N/A

12. N/A

13. On Site Water Supply

14. Fuel Storage Tank

15. Fire Control Room

16. Emergency Smoke Control Systems

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1988 RETROFIT ORDINANCE
Total Occupancies: 394
Staffing: 2 Insp. II
Compliance time: 3 years (with Extensions)

75' to 100' Exceptions

1. Existing risers may be used if in good condition

2. New, on site water supply not needed
   (If existing may be integrated in sprinkler system)

3. 3" test drain provided in stairshafts where pressure regulator valves are used

4. Single 750 GPM pump, 4 hour fuel supply for diesel pump

5. 750 GPM @ 65 PSI at roof

6. New or existing standpipes/interconnected at base of riser w/minimum 1 F.D. connection

7. Emergency standby electric power w/ 4 hour fuel supply for
   A. Fire alarm systems
   B. Emergency exit lighting
   C. Directional Signs
   D. Fire pumps

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ICS HIGH-RISE BUILDING DESIGN AND FIRE PROTECTION SYSTEMS

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Introduction:

Building design, fire protection systems, and construction practices have changed significantly during the past century. One hundred years ago, structural steel was unknown and reinforced concrete was a material which had not yet been used for structural framing applications.

Design professions have also advanced significantly during the past century. Architecture has changed markedly, and techniques of analysis and design are available to engineers today that were unknown a century, or even a generation ago. Building design has become a very complex process, integrating many skills, products, and technologies into its system.

Fire protection engineering has taken strides in its professional development, similar to those taken in other parts of the building industry. At the turn of the century, conflagrations were a common occurrence in cities. However, increased knowledge of fire behavior and building design enabled buildings to be constructed so that a fire could be confined to the building of origin, rather than the block of origin or larger areas. Today's building design is an attempt to confine a fire to the room of origin or to an even smaller area.

The conscious integrated design for building fire safety must be achieved as part of the architectural design process, if it is to be effective and economical. All members of the traditional building design team should include, as an integral part of their work, design for emergency fire conditions. The earlier in the design process that fire safety objectives are established, and engineering design decisions are made, the more effective and economical the final results will be.

The fire service must recognize and identify those areas in which building designers create unnecessary hazards; then steps must be taken to ensure that appropriate safeguards are incorporated to facilitate the rescue of occupants and control of any fire.

It is further recognized that some building designers are content, as are their clients, to meet the minimum safety standards of the local building code. Often both assume incorrectly that the codes provide completely adequate measures, rather than the minimum. In other instances, building owners and occupants see fire as something that will never happen to them. They will tolerate the risk because fire safety measures can be costly, or adequately balance the risk by the provisions of a fire insurance policy. These attitudes require fire departments to compensate accordingly and take appropriate precautions. Fire Officers must make critical decisions relating to fire safety; they must clearly identify the specific needs of the occupancy with regard to the functions of the

building. Fire Officers must consciously ask pertinent questions and ascertain conditions that are incorporated into a building. Such questions must center around decisions relating to the following three areas:

1. Life Safety

2. Property Protection

3. Continuation of Operations

With the advent of the modern high-rise building, the fire service is presented with a new set of problems it has never faced before. The fire service is asked to provide life safety and fire control capabilities for fires in aboveground areas which are extremely difficult to reach, difficult to communicate from, and operate in environments which can be intolerable. The potential for life and property loss is tremendous.

Solving these problems requires an understanding of the unique situations that can be encountered during emergency operations in high-rise structures. Since these problems are, to a great degree, directly related to the design and construction features of high-rise buildings, solutions must also be based on a familiarization with these same features and an awareness of their effect on fire control efforts.

Life Safety

Adequate life safety design for a building is often related only to complying with the requirements of local building regulations. This may or may not provide sufficient occupant protection, depending on the particular building function and occupant activities.

Alerting occupants to the existence of a fire is only one part of the people protection design. A performance objective that could be used is to realize that an occupant should have sufficient prior knowledge of the existence of a fire before the escape route is blocked. In order to accomplish this, the designer must either ensure that the fire and its products of combustion will be slow enough to provide the time, or ensure that provisions are incorporated into the building to achieve that objective..

Escape is, of course, only one alternative to life safety. Life safety design for a building is difficult. It involves more than a provision for emergency egress. It requires knowledge of who will be using the building and what they will be doing most of the time. Consideration must be given to communication, the protection of escape routes, and temporary areas of safe refuge for a period of time reasonable for the building occupants to reach safety.

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Property Protection

The identification of specific items of property which have a high monetary or other value must be made in order to protect them adequately in case of fire. In some cases, specially protected areas are needed. In other cases, a duplicate set of vital records stored in another location may be adequate.

Continuation of Operations

Maintaining operational continuity after a fire is the third major design concern. The owner must identify the amount of "downtime" that can be tolerated before revenues begin to be seriously affected. Often, certain functions or locations are more essential to the continued operation of the building than are others. The designer must recognize those areas that are particularly sensitive to the vital operations of the business, so that adequate protection is provided for that area of the building. Often, these areas need special fire protection attention which is not required throughout the entire building.

Definitions

A "High-Rise Building" is defined as a building which is over 75 feet in height measured from ground level access to the floor level of the highest floor intended for occupant use; **NOT** to the actual height of the building. Most eight-story buildings are high-rise by definition, although some six and seven-story buildings will fall into the high-rise category.

According to the State Fire Marshal's Office, there are approximately 1,700 high-rise buildings in the State of California; of these, Los Angeles has roughly 745. Most of the high-rise buildings in Los Angeles consist of commercial occupancies. About 20 to 25 percent are habitational, such as hotels, apartment building, and condos.

High-rise building are divided into two groups: "Existing High-Rise" and "New High-Rise". The date of construction determines which group, and the required fire protection systems and equipment a building will have.

Existing High-Rise Buildings are ones which were constructed prior to July, 1974. Approximately 520 of the high-rise buildings in Los Angeles are in this category. For convenience, existing high-rise buildings may be divided into two sub-groups: those constructed prior to 1960 and those constructed between 1960 and 1974.

A New High-Rise Building is one which was constructed after July, 1974. Approximately 225 of the high-rise buildings in Los Angeles are new high-rise.

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History of Existing High-Rise Construction, 1900 to 1960

As already mentioned, existing high-rise buildings can conveniently be subdivided into two categories: those constructed before 1960 and those constructed after 1960.

Prior to 1957, all buildings in Los Angeles were limited to 150 feet in height for earthquake safety. Several years passed after the repeal of this limitation before taller buildings were constructed, so it is safe to state that most pre-1960, high-rise building are a maximum of 13 stories. The Los Angeles City Hall, with 27 stories, and the USC-LA County General Hospital, with 19 stories are exceptions to this rule.

All high-rise buildings, then and today, are of Type I Construction, that is, noncombustible construction throughout. The pre-1960 high-rises were generally constructed with a reinforced concrete exterior as opposed to the steel beam construction seen commonly today. Buildings erected before the 1960's usually had open stairways and exterior fire escape assemblies. A "High-Rise Retrofit Program" was initiated by the LAFD and the state in 1976 to bring these buildings into conformance with newer building codes.

Fire protection equipment in pre-1960 high-rise buildings was initially limited to systems not interconnected:

1. Dry (Class I) standpipes supplied by fire department pumpers, if needed.

2. Wet (Class II) standpipes with fire hose. The water for these is supplied by the domestic system. These are intended for occupant use.

3. Automatic fire sprinklers in basements.

Most high-rise buildings constructed prior to 1960 have openable windows, so ventilation during firefighting operations usually presents no special problems. Fire alarm systems, emergency power and lighting systems, and building communication systems were NOT REQUIRED in any of these buildings at the time of construction.

History of Existing High-Rise Construction, Post-1960

By the end of 1957, more stringent earthquake standards had been adopted by the City; the 150 feet restriction was repealed and building codes imposed no limit on the height of Type I buildings.

Like the earlier existing high-rise buildings, the Post-1960 group are also of Type I (fire resistive) construction. Type I (fire resistive) construction is that type of construction in which the structural members, including walls, columns, beams, floors and roofs are of noncombustible or limited combustible materials, and are required to have varying fire-

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resistive rating depending on their usage. The Type I building is designed to withstand the most severe fire to be expected within the building for two or more hours without structural failure. However, instead of reinforced concrete, they were generally built with steel beams coated with a fire retardant material commonly known as Mono-Kote. Floors and roof are of concrete slab or steel decking covered with concrete. The only combustible materials allowed are the interior partition walls and office furnishing. The height and floor areas are unlimited.

By the 1960's, the codes required COMPARTMENTATION, that is, subdivision of buildings into "fire areas." This was accomplished by providing two-hour, fire-resistive separations between floor levels and around vertical shafts. These separations establish a "compartment" to control fire extension. Fire doors and other fire protection assemblies are installed to protect penetrations through these separations.

Most high-rise buildings of this era are of the "Central Core" type. The elevators and stairshafts are in the center of the building, surrounded by a corridor and the outer tenant areas.

Buildings exceeding 150 feet in height after 1960 were required to install Combination (Class III) standpipe systems. These provide a 1 1/2 inch hose for occupant use, and 2 1/2 inch outlets for fire department use. Depending on the time of installation, some 2 1/2 inch outlets are equipped with 2 1/2 inch hoses, however, many are not so equipped. A fire pump on the premises maintains a working pressure within the system.

With a Class III standpipe system, the most common method of controlling working pressure at the various floor levels is with the installation of ORIFICE PLATES. This washer-like device is installed at an outlet to restrict the size of the opening and thereby control the volume. This arrangement effectively lowers nozzle pressure when water is flowing; however, if the firefighting line is shut down, the increased static pressure at the nozzle may make it impossible to reopen.

A second system is the installation of PRESSURE REDUCING VALVES (PRV's) at the outlets. Such PRV's are engineered to maintain a set pressure at varying floors. Another system used in some buildings is a "Zone PRV" which controls the flow pressure for standpipe systems.

Other buildings constructed during this era, which are less than 150 feet, may have utilized Class III standpipe systems, but most often only the Class I and II systems were installed. As in high-rise buildings constructed before 1960, automatic fire sprinkler systems continued to be required only in basements.

At least two approved means of egress (exit stairshafts) were required. Sometimes scissor stairs were installed to better utilize these shafts..

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Smoke-Free Exitways and Firefighter Access

Smoke Towers on the periphery of some high-rise buildings were constructed to provide "smoke-free" exiting and access. The term "smoke tower" causes much confusion. Such exitways are not intended for smoke removal and cannot be used for such; a better term would be "smoke-proof enclosure". In a smoke tower, you travel through a vestibule where smoke can escape to the outside atmosphere as you move between the building and the stairshaft.

The "mechanically ventilated smoke-proof enclosure" is a two-hour rated shaft with positive pressure which can go from the lowest level to the roof and can be controlled by the fire department. As in the pre-1960 buildings, the alarm systems, emergency power and lighting systems, and building communication systems were not required.

New High-Rise Buildings

1. High-rise buildings constructed since July 1974 have more elaborate and complex fire protection systems and features than the existing high-rise buildings already discussed.

2. All new high-rise buildings (post 1974) are fully equipped with automatic fire sprinklers supplied by the same risers as the 2 1/2 inch wet outlets provided for fire department use. This type of system is known as a combined standpipe system, as opposed to the Class III (combination) system formerly used in existing high-rise buildings. Risers and outlets will be found in stairshafts at each floor level and on the roof. Occasionally, they may also be found in other portions of the building. Combined standpipe systems are engineered to deliver specific amounts of water to the sprinklers and standpipes in the building. In some buildings under 275 feet, and all buildings exceeding 275 feet, a looped standpipe system is required.

3. An on-site water supply and a fire pump supplies water and pressure to the combined standpipe risers. Usually the water reservoir and fire pump will be located at the bottom level of the building.

4. As stated before, at least two approved means of egress are required from each floor. In new high-rise buildings, this is accomplished with enclosed stairshafts. The stairshafts and other vertical shafts must be of two-hour construction as are floor separations. Horizontal exit corridors are required to be illuminated at all times.

5. Each new high-rise is required to maintain a one-hour rated Fire Control Room previously known as the building control station, in an approved location (usually the ground floor). This room houses the fire warning system annunciation panel,

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smoke control panel, fire pump status panel, and emergency generator status panel. A fire department lock box will be located in the Fire Control Room. A lock box may also be located just inside the entrance to the building or at a security desk.

The Fire Control Room shall be supervised at all times by either an on-site responsible person, or by a Central Station Signaling System, such as ADT, API, etc. A telephone capable of accessing unrestricted outside lines must be located in the room.

6. Every new high-rise will be protected by a local fire warning system which is initiated by manual and/or automatic devices. Manual pull stations are located on each floor adjacent to stairshafts and other locations. Area detectors are located in and adjacent to one-hour elevator vestibules, HVAC ducts, and selected equipment rooms. Waterflow switches are located on each floor adjacent to each shut-off valve. Actuation of any of these devices will place the floor of actuation, and sometimes adjacent floors, in "Alarm Mode." A localized alarm will sound and there will be annunciation in the Fire Control Room. If the Fire Control Room is not staffed continuously, it is also required to be monitored by a central station. The alarm mode will shut down the air handling system on the floor of actuation and possible adjacent floors, or turn on smoke evacuation systems in affected areas. The alarm mode will activate the powerful fans which pressurize the stairshafts. The alarm mode will unlock all electric locks on stairshaft doors which are normally locked from the stairshaft side, and will also unlock elevator lobby doors which have electric locks. The alarm mode will also close all doors if they are normally held open by magnetic devices. Finally, if the smoke sensor located within the elevator vestibule is actuated, the elevators in the bank will be recalled to the designated floor (lobby) or alternate designated floor.

7. All new high-rise buildings must have an emergency smoke control system, a system capable of exhausting smoke directly to the exterior of the building, or perimeter windows must be openable or have breakable tempered glass in each corner and every 50 linear feet, or a combination of the above.

   HVAC (heating, ventilation and air-conditioning) systems designed for smoke removal may also be used, providing they exhaust a minimum of six air changes per hour, and exhaust to the exterior of the building without recirculating to the other sections of the building. Smoke control systems shall be provided for all below grade levels. Controls for all smoke control and stairshaft systems must be located in the Fire Control Room. All stairshafts must be pressurized to maintain a positive air pressure at any time the building goes into an alarm mode.

8. A Building Communication System must be installed in each new high-rise building. This is a one-way communication system capable of transmitting voice

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messages to all normally occupied areas of the building. The controls for the one-way communication system are located in the Fire Control Room.

9. A Fire Department Communication System must be installed in each new high-rise building. This system consists of sound-powered telephones and jacks for fire department use. The jacks are installed in the Fire Control Room and at every floor level in each stairshaft, including the roof and street level, interior, and exterior. They must also be installed in every elevator car, elevator machine room, elevator lobby, outside the fire pump room, emergency generator room, and at every stairwell exiting to a public way. At least six telephone handsets are required to be on the premises for firefighter use. These will be located in the Fire Control Room.

10. Every new high-rise building must have Emergency and Standby Power Systems. As firefighters, it is important to understand that emergency and standby power systems are supplied by the same power source (emergency generator) and may be in operation at the time of our arrival. These systems operate the fire life safety systems within a new high-rise building if normal power is lost.

    The fire life safety system includes exit lighting, fire pumps, elevators, fire alarm system, smoke control, voice communication systems, etc. This is provided by an on-site generator which automatically provides electrical power in the event of failure of normal power sources. This power must be available for at least eight hours at full demand.

11. Most new high-rise buildings have an Emergency Helicopter Landing Facility on the roof. The number inside the 50 foot by 50 foot pad identifies the load capacity of the pad in thousands of pounds. For example, a number 10 indicates 10,000 pounds. There is also an adjacent 1 1/2 inch exterior standpipe outlet for fire protection or with 1 or 2 Class H (Helispot) standpipe outlets.

12. All high-rise buildings are required to develop emergency procedures which include evacuation manuals, a fire warden system, drills, etc. These procedures should be written in a manual and made available to all occupants.

In July 1974, stringent state codes required new high-rise buildings to install more elaborate systems and equipment. At the same time, it was also recognized that existing high-rise buildings desperately needed upgrading. Implementation of the state-mandated High-Rise Retrofit Program began in late 1976. The changes have significantly increased occupant safety and upgraded firefighting capabilities in existing high-rise buildings.

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The Basic Provision of the state mandated Retrofit Program for existing buildings include:

1. Construction of Stair Enclosures and Floor Separations was accepted as the method to provide compartmentation. This also assured a better means of egress.

2. At least two approved means of egress were required to be provided from each floor level. At least one was to be an enclosed, one-hour stairshaft; the other could be an existing fire escape if no other stairway was available. Exterior fire escapes which were accepted as approved means of egress were required to be certified structurally sound by a Structural Engineer. Also, such fire escapes were required to have wired glass or equivalent protection for the windows on all landings and within five feet on either side of the landing. Thus, IF windows are closed, there would be some protection for persons passing a fire floor.

3. A manually-operated Fire Alarm System utilizing manual pull stations located adjacent to stairs was required. This system must annunciate in the lobby or other approved location. This location became, by definition, the "Building Control Station", now referred to as a Fire Control Room.

4. Additional fire detecting devices were required:

   (a) A smoke detector in each lobby serving automatic elevators which would recall the elevators.

   (b) Smoke detectors in excessively long, dead-end corridors in a few of the older buildings.

5. A Smoke Control System to remove smoke and heat had to be provided. Older buildings with openable windows needed nothing more. The post-1960, sealed, high-rise buildings normally had breakable Tempered Glass around the perimeter of the building every 50 linear feet, mechanical ventilation could be provided by modifying their HVAC (heating, ventilation and air-conditioning) System.

6. Two types of communication systems were required in selected high-rise buildings. A Building Communication System was required in the public areas of buildings over 150 feet in height. This system is a one-way communication system to contact building occupants. A Fire Department Communication system (sound-powered telephones) was required in existing high-rise buildings which failed a radio rest conducted by the Los Angeles City Fire Department. This system provides outlet jacks in each stairshaft at each floor level, roof exits, stairwell exits, and the building control station. The building is required to provide a minimum of six telephone handsets for the system.

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7. Effective emergency power was NOT REQUIRED by the state mandated Retrofit Program. Also, electrically-operated fire pumps and elevators did not have to be provided with a back-up system during power loss.

8. Elevators. In a separate state mandated retrofit program, automatic elevators were required to be equipped with Fire Emergency Service. Refer to Chapter 7 regarding the use of automatic elevators in fire emergency service mode.

9. Another requirement of the state mandated High-Rise Retrofit Program was the so-called "Software" provision. This requires every high-rise building to provide "Evacuation Maps" of their building on each floor level at various approved locations. Emergency manuals must be provided for occupants, a building warden and floor wardens must be appointed, and drills held for all occupants.

10. Approximately 30 of the older existing high-rise buildings chose to not comply with the requirements of the High-Rise Retrofit Program, primarily because of the problem of providing two approved means of egress. These buildings were vacated and sealed.

Retrofit Sprinkler Program (1988)

As a result of the First Interstate Bank Building Fire in May 1988, a Retrofit Sprinkler Ordinance was passed in August of 1988 requiring installation of fire sprinklers in all existing high-rise office buildings. This ordinance effects 356 high-rise buildings in the City of Los Angeles (Reference: LA City Building Code, Section 8604 F).

In addition to requiring the installation of fire sprinklers, the ordinance requires the following:

1. Provision of one-hour rated elevator lobby vestibules.

2. Addition of emergency power generating systems.

3. Provision of a 20 square foot, manually-operated ventilation opening in stairshafts that access the top floor and does not penetrate the roof.

4. Provide a three-inch drain in buildings which are equipped with PRV's. This provides a means to flow test PRV's and return the water back into the tank without running hose lines up the entire stairshaft.

Characteristics Common to All High-Rise Buildings

1. Each high-rise building is required to have a Fire Department Key Box.

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2. All high-rise buildings have some degree of COMPARTMENTATION. This includes enclosed stairshafts, except in a few very old high-rise buildings.

3. All high-rise buildings have a minimum of Two Approved Means of Egress From Each Floor.

4. All high-rise buildings have some type of Standpipe for Fire Department Use.

   (a) These may be CLASS I, II, III or a combination thereof in existing high-rise buildings less than 150 feet in height built between 1960 and 1974.

   (b) CLASS III standpipes are found in existing high-rise buildings exceeding 150 feet in height built between 1960 and 1974.

   (c) Combined Standpipes are found in new high-rise buildings built since 1974.

5. All high-rise buildings have Automatic Elevators equipped with emergency service, except those few with only manually-operated cars.

6. All high-rise buildings have some type of Smoke Control, such as:

   (a) Openable windows, or;

   (b) In sealed buildings, breakable tempered glass windows on the perimeter of the building every 50 linear feet with 20 square foot opening.

      (1) These are supposed to be identified by two-inch minimum luminous or reflective Decals in a lower corner which indicates they are "tempered glass," or;

   (c) Automatic Smoke Removal System, or;

   (d) A combination of the above.

7. All high-rise buildings have Floor Level Numbering Signs at each floor in each stairshaft. These signs indicate the floor level, the stair number, the floors served by the stair, and whether the stair has roof access.

8. Every high-rise is required to maintain an occupant evacuation program with evacuation manuals, building and floor wardens, and annual evacuation drills. These drills may be done floor by floor. For the entire building, it is required that all occupants have an annual exercise.

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Special Extinguishing Systems (particularly Halon 1301 total flooding system)

1. Many special extinguishing systems will be found in high-rise buildings; CO_2 deluge systems, hood systems for kitchens, and Halon 1301 systems. The last is of greatest concern to firefighters.

2. Halon 1301 total flooding systems are usually used to protect computers and other high-value equipment.

   (a) Halon 1301 is a halogenated hydrocarbon gas which interrupts the normal process of combustion, thereby effectively extinguishing fires in hidden areas.

   (b) A halon total flooding system will rapidly dump compressed halon gas into a sealed room upon either automatic or manual activation.

      (1) Five percent or more of the volume of the room will then be composed of halon gas.

      (2) This is adequate to extinguish most fires.

   (c) The long-term effect of halon on humans is unknown, although industry claims that it is completely nontoxic.

   (d) Halon will decompose into toxic gases, principally phosgene, if permitted to heat to approximately 900 degrees fahrenheit.

      (1) If personnel must enter a Halon 1301 atmosphere for investigation of the alarm, use breathing apparatus throughout the investigation.

      (2) Make every effort to contain the halon within the sealed room so far as possible to maintain a concentration significant enough to extinguish the fire.

   (e) If personnel determine for sure that the halon has been accidentally dumped before entering the room, and begin the exhaust process immediately.

   (f) A halon exhaust switch is provided outside these rooms.

The exact building features and functional systems that are found in a particular high-rise building will generally be determined by the age of the building and the various code requirements that were in effect at the time it was built. Because all high-rise buildings are not the same, and because familiarity with construction features and functional

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building systems is so vitally important to the decisions and actions that are taken during high-rise fire control operations, the need for effective pre-incident planning cannot be emphasized enough.

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PREFIRE PLANNING & DOCUMENTATION

INTRODUCTION:

"There I was looking at a twenty (20) story high-rise building with fire showing out the fifteenth (15) floor from three windows." The need to take immediate action based on preplanning and training was needed. This was no time to gather the troops and say, "Well, gang, who wants to take the fire floor, and who wants to be Lobby?" This is also not the time to wonder about the building construction or its internal complexities.

"A battlefield is a very poor place to start making plans."

I am sure that you have all heard that statement before, but it has never been more true than as it applies to high-rise firefighting. If you wait until you have a high-rise fire before you start to plan what you are going to do, to think about what problems you might encounter and to consider what solutions are available, chances are you have already lost the battle.

The answer to a big part of the high-rise firefighting problem is to prepare to handle the emergency before it arrives. The only way this can be done is by a comprehensive evaluation of the potential fire problem and the development of a plan of action to cope with the situation. Or, more simply stated- Effective Prefire Planning. Why is prefire planning so important in high-rise buildings? Why is it different? To answer those questions, you have to consider the problems that are unique to high-rise firefighting:

Time/Distance Factors
Conveyance Methods
Ventilation Complexities
Life Hazard Possibility
Dollar Loss Potential

Each one of these factors can, in itself, pose significant problems to a Fire Officer and each one is capable of compounding the others to turn a seemingly simple high-rise fire into a real nightmare.

REQUIREMENTS:

High-rise buildings should be prefire planned on a periodic basis consistent with other priorities. But they should be at the top of your prefire planning list.

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Once a year is not too often to prefire plan a high-rise building and in many cases is probably a minimum. During the course of a year, many changes can take place in a high-rise building. Equipment is changed, occupancies can change, floor layouts can change and certainly firefighting personnel assignments will change.

Development of prefire plans should be the responsibility of the Company Officers assigned to the station that is first-due to the building and/or has the fire prevention responsibility for the building. If fire prevention of the building is not the responsibility of the first-in company, the Inspector who is responsible for fire prevention in the building should be consulted and utilized for his knowledge of the structure and his contact with Building Management.

DEVELOPING A PREFIRE PLAN:

Prefire planning of a high-rise building should start with a property survey by the officers who are responsible for developing the prefire plan. The property survey is used to gather or verify information that will be used in formulating the plan and in training other members.

The property survey of the building will require contact with, and the cooperation of Building Management. It is important that Building Management understand that the purpose of the prefire planning survey and subsequent inspections or training exercises is to help the Fire Department do a better job if a fire should occur in that building.

Establishing a good relationship with Building Management is necessary for obtaining complete building information and scheduling later inspections or training exercises. It also goes a long way toward selling building modifications or procedures that help to make our operations more effective.

What information is required from the property survey? Generally stated, the survey should be a comprehensive evaluation of the entire building and should include any useful and up-to-date information that could assist the Fire Department in handling a fire in that occupancy.

FIRE PROBLEM APPRAISAL:

Items to consider under the Fire Problem Appraisal are:

a. Building height - usually the higher the building, the greater the problem could be. With a fire on the upper floors the time/distance factor is increased. Even if the fire is on a lower floor there could be a greater area for the smoke to spread to, more people to worry about, etc.

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b. Construction methods - older buildings will usually absorb more heat than newer buildings (masonry walls, thicker concrete) and do not present as many possibilities of fire spread as newer buildings (all glass exterior, open plenum spaces, poke-through construction, etc.). A terrific difference exists in potential fire areas between buildings which are designed for "open-space" concept and those that are "compartmented."

c. Fire loading - can vary tremendously from building to building and even from floor to floor in the same building; and is usually much greater than most people think. A compartmented office floor, with steel-frame furniture, minimal record storage, sheet rock walls and asphalt tile floors has much less total fire load than an open-space office floor with wooden furniture, paneled walls, carpeted floors, drapes on the windows and heavy record storage.

d. Occupancy types - can make a big difference in the overall fire problem in a high-rise building. Office buildings are occupied mostly during daylight hours only, are quite often not supervised at all during nighttime hours, are normally hermetically sealed and have air-handling systems that circulate air from floor to floor.

Apartment buildings on the other hand are occupied and supervised almost constantly, have openable windows and unit air-handling systems, but have more possibilities of fire starting. (Smoking, cooking, electrical, etc.)

e. Exposures - can be just as much, or even more, of a problem in a high-rise fire as in any other type of fire. Usually in a high-rise fire, the building itself becomes the exposure and there are occasions where a high-rise building can expose adjacent structures through radiation or convection. A very definite problem exists whenever vertical openings within the building are not properly protected or if the exterior skin construction will allow unrestricted lapping of fire to upper floors.

f. Unusual hazards - can present themselves in many forms. A restaurant at the top of a high-rise building creates the problem of many possible causes of fire but also a tremendous rescue/evacuation situation. A high-rise hospital building usually contains a variety of material not found in other structures that can add to fire behavior plus it presents the unique problem of possible large numbers of nonambulatory patients.

BUILDING FEATURES:

Items to consider when evaluating the particular features of the building are:

a. Access - to the building is important and can vary from simply walking through the Lobby entrance doors when the building is open, to forcing entry when it is closed. Can aerial ladder or elevated platforms apparatus be used to gain access to upper floors? Are there keys available on the premises to provide access through stairshaft

RETIRED CURRICULUM

doors? Conditions such as falling glass or large numbers of people exiting the building make it necessary to have more than one way of gaining access into the building.

b. Conveyance methods - can make a big difference in the strategy employed in fighting the fire. Are the elevators provided with emergency service controls? Are they vestibuled? Are there split elevator banks? Where is the freight elevator located?

   It is important to know the location and types of stairshafts. Which ones go through the roof? Does the building have a scissor stairshaft system? Is the building equipped with smoke towers or fire escapes?

c. Alarm systems - can have a very definite effect on your approach to locating and attacking a fire. What kind of alarm systems does the building have? Does it have smoke detectors, manual pull boxes, water flow alarms? Are the alarms connected to a central annunciator panel? Do the alarm mechanisms cause activation of any other fire protection devices such as closing dampers in the air-handling system, deactivating door hold-open mechanisms, recalling elevators to ground level Lobbies?

d. Auxiliary firefighting equipment - is required in every high-rise building but the type and amount of that equipment will vary with the size and age of the building and requirements of local building and fire codes. It is extremely important that Firefighters are aware of the auxiliary fire protection equipment built into the building.

   What type of water supply system does the building have? Where are the interior wet standpipes located? Do they have hose? Does the building have 2 1/2 inch dry standpipe system or a combination system? Is the building sprinklered? If so, what areas are sprinklered and where are the shut-offs? Where are the inlets to the standpipes or sprinklers? How about the fire pump? Where is it located? What is its capacity? Does it have an emergency backup? What pressure would have to be pumped into the system to replace the fire pump?

e. Air-handling systems - also vary with the age and design of a high-rise building. Older structures and apartment buildings usually have openable windows and individual heating and air-conditioning equipment. Newer high-rise buildings are hermetically sealed and feature sophisticated HVAC systems (heating, ventilation, and air conditioning) which supply comforting air throughout the structure from centrally located equipment which functions on recirculation concepts.

f. Utility controls - such as electrical, gas and domestic water shut-offs should be located and identified to allow termination of these services as necessary under fire conditions.

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g. Location of Fire Control Rooms - if these are located adjacent to the Lobby, Lobby Command may operate from that position. If they are located on other floors or remote locations, coordination/communication will be necessary.

h. Communications - What are the communications in the building? Sound-powered telephone with jacks on all floors, P.A. Systems, public telephones, etc.

All of these factors need to be included in your version of a "Building Inventory" or "Pre-fire Survey" system.

ASSESSMENT OF FIRE CONTROL RESOURCES:

a. Adequacy of the assignment dispatched to a reported fire in the building being prefire planned should be examined very carefully. Can the first alarm assignment effectively handle the various functional activities that must be employed for even a moderate fire? Can they contain a severe fire until additional help arrives? How much help is available on a second alarm? What would the time delay be before additional help arrives?

   Response routes of units responding from different locations must be analyzed so that problem intersections are identified and a correct approach to a pre-selected base location is possible.

b. Utilization of other agencies - to provide support assistance will ensure maximum use of firefighting personnel. Activities such as crowd and traffic control should be handled by Police Officers who should also be capable of assisting in limited evacuation operations.

   If sufficient firefighting personnel are not readily available, can employees from other municipal departments be used, under the direction of Fire Department personnel, to assist with logistical functions which are not directly connected with firefighting activity? Could they be used to help in the operation of Base, or Lobby, or can they be used to help stock equipment pools, thereby freeing Firefighters normally assigned to these functions for more important tasks?

c. Mutual Aid Agreements - with neighboring Fire Departments that would possibly be called in to assist at a high-rise fire should be analyzed. Consideration should be given as to exactly what type or help they can furnish and how soon it can be expected. Is their communication and firefighting equipment compatible with yours? Are they familiar with your high-rise operational plan?

RETIRED CURRICULUM

d. It is important that any outside agencies or other municipal departments which might be utilized for assistance at a high-rise fire, know how they fit into your operational plan and are aware of exactly what is expected from them. This can only be accomplished by discussions and agreements with representatives of those agencies and cross training their personnel where required.

e. Building personnel - such as Security Guards and Building Engineers should be utilized for assistance whenever possible. Are they always on the premises or are they on call? What help can they provide? Are they aware of the proper procedures to follow in notifying the Fire Department of an emergency? What can they do prior to your arrival?

f. Response of utility companies - should be automatic on all multiple alarm high-rise fires. Problems related to natural gas, electrical, water supply or domestic telephone service can be handled much more efficiently and with greater degree of safety if these personnel are on the scene. It is also good practice to request that an elevator service representative be dispatched to assist in handling elevator problems that might develop.

g. Water supply - is critical in any fire situation and especially so at a high-rise fire. Is the water supply to the building sufficient? Are the main sizes and residual pressures adequate to supply enough water for a major fire in the building?

What about fire hydrants? Are they close enough to the building Are they too close? Is your apparatus capable of pumping at a high enough pressure and large enough volume to supply the water that might be needed? Consideration must be given to each of these items.

h. Operational locations - for static functional operations should be pre-selected. Consider the best locations for a Command Post. Where is the best place for Base? Are there parking lots or large open areas adjacent to the building which could be used for these functions? How about a location for Helicopter Operations? Look over the lobby area to determine the best location for Lobby Control functions.

i. Operational Plan - Hopefully your department has a pre-established operational plan for fighting a high-rise fire. Compare that plan to the building under construction. Go through each step of your high-rise operations. Do they fit that building? Are there any problems or adjustments that have to be made? Does this plan depend on Mutual Aid, Initial Action Strike Teams, etc.

<u>DOCUMENTATION:</u>

The items that we have covered under Fire Problem Appraisal, Building Features

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Evaluation, and Fire Control Assessment are the ones that are most likely to have an effect on your operations at a high-rise fire and are the subjects that should be covered as a minimum during prefire planning of a high-rise building.

Once this information is obtained, what should be done with it?

It must be properly recorded, so that it can be utilized during prefire planning training sessions, disseminated to concerned parties, reviewed and updated on a periodic basis, and used during emergency operations in the particular building.

This information can be recorded in a variety of ways, but however it is done, it should be on standardized basis throughout the department. Probably one of the best ways to record the information is by a Building Inventory or Pre Fire Survey System with copies of written information sheets and plan sheets carried on all apparatus which respond to the building on a first alarm assignment. These types of systems can also be used as a basis for information covered during prefire planning and training sessions.

The following are samples of various "Building Inventory" and "Prefire Survey" systems:

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IRVING PARK, 1655 WEST
LAKE PLACE APARTMENTS
829-8200

1. ARRIVAL: First Engine, Truck Company and B.C. to main entrance. Second Engine and Truck to Pine Grove entrance.

2. HEIGHT-CONST. & OCC. TYPE: 56 Floors, penthouse, 2-level basement, fire resistive construction, concrete roof with tar and gravel, residential building.

3. LOCATING FIRE ALARM INFO: 24-hour guard, main Lobby entrance, first floor. All keys available from Engineer who lives on premises (Room 4617). No fire alarm system, heat detectors in stairwells only. Annunciator in first floor center rear corridor. Alarm system not supervised.

4. SPECIAL BUILDING FEATURES: Wet Standpipes - Siamese located on Northwest corner of building and West of main entrance. Outlets in stairwells and at freight elevator and at roof. Supplied from 2-750 G.P.M. Pump. Pumps on first basement, Northeast. Shutoff and drains in compactor room.

Automatic Sprinklers - Rubbish chute at freight elevator protected. Supplied from fire pumps in first basement, Northeast. Shutoff and drains in compactor room.

Heliport - None.

5. HAZARDS: Pool water treatment room (dry Chlorine) first level in garage South of pool.

6. EXPOSURES: Large parking enclosure, 5-floor residential buildings on West side, high-rise structure East of Frontier Avenue, 5-floor residential buildings North side of Irving Park.

7. VENTILATION: Manual throughout, smoke tower can be used on each floor. Kitchen and bathroom vents can be used in apartments. Garage has fans on East wall.

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8. ELEVATORS: Eight automatic elevators, freight elevators best for Firefighters. Recall keys alongside elevators on first floor. Elevator panel and shut-down in penthouse.

9. ADDITIONAL INFORMATION: Electrical panels on odd number floors, main panel on Northeast wall, first basement. Gas Shutoff in boiler room, North wall, second basement.

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WILSHIRE BLVD. 10551
THE REGENCY WILSHIRE
491-1851

1. ARRIVAL: All units approach from east and west directions on Wilshire Blvd. No other vehicle access.

2. HEIGHT/ CONST: 17 floors/3 levels basement/concrete/habitual & assemblage (meeting hall) occupancy.

3. LOCATING FIRE ALARM INFO: Alarm panel and keys located in fire control room in lobby on P-1 (floor 1). Building engineer in duty M-F. 0730 to 1600.

4. SPECIAL BUILDING INFO: No direct access to building stairways from the fire control room (must go outside then enter the building on floor 2). Building stairways (2) are accessed on floor 2. Parking stairways access P-1 to P-3.
Each building stairway has a sprinkler shut-off and standpipe outlet on each floor (both shut-offs must be closed to shut-off a floor). The parking levels have one sprinkler shut-off per level located near the elevators.
Sprinkler and standpipe inlets are located at the front-center of the building on Wilshire Blvd. Water tank (20,000 gal.) and water mains located on south end of P-1 parking level

5. HAZARDS: Occupied apartments (3rd floor to penthouse). Large meeting hall, gym and sauna on 2nd floor. Electrical main and switching room on P-3.

6. EXPOSURES: Highrise apartment building on east side, house on north side, and 4-story apartment building on the west side.

7. VENTILATION: Best method - windows - all floors.
Stairway manual pressure control located on roof.
Garage exhaust fan room located on P-2.

8. ELEVATORS: 3 located in the center of building access P-3 to penthouse. Machinery and control room located on roof.

9. ADDITIONAL INFO: Sump pump pits (2) with control room and fire pump located at south/east corner of P-3.
Fire pump is diesel powered.

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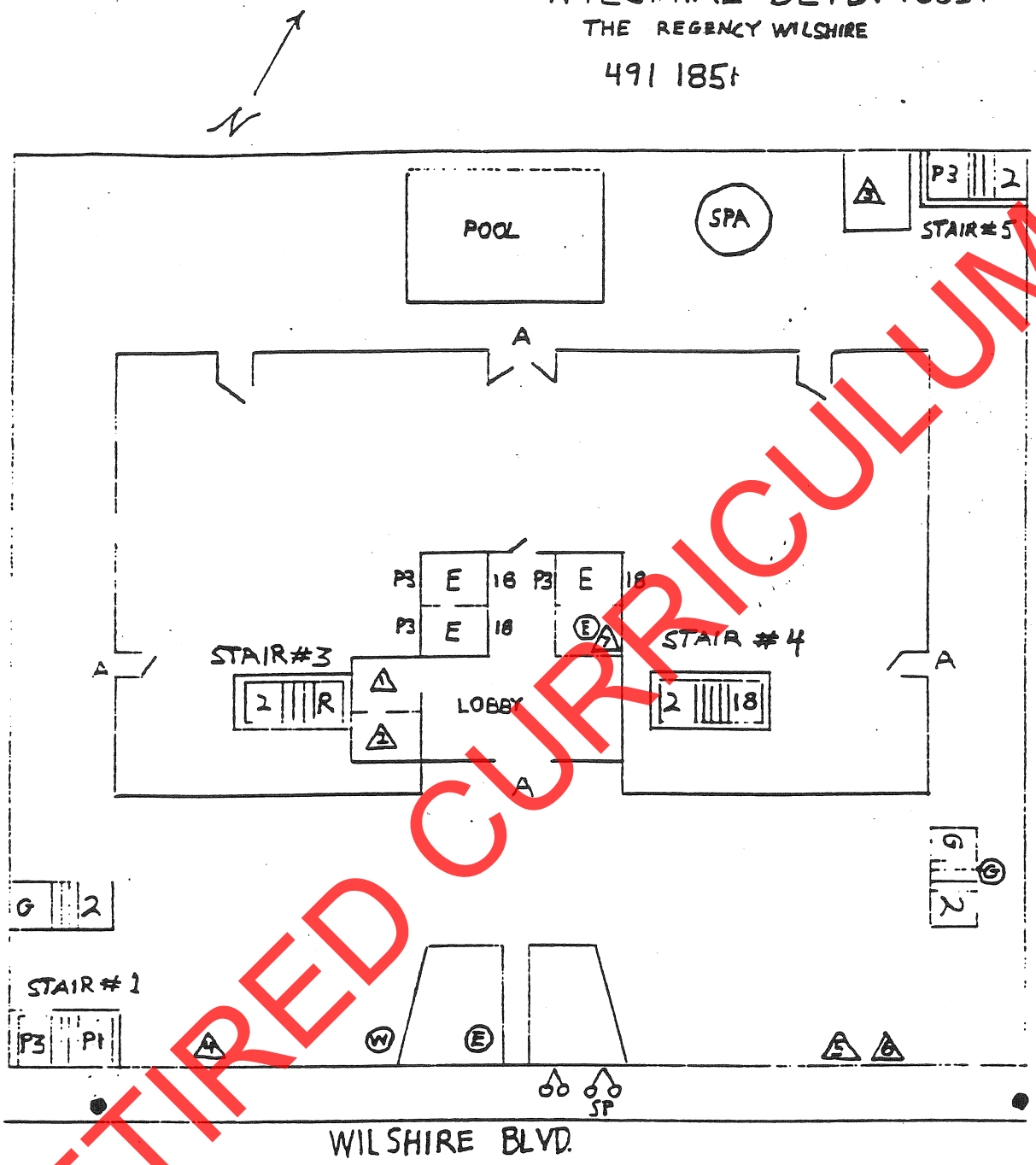
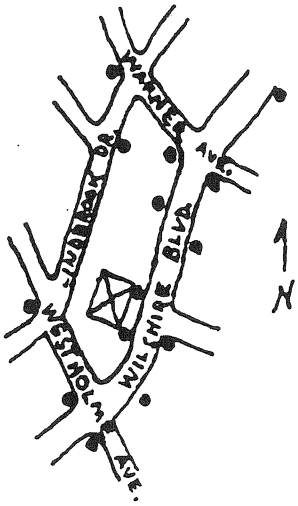
WILSHIRE BLVD. 10551

THE REGENCY WILSHIRE

491 185t



- ① FIRE CONTROL ROOM
- ② FRONT DESK
- ③ POOL HEATER (GAS)
- ④ EXHAUST FAN ROOM (P2 LEVEL)
- ⑤ SUMP PUMP CONTROLS (P3)
- ⑥ FIRE PUMP ROOM AND CONTROLS (P3)
- ⑦ FLOOR (E) ON 4TH, 6TH, 8TH, 10TH, 12TH, 15TH, 17TH AND 18 FLOORS
- (E) MAIN SHUT-OFF ON P3



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FOSTER CITY FIRE DEPARTMENT

FIRE PREPLAN

ADDRESS
METRO TOWER 950 TOWER LANE

DESCRIPTION OF BUILDING 23 STORY FIRE RESISTIVE CONSTRUCTION.
STEEL, CONCRETE, AND GLASS CONSTRUCTION. 393,000 sq. ft. 20,000 sq. ft. per floor

GPM'S REQUIRED
PER FLOOR CONSIDER LOWER AND UPPER FLOOR EXPOSURE
25% 188 50% 375 75% 565 100% 750

% INVOLVED

	Ist ALARM	2nd - STRIKE TEAM ICS HIGH RISE PLAN		
ENGINES	2 FCFD I SMFD	I2	3rd 5 ENGINES	NO. REQUIRED
TRUCKS	I FCFD	2	4th 5 ENGINES I TRUCK	NO. REQUIRED
CHIEFS	I FCFD	5		NO. REQUIRED

STRATEGY
IMPLEMENT ICS HIGH RISE PLAN. LOCATE, CONFINE, EXTINGUI
AND INVESTIGATE FIRE PROTECT ROUTES OF EGRESS. CONDUCT SEARCH AND RESCUE.

FIRE BEHAVIOR
FIRE MAY LAP UP FROM FLOOR TO FLOOR.
PREDICTION SUSPENDED CEILING MAY CONTRIBUTE TO HORIZONTAL SPREAD AND HIDDEN FIRES
HVAC SYSTEM MAY CONTRIBUTE TO SMOKE AND FIRE SPREAD IN BUILDING UNLESS CONTROLLED.

PROBLEMS
LRGE LIFE HAZARD. OCCUPANTS MAY IMPEDE FIRE PERSONNEL
IN FIREFIGHTING FROM ADVANCING UP STAIRWELLS. DUE TO MANY CUBICALS AND INDIVIDUAL
OFFICES LOCATING VICTIMS WILL BE DIFFICULT. RESCUE WILL BE A PROBLEM DUE TO LARGE
LIFE HAZARD AND HEIGHT OF BUILDING.

HAZARDS
WITH GLASS ON ALL FLOORS SURROUNDING BUILDING, FALLING
TO PERSONNEL GLASS MAY BE A HAZARD FOR GROUND PERSONNEL. FATIGUE WILL BE A
PROBLEM FOR PERSONNEL ON UPPER FLOORS ENGAGED IN FIREFIGHTING.

SPRINKLERS - ENTIRE BLDG.
STANDPIPES - ENTIRE BLDG.

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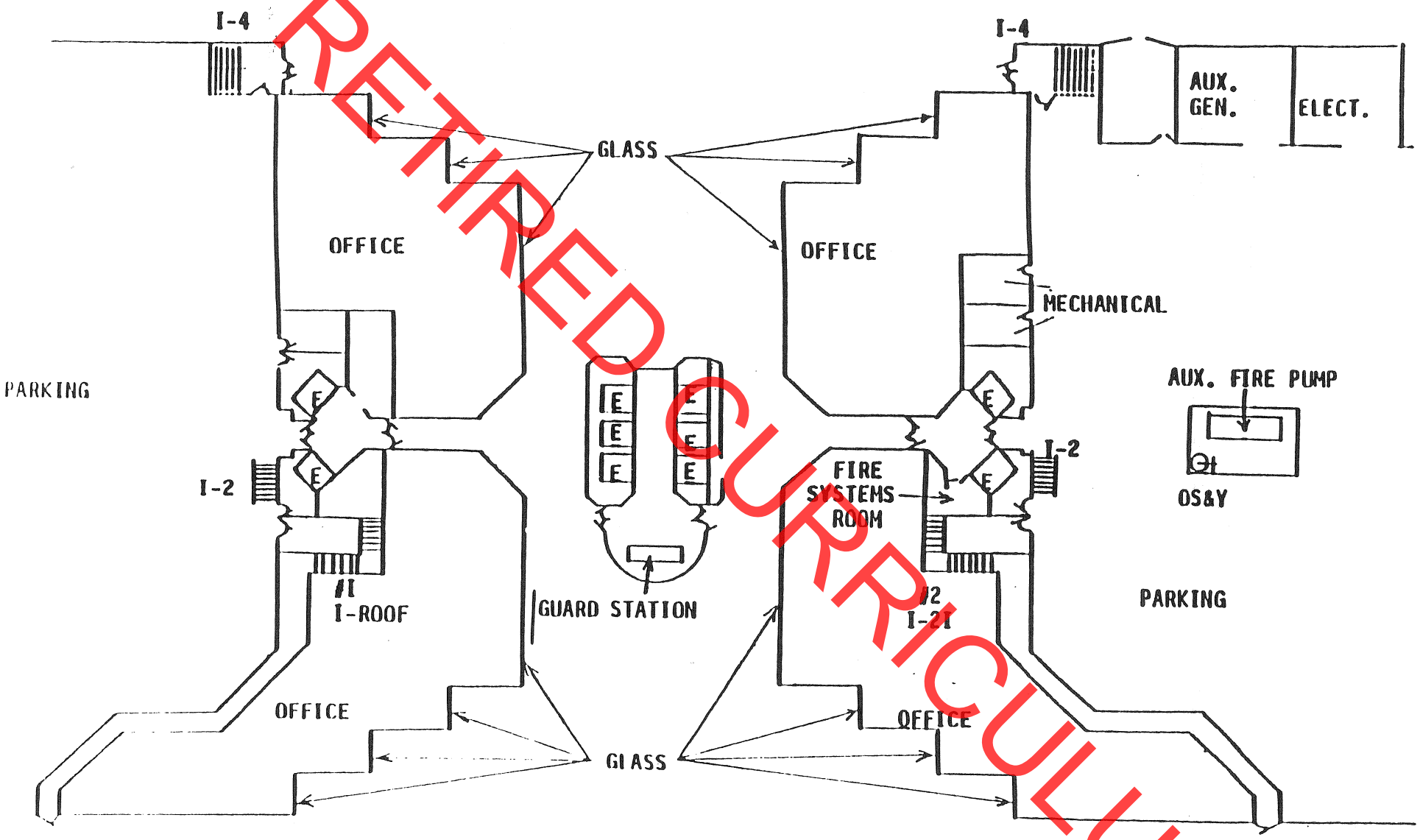

METRO TOWER
950 TOWER LANE
FIRST FLOOR

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PLANO FIRE DEPARTMENT
TACTICAL PROPERTY SURVEY

Box No. _____ Fire Demand Zone _____

Page ____ of ____ pages

Show Northern direction with arrow

Show roof footage

Show exposures

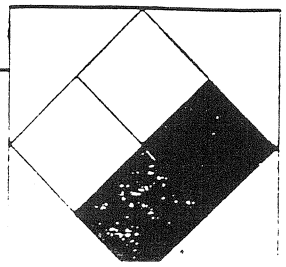
Scale 1 square ____ sq ft

Location _____ Date of Survey _____

Name of Business/Type of Occupancy _____ No Floors _____ Construction _____

Emergency Contact #1 _____ Emergency Contact #2 _____

Name/Phone _____ Name/Phone _____



HAZARDS

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1. **Name of Company** _____ **Address** _____ Survey By _____ Sta
2. **Property Owner** _____ **Address** _____ Phone Number ( ) _____
3. **Occupancy:** (Group) A B E H I M R (Divisions) 1 2 2.1 3 4 Other _____ Use _____
4. **Building:** Height _____ Area _____ x _____ Sq. Ft. _____ Year built _____ Construction _____
5. **Walls:** Exterior _____ Fire Rating _____ Door Type _____ Fire Rating
6. Interior _____ Fire Rating _____ Door Type _____ Fire Rating
7. **Fire Door:** Type _____ Loc. _____ Window Type _____
8. **Other:** _____
9. **Floor:** Type _____ Condition _____ Supports _____ Attachments _____
10. **Other:** _____
11. **Roof:** Type _____ Condition _____ Supports _____ Attachments _____
12. **Other:** _____
13. **Ceiling:** Type _____ Condition _____ Supports _____ Attachments _____
14. **Other:** _____
15. **Fire Control Room Loc.** _____ **Security:** Type _____
16. **Knox Box Loc.** _____ **Elect. Cutoff Loc.** _____
17. **Gas Cutoff Loc.** _____ **Water Cutoff Loc.** _____
18. **Primary Hydrant Loc.** _____ Cross St. _____ Size Main _____ GPM _____/
19. **Secondary Hydrant Loc.** _____ Cross St. _____ Size Main _____ GPM _____
20. **Primary Staging Loc.** _____ Cross St. _____ Near _____
21. **Secondary Staging Loc.** _____ Cross St. _____ Near _____
22. **Ladder (Aerial) Loc.** _____ (Ground) _____
23. **Sprinklers:** Type _____ FD Connect. Loc. _____ Dist. to Hydrant _____ Riser Size _____
24. O.S.&Y. Valve Loc. _____ Water Supply Control Valve Loc. _____
25. **Sprinkler Heads:** Type _____ Temp. _____ Color _____ Test Valve Loc. _____
26. **Standpipe:** Type _____ FD Connect. Loc. _____ Dist. to Hydrant _____ Riser Size _____
27. Class _____ Interior Loc. _____ Reducer Size _____ Hose Size _____
28. **Fire Pump:** Loc. _____ Type _____ Capacity (GPM) _____ Motor Type _____
29. **Extinguishing System:** Type _____ Class/Size _____ Control Loc. _____
30. **No. of Occupants:** Days _____ Evenings _____ Nights _____ Work Hrs _____ No. of Days/Wk _____
31. **Est. Building Cost** _____ **Est. Machinery Cost** _____ **Est. Furnishings Cost** _____ **Est. Total** _____
32. **Insurance Company:** Name _____ Address _____ Phone Number ( ) _____
33. **Special Hazards:** _____

RETIRED COPY

HIGH RISE WATER SYSTEMS

This chapter covers high rise water systems and their components.

The water system in a high rise structure is the most important fire protection system provided to protect the structure and its occupants. Water systems have evolved over the years and the type of system found in a building depends upon its age, height and the building codes in effect when it was constructed. It is important to point out that there are slight variations in some systems due to differing interpretations of building code requirements. There are three basic types of systems, depending upon the year of construction; those constructed prior to 1960, those constructed between 1960 and 1974, and those constructed after 1974.

STANDPIPE SYSTEMS

A standpipe system is a wet or dry system of piping, valves, outlets, and related equipment designed to provide water at specified pressures and installed exclusively for fire fighting. There are four types of standpipe systems: Class I - dry standpipes, Class II - wet standpipes, Class III - combinations and combined.

Pre-1960

Prior to 1960 there was a height limit on buildings of 150', or approximately 13 stories. This height limit was mainly due to the threat of earthquakes.

Fire fighting water systems in pre-1960 buildings consisted of dry standpipes (Class I - dry standpipe system), interior wet standpipes (Class II - wet standpipe system), and sprinklered basements (see Figure #1).

CLASS I (DRY) STANDPIPE SYSTEMS

Dry standpipe systems are found in older (pre-1960) high rise buildings four or more stories in height; in buildings built from 1960 to 1974, four or more stories in height and not exceeding 150'; and in buildings built after 1974, four or more stories in height and not exceeding 150'. They consist of vertical risers with appropriate inlet and outlet connections, installed primarily for fire department use.

Dry Standpipe Risers

Dry standpipe risers are, depending on building height, 4" to 6" diameter pipe and must flow 500 gpm per riser. They will have two to four 2 1/2" inlets at the fire department connection (FDC), depending on building height and if the standpipes are interconnected.

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The total water supply for the dry standpipe system must be delivered by the fire department pumps through the inlet connections. Pressure in the system is controlled by the fire department pumping apparatus and is based on the friction loss in the standpipe system and hose lines, back pressure (head) to the fire floor, and the required nozzle pressures. Since dry standpipes are not equipped with pressure control devices, it is important that the pressure delivered to these systems by fire department operators be proper to provide safe, effective hose streams.

Dry Standpipe Outlets

When dry standpipes are installed, outlets are provided at every floor level and roof landing of required enclosed stairways, fire escapes and smoke towers, except the first floor. Outlets are located based on the requirement that every point within the structure must be reachable by a 30' stream of water from a nozzle attached to 100' of hose.

In buildings built prior to 1960, the outlets of the dry and the wet standpipe systems are straightway gate valves or globe valves.

CLASS II (WET) STANDPIPE SYSTEMS

Wet standpipe systems are required in buildings three or more stories in height (four or more stories after 1983), and are directly connected to a water supply and equipped with 1 1/2" outlets, with hose and nozzle, for use by the building occupants. Depending on the age and height of the building, water is supplied to the wet standpipe system from one of the following sources.

1. Domestic water system

2. Gravity feed or pressurized tanks and domestic water system

Wet Standpipe Risers

In building constructed prior to 1960, wet standpipe risers are 1 1/2" or 2 1/2", depending on the height of the building and year of construction. There are no inlets for the fire department to pump into these systems These risers are supplied off the city mains.

The flow requirements for wet standpipes at the roof outlets are:

Prior to 1948	-	8 psi flowing 20 gpm
1948 to 1959	-	12 psi flowing 35 gpm
1960 to 1970	-	15 psi flowing 35 gpm
1970 on	-	30 psi flowing 35 gpm

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1960 to 1974

In 1960 height restrictions were removed from buildings constructed in the city of Los Angeles and at the present time, there is no maximum height. Changes in these water systems were necessary due to height, center core construction, and sealed buildings. After 1960 standpipes were required in the stairshafts. If the height of the building exceeded 150 feet, standpipes were charged with water and fire pumps were required in the building to provide pressure at the outlets.

The Code changes in 1960 were broken down into the requirements for buildings that did not exceed 150' in height, and those buildings that exceeded 150' in height (high rise). The building that did not exceed 150' in height, and built after 1960, had the same requirements as those built prior to 1960. The exception was that the dry standpipes were required to be in the stairshafts rather than on the exterior of the building.

Buildings built after 1960 that exceeded 150' in height (high rise) are required to have combination standpipe systems (see Figure #2).

CLASS III (COMBINATION) STANDPIPE SYSTEMS

Combination standpipe systems are directly connected to a water supply and equipped with both 1 1/2" outlets, with hose and nozzle attached, for use by the building occupants; and 2 1/2" outlets for use by the fire department. The 2 1/2" system may have 100' of single-jacketed, unlined 2 1/2" hose with a 1" tip attached to 2 1/2" outlets on each floor at the 5th floor and above.

Two separate sources of water supply are required. The primary water supply is through connections to the city water mains. This supply is most often connected directly to the building fire pump or, in the case of some larger buildings, to internal tanks which supply the fire pumps. Fire department inlet connections to combination standpipe systems are required, and are considered a secondary source of water.

As the water is supplied from the domestic system (street mains), two back flow (clapper) valves are required to keep the fire fighting water from flowing back into and contaminating the domestic water system. Outside stem and yoke (OS & Y) valves will be found on each side of the back flow valves so that maintenance work can be done on the valves.

The water then flows into the building's fire pumps, which are usually found on the bottom level of a building. OS & Y valves will also be found on the bottom level of a building. OS & Y valves will also be found on each side of the fire pumps for maintenance purposes. To keep the water from flowing back down the standpipe when the fire pump is shut off, a check valve is placed in the piping on the pressure side of the fire pump, just ahead of the OS&Y valve.

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Jockey pumps are normally installed to make up minor leakage rates in system pressure. They prevent the fire pump from continually starting and stopping due to minor fluctuations in the system pressure.

Combination Standpipe Risers

Combination standpipe risers are 6" and must flow 1000 gpm per riser. They will have four inlets at the FDC (250 gpm per inlet) of if three or more standpipe risers, they will have six inlets. A flow of 300 gpm is required at each 2 1/2" outlet.

After the water leaves the fire pump, the piping will split to supply the standpipe in each stairshaft. The standpipes located in each stairshaft will have an OS & Y at the base of the riser. If one riser were to break, the OS & Y valve can be shut off for that riser and water will still be available from the riser in the other stairshaft. In some buildings risers may also be cross-connected at the top. These will have OS & Y valves at the top of the riser as well as at the base of the riser to allow the entire riser to be shut off and isolated.

A means must be provided for the fire department to pump into the building standpipe system in case of fire pump failure, or water supply disruptions to the fire pump. Fire department inlets (referred to in codes as fire department connections or FDC's) are provided which allow the fire department to pump into the system on the discharge side of the fire pump. This is downstream of the OS & Y valve. To keep the water from flowing back out of the fire department inlets, there is a check valve between the inlets and the riser.

Test valves are required to provide a way of testing the fire pump(s). Test valve piping comes off the riser on the discharge side of the fire pump and goes to the exterior of the building. An OS & Y valve in the piping is provided so that unauthorized opening of the test valves will not flow water. The OS & Y valve, which is normally closed, is opened during tests of the fire pump. The test valve piping may be piped back into the on-site water supply, if applicable, instead of going to test valves on the exterior. This eliminates flowing large quantities of water into the street and saves the cost and waster of the water.

The same standpipes are utilized for supplying the 1 1/2 " wet standpipe system.

This system, installed in buildings exceeding 150' in height and built between 1960 and 1974, is a combination standpipe system.

Buildings that do not exceed 150', built between 1960 and 1974, had the same requirements as those that do not exceed 150' built prior to 1960, i.e., dry standpipes (except they are in the stairshafts), wet standpipes off the domestic system and sprinklered basements.

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Combination Standpipe Outlets

The standpipe outlets in buildings built between 1960 and 1974, that do not exceed 150' (dry standpipe system), are gate or globe valves. On buildings exceeding 150' (combination standpipe systems) the 2 1/2" and 1 1/2" outlets have glove valves with orifice plates (see Figure #3). The 2 1/2" outlets must flow a minimum of 300 gpm. Because building fire pumps must produce pressures that are sufficient to supply required flows to the top floors, provisions must be made to reduce outlet pressures on lower floors. As an example, the riser pressure at the second floor of a 62 story building is 445 psi. If the residual pressure at the 2 1/2" outlet exceeds 135 psi, an approved device must be provided to reduce the nozzle pressure to 45 psi. The system utilized in these buildings is orifice plates on the outlets. Orifice plates are a heavy gauge metal washer-like device which restricts the flow by restricting the size of the opening, thereby reducing the pressure when flowing. They are calibrated to supply 200 gpm at 45 psi through 100' of 2 1/2" hose with a 1" tip. When not flowing calibrated gpm, the pressure increases equal to the riser pressure, i.e., 455 psi.

Orifice plates are required to be securely installed in a fixed position. They are most often soldered to the outlet barrel or held in place by an adapter fitting. In some older buildings, however, the orifice plates are inserted between the outlet valve barrel or drip fitting and the attached hose coupling of the single jacket hose.

The obvious disadvantage of the orifice plate method of regulating outlet pressure is that it has no effect on static pressure. If the flow of water is shut off at the nozzle, the full static pressure of the standpipe will fill the hose, possibly rupturing the hose, especially if it is kinked.

At the 5th floor level and above, some 2 1/2" outlets were equipped with 100' of 2 1/2" unlined, linen hose and a 1" straight stream tip, hung in an approved hose cabinet. The cabinet had to be locked and have a glass panel and marked "Fire Department Use Only". There are no provisions for testing this hose and therefore it is not reliable for fire department use.

1 1/2" Wet Standpipe System

As noted above, the same standpipes are used for supplying the 2 1/2" and 1 1/2" outlets. The 1 1/2" outlets have 100' of 1 1/2" hose with a straight tip, in a cabinet for occupant use.

On wet standpipe systems, if the static pressure on the 1 1/2" outlets exceeds 70 psi, an approved device must be installed to reduce the nozzle pressure to 50 psi. To produce 50 psi nozzle pressure, through 100' of 1 1/2" hose flowing 52 gpm, requires 68.5 psi at the outlet.

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1974 to Present

In 1974 there was a major change in the requirements for fire fighting water systems in high rise buildings. The 150' requirement for high rise buildings was reduced to buildings over 75' in height, measured to the floor of the top floor level designed for occupant use, from the lowest level of fire department access. (see Figure #4 and #5)

COMBINED SPRINKLER-STANDPIPE SYSTEMS

Buildings built after 1974, exceeding 150' in height, will have a combined sprinkler standpipe system which is directly connected to a water supply and is equipped with 2 1/2" outlets for use by the fire department. 1 1/2" outlets are not required in a combined system. The standpipe also supplies water to the sprinkler system. It will have fire department inlet connections, an on-site water supply, and a fire pump which supplies water and pressure to the standpipes. The on-site water supply and the fire pump are usually located at the bottom level of the building.

In 1974, the major change in the building code required buildings over 75' to be fully sprinklered. The supply for the sprinklers is the riser(s) in the stairshafts. The Code still requires buildings exceeding 150' in height to have combination standpipe systems and those that do not exceed 150' are only required to have dry standpipe systems (in the stairshafts). Adding the requirement to fully sprinkler buildings over 75' in height onto these two requirements, results in three different configurations (depending on building height) of water systems in buildings built after 1974.

Combined Sprinkler Standpipes

Since 1974, buildings that exceed 150' are fully sprinklered and use combination (wet) standpipes to supply the sprinklers. Combined sprinkler standpipe risers are required to flow 1000 gpm per riser and have four inlets (250 gpm per inlet), or if three or more risers, six inlets are required.

Standpipe risers and outlets will be found in required stairshafts at each floor level, and occasionally may be found in other portions of the building as well. Combined sprinkler-standpipe systems are engineered to deliver specific amounts of water to the sprinklers in the building. For economic reasons (to use smaller piping), the water supply for each floor may come from a looped system (except 1983 to 1988), that is, the water for a given sprinkler head is delivered from two or more risers. For this reason, the sprinkler shut-off valve at each riser will have to be closed in order to isolate and drain the sprinkler on a particular floor. Signs at each riser should indicate which additional valves need to be closed and the location of the drain valve.

The exception to the "Looping" of the sprinkler systems between 1983 and 1988 was due to the city adopting the Uniform Building Code in 1983. It did not require two separate

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points of connection for sprinklers. The city and the fire department prefer two points of connection (looped) because it makes the system more reliable and less susceptible to failure or isolation. The Code was changed in 1988 to require two points of connection. You will find buildings built between 1983 and 1988 that are not looped, and the sprinklers are supplied by only one riser.

Combined Standpipe Outlets

Another requirement resulted from the fire department's dissatisfaction with the performance of the orifice plates and the unlined 2 1/2" hose in the hose cabinets. They did not perform effectively in fire situations. The solution was pressure reducing valves on the 2 1/2" outlets. The trade off was not requiring the installation of 2 1/2" hose attached to the standpipe outlets.

In buildings built after 1974 exceeding 75', a pressure reducing valve (PRV) system is utilized to reduce standpipe pressure to working pressure. The term PRV is a general term used when referring to the complete system, i.e., a system of pressure reducing valves. The purpose of the system is to maintain a safe flow of pressure to firefighting landlines and sprinklers. The term PRD, pressure regulating device or pressure restricting device should be used when referring to the mechanism that reduces the pressure.

Pressure regulating devices are required to be used on any standpipe outlet where the static pressure exceeds 150 psi. With pressure regulating devices, the pressure control mechanism is built into the supply side of the valve and is preset according to the static pressure of the riser at that outlet (see Figure #6). The upper floors with pressures below 150 psi at the outlet may use orifice plates to restrict the flow.

For the pressure regulating devices to operate properly and provide the proper pressure and flow, the designed static pressure of the riser must be provided, either by the building fire pump(s), or if they fail, by fire department engines pumping the system pressure into the system. Fire fighting personnel cannot change the setting of pressure regulating devices.

Pre-set pressures on pressure regulating devices are required to provide 80 to 125 psi flowing 300 gpm. By policy, fire department inspectors are having the pressure regulating device set at 100 psi at 300 gpm. Tests have shown pressure will vary only slightly whether using one or two lines off of the outlet. The pressure regulating device adjusts pressure automatically, providing a constant nozzle pressure and providing a safety feature on wyed lines not found with the orifice plate system.

It is important to note that for pressure regulating devices to operate properly and to provide rated flow, the valve must be fully opened.

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Wet Standpipe Systems

In building that are sprinklered (over 75' in height), the wet standpipe system outlets, with hose, are not required, provided that there are 2 1/2" to 1 1/2" reducers with cap and chain on the 2 1/2" outlets.

Buildings 75' to 150', 1974 to Present

Buildings over 75' that do not exceed 150' in height are fully sprinklered and utilize the dry standpipe systems to supply the sprinklers.

In buildings with a constant water supply in the dry standpipes supplying sprinklers, the requirements for the fire pump and the on-site water supply are adequate for the sprinkler demand but MAY NOT provide an effective hose stream for the 2 1/2" outlets. Where more than one standpipe is provided, the standpipes shall be interconnected at the bottom.

2 1/2" outlets may have orifice plats of pressure restricting devices to regulate flow and pressure. (see Figure #7)

Pressure restricting devices are found when static pressures are between 135 and 150 psi. Pressure restricting devices work by restricting the flow, hence reducing the psi. The pressure restricting device is mechanical and limits how far the valve can be opened, thereby reducing the flow and the psi.

During fire fighting operations these valves may be adjusted by removing the restricting mechanism. After you have removed the restricting mechanism, it will be necessary to leave a member by the valve to manually regulate flow and pressure. In order to effectively adjust these valves during emergencies, members must familiarize themselves with the different brands of valves.

On-Site Water Supply

Beginning in 1974, new high rise buildings in Los Angeles were required to have on on-site water supply (tank) to supplement the main water supply system. This on-site water supply acts as a safety valve for a building in the event of an earthquake or other disaster where the water supply to the building is interrupted.

For sprinklered buildings, over 75' but not exceeding 150' in height, the on-site water supply must supply the calculated sprinkler fire flow requirements of the most demanding rectangular area of the building for 30 minutes, plus an additional 100 gpm for the total standpipe.

An example of this is the new California Medical Center, a 10-story hospital which has

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an on-site water supply of 4,500 gallons.

For buildrings exceeding 150' but not over 275', the hydraulic calculations for on-site water supplies are calculated on the standpipe demand and the sprinkler demand is ignored. The standpipe requirements are 500 gpm for the first riser plus 250 gpm for each additional riser, for 30 minutes.

For buildings exceeding 275', the minimum amount of water in the on-site water tank is 45,000 gallons. This increases as the area and or hazards of the building increase and can be up to a maximum of 105,000 gallons in a larger high rise. The on-site water supplies for high rise buildings will almost always be found at the bottom of the building.

The code requires these on-site water supplies to be maintained automatically and requires two methods to fill the tank. One is a minimum 2" diameter pipe adequate to fill the tank in not more than 12 hours from the main water supply system, or after 1983 a 6" pipe to fill it in 8 hours. The other method is unspecified. Normally there is a pipe that comes off the piping between the fire department inlets and the standpipe. This allows water pumped into the inlets to be used to fill the tank, except there is a valve in this pipe between the fire department inlets and the tank and it is normally closed.

Buildings Less Than 75', 1974 to Present

Buildings that do not exceed 75', built after 1974, have the same requirements as those not exceeding 150' built from 1960 to 1974, i.e. dry standpipes in the stairshafts, wet standpipes off the domestic system, and sprinklered basements.

These are the descriptions of the types of systems, by age groups, and/or by height, that normally will be found in the city of Los Angeles.

FDC Signs

FDC's are required to have a sign DRY STANDPIPE, COMBINATION STANDPIPE, OR AUTO-SPRINKLER and STANDPIPE, and if interconnected the word ALL.

Buildings Under Construction

During the construction of a building and until the permanent fire extinguishment system has been installed and is in service, fire protection shall be provided as follows. Every building six or more stories in height shall be provided with not less than one standpipe for use during construction. Such standpipes shall be installed when the progress of construction is not more than 50' in height above grade. Such standpipes shall be provided with a 2 1/2" outlet on each floor adjacent to usable stairs. Such standpipe systems shall be extended as construction progresses to within one floor of the highest point of construction having secure decking or flooring.

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Where construction height requires installation of a combination standpipe (exceeds 150' in height), fire pumps and water main connections shall be provided to serve the standpipe. This includes temporary inlets, normally 2 - 2 1/2". Up to 150' in height this system will be a dry standpipe. Once the standpipe exceeds 150', a temporary manually started fire pump shall be installed. There are no pressure control devices required on the outlets. This condition will exist until the building is completed and the permanent fire pump(s) and the pressure reducing valves (PRV's) are installed on each outlet.

Fire Pumps

Fire pumps are required in buildings that have combination or combined standpipe systems. They provide a constant supply of water at the proper pressure to the standpipes.

The primary water supply is from the city water mains, which feed directly to the building fire pump, or from internal tanks (on-site water supply), which supplies the fire pump. Fire department connections (FDC's) to a combination or combined sprinkler-standpipe system are required, and may be considered a second source. The FDC's are plumbed into the discharge side of the fire pump. Shut-off valves are not permitted between the FDC's and their connections to the standpipe system. A required check valve in this piping will prevent the fire pump pressure from reaching the FDC's. The FDC's are located at the base of the building and may be grouped with test outlet valves. In some newer buildings the test valves are in a different location (sometimes in the pump room). The purpose of the test valves is to permit a periodic test of the building fire pump which is required to pump 150% of its rated capacity. The test valves can be identified by their male threads. FDC's will always have female threads.

Types of Fire Pumps

1. Horizontal Pump - A centrifugal pump with the shaft normally in a horizontal postion.

2. Vertical Shaft Turbine Pump - A centrifugal pump with one or more impellers discharging into one or more bowls with a vertical eductor or column pipe used to connect the bowls to the discharge head. They are particularly suitable for fire pump service when the water source is located below ground and where it would be difficult to install any other type of pump below the minimum water level.

3. Pressure Maintenance Pumps (Jockey or Make-Up Pumps) - These types of pumps are used to maintain a uniform, relatively high pressure on the fire protection system. A jockey pump should be sized to make up the allowable hourly leakage rate within 10 minutes, or 1 gpm, whichever is larger. A centrifugal-type pressure maintenance pump is preferable. A check valve should

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be installed in the discharge pipe. The jockey pump should be set to operate at a pressure of 5 to 10 psi higher than the main pumps starting pressure; which means that the fire pumps starting pressure should be at least 5 psi less than the jockey pumps starting pressure. The fire pump should not be used as a pressure maintenance pump.

Fire Pumps - Required Fittings

1. Automatic Air Release Valve - To automatically release air from the pump.

2. Circulation Relief Valve - Located between the pump and the pump discharge check valve, to operate if the pressure exceeds the pressure for which the system components are rated. Water being discharged from the relief valve has to be readily visible or easily detectable by the pump operator.

3. Pressure Gages - (1) A pressure gauge shall be connected near the discharged casting, and (2) a compound pressure and vacuum gauge shall be connected to the suction pipe near the pump. (A compound pressure and vacuum gauge is not required on a vertical shaft pump.)

4. Metering Device - A water measuring device shall be provided to test the pump. Fire pump installation must have the ability to test the pump and the suction supply at the maximum flow available from the fire pump. It shall be capable of water flow of not less than 150% of rated pump capacity.

Types of Driving Motors

Fire pumps can be either powered by an electric motor or by a diesel engine. Prior to 1974, generally there was only one fire pump and it was electrical. Since 1974, buildings over 275' are required to have three fire pumps, one electrical and two diesel.

Electric Motor

Power shall be supplied to the electric motor by one or more of the following sources:

1. Utility Service

2. Single Power Station

3. Emergency Generator

It should be noted that emergency power was not required in buildings built between 1960 and 1974. Some have voluntarily installed emergency power so that if power is lost to the building, the fire protection systems, including the fire pumps, will still be

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operational.

Diesel Engine Drive

1. Instrumentation and controls

- Governors

  Diesel engines must be provided with a governor capable of regulating the engine speed within a range of 10% between the shutoff and maximum load condition of the pump.

- Overspeed Shutdown Device

  Engines shall be provided with an overspeed shutdown device. It shall shut down the engine at a speed approximately 20% above rated engine speed and must be manually reset.

- Tachometer

- Oil Pressure Gage

- Temperature Gage

All the above instrumentation shall be placed on a panel and secured to the engine at a suitable point.

2. Batteries

Each engine shall be provided with two storage battery units. Each battery unit shall have the capacity to maintain a cranking speed throughout a six-minute cycle.

Example: 15 seconds of cranking and 15 seconds rest in 12 consecutive cycles.

3. Fuel Supply U.B.C Sec. 1807 I-1

There must be a separate fuel line and a separate fuel supply tank (day tank) for each engine. There shall be a minimum 8-hour (new high rise) and 4-hour (existing high rise) supply of fuel.

Engine Drive Controllers

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The basic function of a fire pump controller is to start the engine automatically upon a drop in pressure in the riser, or allow manual starting in case of a problem with the automatic system. The controller provides automatic cycled cranking and alarm protection for various engine failures when running. All controllers shall be marked "FIRE PUMP CONTROLLER". Where multiple pumps are provided, serving different areas of portions of the building, an appropriate sign shall be conspicuously attached to each controller indicating the area, zone, and portion of the system served by the pump or pump controller. The controller should be located as close as practical to the engine it controls and always within sight of the engine. A complete set of instructions covering the operation of the controller shall be provided and conspicuously mounted on the controller.

The controller will start the engine when there is a drop in the water line pressure. This is done by a mercoid pressure switch, which is independently adjusted to a high (stop) and low (start) setting. By policy in Los Angeles, the STOP pressure is set 10 psi below system pressure and the START pressure is set 50 psi below the system pressure. As water is flowed from a hose line or a sprinkler(s) operating, the pressure in the system will drop until it gets down to the START setting. Once it drops to this setting, the fire pump will automatically start, bringing the pressure up to the system pressure. As the pressure increases and goes by the STOP setting the controller will shut off the fire pump, except there is a run-out timer to keep the pump from constantly starting and stopping. The run-out timer is normally set for seven to ten minutes for electric driven fire pumps and 30 minutes for diesel driven pumps. These run-out timers can be set manually.

1. Four-Position Selector Switch

   The four position selector switch is labelled "TEST, AUTO, OFF, & MANUAL".

   - Test

     This momentarily drops the water pressure, closing the pressure (mercoid) switch, thus starting the engine.

     Auto

     Puts the controller in the standby mode. All the automatic functions are ready for operation.

   - Manual

     All automatic functions of the controller are bypassed when the engine is started with the manual push buttons. There are two

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manual start push buttons for manually cranking the engine from either set of batteries. In the event of low battery condition, both switches may be depressed simultaneously, increasing the battery potential to the starter. All engine alarms are operative in the manual mode.

- Off

  Turns the controller off. In this position the fire pumps will not start.

2. Manual Stop Push Button

   Mounted on the outside of the controller. It bypasses the selector switch allowing the manual shutdown of the engine. If the demand that caused the engine to start has returned to normal (mercoid pressure switch, and run-out timer), the controller will automatically reset for standby mode, if not, the engine will start up again. The way to correct this is to turn the four-position selector switch to the "OFF" position while pushing the manual stop button.

3. Failure Alarm on the Controller

   There are circuits to provide local lights and alarm on the controller for the following:

   - Overcrank Lamp

     If the engine fails to start at the end of the six crank attempts (six 15-second crank periods separated by five 15-second rest periods) the overcrank lamp will be lit and the audible alarm will sound.

   - Low Oil Pressure

     This is an alarm only.

   - High Water Temperature

     This is an alarm only.

   - Overspeed

     This is an alarm and will also shut down the engine. Overspeed is the only problem that will automatically shut down the engine.

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- Loss of Battery Charger Output

The loss of 115 volts results in the loss of charger output.

4. Status Lights

There are three green lights on the controller that indicate battery power is available from battery one and battery two.

The third lamp indicates that the control is in "AUTO" position.

5. Sequential Starting

The controller for each multiple pump unit shall incorporate a sequential timing device to prevent any combination of engines from starting simultaneously. If water requirements call for more than one pumping unit to operate, the units shall start at intervals of five to ten seconds. If the pressure in the system stays at the START pressure setting of the mercoid pressure switch for four to six seconds the second pump will start, if the pressure stays there for six to eight seconds the third pump will start. Failure of a leading engine to start will not prevent the subsequent engine from starting.

Electric Motor Fire Pump Controllers

An electric fire pump controller will include a single handle for operating both the isolating switch and circuit breaker in the proper sequence. It will also include a starting contactor, a built-in pressure switch for automatic starting, manual start and stop push buttons, and a power available pilot light to indicate that primary and control power are available. An emergency start lever will close the starting contactor independent of the automatic control circuits.

Automatic Transfer Switch

This switch provides for the operation of electric fire pump motors from an alternate source of power when the normal source fails. The switch is interlocked electrically and mechanically to prevent both services from feeding the load at the same time. The transfer switch is capable of manual operation. When the voltage of any phase falls below the preset level, the transfer switch will automatically transfer to the alternate source. This unit has two pilot lights, one for normal position and one for emergency. It provides a visual indication of switch position. A test switch is also provided which simulates loss of normal power so that the transfer switch operation can be checked without interrupting normal service to the fire pump controller.

Remote Alarm Panel

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The National Fire Protection Association requires that when the pump room is not constantly attended, an audible or visual alarm, powered by a reliable source, be provided at a point of constant attendance

Acceptance Test

Fire pump controllers shall perform not less than 10 automatic and 10 manual operations during the acceptance test and shall be operated for a period of at least five minutes at full speed during each of the tests. The automatic operation sequence of the controllers shall start the pump from all provided starting features.

Annual Fire Pump Test

An annual test of the fire pump assembly (pump, driver, and controller) shall be performed to determine its ability to continue to attain satisfactory performance at peak loads. Fire pumps are required to pump 150% of rated capacity and at a pressure of not less than 65% of its rated pressure for a minimum of 15 minutes.

Vane Type Water Flow Switch

Vane type water flow switches are used on wet sprinkler systems to detect water flow. In high rise structures they will be found in the stairshafts where the sprinkler pipe comes off the standpipe. The minimum flow rate for alarm is 4 to 10 gpm (equal to one sprinkler head) and operates in 20 to 60 seconds.

Flow adjustment is controlled by the small coil springs that hold the vane in the normal position against the direction of the water flow. These units have an adjustable pneumatic retard to prevent false alarms due to water surge. The retard is adjustable from 0 to approximately 90 seconds. The water flow switch can be wired as an open or closed circuit. It has two switches, one that can be used to operate a central station, proprietary, or remote station transmitter, while the other contact is used to operate a local bell or annunciator panel.

Valve Tamper Switches

Tamper switches are placed on valves in the fire fighting water systems of buildings to prevent unauthorized closing. The switch will activate within two turns when the valve is operated from full open towards the closed position. Removing the tamper switch cover will also cause the switch to operate.

The tamper switches are wired electrically to the alarm panel and will transmit a trouble signal when activated. The signal may also be transmitted to an alarm company.

You will also find tamper switches that utilize a cable looped through the valve handle

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and the ends of the cable inserted into an alarm box. If the valve is closed the cable is pulled out of the alarm box, activating a trouble signal.

Retrofit Program

The Commercial High Rise Sprinkler Retrofit Program was created in 1988 to amend the Los Angeles building code (Amending Ordinance #163836). Its purpose is directed toward the upgrading of fire and life safety systems in "existing" NON RESIDENTIAL high rise buildings. The term "existing" high rise refers to structures over 75' in height constructed prior to July 1974. These occupancies are office, industrial, or commercial type buildings.

The ammending ordinance requires upgrades such as buildings must be fully sprinklered and have a fire fighting water system to at least one stairwell. Water to this system MAY be provided directly from the city mains, or from an on-site water supply augmented by the city main. Also, the building must have an electric fire pump to maintain adequate pressure within the sprinkler system in the event that a sprinkler is activated.

NOTE: The sprinkler and fire fighting water system must be looped together making it a "COMBINED" type system. Also, the fire pumps are required to maintain adequate pressures in the sprinkler system and will still be able to maintain correct pressure once a fire fighting line is opened. The Los Angeles Fire Department's method for hooking up to FDC's to supplement system pressure is outlined in training bulletin No. 64 of the manual of operation, book 23.

There are 356 buildings in the City of Los Angeles that were affected by this 1988 ordinance. Approximately 40 of the 356 building owners were granted a variance from this ordinance due to various unique conditions that existed in their respective buildings. An example of a building that might be granted a variance is a building already sprinklered at the time the ordinance was enacted. In these buildings the sprinkler and standpipe systems might not be looped together.

Selected buildings which are to remain vacant above the first floor may be exempt from ordinance compliance and could be given extensions of up to 11 years from the date of citation to comply.

With 356 of these existing high rise buildings spread thoughout the city, there is a great likelihood that department members will encounter an emergency in one of these buildings. For obvious reasons, it is important to know what type of water system firefighters will be dealing with throughout the entire process fo the buildings' retrofit program.

The types of buildings that firefighters will find can be placed into two categories:

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1. Buildings that have completed their retrofit program.

2. Buildings in the process of completing their retrofit program.

In completely retrofitted high rise buildings, as in new high rise buildings (built after July 1974), you will encounter different types of pressure reducing valves (PRV's). There are two types of PRV's that firefighters will commonly come in contact with:

1. Pressure **Regulating** Devices

2. Pressure **Restricting** Devices

NOTE: Orifice plates may also be used.

It is important to be able to identify each of the devices. Pressure REGULATING devices are mechanisms encased in LARGE cast metal housings (see Figure #6). Mechanical pressure RESTRICTING devices will be smaller than the pressure REGULATING devices. Mechanical pressure RESTRICTING devices will have calibrating mechanism as an internal part of the unit, or have one attached to it. Orifice plates will be found in normal gate valves (globe valves or angle valves) (see Figure #3).

Members encounting incidents of buildings in the process of the retro-fit program will be faced with greater challenges. Members may find makeshift water systems, one or more floors of a building completely taken out of service while the system is being worked on, temporary connections, and other things different than a normal fire protection system.

The High Rise Unit of the Fire Prevention Bureau has required contractors working on systems to assist the fire department by complying with the following:

- Place signs within the building stating that the building is in the process of being retro-fitted.

- Limit the duration of time a portion of a fire protection system can be taken out of service (between four to six hours) and require that O.C.D. and the first-in battalion commander be notified of the temporary condition.

- Post signs at any connection that has been taken out of service, and the proper parts to fix the system must be on scene close enough to the system to allow the system to be put back into service in a short amount of time.

- Attach a temporary connection to enable the fire department to bypass the portion of the system disabled and still pump to the other parts of the system.

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At times, requirements are violated. The situation encountered will be much different. Members must have knowledge of buildings in their district to compensate for inadequate or unexpected application of these codes. Recently, in a building undergoing retro-fit, firefighters encountered only one very well hidden sign describing the process. Also, floors were out of service without temporary connections and notifications were not made. Additionally, there was storage in the stairwell that would have hindered fire fighting operations.

To ensure safe and effective fire fighting operations, it is paramount that fire stations which have "existing" high rise buildings within their districts identify these buildings, develop a pre-incident plan on them, and share this information with the companies of the first alarm assignment. Remember, due to the fact that most of these buildings were granted up to 11 years to complete their retro-fit, firefighters will be dealing with these buildings for a long time to come.

RETIRED CURRICULUM

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RETIRED CURRICULUM

HIGH RISE WATER SYSTEMS

PRE - 1960

JULY, 19991

RETIRED CURRICULUM

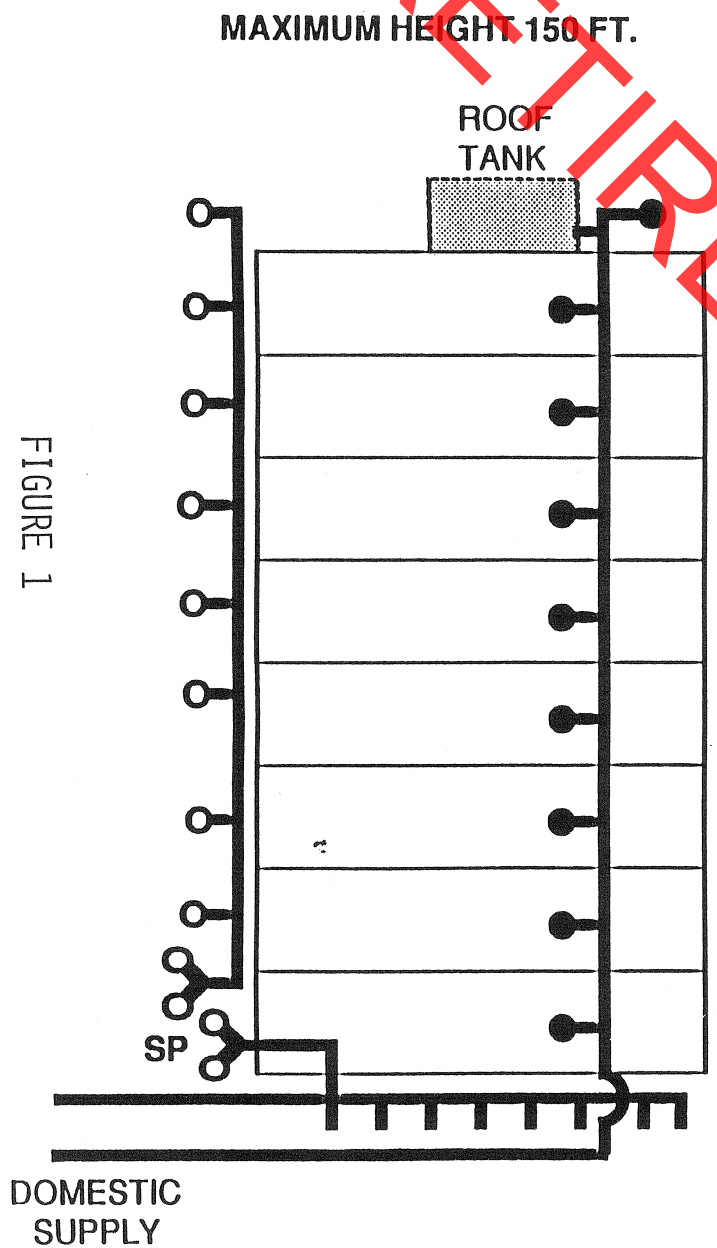


FIGURE 1

3 OR MORE STORIES

CLASS II WET STANDPIPE - (1 1/2" with hose and nozzle). Supplied by domestic system. May have roof tank, generally gravity but may be pressurized.

4 OR MORE STORIES

CLASS I DRY STANDPIPE - 500 gpm minimum. On exterior of building (fire escape), may be in stairwell. Sufficient risers to cover any portion of building with 30' stream from 100' of hose.

OUTLETS - 2 1/2" Globe Valve.

INLETS - 2 - 2 1/2" for 4 to 5 stories.
4 - 2 1/2" for 6 or more stories.

FIRE PUMPS - None
Pressure controlled by LAFD Engine(s).

ON SITE WATER SUPPLY - None.

SPRINKLERS - Required in basement if used for storage. Supplied by domestic system with F.D. connection to augment supply.

HIGH RISE WATER SYSTEMS
1960 TO 1974

JULY, 19991

RETIRED CURRICULUM

BUILDINGS UNDER 150 FEET

CLASS I DRY STANDPIPE SYSTEM
In stairshaft. Refer to pre - 1960 system.

CLASS II WET STANDPIPE SYSTEM
Refer to pre - 1960 system.

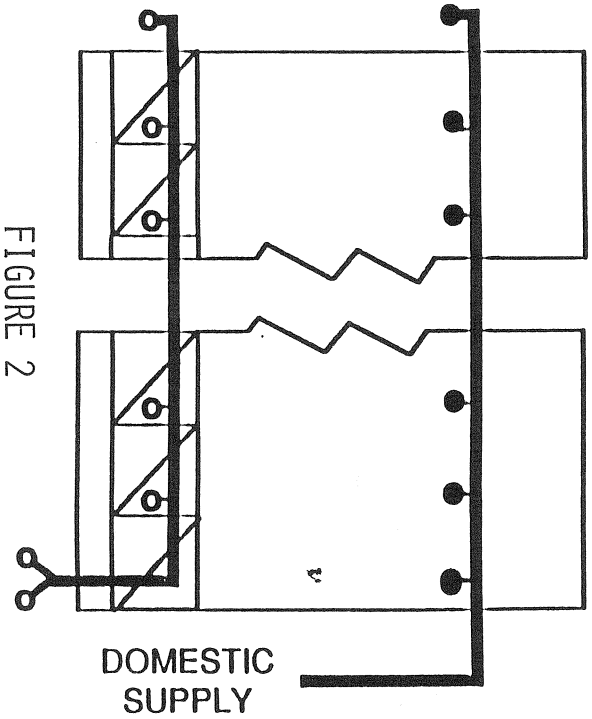
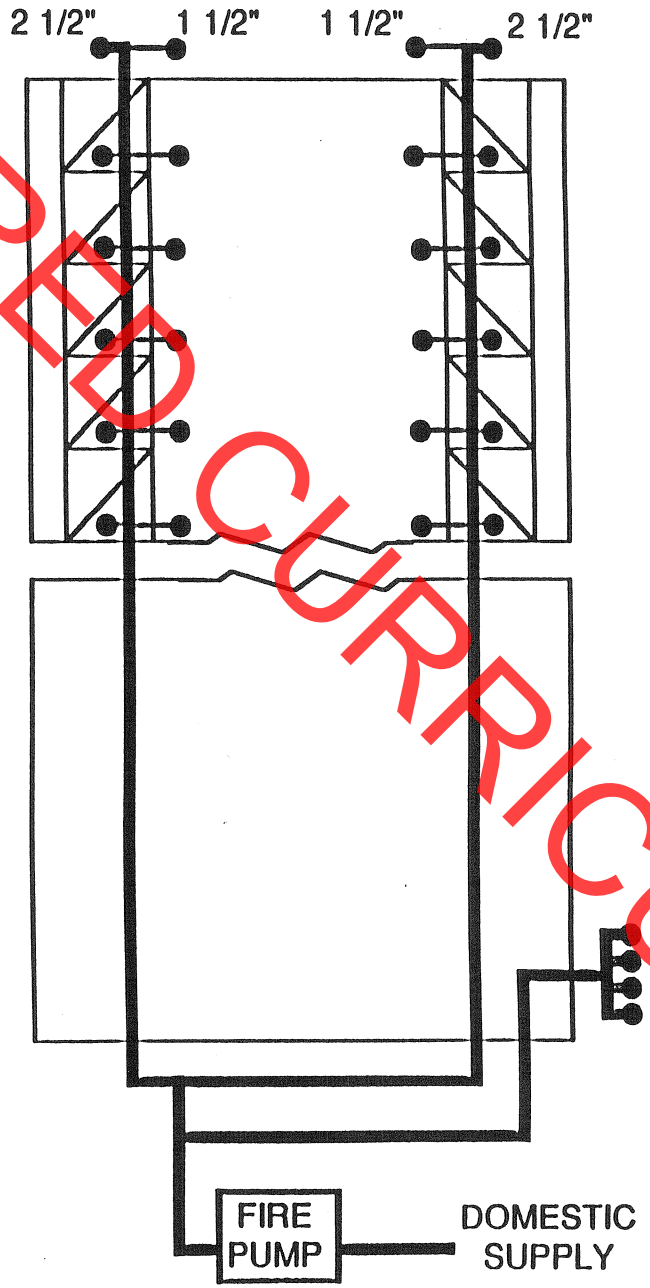


FIGURE 2

BUILDINGS OVER 150 FEET



CLASS III COMBINATION STAND-PIPE SYSTEM

OUTLETS - 2 1/2" in stairshaft with Orifice Plates. Some have 100' of 2 1/2" hose with 1" tip, 5th floor and above. May have PRV's.

INLETS - 4-2 1/2"s, supply 1000gpm.

FIRE PUMPS - Diesel or electric, emergency electrical back-up not required. Jockey pump to maintain static pressure.

ON-SITE WATER SUPPLY - Not required.

SPRINKLERS - Only required in basement. Supplied by domestic supply with F.D. connection to augment supply.

CLASS II WET STANDPIPE SYSTEM (1 1/2" with hose and nozzle) - Supplied off of Combination Standpipe utilizing Orifice Plates to control pressure (flow).

HIGH RISE WATER SYSTEMS

1974 to PRESENT

JULY 1991

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BUILDINGS UNDER 75 FEET

CLASS I DRY STANDPIPE SYSTEM
In stairshaft. Refer to pre - 1960 system.

CLASS II WET STANDPIPE SYSTEM
Refer to pre - 1960 system.

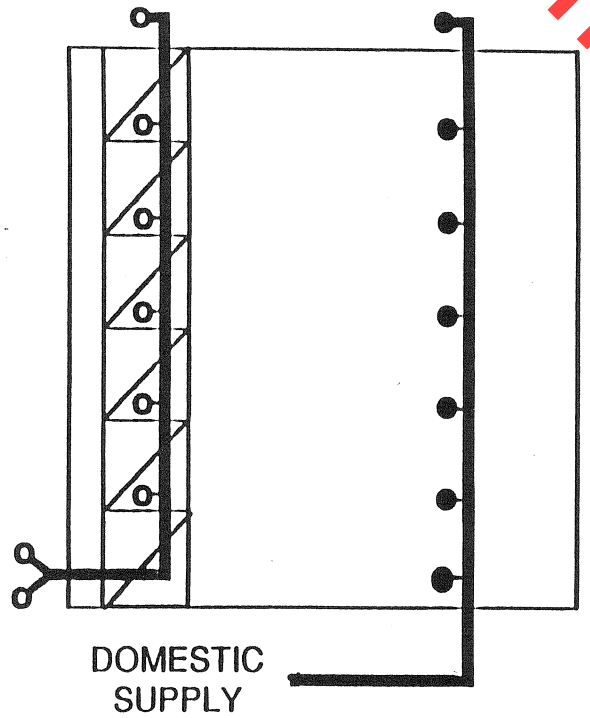
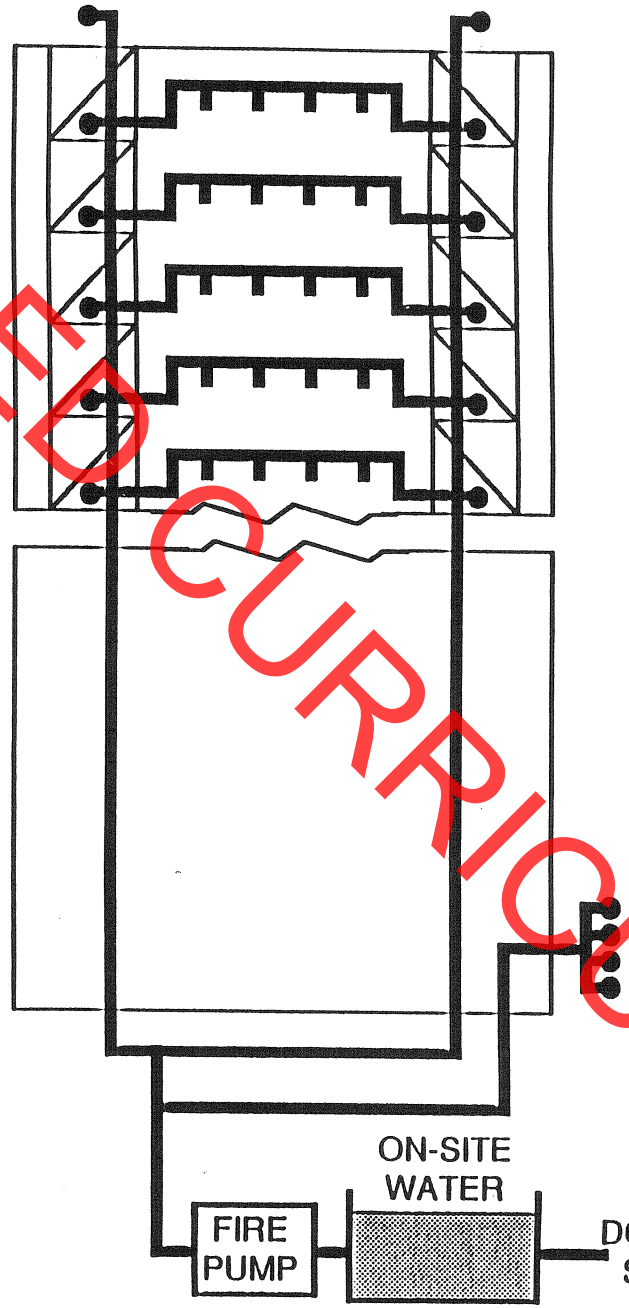


FIGURE 3

BUILDINGS OVER 150 FEET



COMBINED STANDPIPE SPRINKLER SYSTEM

OUTLETS - 2 1/2" in stairwells with PRV's. Set at 80 to 125 psi flowing 300 gpm. May have Orifice Plates where standpipe pressure is less than 150 psi (top 6 to 8 floors).

INLETS - 4-2 1/2"s, standpipe cross connected at bottom.

FIRE PUMPS - 1 required up to 275', 3 required over 275', 1 electric and 2 diesels.

ON SITE WATER SUPPLY - Over 275' 45,000 TO 105,000 gals., depending on square footage. Under 275', calculated to supply sprinkler demand.

SPRINKLERS - Required throughout, supplied off Combination Standpipe. Except 1983 -1988, looped, must shut-off valve at each standpipe to isolate floor.

WET STANDPIPE SYSTEM - (1 1/2") Not required if on 2 1/2" outlets, 2 1/2" to 1 1/2" reducer with cap and chain.

HIGH RISE WATER SYSTEMS

1974 to PRESENT

JULY 1991

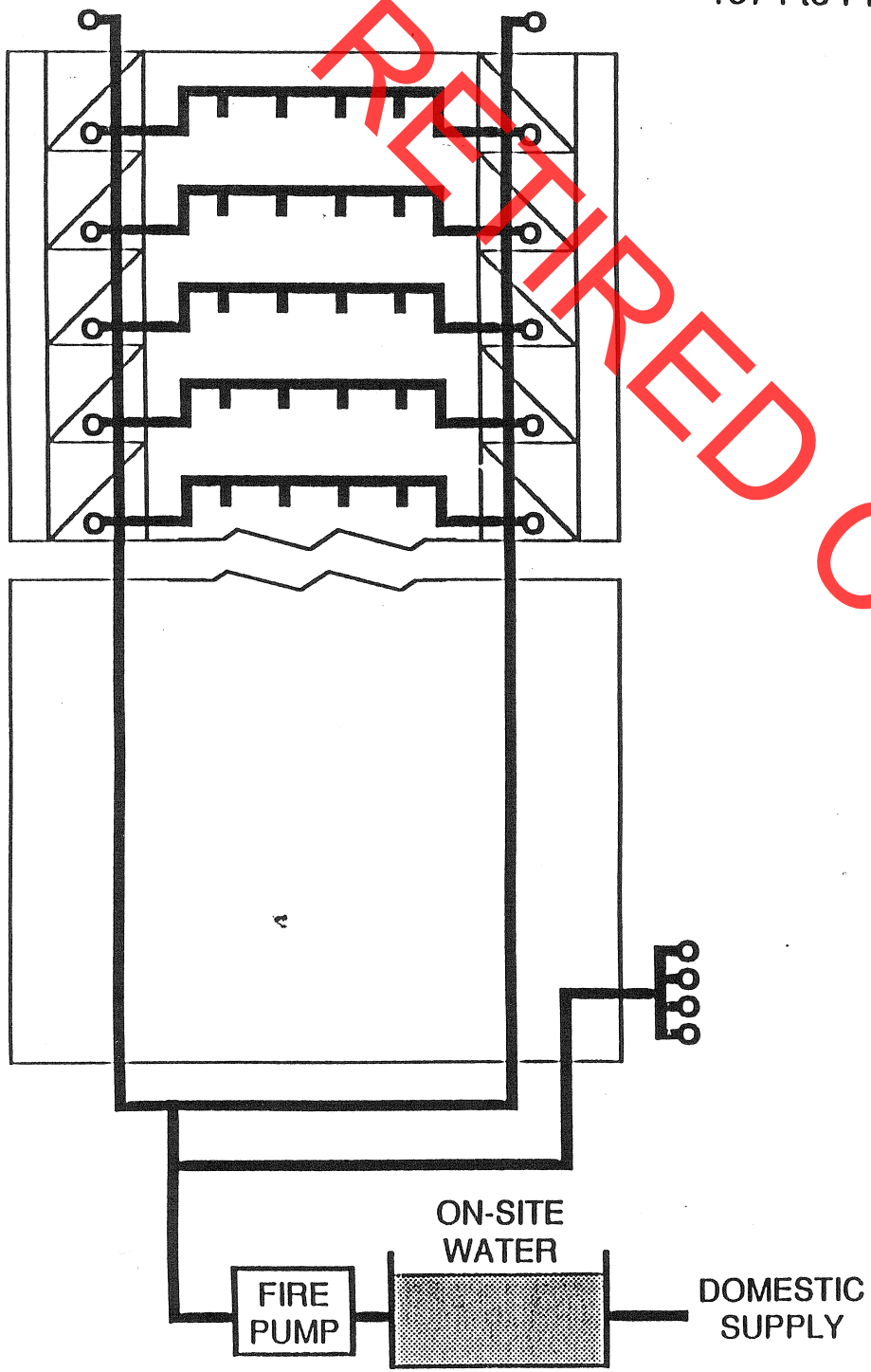


FIGURE 4

BUILDINGS 75 TO 150 FEET

CLASS I DRY STANDPIPE - 500 GPM minimum. Dry Standpipe normally used to supply sprinklers.

OUTLETS - 2 1/2" globe valves.

INLETS - 4-2 1/2".

* FIRE PUMP - To supply sprinkler demand.

ON SITE WATER SUPPLY - Calculated to supply sprinkler demand.

SPRINKLERS - Required throughout for buildings over 75 feet in height, normally supplied off Dry Standpipe. Looped, except for 1983-1988.

CLASS II WET STANDPIPE - (1 1/2") Not required if on 2 1/2" outlets, 2 1/2" to 1 1/2" reducer with cap and chain.

* NOTE - Fire pump pressure is for sprinkler demand and MAY NOT supply 2 1/2" outlets with sufficient pressure / flow for effective hose line.

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PROCEDURES FOR SUPPLEMENTING HIGH RISE FIRE PUMPS

The purpose of this training bulletin is to outline the Departments high-rise pumping procedures and to identify buildings where the procedures would be applied. In addition, safety considerations and obstacles that could be encountered will be discussed.

The high-rise pumping procedures will be implemented on buildings with a building fire pump supplying the standpipe systems. These buildings are existing high-rise buildings (built between 1960 and 1974) higher than 150 feet, existing high rise buildings between 75 and 150 feet that have been retrofitted to include a fire pump, and new high-rise (built after 1974) buildings.

The procedure are designed as a back up to a building's fire pump. In the event that the building's fire pump fails, Fire Department apparatus will be required to assume the building fire pump's function of maintaining the system pressure. The system pressure equals head pressure plus friction loss in the standpipe inlets plus pressure required at the highest outlet.

There are a variety of ways to identify the system pressure. The quickest and most reliable way is to locate the Fire Department Connection (FDC) design, a plaque mounted near the fire department connection inlets. Minimally, the FDC sign provides the system pressure and may also include additional information such as area of building served and address of building. An alternate method to determine the system pressure, would be to consult the building engineer, or to view the discharge gauge of the building's fire pump while the pump is running. The latter two, of course, would not be practical during an emergency and would best be accomplished during a pre-fire inspection. At an emergency, and a FDC system pressure sign is not provided, and estimate of the building's system pressure can be calculated by multiplying the number of floors by five (5) then adding the constant of 150 psi. The sum will be the approximate system pressure. This constant of 150 psi is a figure derived by adding the average pressure required at the roof outlet (125 psi) and the friction loss in the standpipe inlet (25 psi).

Example: 20 story high-rise:

20	(number of floors)
x 5	(amount of head per floor)
100	
+ 150	(constant)
250 psi	

For a 20 story high-rise, the approximate system pressure would be 250 psi.

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PROCEDURES

RESPONSIBILITY

The member responsible for supplying the water system will be the first arriving 200 series engineer, or in the event that the first two arriving companies on scene are single engines, the second arriving engineer will supply the system. The engineer supplying the water system will:

1. Lay hydrant to fire.

2. Spot the apparatus at the Fire Department Connections (FDC's) with the pump panel away from the building. Spot so as to lay the 2½" lines as free form kinks and sharp bends as possible, especially at the discharge gates and 2½" FDC inlets.

3. Remove all plugs from the 2½" FDC inlets to prevent back pressure from leaking past the clapper calves and "locking" them on.

4. Connect two 2½" lines form the apparatus to the FDC's, utilizing the discharge gates on the building side of the apparatus. Each line shall be a maximum of 100 feet. If pumping over 300 psi, strap the lines together using ladder straps on each side of each coupling and midway between each coupling. Load the 2½" lines before strapping.

5. If the high rise in over 20 stories or the system pressure at the FDC is over 250 psi, another apparatus shall spot to the hydrant/4-way and pump half the system pressure to the apparatus supplying the FDC's.

6. If there is a fire pump in to the system <u>100 PSI BELOW THE SYSTEM PRESSURE</u> as shown on FDC sign or on the calculated estimate. This should be below the ON/OFF pressure settings of the building fire pump. This will allow the building fire pump to perform its designed function of supplying the system.

<u>INITIAL PRESSURE TO PUMP</u>

Example: 20 story building -

System Pressure =	250 psi
Less =	<u>100 psi</u>
Pump =	150 psi

If you are not flowing water, monitor the pump temperature. Use the pavement cooler to alleviate water in the pump heating up.

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7. Once the Engineer is hooked up and pumping, determine if the water is flowing or not and notify the Incident Commander to this fact. An expedient way to determine if water is flowing is to feather the discharge gate. If the gate resists closing and/or there is a drop on the discharge gauge, water is flowing. If the water is static, the closing of the gate is easily accomplished and the pressure trapped in the discharge line will register on the discharge gauge. Monitor gauges to determine if and when you start flowing water, this will be indicated by a drop in discharge pressure and verified by feathering the gate. Once water is flowing, throttle up the system pressure and notify the Incident Commander.

8. If there is an actual fire, whether the Engineer(s) is (are) supplying the FDC with one apparatus, or two apparatus pumping in series, request additional engines from the Incident Commander and have them duplicate the operation into the other two inlets of the FDC utilizing a separate source of water, if possible, for the supply lines. This will provide additional GPM and increased reliability in supplying the system.

SAFETY CONSIDERATIONS:

At the scene of a high rise fire, danger from falling glass and debris is a genuine concern. Due to the engineer's exposed position and proximity to the building, precautions shall be taken to guard against the hazards of falling debris. The engineer can protect himself by one or more of the following:

1. Donning all safety clothing.

2. Having a truck company spot their aerial so as to cover both panel and the FDC's. Once spotted, lay salvage covers, folded to a quarter of their width, on the rungs from the pedestal to the top of the aerial.

3. Spotting a second apparatus next to your engine and using a pike pole and salvage cover, create a roof over the panel.

4. Creating a lean-to over the panel out of pike poles, rubbish hooks and salvage covers.

5. Draping rubbish carriers, salvage covers or other such suitable barriers over the offside running board to the ground to protect the legs from the horizontal spread of flying glass shards.

Protection for the 2½" can be accomplished by using ladders, salvage covers, seat cushions, compartment or hose bed liners (wood slats). The means of protection is limited only by the operators ingenuity and the materials on hand

RETIRED CURRICULUM

OCCUPANT LIFE SAFETY

IN A

HIGH-RISE

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LIFE LOSS POTENTIAL:

At any emergency incident that the Fire Department responds to, the primary consideration should always be to provide life safety protection for persons who are threatened or placed in danger by the events that may occur.

Under fire conditions in a high-rise building the potential for life loss and serious injury is probably greater than in any other type of situation we will encounter. This fact has been proven repeatedly in many of the high-rise fires that have occurred in recent years.

The occupant loads in high-rise buildings will, of course, vary with the size and type of structure and can also fluctuate greatly at various times during the day (office building vs. apartment building). However, the total number of people that could be present in a high-rise building is usually much greater than most people think.

For example, in an average size office building or large apartment building, it is not unusual to find fifty (50) persons per floor when the building is fully occupied. If the building is 20 stories high, that represents 1,000 people in the structure. Or consider a large fifty (50) story office building with an occupant load of 100 per floor, that translates into 5,000 people. Some New York high-rise buildings have occupancy loads over 10,000 people. The World Trade Center employs 55,000 people and over 100,000 occupants per day. Los Angeles now has a 72-story high rise.

Under certain conditions, virtually all of the occupants in a high-rise building can be placed in jeopardy from the effects of a fire that occurs. Because the potential for life loss is so great in high-rise buildings, life safety should be the prime consideration in evaluating the overall high-rise problem.

A great deal of the responsibility for life safety in high-rise buildings should rest with the people who design them, maintain them, and use them. Relieving these people of their responsibility shifts the entire burden of life safety to the Fire Department which is wrong but, more often than not, is the case.

DESIGN FEATURE:

When analyzing life safety in high-rise buildings, it is unfortunate that, generally

speaking, only those buildings built within the last few years have the life safety features incorporated into them that the Fire Service has been demanding for the past twenty (20) years.

While it is true that most current building codes now dictate a relatively high degree of fire and life safety requirements for high-rise buildings, it took a series of fire tragedies to provide the momentum to have these laws enacted.

Of particular concern from a life safety design standpoint are the older low-rise buildings (generally pre-1974) which as a rule are sadly lacking in the protectional features now required for newly constructed high-rise buildings. In some cases, legislation has been passed requiring that older buildings be retrofitted with many of the life safety features found in the newer buildings. (On a positive note, the Marriott Hotels are voluntarily retrofitting most of their buildings.)

MAINTENANCE OF LIFE SAFETY FEATURES:

Regardless of what type or how many life safety or fire protective features a high-rise building has, they are worthless unless they function the way they are supposed to when an emergency situation develops.

In a modern high-rise building there are numerous individual items that are related to life safety and/or fire protection. Under emergency conditions, failure or improper operation of these items can have tremendous negative impact on life safety or fire control efforts within the building. These systems should be checked during the construction phase.

Maintenance of life safety systems and fire protection equipment in a high-rise building is the responsibility of the building owner and manager. Enforcement of a program that will ensure that safety and fire protection equipment are properly maintained is a prime responsibility of the Fire Department. Such a program should require periodic testing of systems and equipment with test results certified in writing to the concerned fire agency. Does your Department have a certification system? Every three to five years?

DEALING WITH THE LIFE SAFETY PROBLEM:

Since safety design features and other preventive measures don't always provide a total answer to life safety in high-rise buildings, Fire Departments must be prepared to deal with the problem during fire situations. In many cases, this presents more of a challenge than extinguishing the fire.

The normal approach of ensuring life safety by Fire Department evacuations of all occupants from an involved building is not practical during a high-rise fire. The two biggest restrictions are the time and manpower required to do it safely.

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Uncontrolled evacuations of high-rise buildings during actual fires have resulted in serious injuries to building occupants and caused delays in the efforts of fire personnel to reach the fire floor.

A high-rise fire in Van Nuys, California 1984, Fickett Towers involved a twelve (12) story senior citizen occupancy, with 300 occupants, average age 90. In this fire, uncontrolled evacuation was in progress upon the arrival of the first fire companies. Fifty percent of total resources (32 companies) were committed to search-rescue and evacuation.

Drills that have been conducted in 25-30 story buildings under nonemergency conditions have required 30-40 minutes to completely evacuate the buildings using all available stair shafts and all fire personnel that would respond on first and second alarm assignments.

Delaying firefighting efforts while totally evacuating a high-rise building is not the answer. The best way to ensure the safety of the largest number of building occupants is the following three-step approach.

1. **Aggressively attack the fire.**

2. **Control the building environment.**

3. **Limit the movement of building occupants.**

An aggressive attack on the fire will limit fire spread, smoke and heat production and help to minimize the danger to building occupants. It can also ensure that heat and smoke are prevented from entering stair shafts which may be needed for limited movement of building occupants.

Control of the building environment is an absolute necessity during a high-rise fire. Allowing continual normal operation of the air-handling system will usually result in smoke and heat being transferred to areas of the building that are remote from the fire. Permitting elevators to remain in automatic operation during the fire can also place building occupants in danger by allowing the elevators to stop at the fire floor or becoming stuck in the hoistways.

Unrestricted movement by occupants throughout the building can create a panic situation that can result in serious injuries and also impede access to the fire area by suppression personnel. Coordinated movements of those persons who are in immediate danger to safe refuge areas will ensure their safety and maximize the use of firefighters for suppression functions.

SAFE REFUGE AREAS:

Safe refuge areas within a high-rise building can be defined as locations within the

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building that are protected from exposure to fire conditions or effects (fire, heat, smoke) by distance and/or building construction features.

The primary purpose of using safe refuge areas is to move occupants who may be exposed to fire danger to a safe refuge location while fire extinguishing operations are in progress. Limited relocation of occupants in this manner minimizes the number of fire personnel that would be required for total building evacuation and helps to ensure unrestricted firefighter access to the fire area by clearing stair shaft routes.

Movements of building occupants to safe refuge areas by either firefighters or trained building personnel must be by protected routes of travel that are not exposed to heat or smoke from the fire. One of the best methods of accomplishing this is through the building's Communication System. It is also essential that once occupants are placed in a safe refuge area, fire conditions be closely monitored for any changes that could endanger them. For this reason, occupants should never be isolated from further means of egress and either firefighters or trained building personnel should remain with them in the safe refuge area to maintain order and initiate evacuation if required.

OCCUPANT EDUCATION AND TRAINING:

A large part of the life safety problem in high-rise buildings can be solved by occupant education and training.

It is a well-known fact that in a fire situation the time period prior to the arrival of the Fire Department is critical because occupants behavior is self-determined. Lacking some type of knowledge of the proper procedures to follow during a high-rise fire, the actions of building occupants is often unpredictable. The panic that is created during these situations results in irrational behavior at best.

Most high-rise fire fatalities occur when occupants are trying to get out of the building. They use the conventional "down and out" approach and remain in smoke filled hallways waiting for elevators that are not working, enter elevators that can take them to the fire floor or try to reach stairways that may be filled with smoke and which often do not permit exit at intermediate floors.

This problem is now being addressed by provisions that have been written into most building and fire codes, that require building management to develop emergency preplans for individual buildings and provide training for all building occupants. Many codes also require that in addition to general occupant training, specific building personnel be designated and trained as fire brigade members and floor wardens with specific responsibilities regarding limited evacuation of occupants during a fire emergency.

It is important that building emergency preplans or training programs that are developed

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for high-rise buildings are approved by the local fire jurisdiction and that provisions are made for periodic formal training of all building occupants. Ensuring that a well-designed emergency preplan is in place and that the actions of building occupants will be controlled and monitored can lessen the life safety burden on the Fire Department and allow maximum use of fire personnel in other critical activities.

SEARCH AND RESCUE OPERATIONS:

Even with a comprehensive Building Emergency Preplan in effect, the Fire Department cannot afford to totally ignore life safety considerations during a high-rise fire. There may be conditions present that have caused occupants to be trapped in areas from which they are unable or unwilling to move.

For this reason, at every high-rise fire prompt consideration must be given to the safety of building occupants by fire personnel who first enter the building or the fire area. If it is positively determined that occupants throughout the building are not in danger or a limited evacuation is being effectively handled by building personnel, the situation should be monitored to be sure that it remains the same. If there is the slightest doubt that occupants are in danger or their movement is not being controlled, a Rescue/Evacuation Group should be implemented immediately.

Initially, the Rescue/Evacuation Group may be comprised of only one company and supplemented later with additional companies if needed. It is critical that a specific company or companies be assigned to perform search and rescue activities as indicated and that they be given specific instructions. Don't assume that this function will be handled by companies that have been given other assignments in the fire area. This has actually happened in several high-rise fires.

The primary responsibility of the Rescue/Evacuation Group during a search operation is to locate any potential victims before they become fatalities. This may require covering a large area of the building depending on the size and severity of the fire and extension of heat and smoke beyond the fire floor. It is important that this operation be well-coordinated to ensure prompt and thorough coverage of all affected areas and that the Command Post be kept informed of progress and conditions.

Search procedures during a high-rise fire should consist of a primary and a secondary search. A primary search is a fast initial search of the immediate area in which occupants may be trapped or exposed to the effects of the fire. A secondary search is a more detailed search that extends to a wider area of the building and is conducted after the primary search is completed. Both primary and secondary searches should start with the areas most affected and extend outward and usually upward. Reports should be relayed to the Command Post regarding completion of search activities on each floor or area. An "all clear" message is very helpful to all.

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If the occupants are encountered during a search operation in a location that is considered to be a safe refuge area, they should be reassured and told to stay there. This may require leaving fire personnel with them to maintain calm and prevent any subsequent panic. To reduce the number of fire personnel needed for this activity, occupants can be grouped together. If occupants are found in a location that is, or may be exposed to fire, heat, or smoke, they should be moved to a safe refuge area. As stated earlier, whenever occupants are placed in a safe refuge area, they should never be isolated from further means of egress in the event that conditions change.

The worst situation that can be encountered during a search operation is to find a number of occupants who have been overcome by smoke. In most cases, the time and personnel required to move a large number of people in this condition several floors to a safe refuge area is not available. This is especially true if available stairways are being used for suppression activities. Trying to move building occupants, particularly those that are not fully ambulatory in stairways that are filled with fire crews and hose is almost impossible.

Research was completed in February, 1984, in Los Angeles City, and in March, 1984, at Oklahoma State University, and a model developed to illustrate a search and rescue problem and the resultant guidelines for determining time required to accomplish search and rescue.

A three story apartment building measuring 160 ft. x 40 ft. with a center hall, was selected for the Los Angeles test. Enclosed stairs were located at each end. The room size was 20 ft. x 20 ft.

A search of this structure (one floor) was conducted by two crews of two firefighters in full turnout gear including SCBA. Time required 5.5 minutes.

By covering the lens of the SCBA, smoke was simulated and a second search was conducted. The time required tripled to 16.5 minutes.

It is estimated that if forcible entry is required, the time to search the same floor would double again. Time required 33 minutes.

Other variables including finding victims (the reason we went there) will increase the time again.

The research described above allows us to see the search and rescue problem on more realistic terms. Example: If the Incident Commander desires that the search described above be conducted in 16.5 minutes, he will have to provide two more search and rescue teams of two each.

What efforts have been made in your community to provide the Commanding Officer

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with the data required to determine times and resources (staffing) to accomplish effective search and rescue?

Consider doing your own research into this area.

Methods of marking room/open areas should be common and understood by all involved. Some methods are:

1. Marking on door.
2. Tags on door indicating primary/secondary search completion
3. Chair in doorway with legs toward the door.
4. Tubes for locks, knobs.
5. Magnetic lock barriers.
6. Other (use your imagination).

The next time you are assigned search and rescue, consider time and resources.

In the aforementioned described situation, unless the area is too smoky to work in, help should be brought to the victims. It may be possible to move them to another location on the same floor into a clear area to start working on them.

Under certain conditions, elevators can be used to move victims or possible victims from danger areas within the building. The elevators must have been physically checked and a determination made that they are safe to use. The availability of a split-bank elevator that does not serve the fire floor and is not in a common shaft with those that do is ideal for moving victims to the ground level or roof top for treatment and/or evacuation. If there is any doubt about the safety of the elevators, don't use them!

When necessary, helicopters can be used to remove occupants and victims from roof-top areas providing conditions are favorable. Getting them to the roof is the first problem, especially if they are nonambulatory and on floors well below the roof level. In this case, the logistics of moving them can be quite restrictive unless elevators can be safely used.

Physical conditions, such as lack of space or obstructions, can impede or seriously restrict helicopter landings on many roofs, or, as has happened on some occasions, smoke or wind conditions at the roof level prohibit the helicopter from making a safe landing.

Utilizing helicopters for rescue/evacuation functions at a high-rise fire usually requires a considerable amount of lead time to get the helicopter on scene and a great deal of coordination once it is there. Formation of a Roof Group should be considered. Don't wait until the need arises to find out that a helicopter is not available or cannot land on the roof of the high-rise building that is on fire. These problems should be addressed

RETIRED CURRICULUM

beforehand through effective prefire planning.

SUMMARY:

The best way to maximize the life safety of occupants in a high-rise building is to ensure that the building is equipped with the required protectional features, and that the features are maintained in proper working order.

Occupants of high-rise buildings must be educated and trained so that their actions under emergency conditions do not complicate an already complex demand that has been placed on the Fire Department.

High-rise Rescue/Evacuation Procedures must be preplanned by Fire Departments and initiated early.

Failure to place proper emphasis on any of the items mentioned above can result in needless injuries or deaths in high-rise buildings that could have been prevented.

RETIRED CURRICULUM

MAJOR STRUCTURE FIRE
MARCH 31, 1987
1280 VETERAN - REDWOOD CITY
LOW-RISE STRUCTURE
SENIOR CITIZEN HOUSING

RETIRED CURRICULUM

This report is written for the purpose of examining the tactics and strategy used in this incident.

Action Taken:

Arrived on scene at 0420 hours. Reported to Incident Commander. Assigned ventilation by Operations.

Proceeded to south stairway and checked each floor for smoke. Upon arrival at 4th, 5th, and 6th floors, smoke became worse. Discovered on sixth floor, two firefighters performing CPR on a citizen. Went immediately back to Command Post to report need for Medics on sixth floor.

Returned to south stairway and checked ventilation tactics on each floor. Found electric blowers on 3rd, 4th, 5th, and 6th floors, blowing north. These blowers were not producing enough CFM to effectively evacuate the smoke.

Proceeded to north stairway and discovered larger blower at ground level blowing air into stairshaft. At upper levels, found small electric blowers blowing to the south.

NOTE: On the third floor, was one gas powered blower doing a good job.

We moved blowers from lower floors (that were clear) and double the CFM on upper floors. Also moved the larger blower from ground level to sixth floor.

At the penthouse, one electric blower was used to evacuate the smoke. There were no occupants at this level.

At approximately 0600 hours, all floors were clear of smoke.

Observations:

The fire scene was well-organized. Each floor had a Division Commander. These officers were found in the stairshafts at either end. They seemed to have a good grasp of their area of operation.

The Command Post was well organized, with Chief O'Brien at a separate car away from the command car where sit-stat and re-stat was located.

There was no "Ventilation" group established or "Ventilation Chief" until I arrived on the scene.

The Base location was well-organized. The Lobby was well-organized.

I did not observe any Logistics Chief assigned.

The coordination between County Medics and Fire Department seemed under control (personally by Chief O'Brien).

There were no "stingers" used on the dry standpipes in the stairshafts (short 2 1/2 by-pass with gated wye laying on floor.) There was a wet standpipe used on sixth floor to elevator area.

Screens were still in the windows of two floors at end of north hallway. (Restricts flow of air.)

Opposing blowers were creating a problem on upper floors. Blowers were not producing adequate CFM for this size of occupancy. The large gas blower and the standard gas blower were doing a good job.

Some Chief Officers were not wearing SCBA in the building (including myself).

Captains from all agencies were keeping their members together and properly supervising the operations.

Recommendations:

1. Assign Chief Officers to key positions.
   Ventilation Group
   Search-Rescue-Evacuation-Group
   Logistics

   This would be done ASAP in a high or low-rise fire.

2. Budget for larger blowers. Gas powered. Produce more CFM.

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3. Consider use of "stingers" with hose packs for standpipe operations.

4. Conduct additional training on ventilation in high and low-rise buildings.

   Consider - a. Cross ventilation
   b. Positive pressure
   c. Stairway pressurization and venturi effect for each floor

5. Operations Chief should operate in stairways, talking directly to groups. (Relieve air traffic).

   Periodic face-to-face with Incident Command at Command Post.

6. Preplan photo video documentation. Use in post fire analysis.

Overall Conclusions:

I have seen several high and low-rise structure fires in my career and this fire was very typical. I anticipated the heat and smoke behavior. Ventilation of the upper floors first is a key factor and a priority tactic, coordinated with the evacuation and treatment of occupants.

In my opinion, Chief O'Brien, other Chief Officers, Captains and all Firefighters from the various departments, and all Medical personnel performed in an outstanding manner and prevented a major loss of life from occurring.

The occupants should also be commended for their calm actions and assistance. All other agencies (Red Cross, Peninsula Buffs and law enforcement) contributed one hundred percent to the success of the suppression and emergency medical aspects of the incident.

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HIGH-RISE FIRE AT 1155 VETERAN BOULEVARD
0330 HOURS, MARCH 31, 1987

RESOURCES:

Engines to fire	13
Trucks	4

MOVE-UPS TO R/C

Engines	2
Trucks	1

CHIEF OFFICERS 8

NOTE: See San Mateo High-Rise Plan - (Redwood City)

INJURIES AND FATALITIES:

2 Fatalities
180 people evacuated to Sequoia High School
3 transported - smoke inhalation

MEDICAL RESOURCES:

15 Ambulances
+ Supervisors

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High Rise Operation

Command 2C

State Fire Marshal

June 30, 1993

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INTRODUCTION

The High Rise Incident Command System (ICS) has evolved over a period of years and has been tested and refined through its application during numerous high rise emergencies. The system is compatible with the National Interagency Incident Management System (NIIMS).

The days have long since passed when each company arriving on the scene of an incident simply rushed to what they believed was the location of the emergency and independently committed to an uncoordinated effort. With the evolution of increasingly complex structures and the reduction of resource levels, our efforts must be organized to be safe and base.

The ICS is a management system. The system is designed to control and direct the resources committed to an incident. In this manner incident objectives can be accomplished effectively and in priority order. The need is identified by the first arriving officer and the system is established with the arrival of the first alarm assignment and the filling of the basic functions of Incident Commander (IC), fire attack, lobby control, staging and base.

ICS allows the Incident Commander great flexibility in deploying resources to the maximum advantage. Beyond the basic functions, the Incident Commander implements only those elements of the system needed and in the priority that will result in the greatest effectiveness.

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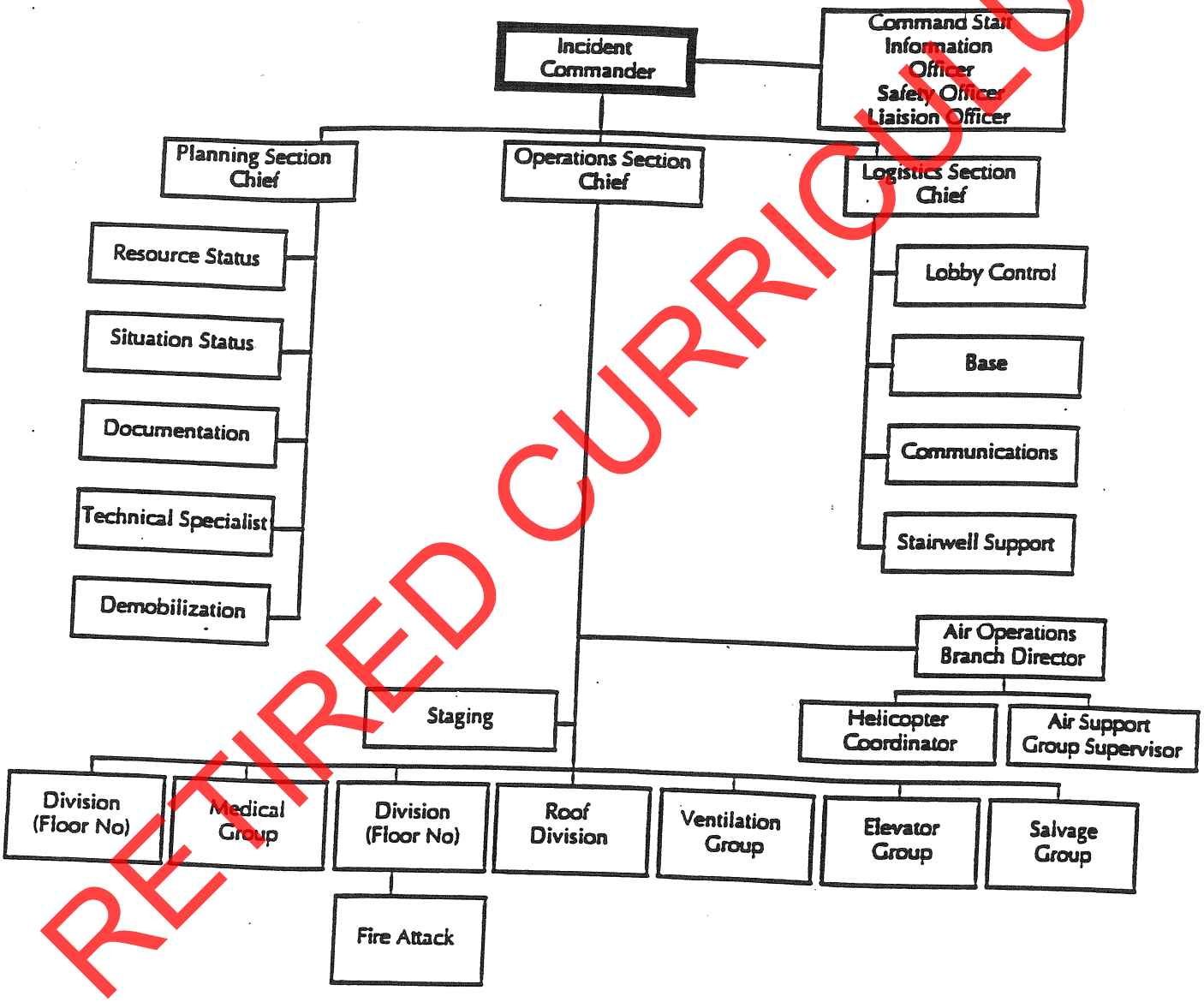
CHAPTER 1

HIGH RISE INCIDENT COMMAND SYSTEM

This chapter is devoted to a brief description of the components of the High Rise Incident Command System. More detailed information for each of the components will be offered in Chapter III Specific Operations.

ORGANIZATION



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HIGH RISE INCIDENT COMMAND SYSTEM

This section is devoted to a brief description of the components of the High Rise Incident Command System. More detailed information for each of the components will be offered in Section II Specific Operations.

ORGANIZATION

Incident Commander

The Incident Commander is responsible for the management of all incident operations.

The Incident Commander plans and directs the overall strategy for control of the incident and establishes the organizational elements necessary to deal with the incident.

The Incident Commander approves the ordering and release of resources and directs and coordinates staff activities.

Planning Section Chief

The Planning Section Chief reports to the Incident Commander. Normally, the first arriving battalion chief assumes this position when relieved as Incident Commander by a superior officer.

The Planning Section Chief assists the Incident Commander in planning overall strategy for containment of the incident. The Planning Section Chief supervises and coordinates the activities of the Situation Unit (SITSTAT) and the Resource Unit (RESTAT).

Situation Unit (SITSTAT)

The Situation Unit creates and maintains a display of current situation status and maintains a roster of incident personnel.

Resource Unit (RESTAT)

The Resource Unit creates and maintains a current roster of the resources assigned to the incident and their status. As the Incident Commander is responsible for overall personnel accountability for an incident, this unit shall initiate an accountability and inventory worksheet at the very beginning of operations and shall maintain that system through completion of the incident.

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DOCUMENTATION UNIT

The Documentation Unit shall be activated for major fires or unusual incidents to provide a comprehensive, chronological record of the incident activities.

Technical Specialists

Large scale incidents may require the assignment of Technical Specialists to augment the Planning Section Chief's staff. these individuals would have specific technical areas of responsibility and may be fire department members, e.g. fire prevention inspector, or specialists not associated with the department such as building engineers and building management personnel.

Demobilization Unit Leader

The Demobilization Unit Leader within the Planning Section is responsible for the preparation of the Demobilization Plan, and assisting incident command in ensuring that an orderly, safe, and cost effective movement of personnel and equipment is accomplished from the incident. In addition, this Unit Leader may be assigned the responsibility for re-entry of occupants to retrieve necessary personal items, i.e., medicine, clothing, and family pets, etc.

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COMMAND STAFF

The Command Staff consists of the following positions:

Information Officer

The Information Officer provides liaison between the media and the Incident Commander, consults with the Incident Commander regarding any constraints on the release of information, and prepares press briefings.

Safety Officer

The Safety Officer is responsible for recon and assessment of hazardous or unsafe situations and developing measures for assuring personnel safety. To accomplish this, the Safety Officer maintains awareness of active and developing situations and advises the Incident Commander and incident personnel accordingly. This officer investigates injuries/accidents to identify causes.

Liaison Officer

The Liaison Officer provides a point of contact for assisting/cooperating agencies and identifies current or potential interagency needs.

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Operations Section Chief

The Operations Section Chief manages all primary tactical operations, i.e., suppressions, rescues, and Emergency Medical Services (EMS) operations. The Operations Section Chief reports to and consults with the Incident Commander regarding the overall strategy and tactics to be employed. The Operations Section Chief assigns and supervises fire attack, staging, branches/division and group supervisors, and air operations.

Fire Attack Team

The first company on scene shall be the Fire Attack Team. The responsibility of this team is to enter the building, determine a safe mean of access, and locate the emergency. Once they have found the emergency they MUST COMMUNICATE THE LOCATION, NATURE, AND EXTENT OF THE PROBLEM TO THE INCIDENT COMMANDER. If there is an active fire, the team can then attack. In this situation the company officer will become the Division Supervisor. The division is identified by the floor number on which that company is operated. If the company attacks the fire on the 12th floor that company would be designated Division 12 until relieved.

Division/Group Supervisor

The Division Supervisor reports to the Incident Commander/Operations Section Chief and is responsible for fire suppression and rescue activities within a geographic area, usually a specific floor.

A Group Supervisor reports to the Incident Commander/Operations Section Chief and responsible for the performance of a specific function, and is not limited to a geographic area. Typical functional assignments would be Rescue/Evacuation Group, Ventilation Group, and Salvage Group.

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Staging Area Manager(s)

The Staging Area Manager reports to the Operations Section Chief. Staging is normally located two floors below the fire. The Staging Area Manager maintains supplies of equipment and reserve resources at a level specified by the Incident Commander. A location may be established in staging to provide first treatment/rehab care for incident personnel.

Resources are dispatched from staging at the direction of the Incident Commander/Operations Section Chief. Anytime resources fall below specified level, additional resources are requested by the Staging Area Manager from base through Incident Commander/Operations Section Chief. Necessary supplies and equipment are also requested from base through Logistics.

Air Operations Branch Director

The Air Operations Branch Director reports to the Operations Section Chief and supervises and coordinates air operations as directed. The air Operations Branch Director is normally located on the ground in the area of the helispot.

Helicopter Coordinator

The Helicopter Coordinator is responsible for coordinating all helicopter tactical operations at the incident. The Helicopter Coordinator is normally airborne and will be the senior pilot at the incident.

Air Support Group

When extended helicopter operations are anticipated, an Air Support Group will be established. This group will establish and maintain the helispot and coordinate overall support functions for the helicopters. This group will report to the Air Operations Branch Director.

gistics Section Chief

e Logistics Section Chief reports to the Incident Command and is a member of the neral Staff. The Logistics Section Chief supervises and coordinates the activities of ly control, base, and the stairwell support.

munications at any incident are critical but especially at a high rise incident. The tics Section Chief must ensure that incident communications are adequate and oning properly. This includes portable radios, spare batteries, fire department s, and the building sound powered system.

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The operational location of the Logisitcs Section chief will normally set-up in the vicinity of the Command Post but can vary depending on which element of the command requires attention at any given time.

Lobby Control Unit Leader

The Lobby Control Unit Leader reports to the Logistics Section Chief. This leader is responsible for controlling vertical access of personnel to known safe routes, operating the elevators, controlling the air handling system, and coordinating the movement of supplies between base and staging.

Note: The location and position of the elevators will dictate whether an Elevator Group is established by the Incident Commander. The Elevator Group's responsibility is to locate unaccounted for elevators and search for occupants.

Stairwell Support Unit Leader

The Stairwell Support Unit Leader reports to the Logistics Section chief and coordinates the transport of equipment through the stairwells.

If an auxiliary water supply is required the Stairwell Support Unit Leader will coordinate and supervise this function.

Base Manager

Base may be established by available personnel and the first alarm assignment. During an incident they will be augmented by additional company(s). The Base Manager coordinates initially to the Incident Commander and then to the Logistics Section Chief when that position is implemented. Base shall be established a minimum of 200 feet away from the incident structure.

The Base Manager maintains a reserve resource level as determined by the Incident Commander.

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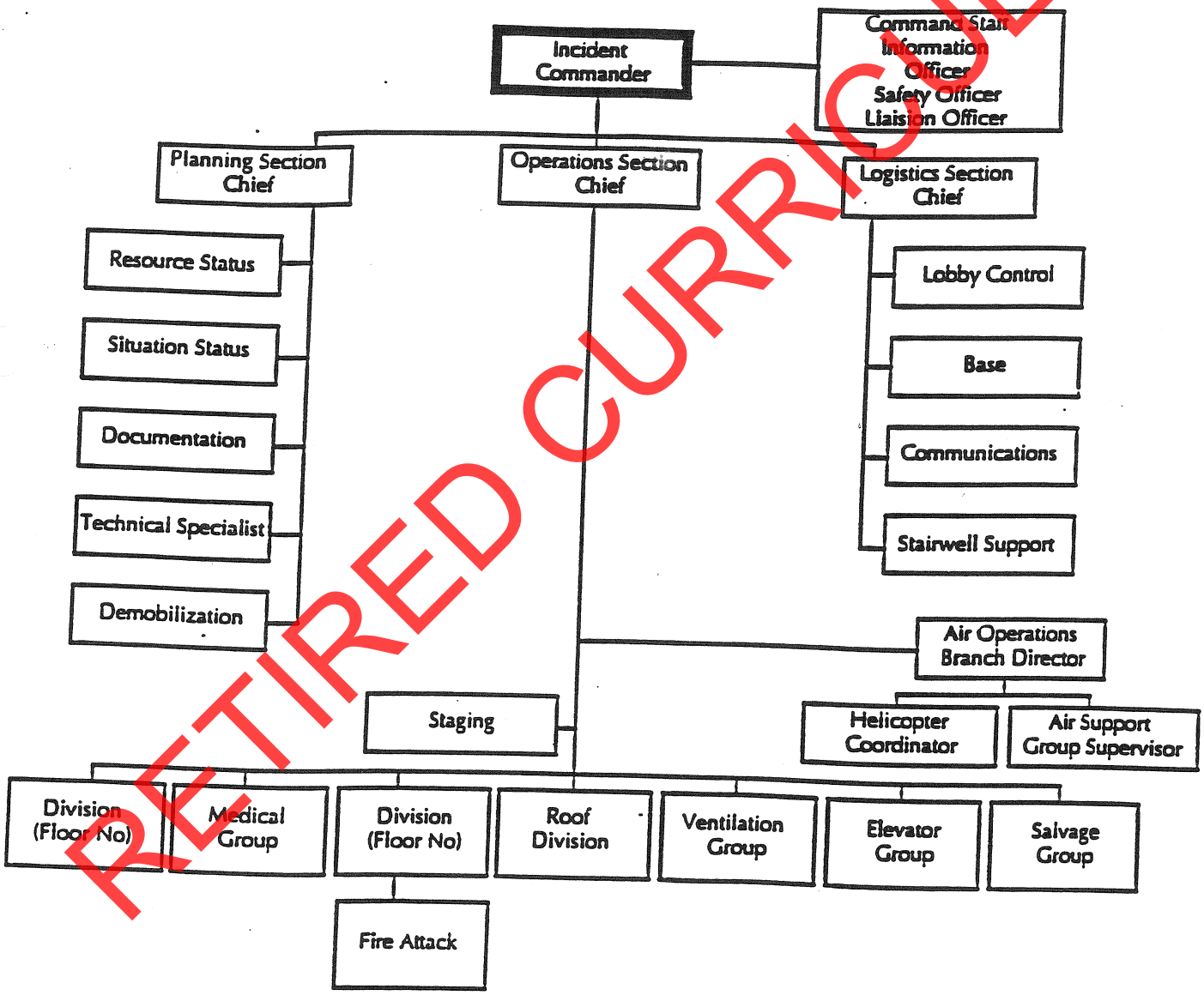
CHAPTER II

SPECIFIC OPERATIONS

This chapter will discuss in specific detail the responsibilities of personnel assigned to implement various elements of the Incident Command System at a high rise emergency. In addition to the description of these responsibilities some of the considerations that impact on the decisions of these individuals will be noted. This information is presented in outline form for clarity.

INCIDENT COMMANDER



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I. RESPONSIBILITIES

A. Management of total incident operations.

1. Including inside and outside the building and the entire surrounding area.

B. Establish command organization

1. As the incident expands, the organization must expand in order to effectively manage the incident.

a. For investigations or minor incidents complementation of the command organization might be limited to a Battalion Chief at the Command post, a fire attack team, and lobby control.

b. For major incidents, the total organizations would normally be implemented.

C. Develop Preliminary Strategy

1. Determine the scope of the problem

a. Where is the emergency located? Where is it going?

b. Is there an immediate life hazard?

c. Does the building inventory plan indicate any unusual features that will assist or complicate operational or logistical planning?

d. Will a medical group be required?

e. Will an Elevator Group be required?

2. Remember, the lead time necessary to get personnel and equipment in position at their assignment is the single greatest difference between controlling an incident in a high rise structure as opposed to an incident at ground level. You MUST plan ahead.

At an actual working fire on the 21st floor of a high rise building 36 minutes elapsed from receipt of the alarm until water was applied to the fire. This was a well-fought fire and this is considered a normal time frame for a high rise incident.

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D. Determine level of resources needed to implement strategy. Some important considerations are:

1. Operations

   a. Number of companies required on fire floor/floors. Plan for early relief (10 to 15 minutes) for fire control personnel. Plan for rotation of three (3) companies on one (1) nozzle every 10 to 15 minutes.

   b. Rescue/Evacuation

   c. Ventilation

   d. Salvage

   e. Medical

2. Logistics

   a. Number of companies needed to staff base, stairwell support, etc.

      All requests for additional resources for the incident shall be made through the Incident Commander.

   b. Utilize building engineer if available.

3. Outside Agencies

   a. Will the services of police, utility companies, etc., be needed?

4. Command Officers

   a. Number of chief officers needed to staff the organization.

E. Direct Activities

1. Command Post Personnel

   a. Planning Section (RESTAT, SITSTAT, Technical Specialists, Documentation)

   b. Command Staff (Information, Safety, Liaison)

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2. Operations

a. Inform as to strategy, resources and overall responsibility.

3. Logistics

a. Inform as to strategy, resources and overall responsibility.

4. Perimeter Control

a. The Incident Commander must assign the responsibility for establishing and maintaining control of the safety zone around the incident building. This responsibility may be delegated to the law enforcement personnel.

II. ESTABLISH LOCATIONS

A. Command Post

1. At least 200 feet from the building.

2. Consider the location as it relates to observation of the involved structure, control of resources entering the structure and effective command of the incident; e.g., an adjacent parking area or structure, or structure. lobby areas.

3. Announce the command post location to the dispatch center.

B. Base

1. At least 200 feet from the building, not in proximity to the command post.

2. Consider the location as it relates to a safe corridor for personnel approaching and entering the building.

3. Announce the location of base to the dispatch center and direct that all companies report to that location. In some situations it may be helpful or specify an approach route to base to avoid companies responding directly past the building or through the incident operations area.

C. Staging

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1. Consider input from fire attack who will have made an inital assessment of the staging area.

2. When the location for staging is determined, normally two floors below the fire, announce its location over the fireground radio frequency.

D. Air Operations

1. At least one-half mile from involved building.

2. Consider large open area where noise, rotor down wash, traffic congestion and crowd control problems will be minimal. Be alert to obstructions: trees, fences, power lines, etc.

3. Normally, helicopters should remain approximately 500 feet from the involved building while in flight.

III. Strategy

A. Consult with the Operations, Plans, Logistics and Command Staff.

1. Evaluate effectiveness of preliminary strategy.

2. Modify preliminary strategy as necessary to develop overall strategy.

B. The Incident Commander must evaluate overall strategy on a continuing basis throughout the duration of the incident. Conditions will certainly be changing and these changes will impact strategic planning.

C. Investigation/Demobilization

1. Determine fire cause

a. Use trained, qualified investigators.

2. Develop and implement an overhaul plan

3. Develop and implement a demobilization plan.

4. Develop safe re-entry procedures for occupants to retrieve necessary personal items.

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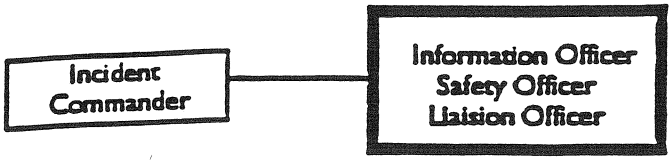
COMMAND STAFF



I. RESPONSIBILITIES

A. Manage command staff function of safety, liaison, and information. Reports to the Incident Commander.

1. The Incident Commander shall assign a safety officer.

   a. The safety officer will "Recon" the incident and assess, identify, and report hazardous conditions or unsafe activities within the incident area.

   b. The safety officer will correct unsafe acts through the regular line of authority, except the emergency authority may be exercised to stop or prevent unsafe acts when immediate action is required.

   c. The safety officer investigates accidents occurring in the incident areas.

2. The Incident Commander designates a liaison officer*.

   a. The liaison officer is the point of contact for agency representatives.

   b. The liaison officer will assess and monitor active and potential agency involvement, insure an adequate communications capability is established, and that the logistical needs of the assisting agencies are met.

3. The Incident Commander designates an information officer*. The information officer will be advised by the Incident Commander of any constraints on method or content of news releases pertaining to the Incident.

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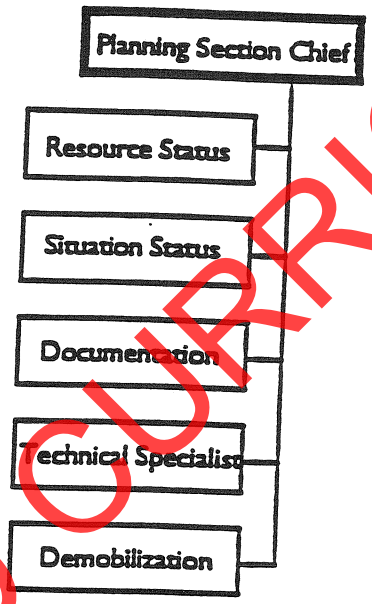
a. The information officer will coordinate dissemination of information to the news media, including interviews with incident personnel. This activity is normally performed by a Public Information Officer (P.I.O.).

* At the direction of the Incident Commander these officers will establish work areas accessible to, but removed from, the command post in order to minimize congestion in the command post area.

PLANNING SECTION CHIEF



I. RESPONSIBILITIES

A. After consultation with the Incident Commander, develops plans to support the Incident Commander's strategy, from initial implementation through demobilization. Reports to the Incident Commander.

1. Supervises and coordinates the activities of the Situation Status Unit (SITSTAT). This unit maintains a diagram of the incident on a fire record sheet depicting the concerned structure, pertinent structure components, the fire location and size and the current situation.

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To assure accountability, the diagram should identify where specific companies are assigned, divisional boundaries, command officers and resources in reserve.

2. Supervises and coordinates the activities of the Resource Status Unit (RESTAT). This unit works closely with the SITSTAT Unit to insure that the status of resources committed to the incident are accurately recorded. Resource assignments should be recorded on the resource status log (fire record sheet).

3. For major fires or unusual incidents, a Documentation Unit shall be activated to provide comprehensive, chronological documentation regarding the incident. Documentation satisfies administrative needs and provides accurate information for post-fire critiques and analysis.

4. Supervises and coordinates the activities of technical specialist.

   a. As necessary, activate water resources unit to assess overall water supply and recommend solutions for existing or potential water supply problems,

B. Control resources, maintain records.

1. All resources requested for the incident shall be approved by the Incident Commander and ordered through the RESTAT Unit.

2. Records shall be maintained of ALL resources requested and/or assigned to the incident.

II. LOCATION

The Planning Section Chief manages the command post subordinate to the Incident Commander.

A. The Planning Section Chief assigns working locations to the command post personnel.

III. INVESTIGATION

A. Coordinate with arson investigators in determining cause.

IV. OVERHAUL

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A. Consult with the Incident Commander to determine overhaul responsibility and method.

1. Extent of department involvement.

2. Building management responsibility.

V. DEMOBILIZATION

A. Consult with Incident Commander to develop overall plan.

1. All resources released from the incident shall be released by the Incident Commander through the RESTAT Unit.

B. When incident command is transferred to another officer, overhaul and demobilization plans shall be clearly understood.

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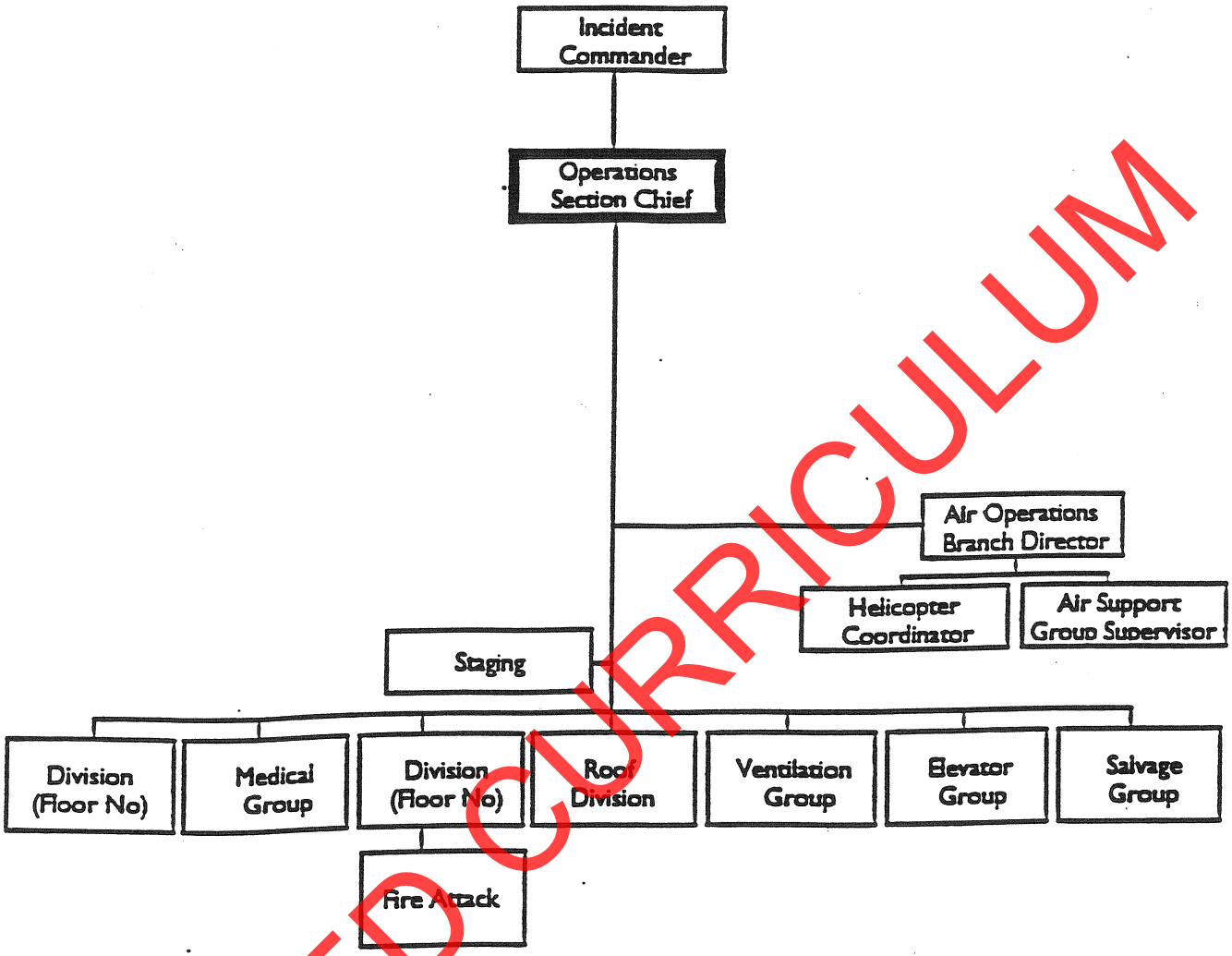
OPERATIONS SECTION CHIEF



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I. RESPONSIBILITIES

A. Manage all suppression, rescue and EMS operations and maintains accountability of resources. Reports to the Incident Commander.

1. Fire attack
2. Staging
3. Rescue/evacuations
4. Air Operations
5. Medical group
6. Ventilation
7. Salvage
8. Overhaul
9. Roof

II. COMMAND LOCATION

A. The Operations Section Chief will normally be at the Command Post.

1. While the location will vary with conditions, it is essential that effective communications be maintained.

2. The Incident Commander and the Division Supervisors should be informed of the Operations Section Chief's location.

III. STRATEGY AND TACTICS

A. Consult with the Incident Commander regarding broad overall strategy.

1. Determine resource commitment, including relief, needed to accomplish necessary tasks, e.g.,

a. Fire Attack
b. Staging
c. Rescue/evacuation
d. Ventilation
e. EMS
f. Salvage
g. Air Ops
h. Overhaul

B. Communicate strategy and assignments to subordinate officers.

1. Direct Activities of subordinates

2. When conditions dictate, provide tactical direction to subordinates.

3. Keep subordinates informed of changing conditions, fire behavior, spread, lapping, etc.

C. Communicate with Logistics Section Chief

1. Establish reliable means of communication: Telephone, building sound powered phone system, fire department field phone, messengers, etc.

2. The logistics function supports operation's efforts. Operations must anticipate needs for personnel and equipment with sufficient lead time to permit logistics to deliver the needed resources to the area

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of need in a timely manner.

DIVISION/GROUP SUPERVISORS

I. RESPONSIBILITIES

A. Division supervisors manage a specific division under the Operations Section Chief. A division is a specific GEOGRAPHICAL area, usually one floor in a high rise incident.

B. Group Supervisors manage a specific FUNCTION under the Operations Section Chief. This function may not be confined to a specific geographic area, e.g., the ventilation group or medical group may be working on several floors simultaneously or a medical group could be working inside and outside a building.

II. COMMAND LOCATION

A. Division and group supervisors will normally be located in proximity to their area of responsibility.

1. Good communications capability is essential.

a. Radio, fire department field phone, building sound powered phone system, telephone or messengers.

2. The Operations Section Chief and subordinate officers should be informed o the division/group supervisors' location.

III. STRATEGY AND TACTICS

A. Consult with Operations Section Chief about:

1. Overall strategy

2. Specific responsibility

3. Resources previously committed and tasks assigned.

4. Status of additional resources ordered.

B. Communicate strategy and assignments to subordinate officers.

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1. Direct activities of subordinates.

2. Provide tactical direction to subordinates.

3. Establish communication methods.

4. Keep subordinates informed of changing conditions.

C. Organization

1. Company officers must keep their personnel together and under their control. Company effectiveness and personnel safety will be greatly enhanced by adherence to this fundamental rule.

2. Tasks should be assigned on a company basis, and be specific as to the area and limits of responsibility.

   a. Who to report to.

   b. Where to report.

   c. When to report.

3. When tasks exceed the capability of a single company, several companies may be assigned under the command of a specific officer, with clearly defined responsibilities.

4. Division/group supervisors must maintain a current roster of resources assigned to their command indicating status and area of responsibility.

5. Division/group supervisors must coordinate the activities of their division/group with those of related *divisions/groups*.

<u>FIRE ATTACK</u>

I. RESPONSIBILITIES

A. The first company on the scene, by a safe route, shall proceed to the area where the emergency exists, assess the scope of the emergency, communicate this information to the Incident Commander and take measures to mitigate the emergency.

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B. Supplying water to the building standpipe system is normally the responsibility of the engineer of the second arriving engine company.

II. ACTIONS

A. Upon arrival, give size-up and order additional resources if indicated.

B. Proceed to the lobby with ALL company personnel, appropriate equipment and the high rise operational packet.

1. Obtain from security/building management

a. What is the nature of the emergency?

b. Where is the emergency located?

c. Is there an alarm system annunciator panel in the building?

d. Is the building equipped with a control room for emergency use?

e. What is the lobby phone number?

f. How many people are in the building at this time?

2. Obtain items from lockbox, if provided.

a. Retain one copy of the building inventory sheet and ONE SET OF KEYS. Remaining contents of lockbox are to be used by the Lobby Control Unit Leader.

3. This officer determines means of ascent and relays stairwell identification to incoming companies. The company then begins their ascent. Normally the entire company including the engineer will proceed aloft. If the captain cannot communicate from inside the building with the incoming companies the engineer will stay outside with his apparatus to relay messages. When relieved he reports to the Lobby Control Unit Leader.

As the fire attack team ascends, the officer should periodically report conditions in the building to the Incident Commander for information and to assure adequate communications are maintained.

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Elevators SHALL NOT be used as a mean of ascent in a building under investigation for a fire emergency until it is determined by fire department personnel that the enter elevator shaft is not threatened with fire. The exceptions to this rule are those buildings with split banks of elevators. These elevators may be used if the highest floor served is a minimum of five floors below the reported fire floor.

4. Fire attack team begins ascent and shall take the following equipment:

   a. Breathing apparatus

   b. Portable radio(s)

   c. Rotary saw or forcible entry tools

   d. High rise hose pack(s)

   Where feasible, the following additional equipment should be taken:

   e. Portable spotlight

   f. Extra air bottles

   g. Portable extinguisher

5. The fire attack supervisor shall evaluate the area two floors below the reported fire floor for use as a staging area and communicates this to the Incident Commander. In addition, this officer should determine the floor plan in the building.

6. The fire attack team shall then locate the emergency, check for vertical extension and give a size-up. If it is a fire:

   a. What is burning?

   b. Are occupants endangered?

   c. What is the potential for vertical extension; interior and exterior?

   d. What is the potential for horizontal extension?

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e. What is the best route for resources going to staging? What is the best route for resources going from staging to the fire floor and above?

7. This officer now assumes the role of division (floor number) and attacks the fire.

a. If they cannot extinguish the fire they must endeavor to protect the vertical openings and contain the fire until help arrives.

b. The Division Supervisor must keep the Incident Commander informed as to progress and conditions in the fire area.

STAGING

I. RESPONSIBILITIES

A. Verify the location of staging with the Incident Commander.

B. Plan layout of staging area.

C. Manage all staging activities.

1. Control of reserve and rehab personnel, in separate area.

2. Maintain separate stockpiles of reserve and expended equipment.

3. Medical treatment station for fire department personnel.

4. Maintain complete accurate record of resource status to assure accountability.

D. Staging Area Manager is subordinate to the Incident Commander/Operations Section Chief.

II. LOCATION

A. The Staging Area Manager will be located in or adjacent to the staging area to facilitate effective control of its activities.

B. Resources should arrive at staging via a common mute. Staging personnel should be positioned to meet them, check them in and direct them to appropriate area. All stairwell access to staging must be controlled to

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prevent companies from bypassing staging.

III. TACTICS

A. Consult with the Incident Commander or the Operations Section Chief to determine resource levels to be maintained in staging.

As resources are dispatched from staging, the Staging Area Manager will order additional resources from base through the Incident Commander/Operations Section Chief. Equipment and supplies will be ordered through Logistics Officer to Base.

B. Communications

1. When feasible, use an alternative to the fireground radio frequency to access the logistics system. This will improve communications and effectiveness overall. Consider:

a. Separate portable radio (tactical) frequency.

b. Building sound powered phone system.

c. Buiding telephone system.

d. Messengers.

2. An effective communications link must be maintained with the Incident Commander/Operations Section Chief.

C. Staging will normally be located two floors below the fire, unless it is unsuitable, e.g., two floors below the fire may be a noisy cramped machinery area, while the third floor below the fire may be vacant. (Note: Some buildings do not have a "13th" floor.)

D. If the Operations Section Chief does not specify equipment, develop an equipment inventory and order from base. When ordering from base specify quantities.

1. Equipment to consider:

a. Airbottles

b. Hose with fittings

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c. Breathing apparatus

d. Smoke Detectors

e. Forcible entry tools

f. Salvage Equipment

g. Pike poles

h. Ladders

i. Resuscitator

j. Medical supplies

Maintain a record of equipment ordered, time ordered and delivery time to minimize duplication of equipment orders.

2. Separate equipment and store like equipment together, e.g., full bottles, empty bottles and breathing apparatus should be stored apart from one another.

a. Make signs and tape to wall to identify different areas.

E. It is imperative that officers maintain control of their companies when assigned to rehabilitation or reserve areas.

F. Breathing apparatus will be a critical need in a working high rise fire. Provide an adequate area to function as an air station.

Use reserve companies to perform tasks in staging, e.g., changing air bottles, separating arriving equipment, etc.

G. Designate and staff a medical treatment area.

H. Designate specific personnel to maintain records, e.g., time and I.D. of companies arriving at staging; assignment, time and I.D. of companies when they leave staging.

<u>AIR OPERATIONS BRANCH DIRECTOR</u>

I. RESPONSIBILITIES

A. Manage all helicopter activities.

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B. The Air Operations Branch Director reports to the Operations Section Chief.

II. LOCATION

A. The helispot location should be located at least one-half mile from the incident site. This will result in minimum impact on incident operations from the noise and rotor down wash from the aircraft.

B. Normally helicopters should remain approximately 500 feet from the involved building while in flight.

C. Air operations should be accessible to the helispot but protected from the noise/rotor down wash to the extent feasible.

III. STRATEGY

A. Consult with the Operations Section Chief about planned or potential helicopter missions.

B. Develop a plan identifying the resources needed for the expected duration of the incident. Consider:

1. Specialized aircraft, night sun, hoist, air ambulance.
2. Helicopter tender apparatus, lights, fuel, etc.
3. Helitac personnel.
4. Relief pilots.

IV. TACTICS

A. Order resources through the Incident Commander.

B. Announce helispot location to dispatch center and the Incident Commander.

C. Organize resources to support helicopter operations.

D. Roof operations.

1. Use helicopter personnel to remove any obstacles.

2. Personnel may be deployed to the roof by landing a helicopter on the roof with a fire/rescue team/

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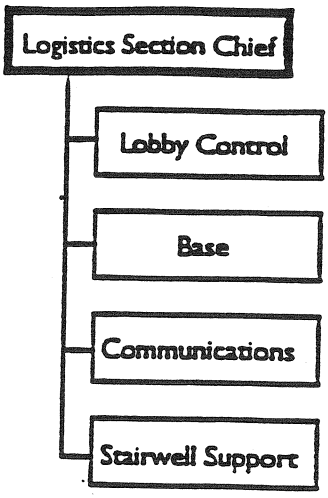
LOGISTICS SECTION CHIEF



I. RESPONSIBILITIES

A. Manage the logistics function to provide resources necessary for the control of the incident. The system will consist of some or all of the following components.

1. Base
2. Lobby control
3. Stairwell support
4. Communications

B. Reports to the Incident Commander.

II. COMMAND LOCATION

A. The Logistics Section Chief serves as a troubleshooter whose attention will be required wherever a bottleneck in the system develops. This officer will typically set-up in the vicinity of the command post and monitor the various components of the system beginning at base and following up at lobby control to insure that adequate resources reach staging.

B. Subordinate officers will normally be located with their personnel in or adjacent to their area of responsibility.

III. STRATEGY AND TACTICS

A. Consult with the Incident Commander regarding overall incident strategy.

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B. Determine level of resources necessary for:

1. Operations activities
2. Logistics system activities
3. Reserves

C. Develop plan for implementing the logistics system.

D. Communicate incident strategy, logistics system plan, and assignments to subordinates officers.

1. Direct activities of subordinates.

E. Coordinate with the Operations Section Chief to insure proper logistics system performance.

IV. COMMUNICATIONS

A. Effective communications are critical to logistics system performance.

1. When feasible use a separate radio frequency for logistics communications. This will improve communications and effectiveness overall. Consider:

a. Separate tactical frequency
b. Building sound powered phone system
c. Building phone system
d. Messengers

B. Assess incident communications problems, implement solutions.

BASE

I. RESPONSIBILITIES

A. Verify location of base with Incident Commander (normally 200 feet from the incident building).

B. Manage all operations at base. The Base Manager reports to the Logistics Section Chief or coordinates with the Incident Commander if that position has not been established.

C. Consult with the Logistics Section Chief, or the Incident Commander to determine resource levels to be maintained at base and what priority

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equipment is to be moved to lobby control. Additional resources are to be ordered through the Incident Commander. Normally, two companies should be kept at base for each company held in staging.

D. Deliver equipment from base to lobby control.

E. Direct companies from base to lobby control.

F. When a water supply is established via the stairwell, Base shall provide a supply line to the entrance of the stairwell.

II. COMMAND LOCATION

A. The Base Manager should be in a situation to control resources as they arrive at Base.

1. Arriving companies must be checked in and given specific instructions as to where and how to park apparatus. Company officers shall keep their personnel together at their apparatus while awaiting assignment.

B. The Base Manager is responsible for establishing and maintaining a security perimeter around Base and a safe corridor from Base to the Entry point of the building.

III. APPARATUS

A. Apparatus parking area.

1. Block streets as necessary; use law enforcement personnel to relieve fire department personnel.

2. Control apparatus parking. Park diagonally so apparatus can be moved independently.

3. Base personnel are responsible for apparatus security.

IV. EQUIPMENT

A. The equipment pool should be located in a secure area.

1. Consider a traffic flow that will facilitate unloading of equipment and transportation to lobby control.

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2. Equipment should be transported on a priority basis.

3. Movement of equipment should be coordinated with lobby control.

V. PERSONNEL

A. Companies in base shall be kept together at their apparatus under the control of their officer.

B. Companies may be utilized to accomplish necessary tasks at base.

IV. RECORDS

A. Specific personnel shall be assigned to maintain records of activities at base. Companies and equipment shall be checked in and out by time and assignment to which they are committed.

LOBBY CONTROL

I. RESPONSIBILITIES

A. Manage lobby control activities

1. Elevators
2. Stairwell access
3. Building engineer contact
4. Air handling system
5. Monitor fire control room or station
6. Priority movement of personnel and equipment between base and staging.
7. Initial pressurization of stair shafts.

B. Inform the Incident Commander of the number of floors within the building and whether the elevators have been recalled.

C. Manage base until another officer assumes that responsibility.

D. An officer shall be assigned to the building fire control room to coordinate the information available from fire control equipment to the Lobby Control Leader or the Incident Commander.

E. Reports to the Logistics Section Chief or the Incident Commander if that position has not been established.

RETIRED CURRICULUM

F. Verify water supply is established into the Standpipe System.

II. LOCATION

A. The Lobby Control Unit Leader will be located in or adjacent to the lobby area.

III. TACTICS

A. Control fire department personnel and civilians:

1. Entering the building.
2. Exiting the building; insure both civilian and fire department traffic exits through a safe corridor and moves directly away from building a minimum of 200 feet (use law enforcement personnel to control civilians evacuated from the building).
3. Ascending to upper floors.

a. Designate a stairwell for fire department use.
b. Elevators SHALL NOT be used until they are determined to be safe. When the elevators are determined safe the Lobby Control Unit leader shall designate specific elevators to be used and assign fire department operators.

B. Obtain fire alarm information from annunciator panel or fire control room. Access lockbox for building inventory plan, elevator and stairwell keys, etc.

C. In the event of an actual fire, shut down the building's air handling system (consult building engineer, if available).

D. Establish equipment stockpiling areas proximate to their anticipated route of ascent. Use companies enroute to staging to assist in the movement of priority equipment.

E. Designate personnel to maintain records; checking personnel and equipment in and out by times and destination.

F. Coordinate with staging and base to determine the priority of movement for personnel and equipment.

IV. MEANS OF ASCENT

RETIRED CURRICULUM

A. STAIRWELLS

Stairwells shall be used for the initial ascent and until the elevators can be verified, by fire department personnel, as safe for use.

1. Designate stairwells for specific use. It may be desirable to designate specific stairwells for fire department personnel use, and a secondary stairwell for movement of equipment or possible civilian evacuation.

2. Locate stairwell ground floor openings; open as necessary. Post personnel to control entry and direct civilians exiting the building (consider using law enforcement personnel for this purpose).

B. ELEVATORS

1. Elevators are the most effective means of transporting personnel and equipment aloft in high rise buildings, however improper use of elevators in a fire situation can expose personnel to serious risk. Elevators SHALL NOT be used until it is determined that the shaft and terminus are not threatened and there will be no disruption of electrical power.

2. Lobby control shall call all elevators to the lobby, using the emergency service control and secure them there. Lobby control shall notify the Incident Commander of the elevator status.

3. The judgement whether or not the elevators are safe for personnel use will rely heavily on reports from the fire attack supervisor.

4. Attempt to verify that elevator rooms for split bank elevators are free from water and smoke residue.

<u>STAIRWELL SUPPORT UNIT LEADER</u>

I. RESPONSIBILITIES

A. Transport equipment via a stairwell, on a priority basis, from ground level to the staging floor.

B. When equipment is delivered to the roof by helicopter, transport equipment via the stairwell to the staging floor.

RETIRED CURRICULUM

C. If an auxiliary water supply is required, the Stairwell Support Unit Leader will coordinate and supervise this effort. Request Base to provide a supply line to the entrance of the stairwell.

D. Reports to the Logistics Section Chief or coordinates with the Incident Commander if that position has not been established.

II. STRATEGY AND TACTICS

A. Consult with the Logistics Section Chief and the Lobby Control Unit Leader to determine which stairwell is to be used.

B. Determine the number of personnel necessary to accomplish the task. Consider one member per two floors and one officer per four or five members.

1. Officers must remain mobile to supervise the operation. Stairwell support is very demanding work and the officers must insure a smooth flow of equipment at a pace that can be sustained. Officers must monitor their personnel closely for signs of undue fatigue or distress.

2. If it is to be an extended operation arrange for timely relief. Consider assigning two member teams alternating with one carrying and one resting.

C. Lobby control will deliver equipment to the stairwell entrance at ground level.

D. Assign floors.

1. Normally one member per two floors, e.g., one member picks equipment up at ground floor entrance to stairwell and carries it to the third floor landing. Member then returns to ground floor for another load. Member at third floor carries the equipment to the fifth floor landing then returns to the third floor for another load. This process continues until the equipment contiues until the equipment is delivered to the staging floor hallway. Moving the equipment beyond that point is the responsibility of the Staging Area Manager.

2. If the route involves unusual problems, long hallways etc., supervising officers will adjust assignments.

RETIRED CURRICULUM

E. Equipment

1. Stairwell support personnel shall have their personal safety equipment, turnouts, helmets, breathing apparatus and spot sights available to them in the stairwell.

F. Communication

1. Officers will carry their portable radios. In addition, consider the use of required phones in stairways for communicating with the dispatch center or the Logistics Section.

RETIRED CURRICULUM

The following section is an outline of responsibilities of each position in the High Rise Incident Command System.

The intent is that each Position Outline be on a separate sheet (legal size if necessary), plasticized, and carried in a High Rise Work Packet with necessary forms, paper, pencils, etc.

RETIRED CURRICULUM

INCIDENT COMMANDER

I. RESPONSIBILITIES

A. Manage total incident operations

B. Establish command organization

C. Develop strategy

D. Determine adequacy of resources

E. Direct activities

1. Command post personnel

a. Plans (RESTAT, SITSTAT, technical specialists, documentation, demobilization)
b. Command staff (info, safety, liaison)

2. Operations
3. Logistics
4. Perimeter control

II. LOCATIONS

A. Command Post

B. Base, "Dispatch all companies to this location"

C. Staging

D. Air operations

III. STRATEGY

A. Consult with Operations. Plans, Logistics, and Command Staff

B. Investigation/Demobilization

1. Determine fire cause
2. Overhaul
3. Demobilization

RETIRED CURRICULUM

OPERATIONS

I. RESPONSIBILITIES

A. Manage all suppression, rescue and EMS Operations:

1. Fire attack
2. Staging
3. Rescue/Evacuation
4. Air operations
5. Medical
6. Ventilation
7. Salvage
8. Overhaul

II. LOCATION

A. Operations Section Chief - normally located at the Command Post with the Incident Commander.

B. Location must provide effective communications.

III. STRATEGY AND TACTICS

A. Consult with Incident Commander.

B. Determine resource needs (including relief)

1. Fire attack
2. Staging
3. Rescue/Evacuation
4. Ventilation
5. EMS
6. Salvage
7. Air Ops

C. Communicate strategy and tactics to subordinate officers.

D. Communicate with Logistics Section Chief.

1. Communications methods.
2. Present and future needs:
   a. Companies
   b. Relief
   c. Equipment

RETIRED CURRICULUM

FIRE ATTACK

I. RESPONSIBILITIES

A. First company on scene to fire floor

1. Determine safe route
2. Assess scope of the emergency
3. Inform the Incident Commander
4. Attack the fire

B. The engineer of the second-in company is normally responsible for water supply.

II. ACTIONS

A. Initial size-up, orders additional companies if indicated.

B. Company proceeds to lobby with all personnel and equipment.

1. Information needed:

   a. Nature and location of emergency
   b. Location of annunciator panel or control room
   c. Lobby phone number
   d. Lock box keys and building inventory plan (one set)

2. Company officer determines safe route and informs incoming companies, gives continuous size-up during ascent. If unable to communicate with incoming companies, engine relays from apparatus reports to lobby when received.

   NOTE: ELEVATORS SHALL NOT BE USED UNTIL DETERMINED SAFE BY FIRE DEPARTMENT PERSONNEL

3. Equipment to be taken aloft

   a. Breathing apparatus
   b. Portable radio(s)
   c. Rotary saw or forcible entry tools
   d. Hose packs.

   ADDITIONAL EQUIPMENT IF FEASIBLE

RETIRED CURRICULUM

e. Portable spotlight
f. Extra air bottles
g. Portable extinguisher

4. Evaluate staging area and inform Incident Commander.

5. Fire floor, size-up of problem to Incident Commander.

6. Fire attack now becomes division (floor #), continuous size-up as needed.

RETIRED CURRICULUM

STAGING

I. RESPONSIBILITIES

A. Verify location of staging area with Operations Section Chief/Incident Commander.

B. Plan layout of staging area.

C. Manage all staging area activities.

1. Control of reserve and rehab personnel, in separate areas.
2. Maintain separate stockpiles of reserve and expended equipment.
3. Medical treatment station for fire department personnel.
4. Maintain complete, accurate record of resources status.

D. Reports to the Operations Section Chief/Incident Commander.

II. LOCATIONS

A. The Staging Area Manager will be located in the staging area.

B. Staging personnel must control stairwell access to staging to prevent companies bypassing staging and to properly route arriving resources.

III. TACTICS

A. Consult with the Incident Commander or Operations Section Chief to determine minimum staffing reserve.

1. As resources are dispatched from staging, additional resources are ordered from base through the Incident Commander/Operations Section Chief.

B. Communications

1. When feasible, use an alternative to the fireground radio frequency to access the logistics system. Consider:

a. Separate portable radio frequency
b. Building sound powered phone system
c. Building telephone system
d. Messengers

RETIRED CURRICULUM

2. An effective communications link must be maintained with the Operations Section Chief.

C. Staging is normally located two floors below the fire.

D. Develop an equipment inventory and order specific quantities from base. Consider:

1. Air bottles
2. Hose with fittings
3. Breathing apparatus
4. Smoke detectors
5. Forcible entry tools
6. Salvage equipment
7. Pike poles
8. Ladders
9. Resuscitator/medical supplies

E. Maintain a record of equipment ordered, time ordered and time delivered.

F. Separate equipment and store like equipment together, identify storage areas with signs taped to wall.

RETIRED CURRICULUM

AIR OPERATIONS BRANCH DIRECTOR

I. RESPONSIBILITIES

A. Manage all aircraft activities
B. Reports to the Operations Section Chief/Incident Commander

II. LOCATIONS

A. Helispot, at least -- 1/2 mile from fire building, noise/wind
B. Air operations accessible to helispot but removed

III. STRATEGY & TACTICS

A. Consult with Operations Section Chief as to planned, potential helicopter missions.
B. Assess resource needs:

1. Night, sun, hoist, air ambulance
2. Helicopter tender (lights, fuel, etc.)
3. Helitac personnel
4. Relief pilots

C. Order resources through Incident Commander
D. Announce helispot location to dispatch center and incident responder
E. Organize resources to support helicopter operations
F. Roof operations

1. Use helicopter personnel
2. Personnel may be deployed to the roof by landing a helicopter with a fire/rescue team

RETIRED CURRICULUM

LOGISTICS

I. RESPONSIBILITIES

A. Manage logistics activities

1. Base
2. Lobby
3. Stairwell support
4. Communications
5. Auxiliary water supply/water supply problems

B. Reports to the Incident Commander

II. LOCATION

A. Normally in the vicinity of the Command Post

III. TACTICS

A. Consult with Incident Commander

B. Determine resource level for:

1. Operations activities
2. Logistics activities
3. Reserves

C. Develop plan for logistics system

D. Communicate plan and assignments to subordinate officers.

E. Coordinate with Incident Commander/Operations Section Chief

IV. COMMUNICATIONS

A. Establish effective communications

1. Staff Communications Unit Leader position if necessary. Provide appropriate frequency assignments.
2. Building sound powered phone system
3. Building telephone
4. Messengers

B. Assess and correct communications problems

RETIRED CURRICULUM

LOBBY CONTROL

I. RESPONSIBILITIES

A. Manage lobby activities

1. Elevators
2. Stairwell access
3. Contract building engineer
4. Air handling system
5. Monitor fire control room or station
6. Priority movement of personnel and equipment, base to staging
7. Initiate pressurization of stairwells.

B. Notify the Incident Commander of elevator status and number of floors within the building

C. Manage base until staffed

D. Assign personnel to fire control room

E. Reports to logistics or Incident Commander if logistics not established.

II. LOCATION

A. In or adjacent to lobby

III. TACTICS

A. Control of fire department personnel and civilians

1. Entering or exiting building through safe corridor
2. Remove civilians a minimum of 200 feet from building
3. Ascending to upper floors via stairwell and/or elevators when determined safe

B. Obtain fire alarm and lock box information and keys

1. Control the issuing of keys to fire department personnel

C. If actual fire, shut down air handling system

D. Establish equipment pool

RETIRED CURRICULUM

BASE

I. RESPONSIBILITIES

A. Verify base location with Incident Commander (normally 200 feet from structure)

B. Manage all operations at base, reports to Incident Commander until Logistics Section Chief is assigned

C. Consult with Incident Commander or Logistics to determine resource levels, normally two companies should be kept at base for each company held in staging.

D. Deliver equipment from base to lobby

E. Direct companies from base to lobby

F. When directed, provides a water supply to the entrance of the stairwell for use of stairwell support

II. LOCATION

A. Base manager located to control arriving resources

1. Control all companies, in and out
2. Establish security perimeter around base and safe corridor to lobby

B. Apparatus

1. Block streets and control traffic
2. Control apparatus parking diagonally
3. Use law enforcement personnel for traffic control, if possible

III. EQUIPMENT

A. Located in secure area

1. Consider flow of equipment from base to lobby
2. Transport equipment from base to lobby by priority
3. Coordinate with lobby control

IV. PERSONNEL

RETIRED CURRICULUM

A. Companies shall remain intact at their apparatus

B. Use companies for tasks at base

V. RECORDS

A. Assign specific personnel to maintain records.

RETIRED CURRICULUM

HIGH-RISE OPERATIONS

"STRATEGY, TACTICS - GENERAL"

I. INTRODUCTION:

STRATEGY-
"A method, plan or stratagem to achieve some goal."

"The science and art of military command exercised to meet the enemy in combat."

TACTICS-
"Military science that deals with the positioning and maneuvering of forces in a battle area."

"The art and skill of employing available means to accomplish and end."

The above quotations appropriately describe strategy and tactics, as they apply to most Department's high-rise emergency operations. Briefly stated, strategy is **what** will be done; tactics are **how** it will be done.

Why do we single out strategy and tactics for high-rise operations? Are they different? Are they different than the strategy or tactics we employ in controlling a large warehouse fire? A three-story apartment building?

The answer is YES! The basic reason for the difference is that the ground rules under which we must operate are not the same. Some of these dissimilar ground rules are:

1. Operating distance from the structure.
2. Conveyance systems within the structure.
3. Time factors.
4. All glass exterior/sealed windows.
5. Sealed environment.
6. Major fatigue factor.

This list could continue on. Suffice to say, many of our normal, conventional operating procedures for structure fire control are not adaptable to high-rise incidents.

RETIRED CURRICULUM

In this chapter, we will address strategy and tactics on a broad scale. The purpose is to give us an overview of certain aspects of high-rise operations which must be given consideration by fire personnel.

II. BUILDING DESIGN:

High-rise structures are becoming common in many communities. Some are of modern design; many are of older design. Some have been erected under current "code" provisions; many were erected under less stringent code provisions. All of these buildings are subject to fire emergencies. Let's look at some of the design features which may or may not be incorporated in the existing high-rise buildings. As we look below at the listed building features, answer the question: Does the existence or the absence of this feature affect strategy or tactics of emergency operations?

1. Automatic Fire Sprinkler System.
2. Building Communication System.
3. Fire Department Communication System.
4. Emergency Elevator Control System.
5. Fire Alarm System.
6. Emergency Smoke Control System.
7. Emergency Power System.
8. Enclosed Stair Shaft Ventilation System.
9. Fire Control Station System.
10. Emergency Helicopter Landing Facility.
11. Vestibuled Elevators.

If you concluded that strategy and tactics would be affected by the existence or absence of any of the above-mentioned features, then the next statement is both valid and important.

No Fire Department in the country is effective enough to sit idly by and let others legislate, inspect and control the design and constructions features in high-rise buildings. Responsibility falls upon all of us in the Fire Service to conduct an unrelenting campaign pursuant to the strategy and tactics outlined at the beginning of this Section.

The strategy and tactics we employ on the fire ground are directly related to those we employ legislatively and code-wise with respect to required fire protection features. And, we would add that this responsibility does not begin and end with the legislative agency or the inspection agency. It encompasses every member of the Fire Service with respect to input and voice regarding what is needed to provide the ultimate in fire protection.

RETIRED CURRICULUM

III. BUILDING KNOWLEDGE:

The strategy and tactics employed during an emergency in a high-rise building will be successful dependent on the knowledge possessed by officers and members as to the design and construction features of that building.

There is a variety of information obtainable on a particular building which can have a positive or negative effect on our emergency operations. Examples: Location of stairwells; operations of elevators; building water supply system, etc., etc. The building is there. Our knowledge must be there also - prior to the emergency!

There are tools and methods available by which we can gain building knowledge prior to the emergency:

1. Prefire Plans.
2. Building Inventory.
3. Information Sheets on premises.
4. Walk-through orientation training exercises.
5. Hypothetical fire training exercises.

One more item should be given consideration:

6. Current occupancy.

   Our strategy and tactics could be far more effective if, by some means, information was available on the premises showing current occupancy of the building, e.g.:

   a. The 15th floor is occupied by the Aged and Handicapped Society of America.
   b. The 17th floor is vacant for remodeling.

As mentioned previously, the tools are there by which we can convert building knowledge into effective emergency operations. To do this, high priority must be given to the use of these tools and methods. Know the buildings in your district and have "A PLAN OF ACTION!!"

RETIRED CURRICULUM

IV. OCCUPANT PERFORMANCE:

People are our most important product. Panic causes people to become irrational in both thought and actions.

Strategy and tactics will vary depending on the occupancy situation encountered at the high-rise emergency. Let us apply this to two hypothetical cases:

In each case we will assume a fire on the 20th floor of a forty(40) story office building. The building occupancy is approximately 100 people per floor.

Case #1:

Elevators and both stairwells are jammed with panic-stricken individuals and more individuals in this same emotional state are trying to enter these conveyances.

Case #2:

Elevators are empty, on hold at the lobby, with doors open. Disciplined people are moving in the east stairwell at floors 20, 21, and 22. The west stairwell is almost totally free and clear.

Would your strategy or tactics differ from Case #1, and Case #2?

The "Occupant Performance" we are referring to here is "Occupant Education and Training".

The Fire Department must be active in the educational and training process for occupants of high-rise buildings. Such occupants should be knowledgeable and geared to preplanned actions provided in an "Emergency Evacuation Plan" that outlines:

- Fire Reporting Method.
- Alerting Method.
- Safe Refuge Concept.
- Use of Conveyances.
- Etc.

From the standpoint of firefighters at emergency incidents, it is perhaps secondary as to what the occupants can do for us - it is primary that such occupants be involved in constructive, disciplined activity of some type. It is the best insurance to avoid or curb panic.

Occupant performance, at an emergency, has a very direct and influential bearing on the strategy and tactics to be employed in controlling the incident.

RETIRED CURRICULUM

V. RESCUE/EVACUATION:

The rescue of building occupants and their removal to a safe location, should always receive first consideration at every fire or emergency incident.

A prompt aggressive attack on the fire and adequate ventilation procedures are the best method of saving lives and preventing further extension of the fire.

There are two concepts that cover rescue/evacuation of building occupants in high-rise structures.

A. Total evacuation.

B. Establishment of safe refuge areas.

Initially, you may not have the luxury of determining which strategy you wish to employ. The stairways may be full of "panic stricken people".

We do not let civilians overrun the fire ground at a regular structure or brush fire and we cannot tolerate this situation at a high-rise incident. If we face such a situation, we have no recourse but to direct certain of our personnel to establish control and give direction.

Total evacuation is not practical. The time required to evacuate 1,000 to 2,000, or even 4,000 people would be prohibitive. If we were to adopt a strategy of withholding attack on the fire while assisting in a total evacuation effort, we would be too late. We would be jeopardizing lives and property beyond reason.

The establishment of safe refuge areas is the answer. There are several procedures that must be followed if the safe refuge concept is to be successful.

A. Occupants have to relocate when in an immediate dangerous area. With the stairways occupied by fire suppression forces and their equipment, occupants above the fires may have to be moved further up in the building.

B. Occupants must have fire personnel with them at all times. If left alone, they may reenter the stairways and the problem starts all over again.

C. Personnel assigned to control civilian occupants should have sufficient equipment to handle any situation that occurs in their area of responsibility. In addition, such personnel should engage civilians in responsible activities. Make assignments, e.g.:

RETIRED CURRICULUM

1. Lookouts
2. Monitors
3. Leaders
4. Head counts

In short, any meaningful activities which will lend a calming effect.

D. If the occupants move to the roof and situation warrants, roof top evacuation should be started immediately. Evacuation of even 100 people from the roof will take time. Don't wait until the conditions are such that fire control is hopeless, before starting roof evacuation.

VI. VENTILATION:

Sophisticated and often times complex Smoke Removal Systems are incorporated into the design of certain high-rise buildings.

There are varying other factors the Incident Commander must take into consideration with respect to ventilation in the fire building:

A. Fire Conditions

B. Climatic Conditions

1. Humidity
2. Temperature
3. Wind
4. Stack effect, stratification, etc.

With all of these varying factors, plus the complexities of the building Air Handling System, we have had bad luck attempting to remove smoke and heat through such building systems. The recommended simplified general rule is this:

1. Shut down the building Air Handling System.
2. BREAK OUT THE WINDOWS.
3. Positive Pressure.

It should be pointed out, however, that while we may initially shut down the Air Handling System, we must evaluate and determine whether the system can be reactivated for smoke removal purposes. If the Building Engineer is on the scene, his expertise should be solicited, Also, we should not overlook the expertise of the officers responsible for the prefires plan of the building.

RETIRED CURRICULUM

NOTE: This information is most important and should be reflected on the Building Inventory.

With the possibility of falling glass at any time, the area around the building must be cleared of people, civilians and fire personnel alike. With glass falling 200 feet from the building, the sidewalk across the street isn't any safer than the one in front of the building.

VII. ORGANIZATION AND ORGANIZATION COMMITMENT:

With a normal structure fire, a Fire Department, regardless of its emergency organizational structure, will one way or another handle the emergency. If nothing more than placing companies on four sides, you will probably handle any exposures and either put the structure fire out or cool the foundation.

I guess you might say the same thing about a high-rise fire, but in high-rise, the building itself is the exposure. We could lose forty(40) floors and 4,000 people. Needless to say, we must be in a posture to prevent such a tragedy.

A. There may not be a perfect organization for high-rise fire fighting - but there must be an organization. In that there are no absolutes when it comes to high rise firefighting, that organization must be flexible.

B. What must a workable organizational structure contain?

1. Clearly defined functions and responsibilities.
2. Standard terminologies.
3. Workable relationship. Where to report and to whom to report.

C. Basic organizational structure. There are two basic approaches that can be employed:

1. Commit all of your alarm assignment to the fire floor.

2. Use the first alarm assignment to initiate and establish basic organization including:
   a. Incident Command
   b. Fire Attack/Investigation
   c. Logistical Functions

The approach which has proven to be the most successful is the second approach, to initiate a basic organization with the first alarm assignment.

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D. Organizational commitments. Normally the congested value district of a city gets the heaviest first alarm assignment. It is not common, however, to find high-rise corridors being developed in outlying areas.

The question is: Does any area of the city have a large enough first alarm assignment to handle the potential fire? The answer is NO!!

How does the Incident Commander evaluate his commitment situation and arrive at a decision as to whether or not he has sufficient companies?

E. Commitment Evaluation Procedure: The basis for a Commitment Evaluation Procedure is the fire potential; the emergency organizational structure; and the Operations Procedures.

1. Basic functional organization:

a.	Fire Attack	-	1	Company
b.	Lobby Control	-	1	Company
c.	Staging	-	1	Company
d.	Base	-	1	Company

NOTE: Incident Command is activated with the arrival of the first Company.

Basic functional organization, then: 4 Companies.

2. Additional commitments:

Let's set up a hypothetical fire:

12th floor - fire
13th floor - potential fire
Questionable use of elevators
Limited rescue/evacuation problem
Ventilation problem
Limited salvage problem

Back to our basic functional organization:

Fire Attack	-	1	Company
Lobby Control	-	1	Company
Staging	-	1	Company
Base	-	1	Company
	TOTAL	4	Companies

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Continuing on:

Minimum fire attack - two companies per floor -
Add one company -

12th floor	1 Company
13th floor	2 Companies
TOTAL	7 Companies

Stairwell Support

per each 10 floors	-	1 Company
TOTAL		8 Companies
Rescue/Evaluation	-	2 Companies
TOTAL		10 Companies
Ventilation	-	2 Companies
TOTAL		12 Companies
Salvage	-	1 Company
TOTAL		13 Companies
Air Support	-	1 Company
TOTAL		14 Companies

The above procedure is merely offered as a Basic Commitment Evaluation Procedure. Depending on conditions, certain of the above mentioned functions would require augmentation. Others might be discontinued. The Fire Attack Companies and the Stairwell Support Force require early relief consideration. It is also obvious that, with a working fire in the upper floors of high-rise building, the potential and the uncertainties involved require that resource/reserves be activated at both the Base and Staging area locations.

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VIII. TIME FACTORS

At a regular fires it takes time to transform orders into actions. In a high-rise incident, the time factor becomes much more critical due to various factors.

A. Distance:

1. Apparatus to the involved structure.
2. Lobby level to the fire floor.
3. Stairwell exit to the involved portion of the fire floor.

B. Fatigue:

1. Carry equipment from apparatus to Lobby.
2. Climbing stairs.
3. Laying lines in confined stairway and narrow halls.
4. Firefighting in a hot and humid environment.

Under normal ideal conditions, utilizing elevators, it will take a company approximately eight minutes to reach the 20th floor of a building. Utilizing the stairs, it takes approximately sixty(60) seconds per floor for fully loaded Firefighters to reach floors.

IX. RESOURCES

Operations at high-rise emergencies may encompass the worst conditions imaginable in that particular building.

For a small department, the tendency probably would be to throw up their hands before beginning. This is where the importance of all agencies understanding the Incident Command System and sharing resources through mutual or automatic aid pays off.

What services are available and how can they help us?

A. Municipal Agencies

1. Police Department

   a. Traffic Control
   b. Crowd Control (falling glass).
   c. Crowd Control (people exiting the building).

2. Department of Water and Power

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a. Additional water supply.
b. Restore power to the building.

3. Department of Public Works

a. Barricades
b. Emergency power
c. Lighting

B. Private Corporations

1. Elevator Companies

a. Restore elevator service.
b. Assist in elevator rescue if needed.

2. Building Engineer

a. Operate or shut down the Air Handling System.
b. Provide extra stairway keys.
c. Provide automatic alarm system monitoring, updating.
d. Provide valuable insight regarding buildings' water system(s)

3. Structural Engineers/Architects

4. Contractors

It doesn't take a great deal of imagination to see that, upon prompt call to these various agencies, we can solicit their expertise and assistance; and thereby improve our overall operations.

X. DISCIPLINE:

Without discipline, the best thought-out and most comprehensive strategy will surely fail.

When job assignments are given, they must be acknowledged and specifically carried out. Chief Officers and companies will be assigned duties that lack the glamour that firefighting possesses.

"Team Playing" is the name of the game. "Freelancing" or disobeying the orders of the game plan because a Company or a Firefighter thinks he has a clear shot at the fire only contributes to confusion and creates safety concerns.

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When companies are assigned to floors above the fire, they must hold their position. Even though conditions may be favorable at that time; conditions do change and in the absence of communication; otherwise, the officer who gave the assignment assumes that the position is covered.

Whenever there is excess personnel encountered, make them available for other assignments.

There must be no "wanderers" (firefighters who may have lost their companies). Officers must be strictly aware of the involvement and locations of their subordinates.

XI. OPERATIONAL LOCATIONS:

Strategy should include preplanned operational locations.

Numerous considerations are involved:

A. Falling glass.

B. Access to the building.

C. Distances from the building:
   1. Movement of personnel and equipment.
   2. Helicopter noise.

D. View of the building.

E. Facilities:
   1. Telephone
   2. Evacuation areas.

These considerations would effect several of the fire ground functions. When selecting locations, do not only consider your immediate needs, but attempt to anticipate what would be required for a maximum effort.

XII. WATER SUPPLY:

What are the various water supply factors we should take into consideration when planning our overall strategy?

A. Is the water supply to the building sufficient?

B. Are the fire pumps capable of supplying the anticipated flow required to handle this incident?

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C. If the water supply to the building or the pumps are not capable of supplying our needs, what can be done to increase the supply?

D. Is the building sprinklered, and is the system operational?

E. If the standpipe system is inoperative, does our strategy include an operational plan to cover this contingency?

All of these factors must be taken into consideration if we expect to have a successful operation.

XIII. COMMUNICATIONS:

Communications related to strategy will not only include our Department Communication System, but even more important, the hardware designed into the building.

A. Department Equipment.

1. Department radios.
2. Fire Department voice powered field telephone.
3. Bull horns.
4. Messengers.

B. Built-in Building Systems:

1. Built-in voice powered telephone system.
2. Telephones
3. Special Emergency Systems.
4. P.A. Systems
   a. One-way
   b. Two-way Control Room
5. Elevator Telephone System.

On those rare occasions when we encounter a major fire in a high-rise, we may have to utilize all the communication systems at our disposal.

XIV. LOGISTICS:

The success of your overall operation at a high-rise emergency is going to be directly related to your logistics organization.

E.g.: You have personnel and equipment in the street - you need them on the floor above the fire - by the time they get from the street to the floor above the fire - you may need them three floors above fire.

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There are several factors that should be considered:

A. How is equipment movement going to be handled?

1. Elevators
2. Stairwell Support
3. Carried by Companies entering the structure

B. How are fire personnel going to ascend in the building?

C. What is the minimum number of reserves required to maintain an offensive attack?

Don't forget the most important resource at your disposal, TIME!!! If you don't use it wisely, it will destroy the effectiveness of your overall operation.

XV. BASIC STRATEGY

The basic strategic concept of controlling all six sides of a fire, apply in a high-rise incident just as much as they do in any structure fire.

Our strategy would be to control the four sides of the fire on the fire floor. The top side would be the spread of fire upward through the poke-through construction and exterior lapping of the fire. The bottom side would be spread downward through poke-through construction.

There are certain locations where we must maintain control. If we are unable to control these areas, the overall strategy could be adversely affected. These areas are:

A. Elevator Lobby areas (affected floors).

B. Hallways adjacent to the stairwells.

C. Stairwells themselves

To this end, it is essential that the Fire Investigation Team ("Fire Attack") inform the Incident Commander of primary conditions.

1. Location of fire - amount.
2. Condition of hallways, elevator lobby area, stairways.
3. Evacuation, ventilation problem, if any. Each of these conditions will materially aid the Incident Commander in his overall strategy and development of resources.

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XVI. FIRE EXTINGUISHMENT

Main strategy in fire extinguishment is to locate fire and contain it at that point... to prevent further spread both horizontally and vertically. To accomplish this objective, it may take one hose line... or five...or more.

Immediate consideration should be given to providing backup lines and companies. When you have to abandon your hose lines... you will normally lose all ground gained! You should also consider the tactical use of two or more stairwells to attack the fire.

Consider using a "pinching effect" when positioning your hose lines ... NOT opposing hose streams, but the use of an offensive/defensive tactic. It takes coordination and extreme discipline.

> Note: At Fire Interstate Fire, hose lines were operating out of four to six separate stairwells.

Additionally, you need to place additional companies and hose lines above the fire floor ASAP to protect for extension. Do NOT have companies above the fire floor without protection lines below!! This would also hold true of companies out on fire floor ... you must have control of the stairwells at all times, to provide for escape.

A major concern to all members working the fire floor(s), should be open spaces and the plenum area of each floor.

Use hose streams or pike poles to take out dropped ceilings.

If heat justifies, TAKE OUT WINDOWS!! Horizontal ventilation is the primary way of ventilating a high rise fire. Remember to control the environment, i.e. stairwells, hallways, occupied floors, etc. Think POSITIVE PRESSURE!!

Realize the limitations of your personnel, protective clothing and equipment. Layers of protective clothing results in heat build-up and eventual fatigue. Officers are responsible for not overextending their personnel.

Last, but certainly not least, when planning your strategy and tactics, thing of SAFETY FIRST!

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CONCLUSION:

At the beginning of this Chapter, we quoted for Strategy and Tactics:

> "Science and Art", "Plan or Method". In conclusion, then, it can be seen that there are many areas of concern; areas of challenge, if we are to be successful in the handling of high-rise incidents.

Our treatment of the subject has been broad and general -- an eye opener, so to speak. From this point, we must delve deeper into each area: construction, design, organization, fire extinguishment, and etc.

We must increase our knowledge; we must preplan individual buildings. We must prepare ourselves -- for our strategy and tactics must be thought out well in advance of the working fire in the upper floor of a high-rise building.

We must have a "PLAN OF ACTION"!

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HIGH RISE OPERATIONS

PRIORITY OF ASSIGNMENT

I. DEPLOYMENT OF FIRST ALARM ASSIGNMENT

There are two basic concepts when it comes to the deployment of a first alarm assignment at a high rise fire. The first is to throw the entire assignment into "Fire Attack" and go after the fire. The second approach is to establish a basic ORGANIZATION with your first alarm assignment and to initiate fire suppression efforts at the same time.

The second approach has been proven to be the way to go. If you do not immediately establish a "command structure", you will never catch up and you will ultimately lose track of resources...guaranteed! As a supervisor, you are accountable for all personnel under your command and as the I.C. you are ultimately accountable for all personnel assigned to the incident. You must think ACCOUNTABILITY!

The difference between a successful emergency operation which is brought to an early conclusion and one that becomes a protracted effort, often heavily taxing a department's resources, depends greatly on actions taken by first arriving companies. Our experience has shown that initial actions at a high-rise emergency must fall into a priority order if the operation is to progress smoothly to a successful conclusion.

The normal first alarm for a reported fire in a high-rise structure is five companies and a battalion chief. Depending on your agency's configuration, the five companies may consist of two truck companies and three engine companies or any like combination adding up to five. In addition, a squad-type company may respond on the first alarm to incidents in certain first-in districts.

When placing the first alarm assignment you should consider establishing the basic high rise command structure as follows:

- First-In Company

  Officer gives radio size-up, assumes responsibilities of Incident Commander and leads the company as the Fire Attack Team into the building. The primary responsibility of this team is to locate and identify the emergency and determine its scope.

- Second-In Company

  This company normally establishes Lobby Control. This is a critical assignment. Lobby Control has a significant responsibility for personnel safety because they control elevators and vertical access routes.

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Lobby Control also controls the air handling system and coordinates logistical support between Base and Staging. In a working incident this responsibility will probably require the assignment of an additional company.

Supplying water to the building standpipe will be the responsibility of the second arriving engine company. In this case the Engineer of the second arriving company has the responsibility for water supply.

- Additional Companies of First Alarm

Staging will be established utilizing a company from the first alarm assignment consistent with strategic considerations and priorities. Staging personnel must ascend by a safe route and set up Staging, normally two floors below the fire. Staging is the assembly point where a reserve of personnel and equipment are maintained awaiting assignment within the building.

Base may be established by available engineers from the first alarm assignment, or by a greater alarm company. Once Base has been established it will be augmented at the discretion of the Incident Commander.

The basic requirements of the Incident Command System have been met with the establishment of Fire Attack, Lobby Control, Staging and Base. Any Additional resources will be assigned by the Incident Commander to supplement the system and implement incident strategy.

II. SECOND ALARM/GREATER ALARM COMPANIES

With the arrival of second alarm and/or greater alarm companies, consideration must be given ASAP to placing companies above the fire floor (2cos.min.). Additionally, resources to back-up fire floor companies need to be given a high priority and be considered early on (2cos.min).

The ultimate operation would be to have two companies assigned to each hose line in operation at all times (providing for constant relief at the nozzle). Another method of providing for constant relief, depending on the size and ability of your companies, would be to split your personnel, but ONLY if you can maintain a minimum of two.

Other positions that will need to be addressed:

• Ventilation	-----	2 companies
• Search/Rescue	-----	2 companies*
• Evacuation	-----	2 companies
• Salvage	-----	2 companies
• Stairwell Support	-----	2 companies*
		10 companies

*more likely 8-15 companies assigned to these groups

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We've just absorbed 19 to 20 companies and we're just beginning. If your companies have less than four personnel assigned, you will have to ask for that many more resources.

ASSIGNMENT OF COMMAND OFFICERS

In a routine high-rise incident company priorities of assignment are implemented as described above. A command officer (Battalion Chief) arrives, relieves a subordinate officer as Incident Commander and deploys resources to control the incident.

In a major high-rise incident involving greater alarm companies it is necessary to build upon and augment the basic system established by the first alarm assignment. As more resources are committed to the incident, command level responsibilities must be assigned on a priority basis to insure a smooth and effective expansion of the system.

The first arriving Battalion Chief normally will be assigned the duties of Incident Commander.

The first arriving Assistant Chief will relieve the Incident Commander (first arriving Battalion Chief) who will then become the Planning Chief.

Additional command level personnel will be assigned at the discretion of the Incident Commander. Critical ICS positions to be considered in a high rise fire should include, but not be limited to:

- Division Supervisors - Fire Floor
  Floor Above Fire
- Logistics
- Operations (normally 4th or 5th arriving chief)
- Group Supervisors
  - Search and Rescue
  - Ventilation
  - Evacuation
  - Salvage
  - Etc.

The fire and needs of the I.C. will determine when each of these positions is to be filled.

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DEMOBILIZATION/OVERHAUL/RE-ENTRY

Introduction

After a high rise fire has been knocked down and the building searched, the demobilization, overhaul, and re-entry phases of the incident can become a bigger challenge than the actual fire. In order to effectively handle these phases of the incident, an organized demobilization plan must be developed. Lost jobs, business interruptions, lost revenues and displaced persons will have a major impact upon the community and create hardships for those involved.

After a knockdown has been declared, the primary goals for an Incident Commander are:

- Develop Cause Determination

- Develop a Demobilization Plan

- Develop an Overhaul Plan

- Develop a Re-entry/Re-housing Plan

All of these goals can be accomplished through the continued use of the Incident Command System.

Cause Determination

The primary responsibility for cause determination rests with the Incident Commander. Due to the magnitude of most high rise fires and the associated dollar loss, this function is normally performed, as per Department policy, by A-Unit. It is the responsibility of the Incident Commander to preserve and guard the fire scene and evidence until the building or portions of the building are released for overhaul by the Arson Investigators.

Demobilization

It is the Incident Commander's responsibility to release resources as soon as possible and turn the building back to the owner/responsible party. In order to do so, the Incident Commander should consider holding a Plans Meeting with key members to discuss demobilization plans. The Incident Commander along with the Operations (when implemented), Logistics, and Planning Section Chiefs need to discuss how to diffuse the incident in controlled stages. Considerations should include staffing for the overhaul, re-entry and security. At this time, the Incident Commander should determine

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the number of resources needed to handle these functions. One important issue to remember is that all responders, especially first-in companies, may have been subject to extreme working conditions. The Incident Commander should consider using fresh or unused companies for extensive overhaul and re-housing of tenants.

It is imperative that the Incident Command System continue to function during demobilization.

Overhaul

The overhauling process is determined through an orderly examination of the fire building and its contents to ensure that the fire is completely out. The Incident Commander shall determine cause, extent of the fire, materials involved, and the structural stability of the building.

The first priority for the Incident Commander is to ensure the building is structurally safe for firefighters. Incident Commanders should consider conferring with structural engineers, representatives from Building and Safety, and department staff regarding structural stability. A plan needs to be established for an organized overhaul procedure. The building must also be thoroughly ventilated so that firefighters can work in comfort. Additionally, hose lines must be charged and in place to extinguish any remaining fire and guard against any flare-ups or unknown extension.

The Incident Commander will determine where the overhaul will begin and give direction as to the extent of the overhaul operations. When starting to overhaul in a room that contains considerable stock or materials, it may be necessary to provide a clear space in which to work. Salvageable articles must be separated from burned materials and placed in a safe location. If overhauling above ground, it is imperative that the floor below be checked for salvage needs to prevent further water damage.

Depending on the location of the fire, it might be unrealistic to carry out burned objects to street level. It is best to move burned objects to the center of the room and provide for thorough extinguishment. Officers should take time to observe conditions on the overhaul floors during this process. Time taken during the overhaul stage will reduce excessive water damage and ensure complete fire extinguishment.

If structural integrity is in doubt, a fire watch should be considered and firefighters should not be allowed to enter the area.

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The Incident Commander should consider turning the overhaul responsibilities to the owner of the building when the following conditions are met:

1. The fire is completely extinguished and there is no possibility of rekindle.

2. No additional fire related damage to the building can occur.

3. Safety of civilian overhaul personnel can be assured.

4. Security of the premises is in place.

Re-Entry/Re-Housing

During re-housing of occupants, it is important that fire department personnel establish criteria for people to enter the building. This will be best accomplished by conducting a Plans Meeting with the general staff, command staff, and building management personnel. The fire department, in conjunction with input from the building management personnel should determine who will be allowed to re-enter the building, when and for how long they will be allowed to re-enter, who will provide tenant escorts, and what access routes will be utilized for the building occupants.

During incidents requiring large-scale evacuation of a building, Re-Entry/Re-Housing Unit Leader position should be established. This position reports to the Evacuation Group Supervisor (if established) or the Incident Commander. The officer in charge of a Re-Entry/Re-Housing Unit shall formulate plans and coordinate with other units in the Evacuation Group and agencies regarding the safe re-entry of evacuated areas and re-housing of evacuees. This officer shall coordinate the release of pertinent information to the evacuees under the direction of the Incident Commander.

Responsibilities

1. Provide information regarding the incident as follows:

   A. Communicate with incident personnel to gather appropriate re-entry/re-housing information.

   B. Brief Community Liaison Officer/PIO's assigned to the Evacuation Group (Shelter, Incident Commander, etc.)

   C. Communicate information to evacuees under the direction of the Incident Commander.

   D. Communicate information to Mayor/Council offices.

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2. Establish RE-entry Plan.

   A. Confirm safety of structure or evacuation area based on information from responsible agencies (Building and Safety, Utilities, fire department supervisors, County Health, etc.)

   B. Determine if re-entry will be of a temporary or permanent nature.

   C. Formulate a plan for a safe/orderly re-entry.

      1. Determine the safety of persons re-entering structure/evacuation area.

      2. Ensure that appropriate safety equipment is provided to persons re-entering as needed (e.g. flashlights, boots, helmets, etc.) The Supply and Maintenance Division is capable of providing the aforementioned supplies as needed.

      3. If temporary, determine duration of re-entry.

      4. Provide supervision/guides for persons temporarily re-entering structure/evacuation area.

      5. Consider using other elements of Evacuation Group ICS to ensure orderly and coordinated re-entry.

      6. Confer with building management regarding the re-entry plan when appropriate.

3. Establish Re-Housing Plan

   A. Coordinate with all elements of Evacuation Group ICS in order to carry out an orderly activation of the evacuation plan.

   B. Ensure that adequate resources are maintained in order to provide a safe and coordinated demobilization.

4. Update Evacuation Group Supervisor relative to

   A. Media Contacts

   B. Mayor/Council Contacts

   C. Evacuees

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D. Confirm safety of structure/evacuation area.

E. Re-entry/re-housing plans.

5. Maintain records regarding

A. All media contacts

B. All Mayor/Council contacts

C. Document Re-entry/Re-housing Plan

D. Maintain accurate records of activities chronologically

E. Use evacuation records to assist re-entry/re-housing

Once the fire department has released the incident, the security of property must be left with the owner or responsible party.

Fire protection devices should be reset, if possible; sprinkler systems restored and elevators operational. Field officers should consider utilizing the expertise of the Fire Prevention Bureau staff when restoring fire life safety systems in these types of occupancies. If building management/department personnel are unable to restore the fire protection equipment, a fire watch notice shall be issued and a fire watch established.

Conclusion

The information provided in this chapter is not intended to address all possible scenarios that could occur during the demobilization, overhaul, and re-entry phases of an incident. It is intended to serve as a guide to assist officers with these functions.

As previously stated, the demobilization, overhaul and re-entry phases of an incident can prove to be a larger challenge and have far more impact than the actual fire itself. It is imperative the Incident Commander have a well thought out and orderly plan so that these phases can be accomplished with the least amount of impact upon the building management and tenants.

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HIGH-RISE OPERATIONS

COMMUNICATIONS

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INTRODUCTION:

As we stand here alone at the Command Post in the street, wouldn't it be nice to say: "Cap, how are things going up there?" "What do you need?"

Cap is on the 23rd floor just moving into position with his crew and he says: "Chief, we're moving in right now. We have the fire cut off at the hallway. The elevators are safe and the west stairwell is clear. Give you a better report in a minute."

Technically, we thought we had that with the advent of the two-way apparatus radio and handi-talkie.

But in the high-rise building of today, we have problems in communications. The handi-talkie works in one location and not in another, if it works, it's difficult to get a message through due to excessive air traffic.

The purpose of this lesson is to briefly cover the alternate means of communications we may find at a high-rise emergency incident. Any one of them, if it works, might be most important to the effectiveness of our operations.

1. BUILDING EQUIPMENT:

Depending on the age and design of any particular high-rise building, various means for communicating both within and outside of the building may be provided.

With respect to Fire Department Emergency Operations in that building, each of the communication means have their unique uses and constraints.

Also, depending on the emergency situation in that building, one communication means may be fine one time and not so good another. Example: If the telephones in the building are connected to a switchboard and inactivated after

hours, an after hours fire will pretty well eliminate the use of telephones. There are, of course, a few exceptions to that example.

Since we've mentioned telephones, let's take a look at them as we will find them in a high-rise building.

The telephone company people tell us there are many types, combinations and kinds of situations we may run into as far as telephone service. And they quickly add: They're working on a lot more.

We will just review a few of the most pertinent points with respect to our operations:

A. Telephones:

1. Power source:

As with the various types of service which can be found in a high-rise building; the power source can be verified.

a. Building power source

b. Back-up battery power

c. Outside power source

2. Telephone Instruments:

Again, with the instruments themselves, there are, of course, different types:

a. No dial

b. Dial

c. Coin Operated

d. Call Director

The use of the instruments, of course is basic. The exception might be the call director type of instrument.

For some of our people, a five minute training program might be in order to show them how to use the "hold" button and thereby use the one

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instrument for more than one call at a time.

As to whether the instrument can be used within the building and outside, it is trial and error.

a. If no tone, "talk" - a switchboard operator may answer.

b. If a tone, "dial" - you may get the number you are trying to reach.

c. With a "tone", you dial but don't make a connection - dial "9", then use the telephone number.

Essentially, the above provisions will cover you whether it be an outside line telephone or a switchboard (manual or automatic).

3. Operations

Under high-rise emergency conditions and at various points in the operation, it can be very advantageous to locate a telephone, find that it works, and use it. A few examples by location:

a. Lobby

(1) Security Guard at console

Fire reported on 14th floor - building occupied.

Possibilities:

(a) Can the Security Guard call someone on Floor 14 for a report of conditions?

(b) Officer going up can get the number of the console telephone to above ground floor, he may be able to use a telephone to contact lobby.

(2) Lobby Telephone

Officer going up takes that number with him, provides a possible avenue of communication back down

b. Elevator:

If the elevators are not to be used, yet the telephone is operational:

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(1) Place elevator in manual operation, holding elevator at lobby, with doors open.

(2) Above ground officers take telephone number with them.

c. Office Telephones:

Using an office telephone and finding it works is, of course, great. You can call the Dispatch Office or the Lobby (if prearranged).

A few other conditions on the office telephones, in those situations where you want to establish and hold a means of communication.

(1) Single Instrument:

Try to get two telephones close together.

(a) Use one for incoming, the other for outgoing, or

(b) Hold one in continued use, leave the other for incoming.

(2) Call Director:

If you have a choice, use a Call Director instrument. You can use it in combination.

(3) Switchboard Service

If you are on a manual switchboard service, ask for the Supervisor and make arrangements as necessary. Don't use switchboard operators to relay messages.

Summing up the telephone aspects, these instruments can be the avenue of communication that makes for a successful operation.

A little preplanning in this area for each high-rise building, will give you a jump on communications effectiveness.

B. Building Communication System (Public Address)

Current codes in our City provide requirements for a Building Communication System in all high-rise buildings (over 75 feet).

In many cases however, existing buildings have already incorporated a

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Communication System of some type. That is the system that is normally used to pipe the music to all floors.

The system transmits from one location and speakers are provided at various locations on all floors. In existing buildings that have such a system, should you wish to use it for emergency communication, preplanning is in order.

1. Can it be activated for voice communication to all floors?

2. How?

3. From what location in the building?

4. Is it selective for given floors?

It is not for our purpose in this lesson to get into code specifics but perhaps it would be well to briefly cover the requirements of such a building communication system of the future.

1. It must be capable of warning building occupants of fire or other emergencies.

2. All areas of the building must be covered and it must be selective.

3. The controls for the system must be located at the Fire Control Room/Station.

   NOTE: The Fire Control Station is our term for an approved location wherein various controls and montitoring equipment are provided for our emergency use.

   EXAMPLE:
   a. Building Communication System
   b. Fire Department Communication System
   c. Fire Detection and Alarm System Panels
   d. Status indicators and controls for elevators and air handling systems
   e. Emergency Power Controls
   f. Public Telephone

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f. Public Telephone

Back to the Building Communication System, there are a few problems or cautions:

1. It is generally a one-way form of communication.

   You can talk to one or all floors but on that instrument, they cannot talk back.

2. For emergency use, a great caution must be used to avoid panic. Any message given over this system must:

   a. Be calmly given

   b. Be definitive in instruction

   c. and must fit the overall emergency plan.

Let's look at a typical code requirement for High-Rise Building Communications.

CENTRAL FIRE CONTROL STATION:

A Fire Control Station shall be provided in the building design and in a location approved by the Fire Department. It shall contain the following:

A. The Building Communication System Panel and the controls.

B. The Fire Department Communication System Panel controls telephones and hand-held telephone sets. The number of telephone sets shall be determined by the Fire Department.

C. The Fire Detection and Alarm System panels, annunciator and controls therefore.

D. The status indicators and controls for elevators and Air Handling Systems.

E. A Public Telephone.

F. Sprinkler Valve Status Indicator and a Water Flow Indicator.

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G. Standby Power, Emergency Power Controls and Indicators.

A Public Communication System capable of warning the building occupants of a fire or other emergency conditions shall be provided as follows:

A. Voice Communication or other system having similar capabilities and acceptable to the Fire Department.

B. All areas of the building shall be covered by the Communication System.

C. The Communication System shall be subject to control from the central fire control station.

D. Installation, alteration and major repair of the items listed in Subsections A, B, and C, of this Section shall be performed under permit.

The Fire Department Communication System will be a combination of the following:

1. Radios

2. Sound powered telephone (built-in)

3. Face-to-face

We could spend a good deal of time discussing the problems we have experienced in our City with respect to the use of handi-talkies in high-rise buildings--but for brevity, let's say. They were not dependable.

Well, if they wouldn't work, what would?

Before answering that question, we set down certain criteria:

1. Must be dependable.

2. Must be two-way clear communication.

3. Must be communicative in all parts of the building <u>and</u> at the Command Post.

4. Hopefully, it is not dependent on the building's source of power,

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conventional or emergency.

Again, in the interest of time, suffice to say:

We borrowed a page from the military and settled on the old military standby, the sound-power (or voice-power) telephone.

It pretty well meets the previously mentioned criteria:

Dependable

Two-way communication

Can be located in all parts of the building

Not dependent on building's source of power.

For the purpose of this lesson, we will cover the Fire Department's Communication System as the code requires for all new buildings.

SYSTEM REQUIREMENTS:

A sound-powered Communication System (2-wire conductor) capable of communication between all floors and with the Fire Control Station as follows:

1. Telephone jack locations

   a. Each floor landing (in each stairwell)

   b. Each exterior stairwell exit (ground level)

   c. Each stairwell roof opening.

   d. At Fire Control Station

2. Multi-stairwell connection

   Interconnection between stairwells.

3. Sound-powered Telephone sets

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Minimum number of Sound-powered Telephone sets to be stored at Fire Control Station.

At this point, with such a system, hopefully, we have communication throughout the building.

We want communication throughout the building and to the Command Post. This now becomes relatively simple.

A 2-wire reel is run from the Command Post to the previously mentioned telephone jack at the exterior of the stairwell entrance, and the Command Post is in the circuit.

The last mentioned link from the building to the Command Post and to the hose location is equipment that could be carried by the Department (more dependable than stored at the building).

A sample of code requirements is:

A sound-powered Telephone Communication System capable of communication between all floors and with the Central Fire Station shall be provided as follows:

A. Telephone jacks shall be located:

1. At every floor level in each stair shaft.

2. At every exterior location where a stair shaft exists to a public way.

3. At the exterior of each stair shaft penthouse located on the roof.

4. In each lobby which exits to the public way.

B. All exterior telephone jacks shall be designed to communicate with the Central Fire Control Station and all other levels of the buildings, including external locations.

C. Sound-powered Telephone equipment, including communication panel, telephone sets and location of telephone jacks are subject to Fire Department approval.

D. A minimum number of hand-held telephone sets shall be made available and stored at the Central Fire Control Station.

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NOTE: If you string your own hand-wire - practice is required regularly. There are tactical methods in placing the wire in service such as:

1. Use duct tape to secure above floor levels.

2. In stair shafts, go up middle area not around stairs.

3. Outside, when possible, secure above ground (trees, poles, etc. If that is not possible, use area not in heavy traffic, such as personnel routes into building.)

4. Resources for manning telephones may not be readily available. Remember, a person has to have the receiver to his ear continuously, or use a head-set.

FIRE DEPARTMENT STANDARD EQUIPMENT:

With respect to Fire Department standard equipment for communications at high-rise emergencies, we are talking primarily about:

Apparatus radios

Handi-talkies (portable radios)

We will make no attempt at an exhaustive treatment of these two items of equipment in this lesson, but rather we will just zero in on a few considerations that seem worthy in any high-rise operation involving a lot of companies.

A. Multi-jurisdiction Operations:

If radio compatibility is not existent, Command Officers should consider:

1. Placing sedans close together so that both channels can be utilized. Adjutants or Chiefs then can establish physical communication.

2. Exchange handi-talkies at Command Post.

Each Officer can then be knowledgeable of the other's radio activity in addition to communication back and forth.

B. Greater Alarm Companies:

The frustrations of excessive radio traffic at a high-rise emergency are

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overwhelming. A little preplanning can eliminate some of that "traffic".

1. As soon as possible, Incident Commander should designate location of base to:

   a. Already dispatched companies.

   b. Dispatcher

   All incoming companies should be dispatched to that designated location.

   These actions, alone, would eliminate about four standard messages.

   Command Post, what are your instructions?
   Company X - standby!
   Company X - report to so and so.
   Roger

2. As soon as companies report in to base, turn off radios.

   a. Eliminate feedback and noise at base.

   b. Eliminate a possible "stuck" transmitter from one of the apparatus at the base.

C. Multi-frequency Radios:

   If multi-frequency radios are available, Command Officers should use command channel where possible.

   Again, a little preplanning.

   If a Chief Officer is working inside a building, he probably needs his handi-talkie on the "incident" frequency, but if he has "command" message he can say,

   "Meet me on 5"; Switch over and transmit.

   Command Post can initiate such a call in reverse.

D. Handi-talkies

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For handi-talkie use in the building, it is trial and error.

1. Try it from your location.

2. Move and try it again.

   a. Try near a window, out a window.

   b. Try near an outside wall.

   c. If near the roof, go to the roof.

3. If you find a location where it works, remember the location. A few feet one way or the other can make the difference.

4. Don't expect the same results two hours later or the following day. Weather conditions evidently play an important part.

E. Bullhorns (portable PA Systems):

Bullhorns if available, provide a ready instrument to assist in controlling people on the ground level area.

Until such a time as you have assistance to establish barriers, this may be your best means of clearing the area for anticipated falling glass. Bullhorns have also been used somewhat by stairwell support officers in communicating with their people.

NOTE: Volume level should be controlled in stairwell due to echo and distortion problems.

The newest form of communications available to the Fire Service is the computer with a mobile terminal. This system is expensive, but the Phoenix Fire Department and other police agencies have installed systems, and they work.

Special Command Vehicles with on-board computers will also enhance the High-Rise Communications. Included in these vehicles are also:

a. Cellular Telephones.

b. Copy Machines

c. Multi-frequency Radios

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d. Scanners

e. T.V. Monitors

NOTE: LAPD has a mobile camera mounted in a helicopter which transmits a signal to the Command Unit. A directional entrance is used. In a High-Rise fire with the helicopter making 360 turns around the building, the Incident Commander should have good visual of his fire.

We all know that "face-to-face" communications are the very best. This practice should be priority whenever possible.

Officers reporting to the incident should park in base and report in person to the Incident Commander for assignment. These single resources can be assigned Command or Functional positions, receive briefing on the incident and who they are relieving, etc.

The Incident Commander should also describe to these officers the incident objectives and strategy.

CONCLUSION:

In concluding the subject of communications, we realize we have only touched the surface due to peculiarities of individual building design we would hope that through our brief exploration, there is some method or combination of methods which will provide adequate communications at a given high-rise emergency.

As always, the key is preplanning.

The key is knowing the building and knowing what communication means or instruments will assist us in the overall operation of controlling the emergency.

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ALEXIS NIHON PLAZA FIRE

Investigation Report
High-Rise Office Building Fire
Montreal, Canada
October 26, 1986

Prepared by

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ABSTRACT

At approximately 5:15 p.m. on Sunday, October 26, 1986, security guards discovered a fire on the tenth floor of a 15-story office tower at the Alexis Nihon Plaza. The 13-hour blaze caused a portion of one floor (including at least one girder and several beams) to collapse and resulted in heavy fire damage on the 10th, 11th and 12th floors. The fire also spread to and gutted the entire top floor of the building. The damage to the structure and contents has been estimated at 80 million dollars (Canadian).

The fire resistive office tower was a non-sprinklered structure with heat detectors in the electrical rooms and smoke detectors in the elevator lobbies.

Originating in an unoccupied tenant area, the fire burned openly and was discovered after smoke had reached the top floor. The fire involved a large area on the 10th floor before fire fighters arrived.

The fire fighting crews could use only one stairway to gain access to the fire floor and this reduced the effectiveness of their early fire attacks. In addition, low pressure in the standpipe system further reduced the effectiveness of interior fire fighting operations.

Aerial equipment could be positioned along only three sides of the building and could extend only as high as the ninth floor. So, similar to the interior fire attack, the exterior attack against the fire was also hampered.

The fire spread horizontally on the 10th floor and breached the enclosure walls for a stairway through non-fire stopped penetrations for communication wiring. This provided a path for fire spread to the 11th, 12th and top floors. In addition to this spread mechanism, the fire was able to reach the 11th and 12th floors through damaged HVOC ducting.

The following are considered significant factors which contributed to the severity of this loss:

1) Lack of automatic detection or suppression of the fire in the incipient stage.

2) Inadequately protected openings in walls serving as fire barriers.

3) Vertical spread of fire through interior stairways and HVAC ducting.

4) Delayed fire location determination due to inaccessible annunciator panels.

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5) Inadequate water supply for standpipe systems due to a partially closed valve and improperly labeled fire department connections.

6) Limited interior and exterior access to the fire areas.

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INTRODUCTION

The National Fire Protection Association (NFPA) investigated the Alexis Nihon Plaza fire in order to document and analyze significant factors that resulted in the loss of property. This investigation is part of the NFPA's continuing effort dedicated to the documentation of technically significant fires and to the reporting of "lessons learned" data for loss prevention purposes.

The NFPA became aware of the Alexis Nihon Plaza fire on October 27, 1986. Michael S. Isner of Fire Investigations and Applied Research Division traveled to Montreal, Canada to document the facts related to this fire. An initial three days of on-site study and subsequent analysis of the event were the basis for this report. Entry to the fire scene and data collection activities were made possible through the cooperation of the Montreal and Westmount Fire Departments. This report presents the findings of the NFPA data collection and analysis effort.

This report is another of NFPA's studies of fire having particularly important educational or technical interest. The information presented is based on the best data available during the on-site data collection phase and during the report development process. It is not NFPA's intention that this report pass judgment on, or fix liability for, the loss of life or property resulting from the Alexis Nihon Plaza fire.

This report describes fire safety conditions at the Alexis Nihon Plaza and presents finding on contributing factors to the loss of life or property based on NFPA analysis of collected data and observations during the investigation. Current codes and standards were used as criteria for this analysis so that conditions at the plaza on the day of the fire could be compared with current fire protection practices. It is recognized that these codes and standards may not have been in effect during construction or operation of the Alexis Nihon Plaza. In addition, NFPA has not analyzed the Alexis Nihon Plaza as to compliance with the codes and standards which were in existence when the plaza was built or during its operation.

The cooperation and assistance of directeur adjoint, Raymond Therrien; assistant directeur, Alan Newbold; and Chef de division, Andre Bourdeau of the Montreal Fire Department are greatly appreciated. In addition, the author acknowledges the assistance of Director of Fire, William Timmons of the Westmount Fire Department; Mr. David Yung, Ph.D. of the National Research Council, Canada; Mr. Rene Caskanetter, Office of the Fire Marshal in Ontario, Canada; Ms. Kathleen Almand of the American Iron and Steel Institute (AISI) and Mr. Delbert Boring, P.E. also of AISI.

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BACKGROUND

The Plaza

The Alexis Nihon Plaza included several structures with different occupancy classifications (see Figure 1). The largest part of the plaza was a five-story concrete structure approximately 360 feet wide and 800 feet long that had two basement levels. The lowest basement level was a utility area and was closed to the public. The next higher basement level, ground floor, and second floor housed a three-story shopping mall with atrium openings between levels; floors three through five were an open-air parking garage.

Three high-rise towers were constructed on top of the five-story concrete building. These included a 27-story apartment building at the end of the plaza facing Wood Avenue; a sprinklered, 18-story office building facing De Maisonneuve Boulevard, and a ten-story office building facing Atwater Avenue. Since the three high-rise towers were on top of the five-story concrete plaza, they were designated as 32 story, 23-story, and 15-story buildings, respectively. (See Figure 1)

The boundary line between the city of Westmount and the city of Montreal passed through the Alexis Nihon Plaza (see Figure 2). Because the majority of the complex was within the city of Westmount, this community had the responsibility for construction approval and post-construction fire inspections for the entire complex.

At the time of construction, the city of Westmount was enforcing a local building code , City of Westmount By-Law No. 577 Concerning Building and Building Construction that had been approved in 1950. This local code was based on the National Building Code - 1950. In addition, a city drafted fire code, City of Westmount By-Law 187 Fire Code was in affect.

The majority of the 15-story office building fell within the city limits of Montreal. As a result, the Montreal Fire Department accepted the primary responsibility for fire suppression in this part of the plaza.

The Office Tower at 1500 Atwater Avenue - General Information

The fire occurred in the 15-story office tower. Because the tower was constructed on top of the five-story plaza, the sixth floor was the first level used as office space. The highest occupied level in the structure was the 15th floor; there was no designated 13th floor so the top floor in the building was the 16th floor.

Most of the tenant areas were dedicated to general office work and contained office equipment, desks, other furnishings, and decorations. In addition, these areas had many filing cabinets, shelves for books and supplies, boxes of paper and other combustible materials. Several spaces were used strictly for records storage and

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contained a high concentration of cabinets and shelves. In general, few conference rooms and lobbies were provided on each floor.

Most floors of the tower had two or more tenants; therefore, the floors were subdivided as necessary to meet the tenant's needs. Even with the changes, each floor had a central corridor which allowed occupants to access the six elevators, Stairway C (the south stairway), and restrooms (see Figure3).

Fuel Load

The actual fuel load in this office tower was not known. A study performed by Culver can provide some insight into the potential fuel load. In 1973, Culver surveyed 23 office buildings and determined that the fuel loading in an office tower ranged from 6.4 lbs/sq.ft. in the general areas to 16.8 lbs/sq.ft. in the storage/file spaces. [1] Most of the areas in the office tower were used for general clerical work. However, these areas had considerable amounts of storage in addition to the materials stored in the spaces designated for that use. Therefore, it appeared that the average fuel load in this office tower was likely to fall in the middle of the range sited by Culver.

Building Construction

The office tower had a protected steel frame and, in general, the columns were spaced 30 ft. on center in both directions (see Figure 3). The girder-to-column, beam-to-column, and beam-to-girder connections were made using double clip angles. In the case of the girder (W24 X 76) to column connections, the clip angles were welded to the column flanges and bolted to the girders. In the case of the floor beams (W18 X 40), the clip angles were welded to the beams and bolted to the columns or girders.

Both girders and beams supported the floor construction which consisted of a 2 1/2 inch minimum thickness concrete slab placed over light steel deck with 3-inch deep channels. Approximately 1 1/4 inches of spray-on mineral fiber covered the steel columns and 3/4 inch of the same material covered the girders, beams and the underside of the steel floor deck. By today's standards, the spray-on material would have provided an estimated 3-hour fire resistance rating for the beams, girders,, and floor construction and an estimated 2 1/2 hour fire resistance rating for the columns.

The exterior walls had seven-foot high glass windows and five-foot high curtain walls. The curtain walls were aluminum and were in contact with the concrete floor slab. Foamed plastic, 1/2 inch thick insulation with an aluminum vapor barrier was attached to the inside of the curtain wall.

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[1] Culver, Charles, G. 1978. "Characteristics of Fire Loads in Office Buildings." Fire Technology. Vol, 14, No. 1, pp51-60.

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Walls that enclosed the interior stairways and walls that provided separation between tenant spaces (see Figure 3) had two layers of 1/2 inch thick, Type X, fire-rated gypsumboard on each side of the metal studs. The Canadian National Building Code required that such walls have a two-hour fire resistance rating. The wall design appeared to be similar to a design listed by underwriters Laboratories, Canada (ULC) and Underwriters Laboratories (UL) for a 1 1/2 hour fire resistance rating. However, the unprotected penetration holes in the area of the communication cabinet compromised the fire resistance rating of the stairway enclosure walls.

Other interior walls, which were not being used as enclosure or separation walls, had one layer of 1/2 inch gypsumboard on each side of metal studs. However, the type of gypsumboard, the number of layers, and other details varied according to the intended use of the wall. For example, most of these walls terminated at the dropped ceiling but some walls, such as those between work stations, were only four to five feet high.

In addition, interior walls that enclosed the electrical rooms on each floor were hollow-core concrete block and ran slab-to-slab.

The distance from floor slab to floor slab was 11-1/2 feet. A non-rated non-combustible suspended ceiling was installed nine feet above the floor. The resulting 2 1/2 foot space above the suspended ceiling was a utility space containing electrical and communication wires, supply-air ducting, and other equipment. The space also served as the return air plenum for each floor.

Means of Egress

Stairways A and B were scissors stairs, i.e. they were enclosed in a common shaft and were separated by a partition common to both stairs (see Figure 4). Stairway A had a flight of stairs that went up to the office tower roof. Both stairways A and B ran from the 16th floor to the 6th floor where they discharged at grade. The entrances to all stairways were protected by labeled, 1 1/2 hour fire rated door assemblies equipped with door closing devices.

The north landings for both stairways A and B contained a communication cabinet which ran slab to slab. These cabinets were the full width of the stairway enclosures and were approximately two feet deep. The walls in the cabinet, like the enclosure for the stairways, had two layers of 1/2 inch, Type X, fire rated gypsumboard screwed to each side of metal studs. A set of nonrated bi-fold doors covered the access opening to each cabinet.

The lower eight feet of the cabinets' interior walls were lined with 3/4 inch plywood. This served as a surface to which connections, wires, and other communication equipment could be mounted. Wires were passed through the floor slabs between cabinets and were passed through walls to the tenant space. The floor

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penetrations contained a fire stopping material; however, wire penetrations through the wall had no observed fire stopping.

Stairway C was continuous from the ground floor through the 16th floor and provided access to the mechanical room on the roof. Like stairways A and B, the enclosure walls for stairway C ran slab to slab and were gypsumboard on metal studs. The door assemblies for this stairway were also 1 1/2 hour fire rated and equipped with a door closing device. This stairway did not contain communication cabinets.

Lockable doors separated the central corridor from the tenant spaces. The layout of most floors placed the north stairways, stairways A and B, on the tenant side of the lockable doors (see Figure 5).

Fire Protection

Wet-pipe automatic sprinkler systems protected the lowest basement, the three levels that comprised the shopping mall, and the 23-story office building. Also dry sprinkler systems protected the three levels of open air parking. There was no automatic sprinkler protection in the 15-story office building.

Standpipes were installed throughout the entire complex. Spaces that were normally heated had wet standpipes and the three unheated parking levels had several dry standpipe systems. The dry standpipes had a manual activation device near each discharge connection. These devices would operate a remote dry pipe valve and supply the standpipe system risers.

A 10 inch fire main dedicated to the fire protection systems looped the entire complex and supplied water to the sprinkler systems in the lowest basement level and in the three shopping levels. The fire main also provided water to the wet and dry standpipes up to the fifth floor. However, the fire department had been reportedly told that all sprinkler systems and standpipe systems were connected to the fire main.

Several Siamese connections with two 2 1/2 inch inlets were installed around the complex and allowed the fire department to pump into the fire main. All the Siamese connections around the building were identified as to the type of suppression system, i.e. sprinkler system or standpipe system that each supplied. The connections, however, were not marked as to the location of the system such as the main plaza, the 15-story office building, or the 23-story office tower.

The 15-story office building had a standpipe riser located near each entrance door for the three stairways. The 2 1/2 inch and 1 1/2 inch hose connections to the standpipe risers were housed in a hose cabinet in the occupant space (see Figure 5) and the cabinets contained 50 feet of 1 1/2 inch hose, an adjustable nozzle, and a 2 1/2 gallon air pressurized water (Class A) fire extinguisher.

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Contrary to the information reportedly provided to the fire department, standpipes in the 15-story office tower were not connected to the 10 inch fire main. Instead, these standpipes were connected to the 6 inch domestic main which supplied water to the officer tower. A booster fire pump having a capacity of 350 gpm at 160 psi supplemented the pressure from the domestic water supply. A separate fire department connection for this system was located on Atwater Avenue.

Heat detectors were in the electrical rooms for all floors. Smoke detectors had been provided in the elevator lobbies and in the return air ducts for the HVAC system. Manual pull stations were near each stairway.

Activation of any of these devices initiated an alarm signal that was displayed on an annunciator panel in the boiler operator's room. The boiler operators had been instructed to call the Montreal and Westmount Fire Departments before notifying security personnel who would investigate and initiate the building evacuation. An alarm signal would also be displayed on another annunciator panel in a locked room on the fifth floor (3rd parking level).

The fire alarm system in the building was not equipped with occupant evacuation alarms, direct connection to the fire department, or interlocks between the heat/smoke detectors and the controls for ventilation equipment.

Ventilation

Heating, cooling, and air handling equipment were housed in a two-story penthouse on the roof of the tower. Conditioned air was supplied to the occupied spaces through large vertical shaft enclosures adjacent to the central corridor. The enclosures for the vertical ventilation shafts were two layers (one 1 inch layer and one 1/2 layer) of Type X fire rated gypsumboard and were lined with rigid mineral wool insulation two inches thick.

Smaller horizontal ducts mounted below the concrete floor slabs transferred the air to the perimeter of the building. At this location, the supply air ducts penetrated the concrete slab and were connected to the discharge registers for the occupied space above the slab. (See Figure 6).

Motorized dampers installed between the vertical and horizontal supply air ducts automatically regulated air flows during normal building operations. There were no observed fire dampers at these locations nor were there any fire dampers in the supply air ducts at the slab penetrations below the perimeter discharge registers. Similarly, there were no apparent fire dampers in the return-air duct work.

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THE INCIDENT

Fire in the Office Tower

On Sunday, October 26, 1986, four security guards were on duty and in the plaza. The office tower adjacent to Atwater Avenue was closed for normal business and the ventilation systems were not operating. Still, there were about 35 office workers scattered throughout the building and five of these people were on the 19th floor.

A woman working on the 16th floor called the security desk to report that she smelled smoke in the corridor (approximately 5:10 PM). Upon receiving the call, the desk guard sent two guards to the 16 floor to investigate and then called the security desk to report that she smelled smoke in the corridor (approximately 5:10 p.m.). Upon receiving the call, the desk guard sent two guards to the 16th floor to investigate and then called Montreal Fire Department at 5:15 p.m. At approximately the same time, the boiler operator also received a signal indication and reported the alarm signal to the security desk.

Once the guards reached the 16th floor, they separated to begin their investigation and to begin telling occupants to leave the office tower. As they completed their search on the 16th floor, one guard used the stairs to reach the floors below in order to continue his investigation. The other guard left the 16th floor in an elevator. Keys for all tenant spaces were not available so the guards were unable to enter some tenant areas, such as the north side of the 10th floor.

One of the guards was on the 9th floor when he entered stairway B, looked up to the 10th floor landing, and was a fire with multi-colored flames in the area of the communication cabinet. He radioed the guard at the desk and informed him of the fire location.

The first units from the Montreal Fire Department were on the scene at 5:18 p.m. and found no visible evidence of the fire. The location of the fire had not been reported at the time of their arrival. A security guard and two of the first fire officers took an elevator to the 16th floor, where smoke had been first reported to begin their search.

While ascending in elevator, the guard received a radio message indicating that fire had been discovered in a ninth floor stairway. The elevator was stopped at the 14th floor. One officer and the guard stayed on the elevator and continued to go to the 16th floor. The other fire officer left the elevator and used a stairway to descend to the ninth floor.

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Once on the ninth floor, the officer was met by several fire fighters who had just walked up to that floor. These men then met the guard who had discovered the fire in stairway B. The fire fighters radioed the Montreal Fire Department dispatch center at 5:24 p.m. and confirmed that the fire had been found.

The fire fighters carried a hoseline with them and connected this hose to a standpipe on the ninth floor. Upon charging the hose, they found that the water pressure was low. Despite this, they entered stairway B, attacked the fire in the communication cabinet, and were able to momentarily knock it down.

The door to the 10th floor was very hot and could not be opened. Fire fighters forced it and discharged their hoseline into the 10th floor tenant area. Despite the efforts of this attack crew, the fire prevented them from advancing onto the 10th floor.

Combustion products from the tenant area continued to enter the stairway through holes at the top of the cabinet walls. The accumulating smoke and hot gases prevented fire fighters from going above the 10th floor in both stairway A and B. Since the access door to the roof was in stairway A, these fire fighters were unable to open the roof door and release the trapped combustion products.

Using stairway C, other fire fighters came to the 10th floor and prepared to attack the fire on that floor. The fire fighters also found that water pressure in the standpipe system was low. The fire fighters in stairway C entered the 10th floor at approximately 5:25 p.m. They found that the flames had extended halfway down the length of the corridor and were at the level of the suspended ceiling. Fire fighters moved down the corridor as quickly as they could control the fire. They broke through the locked doors at the 10th floor tenant separation and were met by intense flames, heat and smoke. Despite their effort, they could not control the fire.

Early in the fire attack, fire fighters thought the dry standpipe system in the parking levels might be contributing to the low pressure. As a result, they activated the dry standpipe systems and the air was exhausted from the piping. Water pressure was not improved.

In another attempt to increase the pressure in the standpipe system, the on-scene fire commander had several pumpers from the Montreal and the Westmount fire departments connect to the fire department connections provided around the plaza. But this attempt, too, did not improve the pressure in the office tower standpipes.

The on-scene commander decided to use the ladder trucks that had been brought into position around the building as a means to supply water to the hoselines inside the building. Once the apparatus were in place, supply lines were brought up the eighth floor and up stairway C. The handlines that were connected to the

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standpipes were disconnected and attached to the new supply lines. The change to the new water supply was completed about 1 1/2 hours into the incident.

In addition to supplying water to the interior attack crews, aerial apparatus were also used to compliment the fire fighting crews inside the building in an attempt to control this fire spread. The Montreal aerial ladders were a nominal 100 feet tall and could place ladder pipes only as high as the ninth floor. The water streams from ladder pipes easily reached the flames near the exterior of the 10th floor and could even penetrate to areas 30 to 40 feet into that floor. As the streams were angled up to the 11th floor, the penetration into the building decreased. The hose streams directed at the 12th floor were only effective against fire close to the exterior walls and no hose stream could reach the 16th floor.

Portable master stream appliances were put on the roof on the plaza to attack the fire on the north side of the building. These streams just barely reached the 10th floor with virtually no penetration into the building.

The interior work proceeded slowly and intense heat continued to prevent the crews from attacking the seat of the fire. At about 6:45 p.m. , fire fighters inside the building noted that the fire had entered the 11th floor in the area of the scissors stairs and was beginning to spread horizontally. By 7:15 p.m.., observers outside were able to see the fire on the 11th floor in the southeast corner of the building. Despite the efforts of fire fighter's from both the Montreal and Westmount Fire Departments, flames began to spread to the 12th floor along the perimeter of the building by 8:00 p.m.

At sometime between 10:00 p.m. and 10:30 p.m. , a section of the 11th story floor assembly collapsed and fell onto the 10th floor. When this occurred, fire fighters were withdrawn from the immediate area and the fire was allowed to burn in areas deemed unsafe. The fire appeared to be contained to the 10th, 11th and 12th floors until 11:30 p.m., when fire was observed on the 16th floor. Fire fighters were unable to control the fire and it spread across the entire floor in 45 minutes.

After this occurred, no new fire fronts developed and the fire fighters gradually were able to extinguish the fires on lower floors. The blaze consumed most of the combustible materials on the 16th floor. Once fire fighters gained access to the floor, they extinguished hot spots.

The fire was declared out at 6:44 a.m. Monday, October 27, 1986. This was 13 hours and 24 minutes after the first alarm.

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Casualties and Damage

There were no fatalities or injuries to civilians; however, several fire fighters received injuries which were not considered to be serious.

Provincial authorities have estimated the direct property damage at 80 million dollars (Canadian). This figure represented damage to the structure and contents which included several computers and a 6 million dollar, private art collection.

The 16th floor was completely destroyed by fire and the contents of the 15th and 14th floors were heavily damaged by smoke and water. Some heat, smoke, and flame damage occurred on these floors in the plenum space near stairways A and B. The most severe damage was observed on walls through which wires from the communication cabinets had been passed.

The 12th, 11th and 10th floors were heavily damaged by fire; however, the flame damage was predominantly limited to the northern half of these floors. Smoke, heat, and water damage occurred in the remaining areas.

Many materials on desks in the southern section of the 10th floor also sustained considerable heat damage from the combustion products that were at ceiling level and in the ceiling plenum space. Runoff water from the office tower and broken pipes resulted in damage to tenant spaces as far down as the 1st level (1st basement level) of the shopping mall.

The office tower was so severely damaged that the northern section of the tower from the 10th floor upward and the entire roof was removed and reconstructed. Even though the fire damage was extensive in many areas of the office tower, the equipment inside of all electrical rooms, including one adjacent to the area of fire origin, was relatively undamaged.

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ANALYSIS

Fire Development and Spread

The investigators from the Montreal Fire Department believe that the ignition occurred on the 10th floor near the entrance doors to stairways A and B. Problems with electrical equipment such as computers or appliances, careless smoking, and intentional ignition were being considered as possible causes for the fire. However, the actual ignition scenario in this fire was not determined.

Since the actual point of fire origin was not established, the materials involved early in the fire growth could not be identified. Debris found in the suspected area of origin indicated that the contents in the area were similar to those observed in other spaces in the building. The materials would have included typical office furnishings, office equipment, filling cabinets containing combustible materials, shelves with books and other combustible materials, and more. It appeared that the large amount of stored materials increased the fuel load above that which is normally present in general business and clerical spaces.

First notification of the fire came from an occupant on the 16th floor even though there were smoke detectors in the elevator lobbies and a heat detector in each electrical rooms. The fire burned freely because there were no people, detectors, or automatic sprinklers in the area of fire origin. The fire had penetrated the enclosure wall to stairway B and ignited the contents of the communication cabinet before being discovered. This amount of fire spread clearly shows that the fire had become quite severe before it was found.

The first attack crew in stairway B found fire entering the stairway from the tenant area. They also found that the fire in the suspected area of origin was large enough to prevent them from entering the 10th floor. The first attack crew to enter the tenth floor from stairway C was met be ceiling level flames that extended halfway down the main corridor, i.e., an estimated 90 feet from the suspected area of fire origin. These accounts from fire fighters also confirm that the fire was very large at the time of their arrival and strongly suggests that the fire involved several hundred square feet of the occupant space.

Fire fighters were able to knock down the fire in the communication cabinet. But, they reported that gases and smoke being produced in the 10th floor occupant space continued to enter and accumulate in the stairway enclosure. This observation indicated that the burning communication cabinet contributed to, but was not the only cause of, the deteriorating conditions in the stairway. The fire fighters also reported that they could not go above the 10th floor in stairway A or B and that they could not open the roof door to ventilate the stairway A. These comments confirm that extreme conditions existed in both stairways early in the fire.

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The intensity of the fire in the northern sections of the 10th floor prevented fire fighters from reaching the seat of the fire. Flames spread horizontally, consuming all the combustible materials in the area and filling the ceiling plenum space with extremely hot combustion products that spread to the northern sections of the 10th floor. Radiant heat from the combustion products significantly damaged exposed materials. This damage shows that combustible materials were being preheated in areas not involved with flame. The preheating of materials would have contributed to an increasingly fast fire spread.

From the moment that the fire on the 10th floor penetrated the enclosure to stairway B, smoke and hot gases traveled upward and were trapped in the stairway. Damage to the occupant side of the scissors stairs enclosure walls on the 14th and 15th floors revealed that heat and smoke escaped through the communication wire openings which had not been fire-stopped.

This evidence strongly suggests the mechanism by which fire originally entered stairway B. The suspected area of fire origin was outside stairway B close to where the communications wires penetrated the enclosure wall. Since the fire was first discovered in the communications cabinet, it is reasonable to conclude that the fire in the tenant space may have entered the communication cabinet through the non-fire-stopped openings for the communication wire.

Later in the fire, the stairway enclosure walls on the 16th floor failed, and the enclosure began to function as a chimney through which combustion products from the 10th,. 11th and 12th floors traveled to the 16th floor. Within an hour of the wall failure at the top of the stairways, fire completely engulfed the 16th floor.

In addition to the vertical fire spread that occurred through stairways A and B, fire near the exterior windows was observed spreading to floors above the floor of fire origin. Smoke, heat, and fire stains on ductwork and the enclosures for the discharge registers revealed that combustion products from the fire area below were leaking through the duct penetration holes in the floor slab (see Figure 6). Flames and hot gases entered damaged ducts and spread to the floor above via the channels for normal air flow. Combustion products also spread to floors above through holes created when ducts distorted and pulled away from the floor slab. In locations where the ducts were heavily damaged by fire, the amount of vertical fire spread increased.

Several dampers in the shaft enclosure walls were not closed and stains found within the shafts indicate that some combustion products might have spread through the large vertical shafts located in the core of the building.

About 10:30 p.m., a 30 foot by 40 foot section of the slab for the 11th floor slab near the area of fire origin collapsed and dropped down to the 10th floor. Even though the 10th floor area directly below was gutted by the fire, combustible materials on the collapsed slab and on the 11th floor around the collapsed area were

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not damaged by fire. The lack of fire damage clearly showed that fire did not spread vertically through the large opening created as a result of the floor collapse.

Fire Suppression

Responding fire fighters did not have easy access to the annunciator panels for the detection system because the panels had been installed in the boiler operator's room and in a locked room on the fifth floor. To determine the areas within the building that should be searched first, fire fighters had to rely on the statements from occupants. Fire fighters were on the scene for about six minutes before they confirmed the fire and its location. Had the information from this panel been made readily available to fire fighters, less time might have been spent searching for the fire.

The fire fighters who attacked the fire in the communication cabinet found that water was available in the standpipe but pressure was poor. The low pressure water supply reduced the ability of fire fighters in stairway B to extinguish the fire in the communication cabinet and reduced the effectiveness of fire fighters when attacking the fire on the 10th floor. The ability of fire fighters to extinguish fire improved only after the aerial ladders provided water to the attack crews.

Following the fire, inspectors from the Montreal and Westmount Fire Departments examined all the standpipe systems in the 15 story office tower and found a partially closed valve in the supply line. They also found that the Siamese connection was for an automatic sprinkler system.

In reaction to the low pressure in the officer tower standpipes, fire fighters charged the dry pipe standpipes in the parking garage because they thought the air in this system might be affecting the office tower systems. In addition, several pumpers from Montreal and Westmount connected supply lines to the fire department connections installed around the building; but, this did not improve the pressure.

Before the fire, the building owner and security personnel had been unknowingly providing incorrect information regarding the water supply for the standpipe systems. As a result, neither fire department realized that the standpipe system for the office tower and the 10-inch fire main for the plaza were not interconnected and that there was only one fire department connection that provided water to the standpipe system in the office tower. The pumpers that tied into the fire department connections pressurized the 10-inch fire main supplying suppression systems that were in the areas not affected by fire.

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Building Performance

Two types of wall construction were used to limit horizontal fire spread. These were the concrete block walls for the electrical rooms and the gypsumboard on metal studs for the stairway enclosures, tenant separation walls, and vertical ventilation ducts. Both types of wall construction happened to be in the area of fire origin.

The gypsumboard wall assemblies were heavily damaged and in some areas completely destroyed by the combined effects of fire and hose streams. The lack of fire stopping at cable penetrations apparently contributed to the horizontal spread of fire through the stairway enclosure walls. The hollow concrete block walls, which had fire stopping at penetration points on the other hand, withstood the intense fire and remained physically intact. These walls prevented fire from entering the electrical rooms as was evidence by the minor damage to equipment in all electrical rooms.

Girders and beams supporting the collapsed section of the floor slab were virtually straight and did not have the typical distortion such as bending, elongation, or twisting associated with steel frame members that have been exposed to excessive heat and high temperatures. In locations within the building, welds that secured the clip angles to the columns broke, resulting in the failure of girder-to-column connections. Subsequently, the free ends of several girders dropped down, and in one area, a 30 foot by 40 foot section of the 11th floor fell onto the 10th floor.

The cause of the failures was not established, however, several factors might have contributed to the failures and could be considered during an analysis of the failures. These are the structural adequacy of the connections (both as designed and as built), the quality of the welds, the effect that the fire may have had on the strength of the welds, and the possible effects of secondary and thermal stresses.

DISCUSSION

The fire in the Alexis Nihon Plaza was notable in many ways. Clearly this fire was a major loss for tenants, owners, and insurers of the building. Undoubtedly, it has resulted in innumerable critiques by the local fire departments, building departments, and city administrators. But above all, it serves as a reminder that the absence of recognized fire protection systems and other fire control provisions, whether required by codes or not, can result in a large loss.

The existing detection system did not provide early warning because initiating devices were not installed in the area of fire origin. Had detectors been installed throughout the office tower, the guards would have received a fire warning much earlier.

The early warning from detectors would have had a ripple effect. The guards

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would have begun their emergency response sooner and, in turn, the fire department would have been notified sooner. With a response earlier in the scenario, the fire fighters might have found a less severe fire, increasing their potential for containing and extinguishing the fire.

Under ideal conditions, the ability of any fire department to contain or extinguish a fire decreases as the size of the fire increases. Since the fire in the Alexis Nihon Plaza was extremely large at the time of fire department arrival, the effectiveness of fire suppression operations was immediately challenged. The ability of fire fighters was decreased further by several problems, such as inaccessible annunciator panels, low pressure in the standpipes, and limited access to the fire area. Because the fire departments were unable to control the fire, it continued to grow on the available fuel in the form of office supplies and furnishings. The fire became large enough to damage walls and ducts and to spread to many areas in the building before being extinguished.

If the high-rise building had contained a properly designed and installed sprinkler system, the outcome of this incident would have been dramatically different. Like a detection system, a sprinkler system could have provided early warning if it was interlocked with the building alarm system. In addition, a properly designed, installed and operating sprinkler system has the capability of controlling and possibly extinguishing a fire similar to the one in this incident.

The early detection and suppression capability of automatic systems makes this form of protection especially valuable in unoccupied or partially occupied buildings as in this incident.

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Postscript

One year after the Alexis Nihon Plaza fire, the reconstruction of the office tower was continuing. In many areas, the exterior walls were removed and the interior was gutted. The only materials left were the structural steel frame without the spray-on fire resistant material and the concrete slabs. A temporary 40 foot x 25 foot wood-frame, office storage structure was built on the ninth floor.

At 7:08 p.m. on November 16, 1987, a fire was reported at the Alexis Nihon Plaza. Arriving fire fighters found the office and storage structure on the ninth floor involved in fire. Twenty-one apparatus were committed to this incident and it took fire fighters from Montreal and Westmount approximately 45 minutes to extinguish the fire.

The cause of the fire was not determined and the primary fuels were reported to be materials used for the construction of the office/storage building and the materials stored within the structure.

The fire occurred in an area that had received little damage during the previous fire. It appears the strength of structural frame members in the area of the second fire was not diminished during the first fire. However, like the first fire, welds for clip angles released and several girders and beams in the area of fire origin dropped down in this incident. These steel frame members were straight and did not show the typical distortion associated with steel structural member exposed to excess heat.

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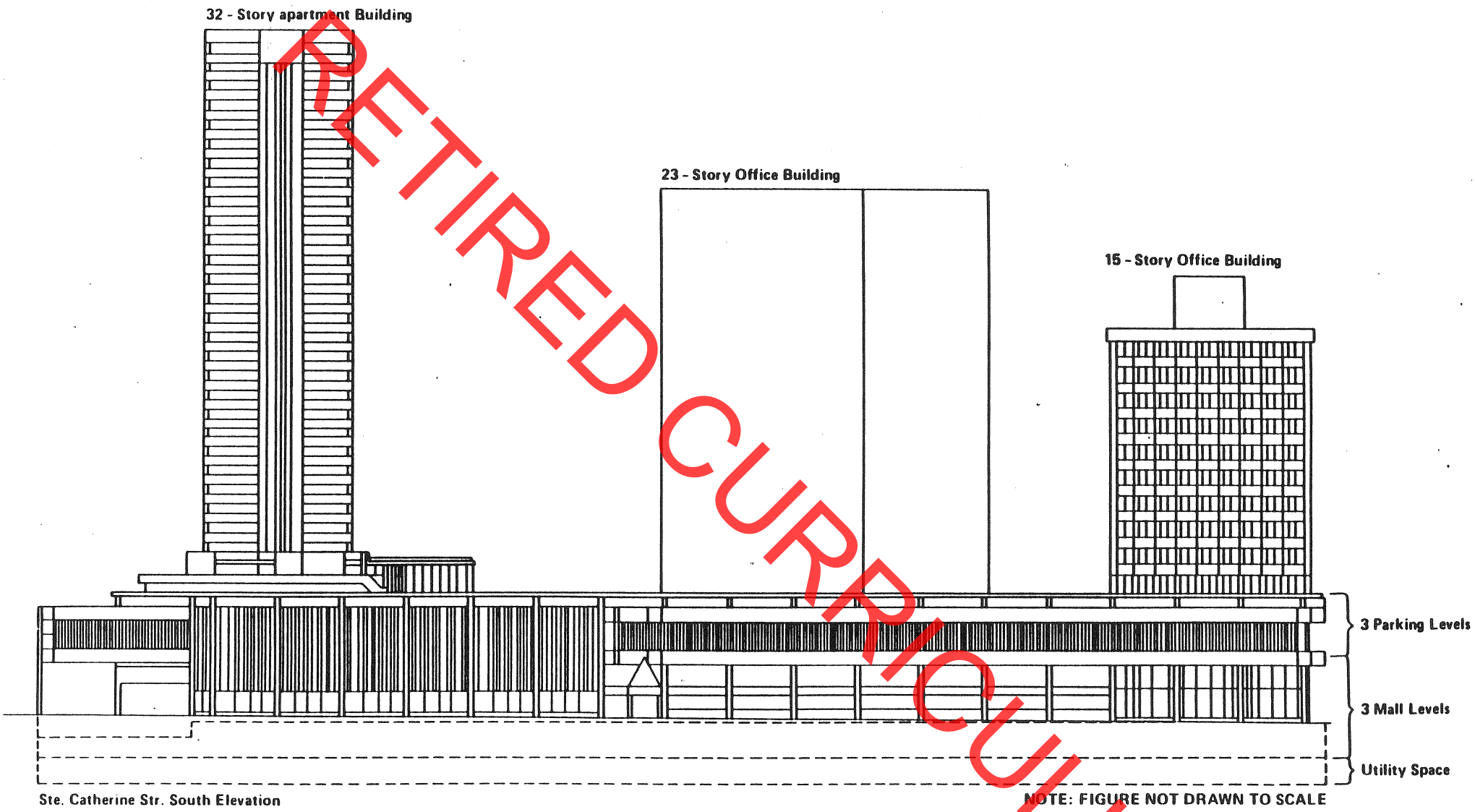

ALEXIS NIHON PLAZA

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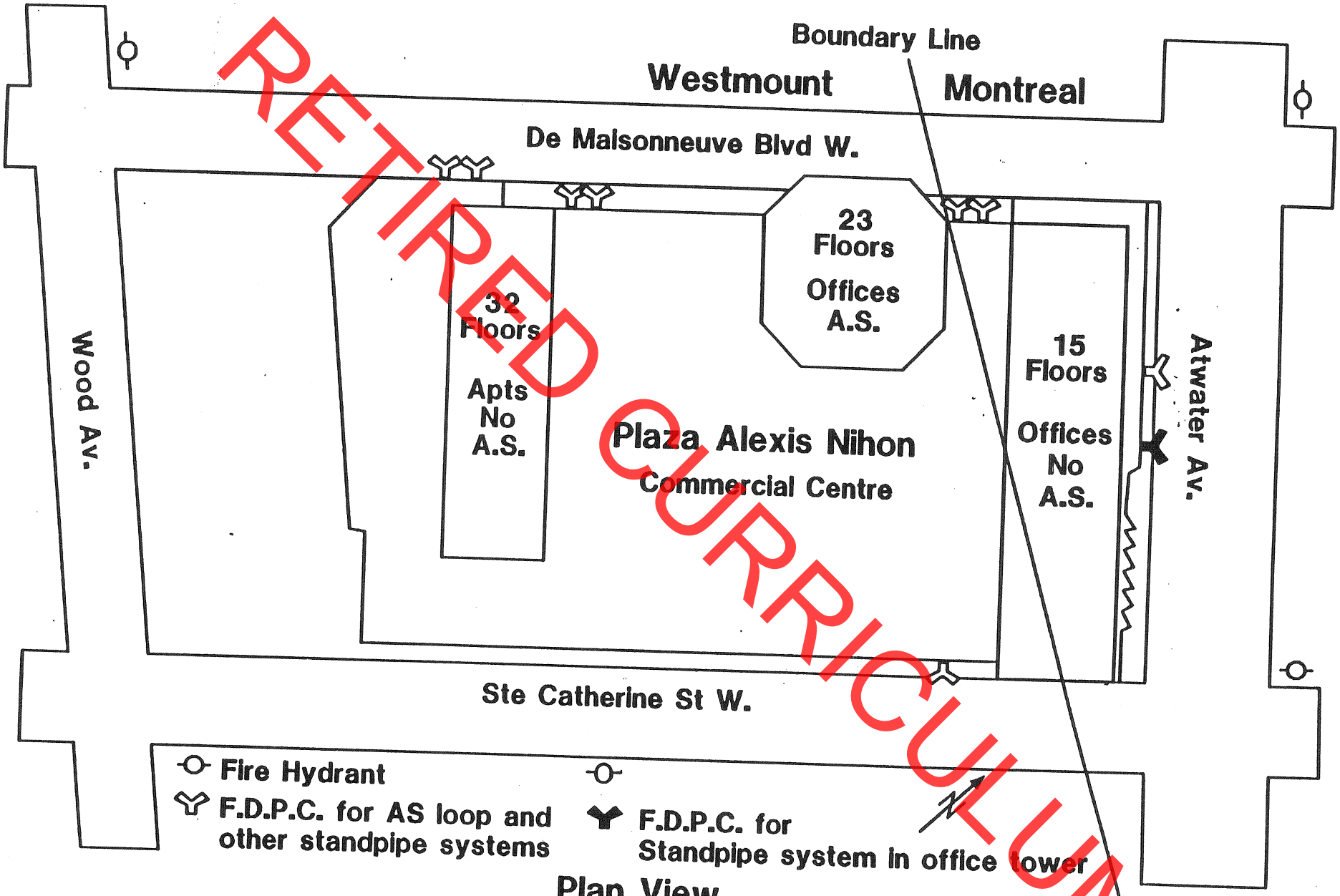

Plan View
Figure 2

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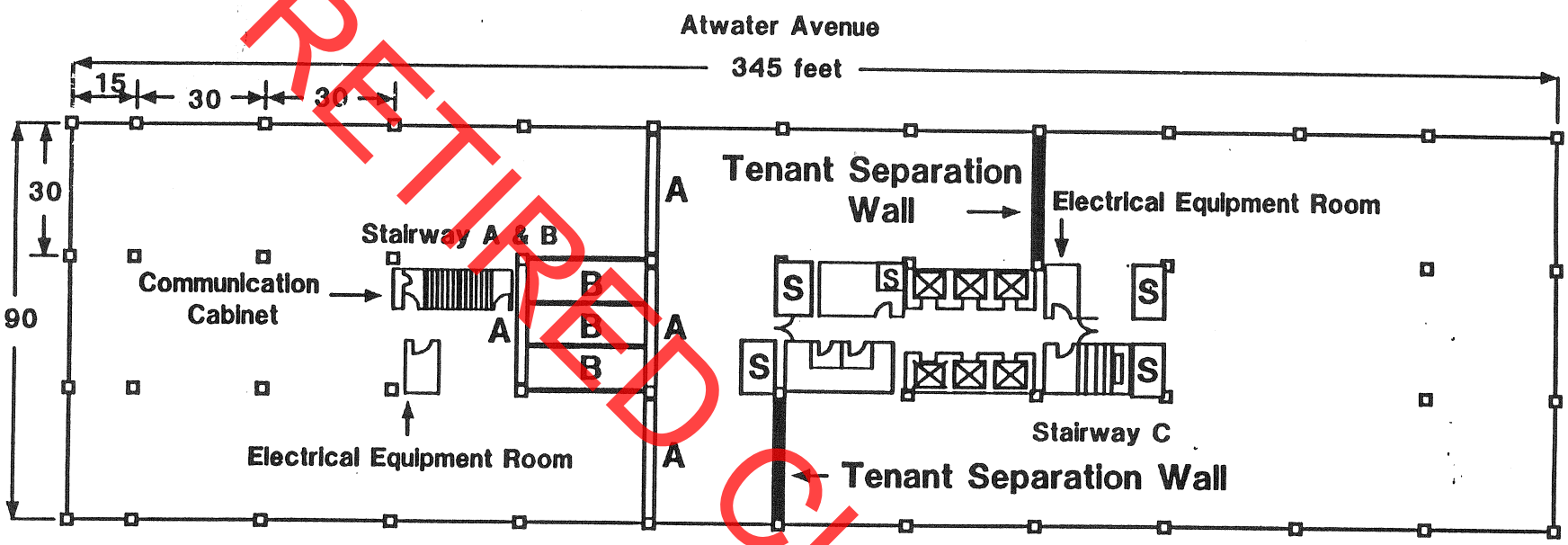

A Girder (W24 X 76)

B Floor Beam (W18 X 40)

Elevator

S Vertical Ventilation Shaft

Dimensions are rounded to the closest 5 feet

Assume North

True North

Alexis Nihon Plaza Office Building

Tenth Floor Plan Not to Scale

Figure 3

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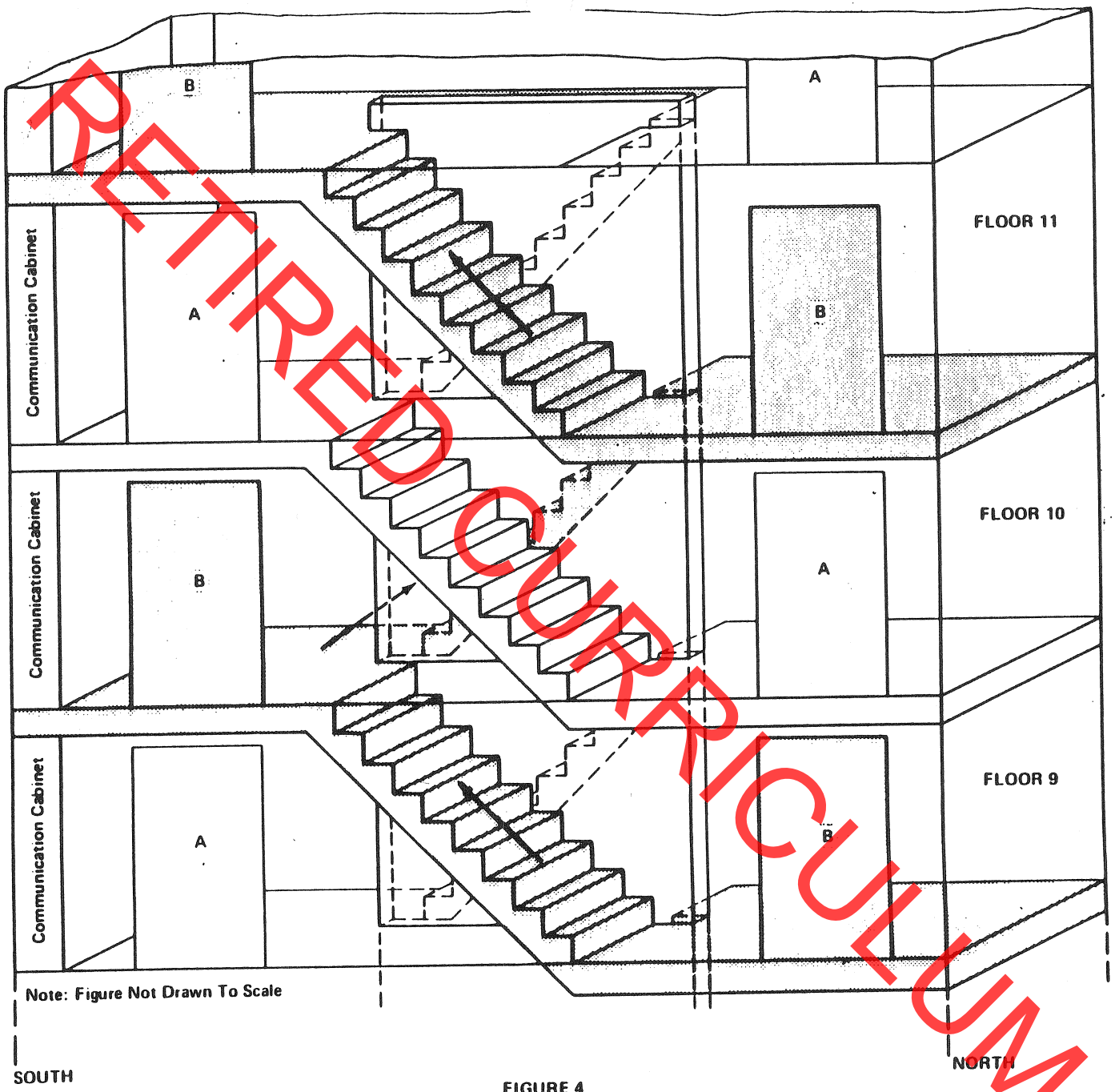

FIGURE 4
SCISSOR STAIRCASE DIAGRAM

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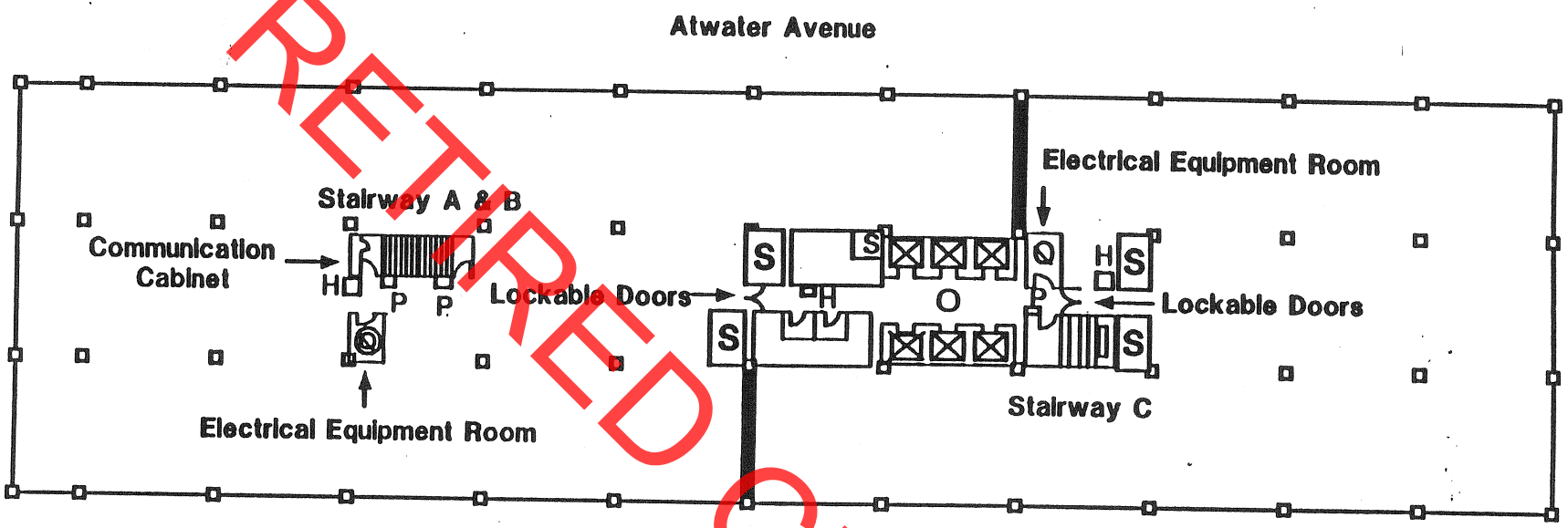

Smoke Detector
Heat Detector
H Hose Cabinet
P Pull Station
Elevator
S Vertical Ventilation Shaft

Assume North
True North

Alexis Nihon Plaza Office Building

Tenth Floor Plan Not to Scale

Figure 5

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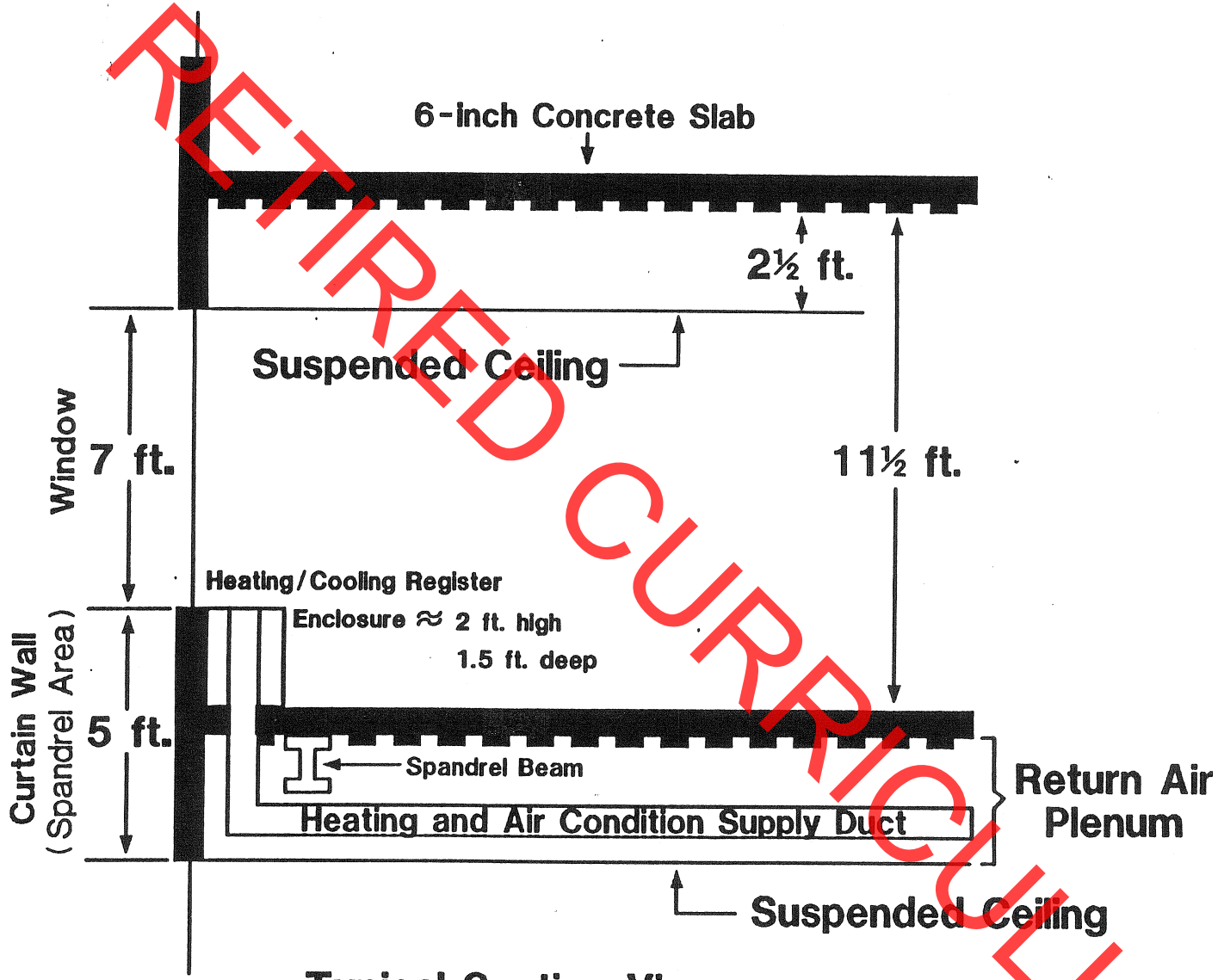

Typical Section View
Figure 6

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VENTILATION

The migration of smoke and toxic combustion products throughout a high rise building may often present a greater hazard to life and firefighting efforts than the spread of the fire itself. Smoke patterns within a high-rise building are usually characterized by the movement of air from lower to upper floors by way of vertical shafts, poke-through construction, Heating, Ventilation, and Air Conditioning (HVAC) Systems, etc. During fires, the ability of air to migrate through a high-rise building frequently results in the spread of smoke and toxic gases to areas far removed from the actual fire, which may cause vertical and horizontal escape routes to become impassable, and fire suppression efforts to be hampered. Due to the height of high-rise buildings, smoke movement "characteristics," such as potential stratification of smoke on one or several floors, present unique and varied ventilation problems. A well planned approach to ventilation with specific plans for the effective use of personnel and equipment is essential. Additionally, when ventilation operations are necessary, a clear understanding of the parameters (building and air movement characteristics) imposed by high-rise buildings is necessary.

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I. BUILDING CHARACTERISTICS

The following characteristics are common to high-rise buildings and can affect the travel of containments within a building and assist or hamper ventilation operations:

A. Stairshafts and Elevators

Stairshafts and elevators may be located in a central core (known as a center core building), or can be randomly located within a building. These vertical passageways provide excellent channels for the travel of smoke, and are also utilized by occupants and Fire Department personnel to exit or access the interior floors. Elevators and stairshafts may be constructed as follows:

<u>Elevators</u>

1. Elevators may service all floors of a building (service elevator). These elevator shafts run the entire height of a building.

2. Elevators may service only selected floors of a building (P-4 through 1), or banked elevators (i.e., 1-15 and 15-30, etc.).

<u>Stairshafts</u>

1. Stairshafts may service all floors of a building.

2. Stairshafts may service odd or even floors of a building (scissor stairways).

3. Stairshafts may service selected floors of a building (P-4 through 1).

4. Stairshafts amy or may not terminate onto the roof.

5. Stairshafts in high-rise buildings constructed after 1974 are required to employ a Stairshaft Ventilation System. Pressurization fans that function when the sprinkler or smoke detector system are activated, are required to provide a uniform air velocity within each enclosed stairshaft. The fans must provide not less than 509 cubic feet per minute while maintaining a positive pressure of not over 25 pounds on interior doors. The air is then vented to the exterior of the building.

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B. HVAC Systems

Heating, ventilation, and air conditioning (HVAC) systems can form natural channels for the distribution of smoke within a building. These systems may be operated by manual or automatic systems.

C. Unsealed Openings

Depending on various factors such as the type of construction and various unsealed openings between the floors of a high-rise building (plenums, elevators shafts, pipe and electrical alleys), a high-rise building will "leak internally" (movement of air, smoke, etc.) between the floors and into the stairshafts.

D. Sealed Buildings

Most high-rise buildings can be classified as "sealed buildings" (external glass panels are not openable). These buildings control their internal environment (temperature, humidity, etc.) by HVAC Systems and are capable of retaining smoke, heat, and fire gases until they are manually ventilated to the exterior of the building.

II. AIR MOVEMENT CHARACTERISTICS

Air movement within a high-rise building can assist or hamper ventilation operations. Therefore, an understanding of basic air movement characteristics is essential in formulating effective ventilation operations. Smoke movement within a high-rise building can be affected by the following characteristics:

A. As previously mentioned various construction factors, high-rise buildings will "leak" between floors and from floors into stairshafts. Smoke can travel between floors due to different types of construction such as unsealed openings, spaces or cracks between floors, and "poke through" construction (openings utilized for pipes, elevator shafts, electrical alleys, etc.). Additionally, the pressure generated by a fire (up to three times atmospheric pressure) will force smoke through these openings and may contaminate other floors or stairshafts within the building.

B. Mushrooming and Stratification

The formation of stratified smoke and fire gases on floors below the top floor in multi-story buildings is enhanced in high-rise buildings due to their height and open vertical passageways (such as stairshafts). Stratification of smoke and fire gases occurs as heat and smoke travel vertically within

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a building. These products of combustion will rise through any available vertical openings, cooling as they rise, until their temperature is equal to the temperature of the surrounding air. When stabilization of the temperature occurs, smoke and fire gases will form layers or clouds within the building (Figure 1). This stratification of smoke and fire gases generally serves as a "lid" for other products of combustion which will tend to bank down below the stratified smoke and horizontally spread to other portions of a building. This process is common in vertical stairshafts.

Mushrooming is a condition caused by smoke and fire gases that cannot vertically escape a building. smoke and fire gases will rise to the highest level possible and then begin to bank down and fill all available spaces (Figure 2). Mushrooming smoke and fire gases can contaminate the upper floors, or contaminate the floors below stratified smoke in a stairshaft. Smoke may bank down below the fire floor. In stairshafts, this may occur all the way to the entrance level.

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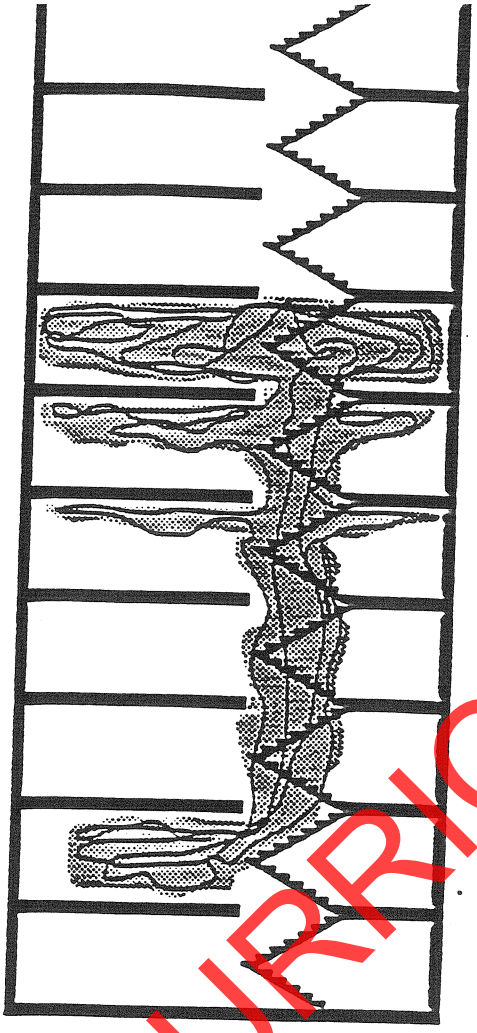

Figure #1

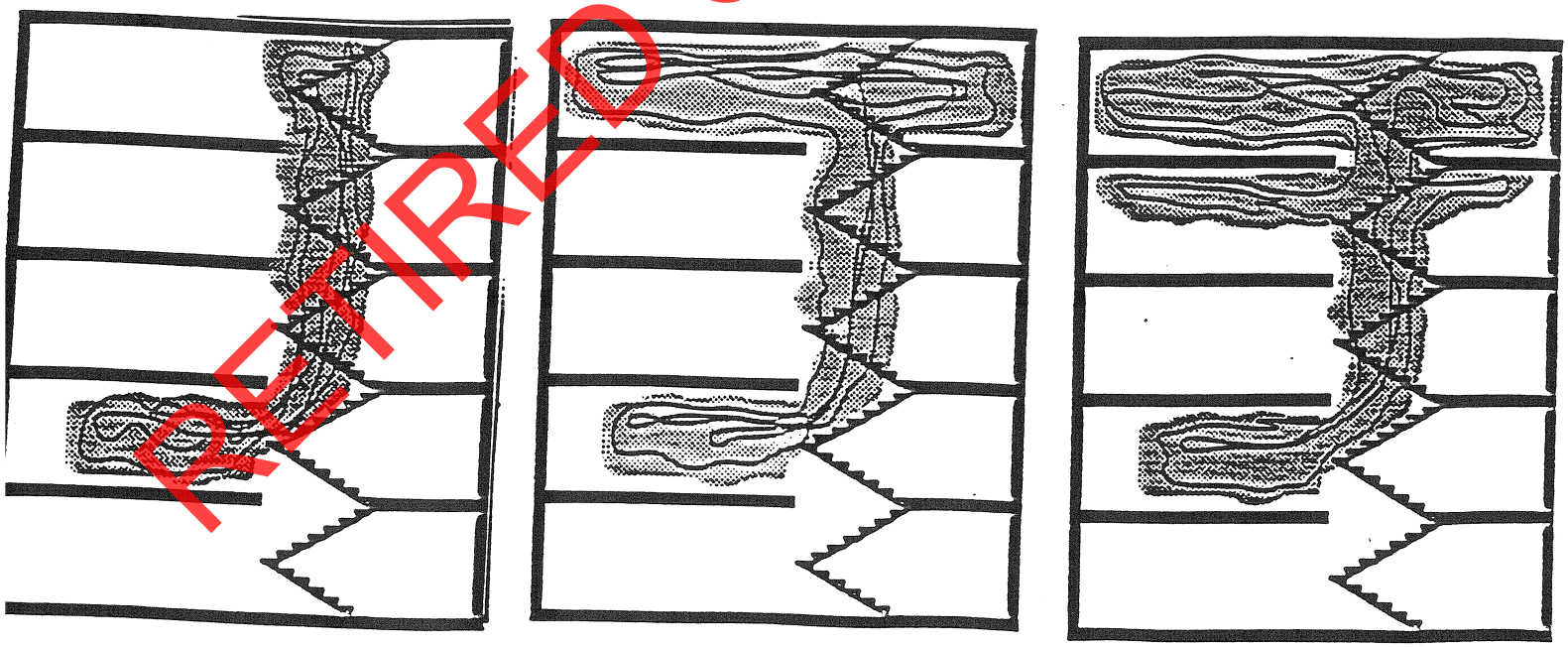

Figure #2

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C. Doors

Open passageways created by doors that have been opened or inadvertently "left open" will allow smoke to travel horizontally and/or vertically to additional areas within a building. It is essential that the status of doors that may effect the travel of smoke from a contaminated area to be monitored. Stairshaft doors must receive special consideration. Doors to stairshaft enclosures that are left open will allow smoke and heat to be drawn into stairshafts, creating an exposure problem to personnel in the stairshaft and/or upper levels of a building.

D. Windows

Openings created by windows that have been removed/opened will allow smoke to travel horizontally to the exterior of a building. Panels or windows in the exterior walls that are not openable may need to be removed/broken to create ventilation openings to the exterior of a high-rise building.

In the city of Los Angeles, windows in exterior walls that can be used for the removal of heat and smoke are required as follows:

* Pre-1960 - Openable windows

* Post-1960 - Tempered glass on at least two sides of the building. (At corners, and at 50 foot intervals or less)

* Post-1974 - Tempered glass on four sides of the building. (At corners, and at 50 foot intervals or less.)

Tempered glass windows are identified by three inch luminous or reflective decals in a lower corner which indicates they are "For Fire Department Use."

NOTE: Openable windows or mechanical smoke removal systems may be substituted for tempered glass.

Prior to breaking windows, a radio notification shall be made delineating the glass breaking and appropriate side of the building.

A reasonable attempt should be made to coordinate glass breaking with personnel at street level to ensure that the area of fallout is clear of people.

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E. HVAC systems

Heating, Ventilation, and Air Conditioning Systems (HVAC) are utilized to control the internal environment of high-rise buildings. Many HVAC Systems incorporate remote controlled dampers at the supply and return ducts on each floor. These dampers can be closed to prevent heat loss during periods when the building is unoccupied (conservation of energy), and can be opened to supply "conditioned" air to floors within the building as necessary.

HVAC Systems can cause the spread of smoke through the building. However, a HVAC System within a high-rise building can also assist in the removal of smoke by utilizing the building system to selectively supply and/or exhaust air from areas or floors within a building. Unfortunately, many variations are found in HVAC Systems. Systems many be manually or automatically activated by smoke detectors. Some systems may use a combination or manual or automatic activation. Unless personnel are totally familiar with a HVAC System encountered at an incident, the HVAC System should be shut down until proper operation has been verified. This will wnable the effective and timely utilization of a particular system and/or prevent the accidental spread of heat, smoke, and other contaminants.

F. Stairshafts

Stairshafts provide natural channels for the flow of smoke and fire gases within a high-rise building. When openings are created (open doors) at the top and bottom of stairshafts, a natural upward flow of air will quickly develop. This natural upward flow of air can also be utilized to assist in the removal of smoke and fire gases within the stairshaft or building.

For Ventilation purposes, stairshafts can be placed in two categories as follows:

1. STAIRSHAFTS THAT OPEN TO THE INTERIOR ONLY OF A BUILDING AND PROVIDE ROOF ACCESS (Figure 3).

   Tests have indicated that regardless of the atmospheric temperature or humidity, any natural movement of air is almost always upward. However, natural air flow within these stairshafts is virtually static in buildings up to 25 stories and buildings over 25 stories will naturally flow minimal amounts of air in an upward direction.

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Therefore, ventilation efforts directed at removing contaminants in these stairshafts must be augmented by operations other than utilizing natural air flow to remove contaminants.

2. STAIRSHAFTS THAT OPEN TO THE EXTERIOR OF A BUILDING AND PROVIDE ROOF ACCESS (Figure 4).

Again, tests have indicated that regardless of the atmospheric temperature or humidity, any natural movement of air is almost always upward. However, natural air flow within these stairshafts can be significant.

Natural vertical air currents of three to six mph, that flow upward in stairshafts, can be created by simply opening a door at the bottom and roof levels of a stairshaft. these air currents can be effectively utilized to remove contaminants that have collected or are entering a stairshaft from a fire within a building.

Additionally, the natural vertical air flow in a stairshaft ban be created or augmented by the following:

a. Stairshaft Pressurization Fans

By activating these fans within the stairshaft, an upward flow of air will be created when an opening (door, etc.) is created. These fans are normally capable of providing adequate air flows for ventilation operations; however, excessive opening of stairshaft doors will diminish effectiveness.

b. Positive Pressure

Positive pressure created by Fire Department blowers can effectively create or augment the natural flow of air in a stairshaft and result in the discharge of contaminants within a stairshaft by pressurizing the ground level entrance opening to he stairshaft and removing the contaminants through the smoke control dampers (if present) at the top of the stairshaft and/or opening the roof level door. Positive pressure cia also be

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used to augment stairshaft pressurization fans for increased air flow and efficiency.

G. Emergency Smoke Control System

High-rise buildings constructed after 1974 are required to employ an emergency smoke control system that is comprised of the following components:

1. Pressurized stairshaft

2. Mechanical Smoke Removal System, or

3. Tempered glass or openable windows

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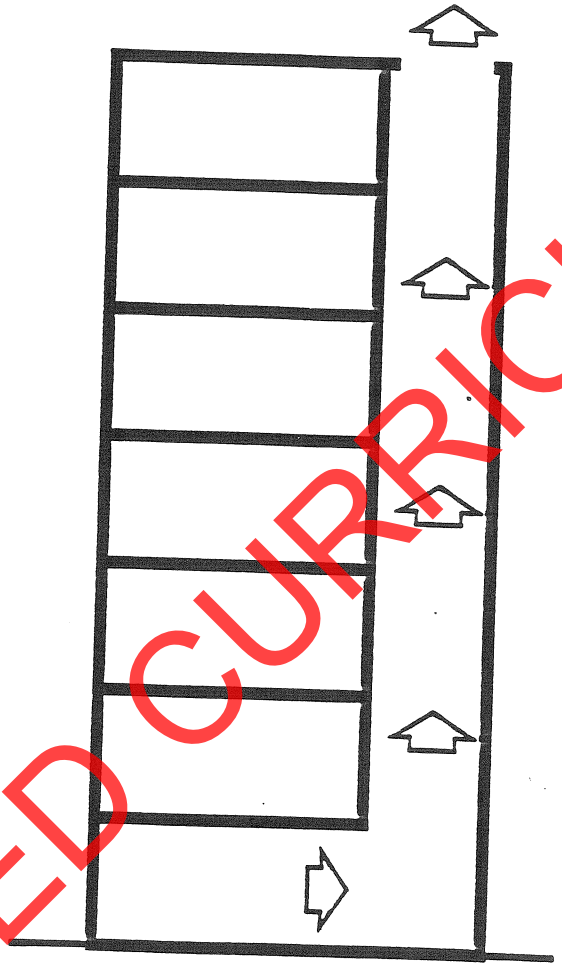

Figure #3

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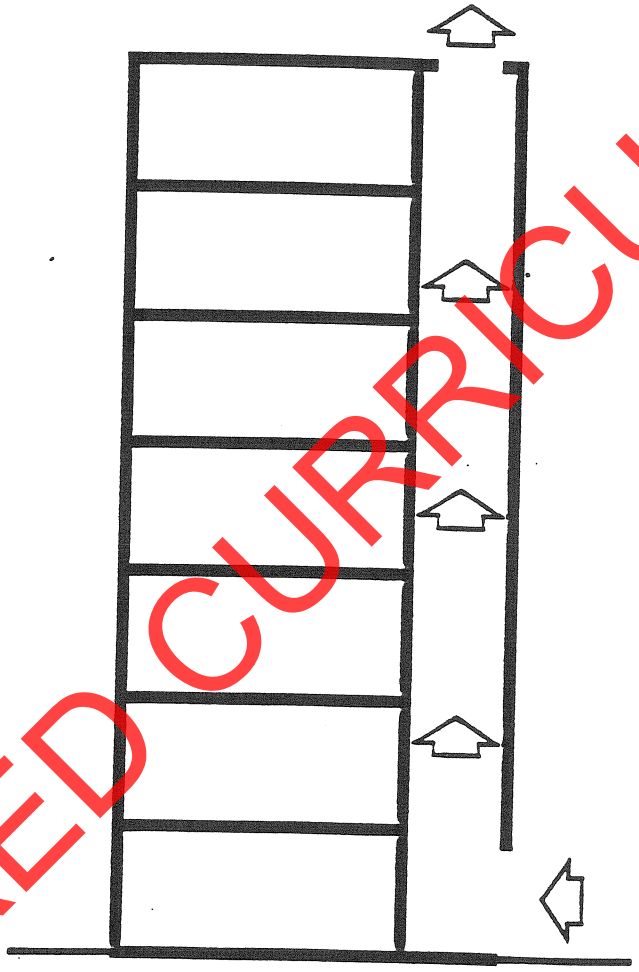

Figure #4

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Operational Guidelines

Is there a fire or are there contaminants from a fire within the building? If so, what is the specific location and extent of the problem.

Remember that most high-rise buildings are "sealed" buildings and are capable of containing extensive fire and smoke with "nothing showing" on the outside of the building. If there is a fire or contaminants in the building, lobby shall be responsible for the following:

A. Building Control room

If the building is equipped with a building control room, or fire control station, the location of the system should be determined. When the room or station has been located, check the status of the following:

1. Smoke indicators for potential location and extension of fire.

2. Designated "FIRE DEPARTMENT" elevators for potential access to and from the fire WHEN the safety of the elevators has been verified by the attack team.

3. Building HVAC System. If sufficient expertise is not available, ensure the system is turned off. This will limit the potential extension of fire and/or contaminants and may be used for potential ventilation of contaminants.

4. Building stairshaft pressurization fans. Activation (manual or automatic) will supply positive pressure to stairshaft(s) or assist in keeping a stairshaft clean of contaminants. Primary emphasis shall be placed on the stairshafts used for evacuation or occupants and/or access by the Fire Department personnel.

B. Stairshafts

Determine the location of all stairshafts within the building, the configuration of the stairshafts, the status of the stairshafts (are they clear, charged with smoke, being used for evacuation, etc.), and the stairshafts that could be used for ventilation operations, if necessary. Emphasis should be placed on determining the stairshafts that open to the roof of the building. These stairshafts can be easily cleared of contaminants, facilitating the use of the stairshafts for evacuation, access, or ventilation operations.

RETIRED CURRICULUM

C. Ventilation Considerations

Lobby shall be responsible for ensuring that stairshafts within the building are pressurized. Primary emphasis shall be placed on the stairshaft utilized by the attack team or stairshaft used to access staging.

1. Positive Pressure

When the preceding factors have been analyzed and a fire or significant contaminants from a fire have been verified within a high-rise building, positive pressure can be utilized at the discretion of the Incident Commander as follows:

NOTE: The following operations may require personnel on the roof <u>and</u> ground for proper coordination.

2. Vertical Ventilation

By opening the bottom door to a stairshaft and placing blowers to pressurize the door openings on each floor and stairshaft, the following will be accomplished:

a. <u>Evacuate contaminants within the stairshaft</u>.

This operation will require an opening (door, etc.) at eh top of the stairshaft to exhaust the stairshaft contaminants to the exterior of the building (Figure 4). Stairshaft pressurization fans may be utilized "with or without" blowers for this operation.

b. <u>Keep contaminants from entering the stairshaft from fire involved floors</u>.

This operation is most effective with no openings at the top of the stairshaft. However, when air is flowing upward through and pressurizing a stairshaft, contaminants will not be able to accumulate within the stairshaft.

3. Cross Ventilation

Cross ventilation of a contaminated floor in a high-rise building can be effectively accomplished by utilizing blowers or a combination of blowers and stairshaft pressurization fans to pressurize a stairshaft and then directing the flow of pressurized air across the floor to be

RETIRED CURRICULUM

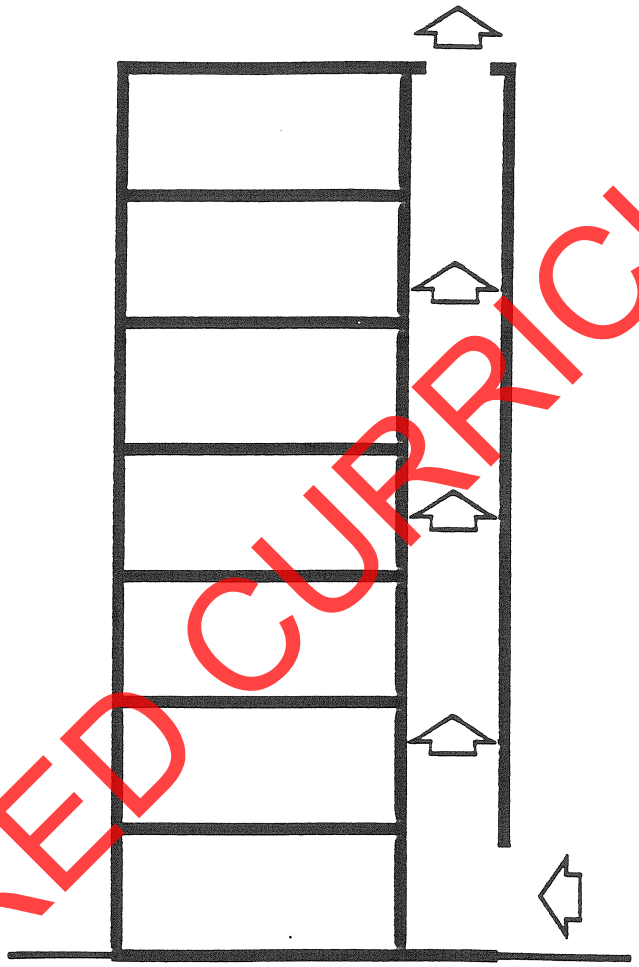

Figure #4

RETIRED CURRICULUM

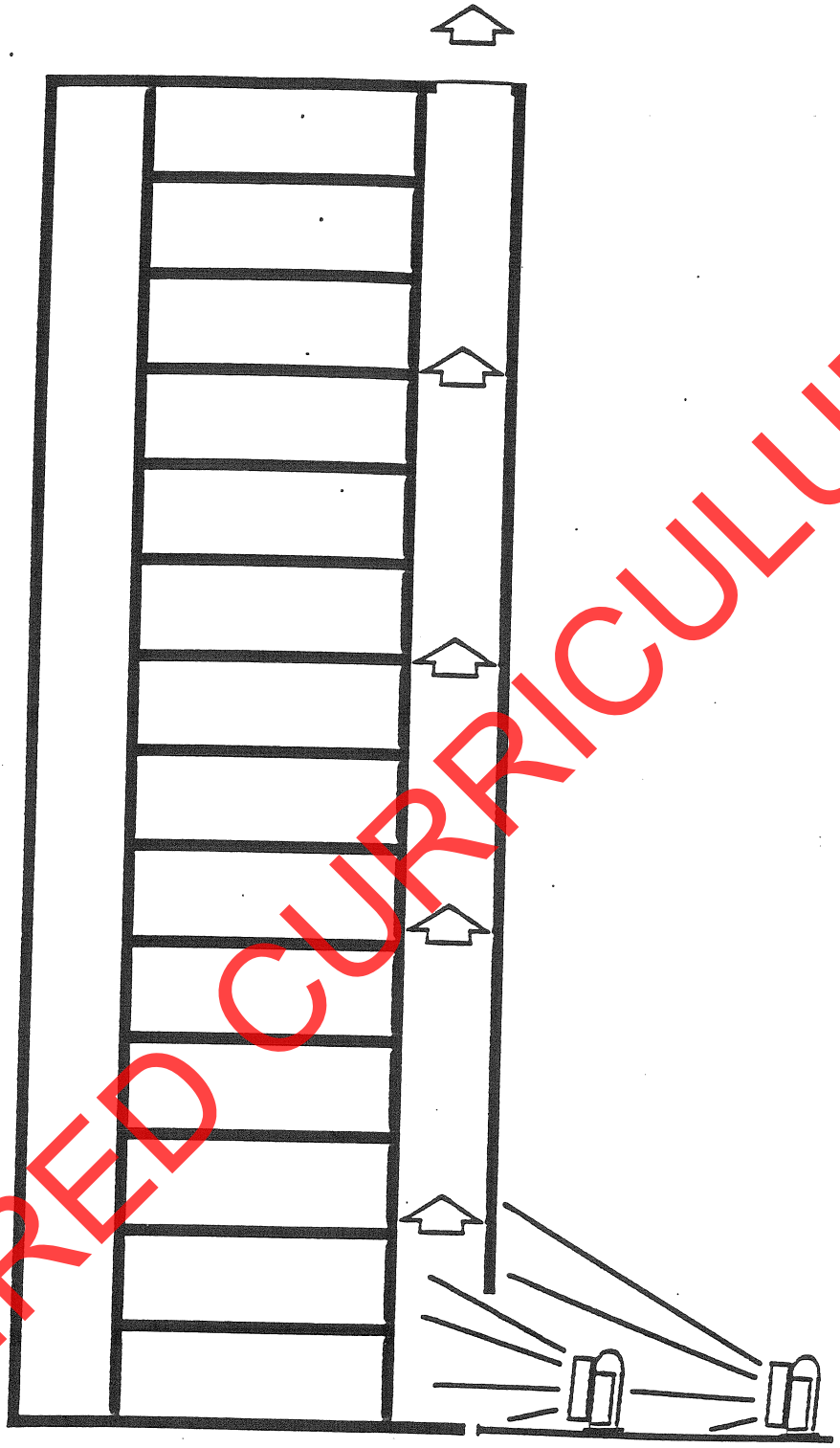

Figure #5

RETIRED CURRICULUM

ventilated as follows:

a. To windows on the contaminated floor that have been opened/broken by personnel or a fire (Figure 6).

If windows must be opened/broken for ventilation purposes, utilize the windows on the leeward side of the building if possible. Have hose lines in place for protection and to prevent fire lapping.

b. To an opposing stairshaft that opens to the roof of the building (Figure 7).

The exhausting contaminants from the effected area will be vertically exhausted from the opposing unpressurized stairshaft with the roof access door open.

The preceding cross ventilation operations are effective up to 25 floors in a high-rise building. If it is necessary to cross ventilate floors above the 25th floor, it may be necessary to utilize an additional blower in the pressurized stairshaft to supply additional pressurized air to the floor to be ventilated (Figure 8). Additional pressurized air may be necessary due to the leakage (through vents, unsealed openings, etc.) in stairshafts over 25 floors high.

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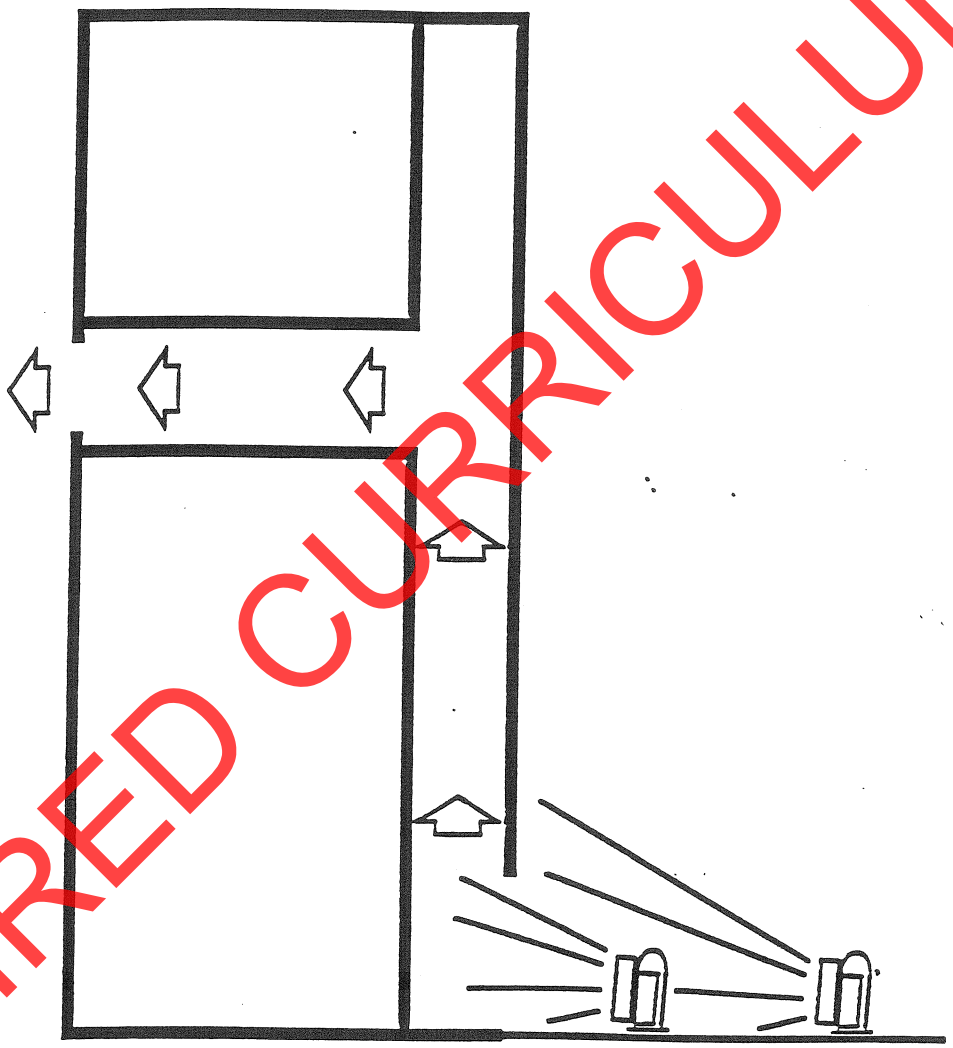

Figure #6

RETIRED CURRICULUM

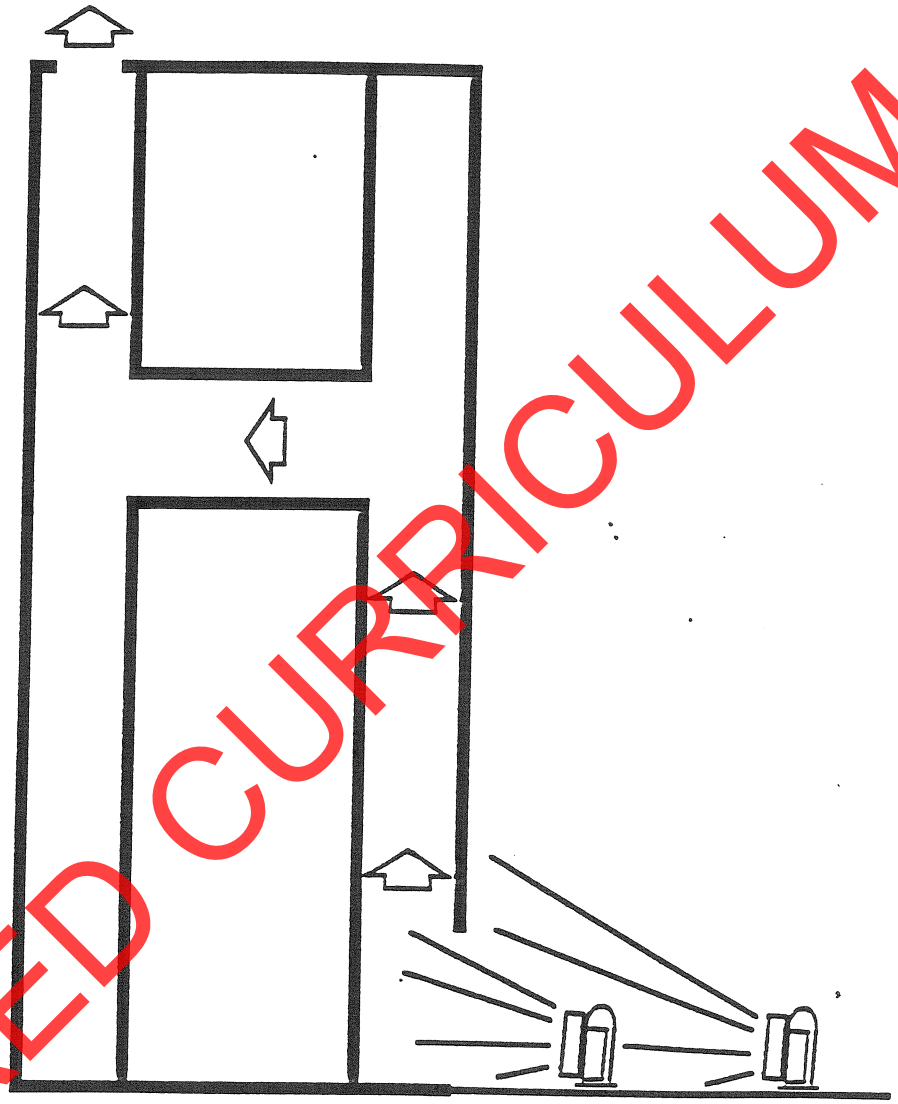

Figure #7

RETIRED CURRICULUM

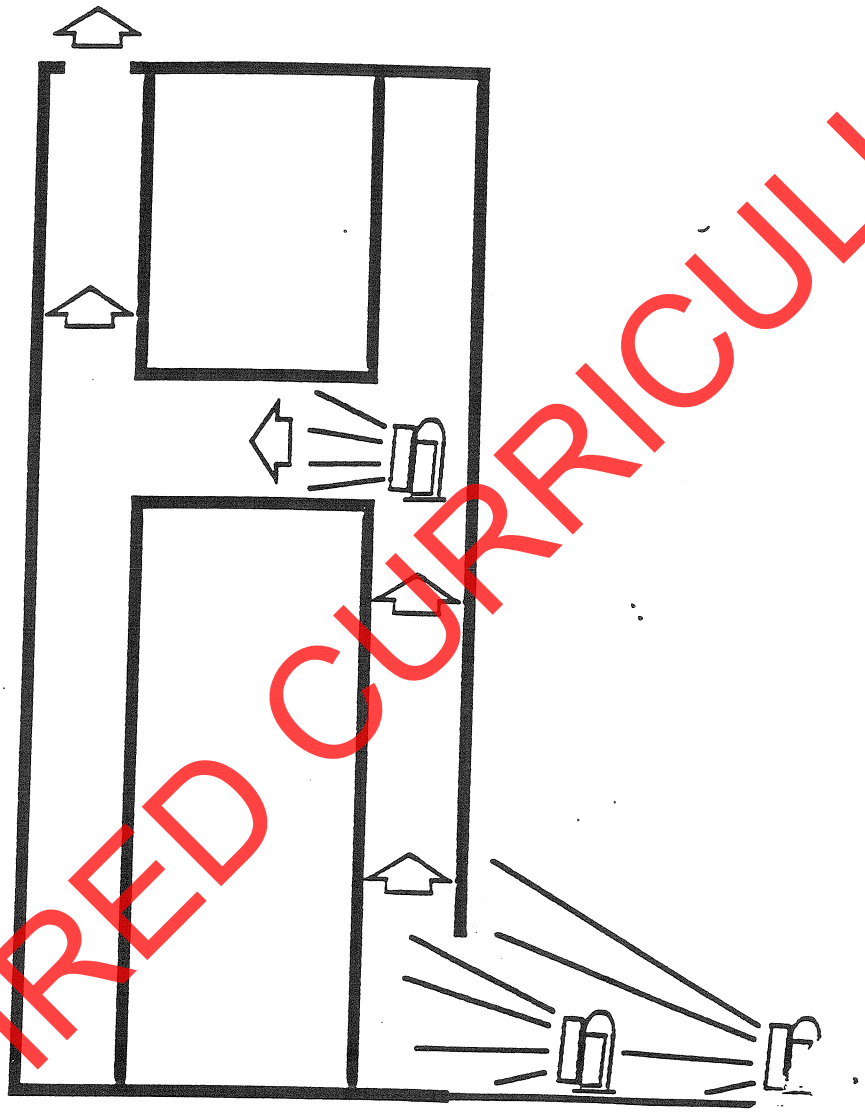

Figure #8

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HIGH RISE OPERATIONS
COMMAND 2C

FIRE SIMULATION EXERCISE

OBJECTIVES:

Participants will demonstrate their understanding of the material presented in this course by assuming various roles during a simulation exercise.

OVERVIEW:

This exercise places class participants in role-playing assignments at a hypothetical high-rise fire incident. The purpose of the exercise is to apply information presented during the course to a simulated high-rise emergency.

The resources used are itemized below. Class participants will be assigned to the various roles of Chief Officers, Company Officers and other functional positions.

Response times are real times from time of dispatch (either A.M. or P.M.). Two students will be assigned the dispatch duties.

Prior to each simulation, students will receive a pre-fire plan of the occupancy.

To facilitate interaction between the various command functional positions that will be used in the exercise, a common incident management system and terminology a presented during this course will be required.

At the conclusion of each exercise a brief critique will be conducted to review the effectiveness of the strategy and tactics employed, utilization of resources and command organization.

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FIRE SIMULATION GROUND RULES:

Assignments:	Two members per assignment. Wear identification badges. Select one member to be in charge. The second member is the assistant. this includes all monitors except the three instructor assistants, C.P. monitors and fire monitors.
Communication:	All companies and Chief Officers will have portable radios. Check radios and frequencies before exercise starts. We will use one frequency (2#).
Time Factors:	Real time will be used, either A.M. or P.M. Delays will be indicated by the instructors. There will be a one-minute per floor delay. Elevator use will be simulated.
Extinguishing Lines:	They will be drawn on a floor plan by an instructor. Take enough hose to reach the fire. SCBA time factors are 10 minutes. If you run out of air without relief, the hose lines will be erased from the floor plan. When you are out of air or relieved, go back to staging.
Equipment:	Equipment cards will be issued to each company. Carry only a reasonable amount. ICS work packets are available at the C.P.
Building Descriptions:	All exercises will be simulated in modern high rise buildings. Base, Lobby, Staging and various floors will be identified by signs.
Monitors:	Students not assigned to positions will be assigned as monitors and instructor assistants.
I.C.S. Protocols:	There will be a change of command. Battalion Chiefs and Assistant Chiefs will take charge upon arrival at the scene.

NOTE: TURN IN ALL EQUIPMENT CARDS, RADIOS, AND NAME BADGES AT THE CONCLUSION OF EACH EXERCISE.

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SIMULATION EXERCISE

TOTAL RESOURCES FOR SIMULATIONS

Fire Department:	Three platoons. Total on duty = 41
On-duty make up:	1 A/C (on-call) 3 B/C's - B/C-1, B/C-2, B/C-3. 7 engine companies E-1, 2, 3, 4, 5, 6, 7. (E-Co. staffing 3 members) 4 truck companies T-1, 3, 5, 7. (T-Co. staffing 4 members)
Recall of the off-duty platoon:	30 member - takes 30 minutes. 30 member - takes 60 minutes. No reserve apparatus. 2 county Mobile air Units-25 cylinders each.
Mutual Aid:	Request resources as needed. Response time will be 15 to 30 minutes.
Other resources:	Helicopter is available from the army - takes 30 minutes. Police. Utilities, Red Cross, elevator repair, and any other resources will be simulated.

CONCLUSION OF THE EXERCISE

The exercise will continue until all chief officers and companies are in their functional positions and the appropriate resources have been requested and committed or placed in Base. When it is apparent that the strategy and tactics have been successful or unsuccessful in controlling the incident, the simulation will be concluded.

At the conclusion of each simulation, a brief incident analysis will be conducted with the entire class present. Discussion should center on command organization, strategy and tactics employed, and any problems encountered by the various functional and command positions.

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SECTION 14: FIRE RECORD SHEET

FIRE RECORD SHEET
(RESOURCE AND SITUATION STATUS RECORD)

Keeping track of your resources and their status is a basic prerequisite to maintaining control of the scene of any emergency incident and is especially critical in high rise operations. As an incident commander (whether you're the first-in company, first-in battalion chief or chief of the department) you have to know what you have, where they are and what they are doing.

The following five pages are examples of the Fire Record Sheet This form is a tool to help you, as incident commander, to keep track of the situation and the resources at hand or en route. Most of the boxes and lines are self explanatory.

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EXAMPLE #1

ENR

The first thing that is listed is the first alarm assignment **by company** (as opposed to task force, group, etc.). Listing by company helps keep track of assignments and total resource count.

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EXAMPLE #1

RESOURCE and SITUATION STATUS RECORD

Time/Alarm	Address	Unit No.	Inc. No.	Date
2203	391 S. HILL ST 18TH FLOOR		640	11/11

Time/Scene	Occupancy - Size/Type	Dispatch Ch.	TAC.	TAC.	TAC.	TAC.
2207	22 STORY OFFICE	7	12			

1st Scene	DBA / Occupant	Telephone	Property Loss	Contents Loss
Agent Appl.	Owner	Telephone	Exposure Loss	Exposure Loss
Knockdown	Owner Address		Civ. Inj.	Civ. Fatal	F.D. Inj.

RESOURCES

CO. ENR.	ONS	ASSIGNMENT	AVI
T9	/		
E9	/		
T10	/		
E10	/		
E3	/		
BC1	/		

RESOURCES

DIV	TAC

SITUATION

AQMD	Gas Co.
Arson Unit	Helicops/Air Recon.
Bldg. Engineer	HMRU/Comm. Unit
Cal. Trans.	L.A. County Health
Coast Guard	PIO
Code 20/SigAlert	Police/CHP/DOT
D.W.P.	R.A.s
Elevators	Staff /Chief Officers
Emergency Air	Stairwells
F.A.A./N.T.S.B.	Telephone Co.
Fish and Game	Vent./Air Cond.
Food Srv./Red Cross	Water Supr

IC (Location)	Safety Officer	
Staging (Location)	Medical Group/Branch	TAC.
Base (Location)	Tunnel Division/Branch	TAC.
Operations	Ventilation Group/Roof Division	TAC.
Plans	Hazmat Group	TAC.
Logistics	Evacuation Group	TAC.
Lobby	Elevator Group	TAC.
Recon Officer	Rescue Group	TAC.
Liaison	Salvage Group	TAC.
Public Information Officer		

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EXAMPLE #2

ONS

A check in this box indicates that the company is on scene and if nothing is indicated in the assignment box the company should be in base.

ASSIGNMENT

As companies are given assignment it is briefly listed in this space. Also enter which stairshift is being used when appropriate.

On the right under RESOURCES is a floor indicator diagram. Indicate the fire floor in the division box (in this case 18).

While companies are going to work, there is time to enter the information at the top of the form, e.g: Time/Alarm, Address, Date, Incident No., Frequency Identification, Identify Dispatch, and Tactical Channels, etc.

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EXAMPLE #2

RESOURCE and SITUATION STATUS RECORD

Time/Alarm	Address	Unit No.	Inc. No.	Date
2203	391 S. HILL ST 18TH FLOOR		640	11/11

Time/Scene	Occupancy - Size/Type	Dispatch Ch.	TAC.	TAC.	TAC.	TAC.
2207	22 STORY OFFICE	7	12.			

1st Scene	DBA / Occupant	Telephone	Property Loss	Contents Loss
TF9				
Agent Appl.	**Owner**	**Telephone**	**Exposure Loss**	**Exposure Loss**
Knockdown	**Owner Address**		**Civ. Inj.**	**Civ. Fatal** / **F.D. Inj.**

RESOURCES

CO. ENR.	ONS	ASSIGNMENT	AVI
T9	X	LOBBY	
E9	X	FIREATTACK STAIR 4	
T10	X	VENTILATION	
E10	X	FIREFLOOR STAIR 4	
E3	X	STAGING	
BC1	X	IC	

RESOURCES

DIV	TAC
18	12

SITUATION

IC (Location)	Safety Officer
Staging (Location)	Medical Group/Branch TAC.
Base (Location)	Tunnel Division/Branch TAC.
Operations	Ventilation Group/Roof Division TAC.
Plans	Hazmat Group TAC.
Logistics	Evacuation Group TAC.
Lobby	Elevator Group TAC.
Recon Officer	Rescue Group TAC.
Liaison	Salvage Group TAC.
Public Information Officer	

	AQMD		Gas Co.
	Arson Unit		Helicops/Air Recon.
	Bldg. Engineer		HMRU/Comm. Unit
	Cal. Trans.		L.A. County Health
	Coast Guard		PIO
	Code 20/SigAlert		Police/CHP/DOT
	D.W.P.		R.A.s
	Elevators		Staff /Chief Officers
	Emergency Air		Stairwells
	F.A.A./N.T.S.B.		Telephone Co.
	Fish and Game		Vent./Air Cond.
	Food Srv./Red Cross		Water Supr.

RETIRED CURRICULUM

EXAMPLE #3

When you call for help, list the companies called for by type only in the ENR column. In this case, 3 truck companies, 3 engine companies and an additonal battalion chief were called for.

Use the check-off boxes at the bottom as a reminder for special requests to indicate what requests you have made (by checking the appropriate box) and enter the time you made the request.

RETIRED CURRICULUM

EXAMPLE #3

RESOURCE and SITUATION STATUS RECORD

Time/Alarm	Address	Unit No.	Inc. No.	Date
2203	391 S. HILL ST 18TH FLOOR		640	11/11

Time/Scene	Occupancy - Size/Type	Dispatch Ch.	TAC.	TAC.	TAC.	TAC.
2207	22 STORY OFFICE	7	12			

1st Scene	DBA / Occupant	Telephone	Property Loss	Contents Loss
TF9				

Agent Appl.	Owner	Telephone	Exposure Loss	Exposure Loss

Knockdown	Owner Address	Civ. Inj.	Civ. Fatal	F.D. Inj.

RESOURCES

CO. ENR.	ONS	ASSIGNMENT	AVI
T9	X	LOBBY	
E9	X	FIRE ATTACK STAIR 4	
T10	X	VENTILATION	
E10	X	FIRE FLOOR STAIR 4	
E3	X	STAGING	
BC1	X	IC	
T			
E			
T			
E			
T			
E			
BC			
BC			
DIV			
RA3			
RA4			

RESOURCES

DIV	TAC
18	12

SITUATION

IC (Location)	Safety Officer
Staging (Location)	Medical Group/Branch TAC.
Base (Location)	Tunnel Division/Branch TAC.
Operations	Ventilation Group/Roof Division TAC.
Plans	Hazmat Group TAC.
Logistics	Evacuation Group TAC.
Lobby	Elevator Group TAC.
Recon Officer	Rescue Group TAC.
Liaison	Salvage Group TAC.
Public Information Officer	

	AQMD		Gas Co.
✓	Arson Unit 2220		Helicops/Air Recon.
	Bldg. Engineer		HMRU/Comm. Unit
	Cal. Trans.		L.A. County Health
	Coast Guard		PIO
✓	Code 20/SigAlert 2220	✓	Police/CHP/DOT 2210
	D.W.P.	✓	R.A.s 2220
	Elevators		Staff /Chief Officers
✓	Emergency Air 2210		Stairwells
	F.A.A./N.T.S.B.		Telephone Co.
	Fish and Game		Vent./Air Cond.
	Food Srv./Red Cross		Water Supp.

RETIRED CURRICULUM

EXAMPLE #4

When the dispatcher gives you the identification of the companies being dispatched in response to your request, list them next to the company type that you already entered in the ENR column.

RETIRED CURRICULUM

EXAMPLE #4

RESOURCE and SITUATION STATUS RECORD

Time/Alarm	Address	Unit No.	Inc. No.	Date
2203	391 S. HILL ST 18TH FLOOR		640	11/11

Time/Scene	Occupancy - Size/Type	Dispatch Ch.	TAC.	TAC.	TAC.	TAC.
2207	22 STORY OFFICE	7	12			

1st Scene	DBA / Occupant	Telephone	Property Loss	Contents Loss
TF9				

Agent Appl.	Owner	Telephone	Exposure Loss	Exposure Loss

Knockdown	Owner Address	Civ. Inj.	Civ. Fatal	F.D. Inj.

RESOURCES

CO. ENR.	ONS	ASSIGNMENT	AVI
T9	X	LOBBY	
E9	X	FIRE ATTACK STAIR 4	
T10	X	VENTILATION	
E10	X	FIRE FLOOR STAIR 4	
E3	X	STAGING	
BC1	X	IC	
T4	\		
E4	\		
T11	\		
E11	\		
T17	\		
E17	\		
BC11	\		
BC7	\		
Div 1	\		
RA3	\		
RA4	\		

RESOURCES

DIV	TAC
18	12

SITUATION

IC (Location)	Safety Officer
Staging (Location)	Medical Group/Branch TAC.
Base (Location)	Tunnel Division/Branch TAC.
Operations	Ventilation Group/Roof Division TAC.
Plans	Hazmat Group TAC.
Logistics	Evacuation Group TAC.
Lobby	Elevator Group TAC.
Recon Officer	Rescue Group TAC.
Liaison	Salvage Group TAC.
Public Information Officer	

	AQMD		Gas Co.
✓	Arson Unit 2220		Helicops/Air Recon.
	Bldg. Engineer		HMRU/Comm. Unit
	Cal. Trans.		L.A. County Health
	Coast Guard		PIO
✓	Code 20/SigAlert 2240	✓	Police/CHP/DOT 2210
	D.W.P.	✓	R.A.s 2220
	Elevators		Staff /Chief Officers
✓	Emergency Air 2210		Stairwells
	F.A.A./N.T.S.B.		Telephone Co.
	Fish and Game		Vent./Air Cond.
	Food Srv./Red Cross		Water Supp

RETIRED CURRICULUM

EXAMPLE #5

As information becomes available, make notes that will be helpful to you in tracking the situation and the resources (and who, by name, in charge of them, where it is appropriate); e.g., on the fire floor(18) the situation is one office unit that is well involved with four companies on the ifew floor under division 18.

Additonal information at the top will be filled in as it becomes available.

As the chain of command changes be sure to know and record who replaced whom, (usually by drawing a single line through the person's name who was replaced and entering above or below, the name of the person who replaced him).

Continually cross check the situation and resource information on the right against the resource column on the left. (It should agree.)

AVI

As demobilization takes place and companies are made available to the dispatcher, the AVI box is checked. (A time may be entered if helpful.)

RETIRED CURRICULUM

EXAMPLE #5

RESOURCE and SITUATION STATUS RECORD

Time/Alarm	Address	Unit No.	Inc. No.	Date
2203	391 S. HILL ST 18TH FLOOR		640	11/11

Time/Scene	Occupancy - Size/Type	Dispatch Ch.	TAC.	TAC.	TAC.	TAC.
2207	22 STORY OFFICE	7	12	14		

1st Scene	DBA / Occupant	Telephone	Property Loss	Contents Loss
TF9	PEFEO, GILLIS & CO			

Agent Appl.	Owner	Telephone	Exposure Loss	Exposure Loss
2235	METRO BANK			

Knockdown	Owner Address	Civ. Inj.	Civ. Fatal	F.D. Inj.
	SAN FRANCISCO CA			

RESOURCES

CO. ENR.	ONS	ASSIGNMENT	AVI
T9	X	LOBBY	
E9	X	FIREATTACK STAIRY	
T10	X	VENTILATION	
E10	X	FIRE FLOOR STAIRY	
E3	X	STAGING	
BC1	X	~~IC~~ PLANS	
T4	X	BASE 7TH/GRAND	
E4	X	FIREFLOOR STAIRY	
T11	X	FIREFLOOR STAIRY	
E11	X	STAGING	
T17	\		
E17	\		
BC11	X	DIVIS/FIREFLOOR	
BC7	X	OPERATION	
DIV1	X	IC	
RA3	\		
RA4	\		

RESOURCES

DIV	TAC	
	14	MECH VENT SHUTDOWN STAIRSHAFT 4 DOOR OPEN VENTILATION
18	12	OFFICE UNIT W/W CORRIDOR WELL INVOLVED
		STAGING E3 (16)

SITUATION

T10 EVERETT
BC-11 - DINGER E10 - HALL E4 - RIVEROS T11 - THOST
E3 - GOMEZ E11 - AMES

	AQMD		Gas Co.
✓	Arson Unit 2220		Helicops/Air Recon.
	Bldg. Engineer		HMRU/Comm. Unit
	Cal. Trans.		L.A. County Health
	Coast Guard		PIO
✓	Code 20/Sig Alert 2210	✓	Police/CHP/DOT 2210
	D.W.P.	✓	R.A.s 2220
	Elevators		Staff /Chief Officers
✓	Emergency Air 2210		Stairwells
	F.A.A./N.T.S.B.		Telephone Co.
	Fish and Game	✓	Vent./Air Cond.
	Food Srv./Red Cross		Water Supr

IC (Location) DIV I NEAMY 7TH/HOPE	Safety Officer
Staging (Location) 16 - E3 THOMAS	Medical Group/Branch TAC.
Base (Location) T4 - BARBER 7TH/GRAND	Tunnel Division/Branch TAC.
Operations BT - GILLIS	Ventilation Group/Roof Division TAC. T10 - EVERETT
Plans B1 - DEFEO	Hazmat Group TAC.
Logistics	Evacuation Group TAC.
Lobby T9 - GALIEN	Elevator Group TAC.
Recon Officer	Rescue Group TAC.
Liaison	Salvage Group TAC.
Public Information Officer	

RETIRED CURRICULUM

CONTROVERSIAL COMMUNICATIONS

High-rise deaths leave two cities questioning emergency services.

By HARVEY EISNER

One woman was killed and three fire- fighters were injured during a two-alarm fire in a high-rise office building in the downtown "Loop" section of Chicago on May 13, 1987.

In the weeks following the fire, many serious questions arose concerning the procedures, policies and effectiveness of the Chicago Fire Department and the city emergency 911 telephone system.

A lawyer representing the family of the late Nancy Clay initially requested the city turn over all tapes between Clay and the dispatchers at the time of the fire.

Cook County Circuit Judge Odas Nicholson also ordered the city to turn over all the rules and training information that 911 personnel receive.

The city had supplied attorney Robert Clifford with much of the requested materials and has until the court-ordered deadline of August 14 to supply the remainder.

Allegations were raised after the tape recorded phone calls from the victim to 911 were played for reporters by attorney Clifford.

Nancy Clay, 31, worked as a production manager for Frankel and Company. She was working overnight on a project in a twentieth-floor office in the building at One Illinois Center, also known as 111 East Wacker Drive, when she discovered the fire shortly after 3 A.M. on May 13, 1987, and called 911 to report it.

Several minutes later, when help didn't arrive, she called 911 again. The first call was received via 911 at the police department communications center and was fast-forwarded to one of the two alarm offices of the fire department. In this case, it was transferred to the main fire alarm office located in city hall.

The initial phone call at 3:01:50 A.M. between Clay and the dispatcher follows:

Clay: "Hello. I'm in a burning building."
911 dispatcher: "Hold on. I'll connect you to the fire department."
Clay: "Hello. I'm in a burning building at One Illinois Center."
Fire dispatcher aide to dispatcher: "One Illinois Center. Is that a good [valid] address?"
Clay: "111 East Wacker."
Dispatcher aide to dispatcher: "111 East Wacker."
Clay: "I'm on the twentieth floor."
Dispatcher aide: "Twentieth floor."
Clay: "I need help. I don't know how to get out."
Dispatcher aide: "Okay. We'll be there. You got a fire?"
Clay: "I'm on the twentieth floor. It's raging!"

RETIRED CURRICULUM

Dispatcher aide: "All right. 111 East Wacker. On the twentieth floor. A fire."
Clay: "Yes!"
Dispatcher aide: "We'll be there."
Clay: "Thanks!"

At approximately 3:03 a.m. Engine 13 and Truck 12 were dispatched via voice alarm from their station, located one-and-a-half-blocks away.

Two minutes and 30 seconds after the dispatch, Engine 13 and Truck 12 arrived at the scene at 3:05 A.M. Engine 42, Truck 3 and the first battalion also were enroute.

Apparently, the dispatcher never told the first-arriving units there was a woman trapped on the twentieth floor.

After calling 911, Ms. Clay telephoned her father while awaiting the firefighters. She told her father she had gotten as far away from the blaze as she could and then had to get off the phone because the smoke was too thick.

At 3:06 a.m. Ms. Clay called 911 a second time, three minutes and 10 seconds after she had hung up from the first call. Like the initial call, she first spoke to a 911 operator, who fast-forwarded her call to the main fire alarm office. Her second conversation, as reported by the ***Chicago Sun-Times***, follows:

Clay: "Please help me. I'm gonna die!"
911 dispatcher: "What's the matter?"
Clay: "Smoke inhalation. I'm on the twentieth floor."
911 dispatcher: "Where at?"
Clay: "One Illinois Center."
911 dispatcher: "Something on fire?"
Clay: "Yes! I'm stuck in the fire on the twentieth floor."
911 dispatcher: "Hold on. I'll connect you to the fire department." (Gasping and moaning is heard on the line.)
Clay: "Help! I'm gonna die! Twentieth floor!"
Fire Dispatcher: "Fireman are there, ma'am."
Clay: "One Illinois Center. Twentieth floor!"
Dispatcher aide: "What's the address?"
Clay: "One Illinois Center. I can't breathe." (gasping) "It's too smoky."
Dispatcher aide: "One Illinois Center."
Clay: "(exasperated) "111 East Wacker!"
Dispatcher aide: "All right. 111 East Wacker. Twentieth floor. They're on the way up there."
Clay: "Somebody's got to find me before I die!" (Collects herself, speaks deliberately.) "I'm in an office, on the northwest corner of the floor in an office."
Dispatcher: "Okay."
Clay: Trying to stay down. I can't breathe/ I'm going to pass out."
Dispatcher aide: "All right. We'll send an ambulance."
Clay: "Hurry!"
Dispatcher Aide: "All right."

RETIRED CURRICULUM

Seconds after Clay made her second call, the chief of the first battalion arrived on the scene at 3:06 A.M. Forty seconds later, the fire dispatcher radioed Battalion One to have someone check the northwest corner of the twentieth floor. But the dispatcher never explicitly told them there was a woman trapped.

An ambulance was dispatched after Clay stated she was going to pass out and couldn't breathe. Main notified Ambulance 42 by radio on the EMS dispatch channel at 3:11 A.M. that there was a woman trapped on the twentieth floor. When Ambulance 42 arrived on the scene they had a conversation with the aide to Battalion One in the street. They informed him of their recent radio message. This information apparently was not relayed to the first battalion chief.

Paramedic crews do not have firefighting training, equipment or masks and are usually sent to the support area. Initially, they were kept downstairs.

Erected in 1970, the building at One Illinois Center is 30-stories high, measuring 270 feet long and 125 feet wide and built of fire-resistive construction.

The twentieth floor contains approximately 150 offices plus cubicles with partitions that do not extend to the ceiling. There are several interior, exterior and angular hallways and offices around the entire periphery. It also contains a theater, small kitchen and keyline assembly unit. The twentieth floor is served by four stairways and six elevators.

When the first engine and truck arrived, they took their equipment into a lobby and rode an escalator up one flight to the main level. They recalled the elevators and activated the elevator in "fire mode." When four members of Truck 13, acting as the fire investigation team, proceeded to the seventeenth floor, which was to be used as a support and staging area, the doors quickly sputtered open approximately eight inches and closed. Then the elevator proceeded up to the twentieth floor. The fire system is designed so that the doors will not open unless the "open" button is pressed. However, this time the doors flew open when the elevator stopped at the twentieth floor--right where the most intense fire was located.

The firefighters were able to force the elevator doors closed and radioed for help. The officer reported the elevator had malfunctioned, they were trapped on the twentieth floor and had taken in intense heat and smoke. Firefighters held the doors closed for approximately 15 minutes until the elevator rose to the twenty-first floor, where it remained stuck for at least five more minutes until Snorkel Squad 1 was dispatched to extricate the members of Truck 12. There were reports that a building employee was reprimanded twice for operating the elevator command panel.

The crew of Engine 13 had taken another elevator, successfully reaching the seventeenth floor. They were confronted with light smoke on that floor and proceeded to a stairway and up to the twentieth floor.

There was a police officer in the same elevator that Engine 13 had used to reach the seventeenth floor. He told the firefighters sometime between 3:12 and 3:15 A.M. that through police communications, he received a report there was supposed to be a woman trapped in the northwest corner of the twentieth floor. There was some confusion as to if all or only some firefighters knew this.

Engine 13 proceeded in the stairway to the twentieth floor and found smoke issuing from around the warped and deformed door that had to be forced open. Subsequent investigation revealed temperatures of at least 1000 degrees Fahrenheit were necessary

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to warp the hollow metal door. Entering the floor, Engine 13 experienced tremendous heat and smoke and poor visibility.

They didn't hear the communication that the elevator containing Truck 12 had gone up to the twenty-first floor. They hit fire near their position and then moved south. They extinguished as much of the fire as they could and then turned around to find the elevator bank. They advanced to the reception area that was partitioned by glass windows in aluminum frames. The intense heat now was estimated to be at least 1275 degrees Fahrenheit and had melted the aluminum frames and shattered the glass. The firefighters worked their hose-line on the elevator doors and extinguished the fire in the elevator lobby. When they learned Truck 12 was out of danger, they continued their attack down the interior hallway to the north. Hitting visible fire as they advanced past the next set of stairs, they could hear pounding on one of the stairway floors.

Engine 42 had taken an elevator to the fourteenth floor and walked up to the twentieth. Alone, without a truck company, they attempted to force the door.

First Battalion Chief William Crawford, relieved from his position in the lobby, radioed for a box alarm as he made his way up to the fire floor.

Truck 3 was searching behind Engines 13 and 42 as they advanced and knocked down the heavy fire. The search was slow and complicated, considering the large number of offices and maze-like layout of the twentieth floor. Units still had little visibility due to the reluctance to vent the windows that were nearly 200 feet above the street.

Firefighters were now nearly 135 feet from the keyline assembly room where the fire originated. They were heading toward what they perceived to be the northwest corner. Post-fire investigations reveal ceiling temperatures reached nearly 1500 degrees Fahrenheit.

After Squad 1 extricated Truck 12 from the elevator, the units split up and each came down to the twentieth floor via a different stairway. The hallways were filled with dense smoke and a glow was visible. They had no hose-lines, so they opted to use the house-lines attached to the standpipe system. As they extinguished the visible fire, they initiated a primary search of the rooms.

Given the configuration of the floor, Squad 1 came extremely close to the area where the victim was located, but they never got to her specific office. The poor visibility, maze-like conditions and very large floor area prevented the search of several offices in this area until the secondary search began.

Fourteen firefighters were overcome by heat and were treated by Ambulance 42. Another ambulance was requested when oxygen began to run low.

Truck 1 found Clay unconscious in the third office off the northwest corner, approximately one hour and 35 minutes after her initial call. Firefighters started CPR and placed an air mask on the victim. The paramedics of Ambulance 11 were brought up to the fire floor and started to work on the victim. They continued CPR and transported her to Northwestern Memorial Hospital where she was pronounced dead from smoke inhalation at 5:36 A.M.

The fire consumed approximately 40 percent of the twentieth floor. It took a second-alarm assignment to extinguish the blaze.

The fire department has been unable to determine the cause of the fire. They have determined that the area of origin was the keyline assembly room and theorized the fire had to have been burning for at least 15 minutes prior to the victim's call, because of the

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temperatures the fire reached.

After the release of the victim/dispatcher recordings to the news media, severe criticism and allegations were leveled at the Chicago Fire Department. Because of the nature of these tapes, the account instantly became a front-page and top television news story.

One of the many questions raised by city aldermen was: Did firefighters responding to the high-rise fire know there was a woman trapped on the twentieth floor of the building? Other questions followed:

- Should civilians be replaced by sworn firefighters as fire-alarm dispatchers?
- Is the 911 emergency system, which handles more than three million calls a year, understaffed and underequipped for the volume of calls?
- Should there by a separate number such as 912 for fire emergencies?
- Should the use of vanity addresses such as One Illinois Center instead of 111 East Wacker Drive be eliminated?

The fire department refused to comment on the allegations or to discuss procedures while the fire was under investigation. Jerry Lawrence, fire department spokesman, stated that while the department knew the "no comment" policy would lead to one-sided news coverage, it was felt that releasing only partial information would be even more misleading.

So far, Clifford has filed suit against Metropolitan Management Company, manager of the building for negligence in installing smoke detectors in a ventilation system.

The family has decided to hold off suing the fire department to give Fire Commissioner Louis T. Galante a chance to explain questions about the incident. Through Commissioner Galante's office, 15 members of his staff were involved in making a multi-pronged investigation while complying with the court order to produce documents and records.

Because the fire triggered such intense criticism of the city emergency response capabilities, an investigation was ordered by the police and fire committee of the Chicago City Council.

On June 12 and 15, 30 days after the fire, Commissioner Galante appeared before the city council hearings, which were broadcast by a Chicago radio station. In his opening statement he said: "I have refrained up until now from saying anything because I felt it wouldn't be prudent to comment on an investigation that wasn't completed...Because of that, we've suffered some severe criticism...in the media. We were given mandates by the courts to produce documents. Unfortunately, the documents we producerd were, in many cases, partially given to the press and they formulated some ideas which were not the whole story, and I've come here to set everything straight."

Through several hours of testimony over a two-day period, some important points were expressed adn others clarified. The commissioner gave an in-depth scenario of the fire, explained firefighting procedures and high-rise tactics. He also described radio communications adn EMS policy and responsibilities.

Some excerpts from the council hearings follows:

Alderman: "The first battalion driver is there as the communications man?

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Galagnte: "That's correct."
Alderman: "And did the driver tell the chief that the ambulance (personnel) had told them there was a woman trapped on the twentieth floor?"
Galante: "We find no record of his communicating that information."
Alderman: "Is there a breakdown then of communications?"
Galante: "Yes, we'd say that. I think there are several areas where we need to improve our performance."
Alderman: "Why was it that the initial dispatch did not notify Engine 13 of the presence of a victim at 3:02 A.M.?"
Galante: "That's something we're looking into...The fire companies knowledge, whether given by the dispatch center-which I believe it should have been-or by a police officer, would not have changed what the firefighters did in attacking the fire, given what we had on that floor. They would not have been able to perform any differently then they did given the intensity of the fire."
Alderman: "Is it the policy of the fire department that the first priority in a high-rise fire is assist any civilians?"
Galante: "Our first priority at all fires is life. Our second priority is to confine the fire to its place of origin or extinguish it. There are many times when we must reverse that procedure, as in this instance. If it's physically impossible to effect rescue, you must extinguish the fire to effect the rescue."
Alderman: So the policy in this instance was to put out the fire first and then conduct the search. Commissioner, you said you had some dissatisfaction with the dispatcher. Could you explain what those dissatisfactions were?"
Galante: "Primarily, my dissatisfaction is that the information relative to the person being trapped wasn't transmitted immediately."
Alderman: Does your dispatchers' manual mention anything about giving pertinent information to firefighters in the field?"
Galante: "No it doesn't deal with that subject specifically."
Alderman: "That seems to be a large oversight. Is this the first time you've had problems getting information to firefighters in the field?"
Galante: "No. I think from time to time we've had that problem."
Alderman: "And why hasn't it been addressed?"
Galante: "...I feel the problem we had, we've been working on."
Alderman: "A compass costs $2 and isn't affected by heat. For a $2 compass, you could have found northwest from three floors below when you were planning your attack."
Galante: "Alderman, if you think having firefighters carry a compass is a valid idea, I'll certainly look into it. I've been around for 34 years and (have) never used a compass. If you feel that's valid with your experience, I'm more than willing to consider that. I'll consider any suggestion that helps us to do our job better."
Continued he: After viewing the building where the fire occurred, I went

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over to the firefighters who worked the shift and complimented them on the courage it took to go into that living hell. I think they did an exemplary job. "My firefighters ...(feel) a deep sense of remorse that they weren't able to save her(the woman's) life. This is the reason why...I wanted an investigation. We're concerned about the life and safety of the people in this city."

During the coming months, this incident will continue to be scrutinized in the press and in the courts. One alderman summed up the hearings this way: "I just hope that out of this hearing we do all that is necessary to prevent a repetition of this incident. One life is too much to lose finding areas where we could improve and didn't."

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DEATH LEAP

Harlem, New York, high-rise claims seven lives.

By Harvey Eisner

Seven people were killed on March 22, 1987, three of whom were forced to jump to their deaths, during a two-alarm blaze in the worst high-rise fire ever to strike New York City. Flames roared up a 35-story high compactor chute which had a sprinkler system that apparently was turned off. The New York City Fire Department has convened a special Board of Inquiry to probe the fire.

On Sunday, March 22, at 7:56 A.M., units in the Harlem section of Manhattan received an alarm for a compactor fire at 1295 Fifth Avenue. The first-due units, Engine 58 and Ladder 26, responded to Box 1335 from their station at Fifth Avenue and 114th Street four blocks north of the fire.

Because compactor fires occurred frequently in the building, firefighting priorities had been preplanned. Responding first-alarm units were given computer printouts listing the address and assigned units, which stated that in the event of a serious compactor fire creating heavy smoke conditions on upper floors, the use of an additional ladder company may be required.

As units approached, heavy smoke was visible. The octagonally shaped building measured 100 feet long by 100 feet wide. Including the adjacent, twin building, the whole complex took up an entire city block, bordered by Fifth and Madison Avenues and East 110th and 111th Streets. Built by the State of New York, the 15-year-old structure had less stringent building codes than those required by the City of New York. The high-rise containing 270 apartments, eight per floor, lettered A through H, was fully occupied with sleeping residents.

Companies found their way to the basement and found someone already applying water to the compactor. The first-due engine was preparing to operate on the floor above to drown the fire in the compactor. A firefighter from first-due Ladder 26, assigned the roof position, had chocked open the doors leading from both stairways to the roof. Then, he proceeded down to the top floors to check conditions and reported via radio there was a fire on the thirty-fourth floor.

The remaining members of Ladder 26 took an elevator to the upper floors. Once on the thirty-fourth floor, they discovered there was fire on the thirty-third floor. Engine 58 took an elevator up to the thirty-second floor. The malfunctioning elevator opened on the thirty-third floor, surprising firefighters who found smoke banked down to the floor. One firefighter, knowing where the stairway was located, darted through the smoke, found the stairs and shouted to the remaining members of Engine 58 to seek refuge in the stairwell.

Hooking up their hose to the standpipe system, the firefighters started searching for fire. They found the metal door to 33H glowing cherry-red and warped from the heat. Engine 53 and Rescue 1 operated with Ladder 26 on the thirty-fourth floor. On the floor below, Engine 91 and Ladder 43 joined Engine 58 operating in the large apartment. On the thirty-fourth floor, the fire was located in the same line of apartments, 34H. Officials are investigating whether the fire had been burning in the basement compactor or in the

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compactor shaft at various levels. Rubbish and discarded materials apparently had clogged the chute, and the fire may have dropped down to the basement.

The compactor shaft was located next to the kitchens (to the right of the entrance doors) in the H apartments, which were adjacent to the public hallways on each floor. The fire, burning in the H apartments just inside the entrance doors, blocked any escape through the public hallways. On the thirty-third floor, intense heat and flames forced the Jenkins children -Dwana, 12, Robin, 16, and Stanley, 22 -to leap from their apartment window to the courtyard below. Burned to death was their mother, found on the bed closest to the window.

Quickly, additional units were special called and a second alarm requested. One truck company was sent to investigate conditions on the top floor. After forcing the door to apartment 35H, firefighters were hit with a tremendous blast of heat and jet black smoke that blew out into the hallway. An engine company urgently was requested to operate on the thirty-fifth floor, and Engine 36 responded. Flames from the thirty-third and thirty-fourth floors were venting skyward.

Apparently, the fire auto exposed from the lower floors and entered the bedroom on the top floor, with flames reportedly blowing 15 to 20 feet above the roof. At least a dozen excited civilians who made their way up to the roof seeking safety were advised to remain on the roof away from where the fire was venting. Additional fires on the twenty-third and twenty-ninth floors were reported over the extremely busy fireground radio frequency. Companies finding these fires requested engine companies to supply hose-lines immediately.

Water from the hose streams operating on the upper floors knocked out the elevators, forcing units to walk. Upstairs, companies were notified there would be a delay in bringing lines.

The fires were confined to the kitchen areas in apartments 23H and 29H. During the initial stages of the fire, units were hampered by low water pressure. The standpipe connection was either defective or had been vandalized. Additional supply-hose had to be stretched into the first floor, and hooked up to supply the system via the standpipe outlet.

The building compactor chute was equipped with a sprinkler system. There were reports of sprinkler heads on every third floor, but the system had been shut off. One resident claimed she smelled smoke as early as 7 A.M. but went back to bed because smoke from compactor fires was common in the building. Officials are checking reports of a fire burning even earlier than 7 A.M.

On the thirty-fourth floor, the firefighters found the bodies of Harriet Wynn, 45, Clementine Greshan, 46, and Charles Greshan, 28. They, too, died of burns. Apartments 33H and 34H received extensive damage. While searching firefighters helped more than 200 residents to safety, most occupants escaped unassisted via stairwells.

The fire was placed under control by Chief of Department Robert Butler at 10:09 A.M. In addition to the seven fatalities, there were 28 injured civilians, including four police officers. Eighteen firefighters suffered a variety of minor injuries.

A special Board of Inquiry was convened to clarify the outstanding questions regarding the fire and the building. Five high-ranking members of the fire department will have a subpoena powers and will be empowered to investigate all matters relating

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to the building sprinklers and make recommendations regarding any criminal activity. Additionally, they will make recommendations on compactor sprinkler systems and their quality and building and fire codes.

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FDNY Under Scrutiny

On March 22, 1987, seven people were killed and 46 people, including 18 firefighters, were injured during a high-rise fire at the Schomburg Plaza in Harlem, New York. (See "Death Leap," June 1987.) Following the calamitous fire, FDNY Fire Commissioner Joseph E. Spinnato appointed a board of inquiry. The five-member board was charged with determining the causes of the fire, ascertaining any negligence on the part of the building owners or the fire department, and developing measures to prevent a repetition of the tragedy.

The interim fire report was released at a press conference at the conclusion of a three-month investigation. The board spared no one. Its finding were highly critical of the workings of the FDNY at the incident; of a fire department inspection of Schomburg Plaza weeks prior to the fire; the construction of the compactor shaft; and the condition of the compactor sprinkler system. Said Commissioner Spinnato of the report: "While I am troubled by the findings in the report, I am proud of the work done by the board; it has enabled the fire department to take a hard and detailed look at itself and where necessary, to take corrective actions."

The report showed that between the first call reporting a fire at the building at 7:57 A.M. and 8:07 A.M., the office of the dispatcher received more than 21 phone calls from tenants on the fifteenth through the thirty-third floors, reporting large amounts of smoke in hallways and apartments. Only two of those calls were relayed to the chief's aide via radio.

Despite heavy smoke conditions on the upper floors--believed by fireground officials to be the result of the fire in the basement compactor--it was not until a firefighter dropped down from the roof to check the upper floors and discovered a fire on the thirty-fourth floor that the firefighters were aware of a working fire. Seconds later, three people on the thirty-third floor jumped to their deaths.

The board of inquiry expressed concern with the approximately 16 minutes between the arrival of the first unit and the discovery of the fire on the upper floors. Evidence showed that by 8:16 A.M., nothing could have been done to limit the fire fatalities.

The board also cited the lack of communication on the fireground between officers and firefighters who apparently made key observations during the progress of the fire and didn't relay same to the battalion chief. Additionally, several dispatchers were said to be rude and insensitive to the many callers. According to the chief on the scene, the dispatchers were under the impression the fire was extinguished.

Two dispatchers were relieved of their duties while the investigation continues.

Regarding the construction of Schomburg Plaza, the board reached the following conclusions:

- The building plans for Schomburg Plaza required a three-inch shaft enclosure wall for fire safety purposes, but the shaft wall was only 2 5/8 inches thick.
- The compactor shaft had construction defects such as voids and improperly installed metal brackets, resulting from shoddy workmanship.
- The sprinkler system was inoperable and had been so for quite a while. Additionally, the valve controlling the system water supply was shut off at the time of the fire.

Commissioner Spinnato said shortcomings have been uncovered in department

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operations and procedures regarding timely inspection of buildings, the performance of fire-alarm dispatchers and fireground operations at the high-rise fire.

In response to the findings, Commissioner Spinnato ordered the following measures be taken:

o All field units have been instructed to complete inspection checklists that provide an inspection guide and record for the units.

o A compactor inspection program has been instituted.

o All probationary firefighters will be required to attend additional field inspection indoctrination during their initial training.

o Administrative districts will be reviewed to obtain a more manageable inspection workload.

o Building inspection teams will be established in the Bureau of Fire Prevention to complement field forces.

o Cooperation of fire unions will be sought to double the amount of time devoted to field unit inspections.

o The Bureau of Fire Communications will develop an enhanced training/sensitivity program for all dispatching personnel.

Said Spinnato: "Any department personnel who acted negligently or in violation of this department's rules or regulations will be held accountable through the department's disciplinary procedures."

Continued he: "The preliminary report has been forwarded to the Manhattan District Attorney for pursuit of any and all possible criminal violations disclosed by our investigation." The Manhattan District Attorney is impaneling a grand jury. The probe is unprecedented because it will focus on actions of fire department personnel, as well as those of the Schomburg Plaza builders, owners and managers. It could affect anyone who may have been involved, leading to a maximum charge of criminal negligent homicide.

Discussion has concentrated on reports that the building had been unsafe with numerous fires in the past. A letter written by three of the victims in 1981 cited concerns about flaws in the building during the three previous years. the final report should be finalized in late September.--H.E.

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HIGH-RISE TRAINING

Now that we have a good understanding of high rise buildings, it's time to have a high-rise training exercise. Training in the Fire Service has always been a top priority subject. In some of our special type incidents (hazardous materials, multi-casualty and wildland) we develop specialized training to match the incident. A high-rise fire is no exception. The demands on everyone, chief to firefighter, are maximum at a working high-rise fire. Therefore, the energy level and planning for a training exercise should also be at a maximum.

The methods used in high-rise training can vary from classroom, simulators, on-site simulation, to actual line placement in a building. **INNOVATION** is the key to effective training. This information is from actual training methods used throughout the fire service.

MAJOR COMPONENTS OF HIGH-RISE TRAINING:

There are a number of components to consider when planning a training exercise in a high-rise building:

- Your organization
- Terminology
- Site selection
- Walk-through orientation training
- Full scale training exercise
- Variations
- Evaluations

Organization

Consider the size of your organization. Can you develop maximum resources (15 to 30 companies) from within your department or are you dependent on initial-action, mutual aid, or a county-wide predetermined resource allocation plan? (High-Rise Strike Teams) Your training exercise should involve all the resources you anticipate will be needed in the case of an actual fire.

Terminologies

Terminologies which are part of the High Rise Operations must be clearly defined. The high-rise fire is not the time to discover the Stairwell Support Force moves equipment up the stairwell.

Confusion occurs when the terminologies are not prefire determined and standardized. This is especially true when the incident requires mutual-aid resources. "Get the Buffalo

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Gun and the Big Key," .... he said what???

NOTE: Buffalo Gun - Portable Monitor

Big Key - Hayward Tool, forcible entry tool

It is also important to clarify the communications used. What radio language do you use? **"CLEAR TEXT"** is preferred. In short, any and all terminologies which are unique to high-rise emergencies must be standardized and included in the Operations Procedures.

Site Selection

The selection of the actual site of the training can vary from a single classroom to an actual high-rise building. What is available in your area?

A single or group of classrooms can be used very effectively:

Example:
Classroom 1 - Simulator and Command Post
Classroom 2 - Base
Classroom 3 - Lobby Operations
Classroom 4 - Staging
Classroom 5 - Fire Floors

You can also combine functional areas such as:

Use of a two or three story building -
First Floor - Command Post, Simulator, Base and Lobby
Second Floor - Staging and Fire Floor

Use of a fire station and a training building -
Fire station - Simulator, Command Post and Base
Training Building - Lobby, Staging and Fire Floor

Although there are a variety of locations to hold a training exercise, the use of an **actual high-rise building** is still the best training site. An actual high-rise under construction is very good. An occupied high-rise is also very good, but consider inconvenience to occupants. In any building not belonging to the City of department, the relationship with the Building Management is very important. Contact the responsible person and explain the fire department's objectives. Discuss time of training. In an occupied office building, night-time training is better. Discuss minimum bother to occupants. Discuss media involvement (a good selling point for hotels).

Most important, discuss possible damage to building and contents. Firefighters have

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been known to break things.

Orientation/Walk-Through Training Exercise:

The orientation/walk through training exercise is planned to provide EVERYONE an opportunity to view the entire high-rise operation plan as designed. Its purpose is to let everyone know how given functions or operations fit into the big picture.

We recommend handling this exercise as follows:

A. Assemble - orientation
Assembling the group on site at a predesignated point affords opportunity for all members to familiarize themselves with the building site and surrounding areas. If this rendezvous point corresponds with a predesignated Base Operation for this building, so much the better.

The Orientation for this gathering should include:

1. A hypothetical fire for the walk-through training exercise.
2. Pertinent points from the High-Rise Operations Procedures which will not be covered during "walk through" portion of the exercise.
3. Pertinent points from the Building Inventory which will not be covered during "walk through" portions of the exercise.

B. Separate into groups - tour:

Separating into small groups at this point will afford informal discussion by the orienting officers at the various functional stations. These functional stations correspond t approved High-Rise Operation Procedures.

Examples:

1. Command Post
2. Lobby Control
3. Base
4. Fire Attack
5. Etc.

The groups then move from station to station for approximately 15 minutes orientation by assigned officers.

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Such assigned officers may use general outline covering their particular function or activity. They should cover the general outline as applicable to the involved building.

Example:

The Lobby Control Officer should conduct the orientation in the Lobby if possible. Where the outline states, "Capture elevators", obtain key and show how to capture elevator. If there is a lockbox in the Lobby, open it and show what is inside, etc.

C. Assemble - questions

After all groups have completed orientation, reassemble the entire group for any concluding remarks at this time and afford members opportunity for questions.

If appropriate, orientation can be given with respect to full scale training which will follow later.

Full Scale Training Exercise - hypothetical fire

Conducting a full scale high-rise training exercise, of course, can take on variations beyond limit:

Assuming the building in point is an office building, you can hold the drill on a Saturday or Sunday and hopefully, it will be almost vacant. Hold it on a weekday when it is full and you have tenant participation, whether you want it or not.

Regardless of the day (or night) that you hold it, you have to determine whether you are going to block traffic or not. If so, do you need to include the police? Do you need to obtain street barricades?

As mentioned, variations are unlimited. With that, for the purpose of this lesson, we will continue our discussion to some basic considerations which are pertinent to this overall lesson.

Overall, from this type of training program we want to ascertain:

- Are our Operations Procedures sound?
- Are there areas for improvement?
- Is there anything that Building Management can do or provide to make our job easier?

or to afford the occupants of the building greater protection?

Unlike the drill tower, we get one chance this year, in this building, to get our answers.

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So a good deal of preparation should be in order.

That preparation should lead us, on the day of the exercise to:

A. Gathering of Forces - Comprehensive Orientation:

1. Ground rules
2. Description of fire problems
3. Monitoring procedures
4. Dispatch procedures
5. Etc.

B. Conducting of Exercise:

Once the exercise is under way, conditions should be made as realistic as possible.

1. Smoke and heat conditions
   a. Use signs or smoke machine if cleared by management
2. Falling glass
   a. Use signs, chalk, etc.
3. Locked doors
   a. Use chalk to show how it was opened
4. Re-Stat/Sit-Stat
   a. Equipment
   b. Personnel
   c. Times

Ideally, a monitor should be provided for each separate function and/or each Company. The monitor should log:

a. Time
b. Problems
c. Innovations
d. Recommendations

Officers in charge of functions should maintain their own log of the same type of information.

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C. Exercise wind-up

Upon conclusion of exercise and prior to dispersal, accomplish the following

1. Debriefing (companies)
   a. Allow officers approximately 15 minutes to discuss their operations with immediate subordinates

2. Debriefing (officers)
   Gather all officers and monitors together for a quick debriefing and sharing of lessons learned. During this time, officers should direct their subordinates to:
   a. Return equipment to apparatus and "ready" for duty
   b. Return building to original condition.

3. Logs, critique sheets
   a. Instruct officers and monitors to edit logs and critique sheets - submit later of Officer-In-Charge.

4. Preliminary critique
   a. Assemble entire command prior to dispersal for brief preliminary review of the overall operation

5. Restoration of building
   a. Assign company to make final tour of building for equipment, damage assessment, etc.

6. Company critique
   Instruct all officers to subsequently hold individual company critiques and submit written report pertinent to the following

   a. Assessment of their operation
      1) Problems
      2) Innovations
      3) Recommendations/Solutions

   b. Assessment of other operations (which affected their operation)
      1) Problems
      2) Innovations
      3) Recommendations

   c. Building features (pertinent to our operations)
      1) Good
      2) Poor

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3) Recommendations/solutions

Variations

Variations to High-Rise training acknowledge the fact that the exercises just presented are very complex and most difficult to accomplish with respect to coordination, priorities, availability of personnel and equipment, time, etc.

The following variations would eliminate some of these complications.

A. Sectional Training Exercise

As an alternative to either of the full scale training exercises we have presented, sectional training exercises, one or two companies at a time can be very effective.

In this case, one or two companies can be scheduled to the site, orientation given and:

1. Walk-through training exercise:

   a. Company(ies) ushered to each functional location (Lobby Control, etc.) and given orientation.

   b. Upon completion, second company(ies) brought in.

2. Training exercises (Hypothetical Fire)

   a. Company(ies) ordered to carry out a given function (Stairwell Support, etc.)

   b. Upon completion, second company(ies) brought in.

In either case, good orientation and recognition of problems, etc. can be accomplished. However, you obviously lose in the areas of coordination, time frames, communications, etc.

B. Actual Fires

We have listed actual fires as a variation in our training inasmuch as we propose varying our normal procedure of handling such actual fires.

We normally handle a fire with dispatch! Put it out - clean up - pick up - and go home.

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We do not propose changing the first part - PUT THE FIRE OUT!

In other aspects, however, we do propose a subtle change.

Where possible, if you have a reported fire in an upper floor if a high-rise, go into as full scale an operation as you feel you can on a practical basis.

The practical aspect is that with a high-rise sealed building, you could actually have a working fire in progress and not see a thing from the street. This is your justification then, to evaluate your Operational Procedures and to get your people used to those high-rise procedures.

Block the street!
Set up your Command Post!
Start Additional companies on the way!
Establish Lobby Control, Base, etc.a

In short, get the maximum training application you can from the limited number of high-rise emergency incidents that you have.

Building management can be sold on the benefits and the need for such full scale procedures.

And finally, through this particular incident may be a wastebasket fire - the next one amy develop into a working fire! In the latter case, you will be glad your organization was started immediately.

Evaluation:

Evaluation involves the gathering together of all the documentation that has been accumulated to this point, i.e.,

A. Operational Procedures
B. Prefire Plan/Building Inventory
C. Logs, Critique Sheets, etc. (Prepared by Monitors, Company Officers, etc. at full scale training exercises.)
D. Company Critique Sheets (Written reports by Companies)
E. Assignment Assessment

Upon receipt of the above mentioned information, break it down and delegate additional assessment by responsible Officers.

Upon completion of officer assessment, it becomes decision or recommendation time.

A. Recommendations for Alterations to Building

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B. Building Inventory
C. Recommended Revisions to Department Operations Procedures

Upon completion of the above mentioned considerations, schedule:

A. Meeting with Building Management
B. Final Critique Session with Concerned Officers with respect to:
   1. Full scale training exercise
   2. Building alteration
   3. Building inventory/prefire plan revisions
   4. Recommended revisions to department operations procedures

CONCLUSION

In conclusion, we call attention to the fact that there are many approaches to training, and to high-rise training in particular

We could only emphasize that whatever the method, lay out your ground rules:

Who, What, When, Where, How and Why

Whenever possible, make your training exercise as REALISTIC as possible.

And **finally**, you will be able to measure the effectiveness of your training program by the amount of planning and preparation you put into it.

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HIGH RISE ELEVATORS

This chapter defines components and provides operational guidelines for the use of elevators in high rise buildings. Emphasis is placed on emergency operations under fire conditions.

Although elevators are necessary for moving large numbers of people throughout the building under normal circumstances, experience has proven that the operation of elevators under fire conditions can be erratic and dangerous. Elevators are subject to serious malfunction from the effects of heat, smoke and water on drive machinery and/or control equipment.

Successful use of elevators during emergency operations is dependent upon the knowledge of elevator systems in general, knowledge of the particular system installed in the building and hazards associated with elevator use under fire conditions. Title 24 of the California Administrative Code provides requirements for operation of elevators under fire and emergency conditions. The code requires a building to have:

1. Designated Level - The floor that elevators will respond to upon recall. It may be the main floor or any other level that best serves the needs of emergency personnel for firefighting or rescue purposes. This floor will contain the "Emergency Service" switch needed to recall the elevators and will be referred to as LOBBY for the remainder of the chapter.

   NOTE: Alternate designated floors, may be required, due to smoke detector placement and/or split banks of elevators.

2. Smoke Detectors - There shall be a smoke detector installed adjacent to the elevators at each landing, usually in a vestibule, on each floor except the lobby. Generally, elevators serving the landing or vestibule where a smoke detector is actuated are the only cars automatically recalled. Elevators in other banks continue to operate until smoke reaches their sensors or the lobby "Emergency Switch" is operated (turned to "on" position).

   Vestibule doors, if held open by electromagnetic devices, require smoke detectors on both sides of opening. The smoke detector located within the elevator vestibule must activate in order to recall the elevators securing that vestibule.

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AUTOMATIC ELEVATORS

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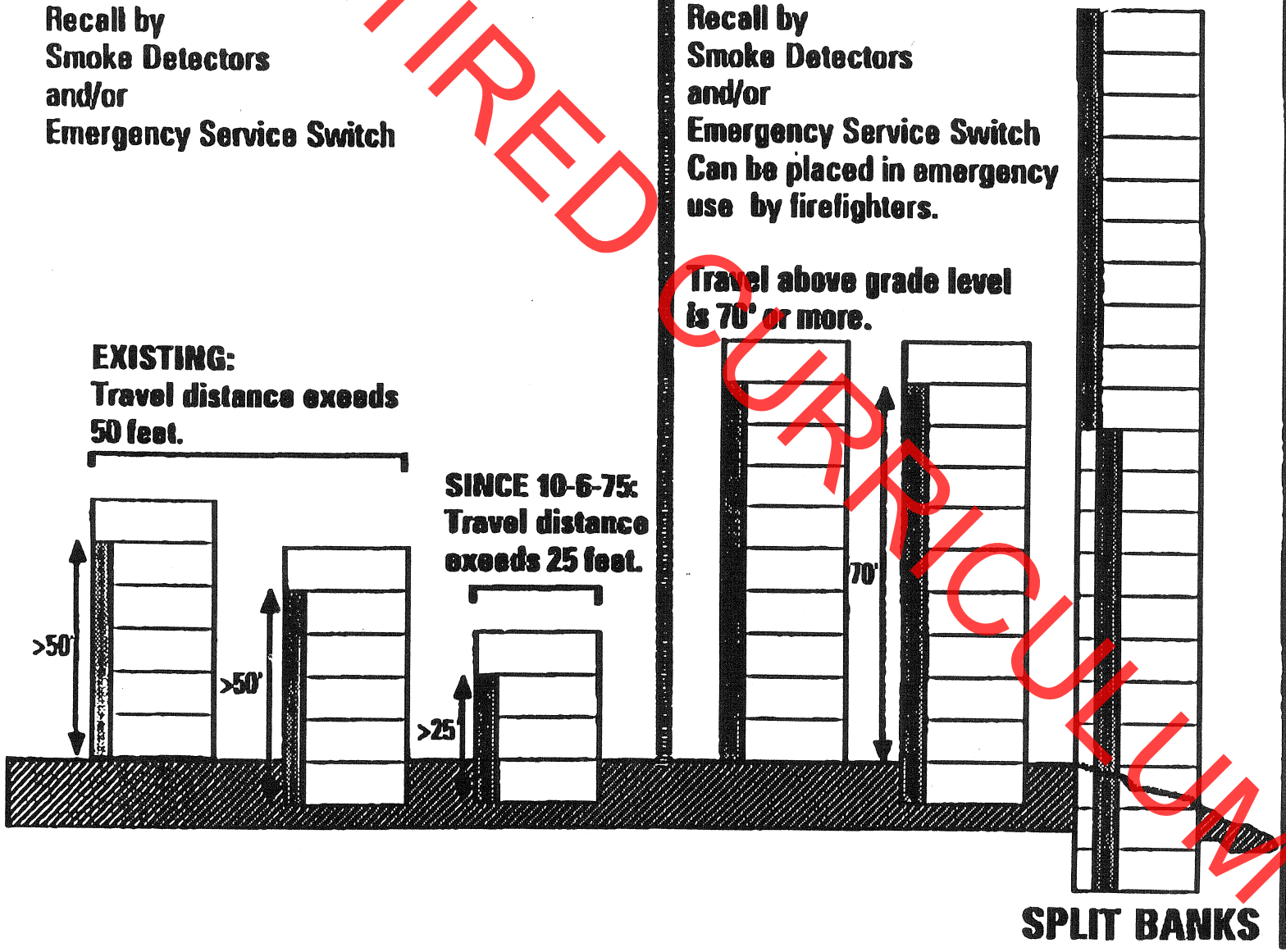
RECALL PHASE
(Phase 1)

Recall by
Smoke Detectors
and/or
Emergency Service Switch

OVER-RIDE PHASE
(Phase 2)

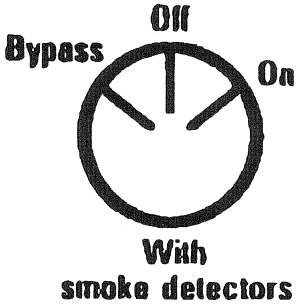
Recall by
Smoke Detectors
and/or
Emergency Service Switch
Can be placed in emergency use by firefighters.

Travel above grade level is 70' or more.

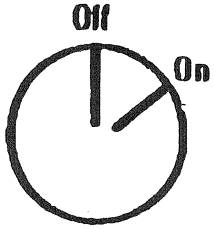


EMERGENCY SERVICE SWITCH

One per Elevator Bank Located in Lobby Level (key non-removable in bypass position)



IN-CAR SWITCH



(Key non-removable in On position)

3. Elevator Emergency Service - Recall or recall/override capability.

Phase I "Recall Phase" - Elevator recalled will respond non-stop to the lobby and ignore all other call button requests. Automatic elevators having a total travel of more than 50 feet (or more than 25 feet, if new after October 6, 1975) may be recalled to the lobby by sensing devices (smoke detectors) or by a three position key operated "Emergency Service" switch in the lobby.

NOTE: A minimum of one switch per bank is required. In the event a Building Control Station is required and is on the same floor in the area of elevator bank, the "Emergency Service" switch may be located in the station. If the station is remote, it may have a second "Emergency Service" switch, but it must be labeled and identified in the same manner as the lobby "Emergency Service" switch.

Phase II "Override Phase" - Recalled elevators will respond as per Phase I, but in addition can be placed in emergency use by firefighters. All automatic elevators having a travel of 70 feet or more above the lowest grade level may be recalled to the lobby by smoke detectors or by a three position key operated "Emergency Service" switch in the lobby.

A two position "Emergency Service" switch is provided in each car. The in-car switches are operative when lobby "Emergency Service switch" is in the "on" position. The in-car switch is key activated and shall only be operated when the lobby "Emergency Service Switch" is in the "on" position. Turning both switches to the "on" position operates the "Override Phase."

ELEVATOR OPERATION - EMERGENCY SERVICE PHASE I

The lobby level "Emergency Service" switch is normally in the "off" (automatic) position. It operates in the following manner:

a. When the lobby "Emergency Service" switch is turned to the "on" (emergency) position, all elevators in the bank controlled by the switch will be recalled to the lobby floor and remain there with their doors open. The lobby "Emergency Service" switch shall be turned to "on" even if the cars have already been returned to the lobby floor in response to the activation of a smoke detector. After the key is turned to the "on" position, remove the key from the switch. The cars are then no longer subject to calls from other sources.

b. The photo electric beam and other non-mechanical door retraction

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safety devices are deactivated.

c. If the car is at a landing at the time the Recall Phase is activated, the car will start moving to the lobby as soon as the doors close.

d. The "bypass" position is used during an incident to place the elevator in operation on a temporary basis when the entire building has been deemed safe for normal use, but there is still enough residual smoke to actuate the detectors or the detectors are malfunctioning. The key is not removable when the switch is in the "bypass" position.

PHASE II

The lobby level "Emergency Service" switch is normally in the "off" (automatic) position. It operates in the following manner:

1. When the lobby "Emergency Service" switch is turned to the "on" (emergency) position, all elevators on the bank controlled by the switch will be recalled to the lobby floor and remain there with their doors open. The lobby "Emergency Service" switch position shall be turned "on" even if the cars have already been returned to the lobby floor in response to the activation of a smoke detector. After the key is turned to the "on" position, remove the key from the switch. The cars are then no longer subject to calls from other sources.

2. Use key to place the in-car switch in the "on" position; the car will be operable only by a person in the elevator. The car will not respond to a call from any other source.

3. When operating elevators in "Emergency Service" mode, the automatic door open feature and photo electric device are rendered inoperable. The destination is selected by actuating a floor button in the normal manner.

   Opening of the power operated doors is controlled by continuous pressure on the "Door Open" button. If the button is released prior to the doors reaching the fully opened position, the doors will automatically reclose. The only exception is that the doors may automatically open upon return to the lobby.

   Open doors are closed by continuous pressure on the "Door Close" button, if provided. If no "Door Close" button is provided, continuous pressure ont

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the desired floor button will serve to close the doors. If either of these buttons are released before the doors reach the fully closed position, the doors will automatically reopen.

4. If multiple floor buttons have been actuated, the car will stop at the first of the selected floors that it reaches. At that time all other selections will be canceled. The car doors will remain closed.

   NOTE: Elevators installed after October 15, 1985, must have a separate call cancel button for use by emergency personnel.

5. The "bypass" position is used to place the elevator in operation on a temporary basis when the entire building has been deemed safe for normal use, but there is still enough residual smoke to actuate the detectors or the detectors are malfunctioning. The key is not removable when the switch is in the "bypass position."

   NOTE: In either Phase I or II the elevator car(s) may be equipped with an Independent Service Mode (with or without photo-electric devices). Do not use for emergencies. This mode is used by employees or service personnel for routine, non-emergency operation.

   Independent service may be operated by key (not compatible with in-car fire service switch) or toggle switch. Usually the controls are found behind a locked panel on the control panel inside the elevator car. Keys are available from building personnel.

   While the elevator is operating in the "Independent Service" Mode, the photo-electric hold open device is rendered inoperative, but the automatic door open feature will continue to function. While the cars are being used in the "Independent Mode" they are not subject to recall by either the sensing device or the key operated switches. Under emergency conditions, depressing the "Door Close" button will cause the doors to close, but only after they have reached the fully opened position. However, if elevators are in recall phase, returning the elevator car to automatic operation from Independent Service will place the car in the recall phase.

LIFE-SAVING EMERGENCY MEASURES

In either Phase I (Recall) or Phase II (Override) Modes, if for any reason an emergency occurs while you are in an elevator car and the sensing devices do not work or the

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elevator reverts to the Automatic Mode, the following procedures may be used:

1. Automatic Mode (Without Photo-Electric Devices) - Depress the "Door Close" button to cause the doors to close, but only after they have reached their fully-open position.

2. Automatic Mode (With Photo-Electric Devices) - It is possible that the smoke may be of sufficient density to block the photo beam and cause the door to remain open. The photo-electric device can be rendered inoperable by depressing the switch marked: "TO BE USED IN CASE OF FIRE ONLY." This action will cause the doors to close.

3. The "Emergency Stop Switch" is operative during the time the car is in the Automatic Mode, and upon activation will immediately stop the car. In most elevators, operation of this switch will cancel any previous floor selections.

   NOTE: THESE PROCEDURES ARE NOT TO BE USED DURING OUR NORMAL EMERGENCY OPERATIONS.

USE OF ELEVATORS DURING EMERGENCIES

1. Restrict the use of elevators by both building occupants and firefighting personnel until the safety of the elevators is determined.

2. Obtain a key for the "Emergency Service" switch from the required building lock box or from building personnel.

3. Recall all elevators or groups of elevators not automatically recalled to the lobby area by use of the "Emergency Service" switch in the lobby area. Locate the "Emergency Service" Switch. Insert the key into the "Emergency Service" switch and turn it to the "on" position. This will recall the elevator car(s) directly to the lobby level area and hold the car(s) at that location with the doors open. Leave the switch in the "on" position and remove the key. This will eliminate the possibility of use by other than Fire Department personnel and SHALL be done in all cases, regardless of whether fire personnel plan to use the elevators.

   If elevator was installed under Phase II provisions, insert key into in-car "Emergency Service" switch and turn to "on" position. In addition, check to determine if car is in "Independent Service." If so, remove from "Independent Service" before using in "Emergency Service" mode.

4. At every high-rise incident, the use of elevators shall be delayed until Fire

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4. At every high-rise incident, the use of elevators shall be delayed until Fire Department personnel determine they are safe to use. Only then will elevators be considered for movement of emergency personnel. This policy requires the initial Fire Attack Team(s) to use stairwells to reach reported fire floors and make a visual assessment of actual conditions that might affect elevator use.

   Information received from this/these teams regarding the safety of elevators and actual floor conditions on the reported fire floor and preceding floors should be relayed immediately to the Incident Commander, who will then determine if the elevators are safe to use.

   EXCEPTIONS: Early considerations of elevator usage is acceptable when split bank elevators exist, in which the top of the shaft and machinery room is a minimum of five floors below the reported fire floor. The determination to use the elevator is ultimately the responsibility of Fire Department personnel.

5. Initial Fire Attack Team personnel traveling in elevator cars, even though the cars maximum travel is five floors below the reported fire floor, must be equipped with donned breathing apparatus and facepiece, a dry chemical extinguisher and portable spotlight. Breathing apparatus facepieces should be connected to regulators and ready for immediate use.

   A firefighter should be assigned to keep dry chemical extinguisher in readiness with the lock pin removed and the nozzle pointed at the elevator door. The portable spotlight is to be used in case of lighting system failure. It can also be used to check the hoistway for smoke before use. If even the slightest amount of smoke is visible in the hoistway, the elevator should not be used. At all times the elevator is in motion, fire fighting personnel should be prepared to take immediate action that will cause the doors to close if the car responds to a floor where fire or smoke conditions are present. That action will be dictated by the elevator control equipment and the current operating mode.

6. Upon verification by Fire Department personnel that the elevators are safe to use during emergency operations, a Fire Department member shall be designated to control the operation. In addition to the aforementioned safety equipment, the operator will have a portable radio to maintain communications with lobby control. In addition, if phone jacks are available in the cars, sound-powered phones should be placed in operation.

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CONCLUSION

Members must have a working knowledge of elevators and elevator operation in order to function safely during high-rise operations. Members shall familiarize themselves with the operation of individual elevator systems during pre-fire planning and routine fire prevention activities.

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FIREFIGHTER SAFETY AND SURVIVAL

IN

HIGH-RISE INCIDENTS

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The fire is on the twentieth (20th) floor, there is fire showing as you arrive on the scene. What safety and survival concerns should you be concerned with?

You should consider:

1. Your physical strength and endurance to effectively fight the fire.
2. Your knowledge of the building construction.
3. Your knowledge of physical hazards in the building.
4. The protective clothing and equipment you will use. What are its limits?
5. The hazards of products or combustion.

STATISTICS OF THE U.S. FIREFIGHTER DEATH AND INJURY:
(The Command, June, 1987)

1986 STATISTICS:

-One hundred thirteen (113) Firefighters died in the line of duty. Sixty (60) were career firefighters, fifty-three (53) were volunteers.

-More than half of the fatal injuries occurred while firefighters were involved in nonfireground activities.

-Heart attack was the leading cause.

-Thirty-seven point eight percent (37.8%) of the deaths occurred in residential fires.

-Apparatus/vehicle accidents accounted for twenty-seven (27) deaths.

-Twenty-three (23) firefighters were killed in incendiary and suspicious fires.

Firefighter death by type of duty:

Firefighting	39.8%
Responding or returning	34.5%
Other on-duty	14.2%
Training	6.2%
Nonfire Inc.	5.3%

Firefighter deaths by cause of injury:

Stress	52.2%
Struck by or contact with object	24.8%
Exposure to fire products	8.0%
Caught or trapped	7.1%
Falls	5.3%
Structural collapse	2.7%

Firefighter deaths by nature of injury:

Heart attack	51.3%
Internal trauma	23.0%
Asphyxiation	12.4%
Crushing	8.0%
Stroke	2.7%
Bleeding	0.9%
Electrocution	0.9%
Gunshot	0.9%

The number of firefighter deaths in 1986 was the lowest since 1983. According to Fire Command, June, 1987, falls from apparatus and heart attack are two areas of concern. The high-rise fire unfortunately offers an environment that will result in several type of injuries and possible fatalities.

THE HAZARDS IN A HIGH-RISE FIRE:

Many of the hazards confronting Firefighters during a high-rise fire are built into the building. Let us examine some of these factors:

-Hidden fires in return air plenums. Always check the area ABOVE you when entering a floor. Use a hose stream (knock out panels) or a pike pole to open ceiling.

-Fires will also spread vertically through electrical and plumbing holes in floors. Watch opening doors in these closed areas.

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-Remember the six (6) sides of fire.

-Use of elevators. Never use elevators without the following knowledge:

1. Where is the fire?

2. How much fire?

3. Single shaft or double shaft elevators? High-rise/low-rise system.

4. Knowledge (prefire) of elevator operation?

5. Smoke condition on upper floors?

The best advice - DON'T USE THE ELEVATORS!!!

-Open shafts - elevator shafts, dumb waiters, linen shafts, rubbish shafts. In a severe fire, these could be left exposed. Watch your step after the fire.

-Floor to ceiling windows. In heavy smoke, feel your way. After fire, secure or rope off windows.

-Air cylinders and equipment left on floor landings in the stairways. These cylinders may become dislodged and roll down stairway.

-Falling glass. EXPECT GLASS TO BE BROKEN. Glass will sail two hundred (200) feet from the building. It will also fall straight down the side of the building. Firefighters have been seriously injured by falling glass. Water supply lines have also been cut.

Now lets explore other types of hazards.

-The products of combustion (POC) Smoke, Carbon Monoxide, Acids, etc. are always present in any fire. In a high-rise building, the POC is trapped and spreads.

Even down stairways. In one fire in Los Angeles, firefighters found heavy smoke at ground level stair shaft with the fire on the 12th floor. What does that do to your SCBA time frame? Your survival time is limited. Ventilation becomes a priority.

-The heat and humidity produced will have a dramatic effect on firefighters. Plan for relief early in the fire.

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-The medical aspects include:

Stress	-	emotional
Heart	-	cardiovascular
Muscular	-	skeletal
Lungs	-	respiration

Health Maintenance Programs (HMPS) are one of the answers to combating the hazards. Physical Fitness is a priority.

THE SURVIVAL TRIANGLE:

The Firefighter's Survival Triangle is like the old fire triangle (heat, oxygen, fuel). It requires a coordinated effort at:

Physical Fitness
Protective Clothing
Training

Each factor is important one cannot stand alone and provide survival.

"Physical Fitness" is becoming a way of life around the fire station. Many departments have adopted mandatory programs.

In addition to the physical exercise with emphasis on cardiovascular conditioning as a part of the total HMP, stress awareness and intervention, diet, employee assistance programs, and comprehensive base line medicals, make up the total HMP.

PROTECTIVE CLOTHING:

How much of your protective clothing meets the NFPA Standard? Is your station uniform fire resistive? Do you respond to all structure fires in full turnouts? Are you purchasing state of the art turnout clothing? PBI shells, gortex liners? Attached wristlets?

All of these questions need to be asked and answers need to be positive. There is a variety of systems across the U.S. Climatic conditions will sometimes decide on your protective clothing. High-rise fires demand full protective clothing and ALWAYS approved SCBA.

TRAINING:

The essential element, always present and necessary, from rookie to Chief Officer - TRAINING.

In high-rise fires the prefire training is going to play an important role in your survival.

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Training methods start in the classroom, end in the simulation, and practiced everytime you respond to that "reported fire" in the high-rise. Practice what you learn in every response. Get into the buildings. Check out the systems. Study the high-rise under construction. You will learn more than you thought was possible.

NFPA 1500:

The intent of this new standard is to provide a framework for a safety and health program. The document is also an "umbrella" document. A series of companion documents with more specific details to follow.

Let's touch on those elements in NFPA 1500 that may be involved in a high-rise fire.

CHAPTER SIX (6) EMERGENCY OPERATIONS:

-An Incident Command System (ICS) shall be established. All members shall be familiar with Incident Command System.

-Safety responsibilities shall be assigned to supervisory personnel at each level of the organization.

-The incident Commander shall be responsible for overall safety.

-A standard system shall be used to identify and account for the assignment of each member at the scene of an incident.

-At incidents or situations where special hazards exist, an Officer shall identify and evaluate hazards.

-Members working in hazardous areas shall work in teams of two (2) or more. There shall be at least one member specifically assigned to remain outside the hazardous area and maintain an awareness of the operations. Backup personnel shall be available. Standby qualified basic life support personnel with transportation shall be available.

Are you ready to apply the above items, with your resources, in a high-rise fire?

The above is only a small portion of the NFPA 1500. We suggest you explore the entire standard and examine your own operation.

In conclusion, we offer you a series of "Safety Truths" (Courtesy of Alan Bruncini).

-THINK!!!
-Drive defensively!
-Drive slower rather than faster.
-If you cannot see, stop!
-Don't run for a moving rig!

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-Always wear your seat belt.
-Wear full turnouts and SCBA.
-Attach with a sensible level of aggression.
-Always work with Incident Command System, no free lancing.
-Don't ever breathe smoke.
-Keep your crew intact.
-Maintain a communication link to command.
-Evaluate the hazard - know the risk.
-Follow SOP, know and be a part of the plan.
-Ventilate early and ventilate often.
-Use a line that is big enough and long enough.
-Do not ever go beyond your air supply.
-Always have an escape route.
-Provide lights for the work area.
-If it is heavy, get help.
-Always watch your firefighting position.
-Look and listen for signs of collapse.
-Rehab fatigued companies - assist stressed companies.
-PAY ATTENTION ALL THE TIME!!
-Everybody looks out for everybody.

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CONTROLLING A HIGH-RISE EMERGENCY WITH A SMALL FIRE DEPARTMENT

RETIRED CURRICULUM

William Pajares
Battalion Chief
Training Officer
Santa Monica FD

I. OBJECTIVE

The objective of this paper is to show how a smaller fire department like the city of Santa Monica, with 31 on-duty personnel, can successfully control a major high-rise emergency.

II. BODY

A smaller fire department has the ability to control a major high-rise emergency by using a variety of ready made techniques and procedures. The items to be discussed in this paper include: utilizing the ICS System, pre-fire planning and building inventories, proper training, and good mutual aid contracts.

Of most importance is utilizing the ICS System for control of emergencies, especially a high-rise fire. The system creates the control of personnel and planning for all contingencies that is required for any size fire department. With a small fire department the system is an absolute must. Every firefighter has an assignment and each member must be utilized to the fullest extent. When you only have 32 people at the scene in the fires initial stages you can't afford to be inefficient or forget to cover an important function. Additionally, you need to all be talking the same language when the fire grows in intensity and mutual aid arrives to assist.

In the city of Santa Monica we have taken some liberties with the Los Angeles City High-Rise firefighting model so it can be utilized on a smaller scale. These liberties are most evident in the priority of assignment and deployment of the first alarm assignment. What we don't have in total numbers of personnel we try to make up for by covering the basic skeleton of ICS requirements, while trying to put as much firefighting capability to work on the seat of the fire as possible in the hopes that we can stop it while it is small. The theory is that as more companies arrive we can flesh out the entire ICS system in preparation for arriving mutual aid companies.

Our first alarm assignment is three engines (four firefighters each), one truck (five firefighters), one squad (two firefighters), one B/C. Our first-in company is Fire Attack and takes all members aloft via the stairs. Second-in assumes lobby, and in addition to the normal lobby functions also establishes staging with one man (see Appendix #1). The B/C sets the command post and base locations, but the base remains unmanned until the arrival of mutual aid companies. The IC also retains the responsibility of water supply. He then has the flexibility of utilizing the built in fire pump system in the initial stages of the emergency or he will have the third-in engineer pump to a dry system (see Appendix #2). Under normal conditions we can usually put our third and fourth-in companies and our squad right in behind Fire Attack. As you can see we now have a company as Fire Attack with two companies and a squad right behind them. We have

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a company in lobby taking care of elevator control, fire control room, stairwell access and HVAC system control. They have sent one firefighter to control staging two floors below the fire. We have a B/C as the IC taking his own sit/stat and re/stat and having the responsibility of water supply and an unmanned base (see Appendix #3). At this point we are stretched to the limit, but we have the system in place, it's working and no one can get lost.

As our second alarm assignment arrives we start filling in with companies in those positions that are needed most. Don't worry about the B/C, just about the time his toes are starting to come off ground our second squad arrives and goes to sit/stat and re/stat.

Prefire planning and a good building inventory system is one of our most important assets. The Santa Monica Fire Department prefire plans a variety of typical hazard occupancies within the city creating building inventory sheets carried on all our apparatus. High rise buildings are of special interest to us due to their nature. Each fire companies first-in district is divided into an inspection district that they are responsible for. Any high rise building is required to be prefire planned at least twice a year and one of those inspections must include the entire platoon. This keeps the building inventory sheet current and each of the platoons gets through every high rise building each year as a refresher. Being a small city of 8½ square miles and only 30 high rise buildings does have its advantages at times. We use the Los Angeles City Fire Department building inventory model and our actual work is done on a Macintosh computer, so it can be easily changed or altered.

Proper training in high rise firefighting is also very important to us. Each company library has a high rise training manual that is a copy of the Los Angeles City manual altered to reflect our changes in priority of assignment. Each company officer utilizes this manual to train their crew. In addition to platoon wide prefire planning sessions where a good deal of training takes place, each platoon conducts a minimum of one high rise drill a year under the watchful eye of their Platoon Commander. The training division also conducts periodic high rise drills and includes mutual aid companies to help polish the coordination between the agencies.

Last but not least, are the good neighbors involved in a good mutual aid contract. We have been very fortunate in the past and have been able to keep the high rise fires that have occurred in the city of Santa Monica relatively small in size. We have been able to keep most to the room or origin or original apartment and only one that had been able to get out into a corridor and start a run. We know, however, that it is only a matter of time before a delayed alarm or untimely attack on the seat of the fire will overwhelm our limited resources. We have been more restrictive in our code adoption than most cities, building in better fire protection, but even that will not prevent the inevitable. Our best hope for that event is mutual aid. We work closely with the cities of Beverly Hills and Culver City with which we form a strike team when called by the Area "A" coordinator. Those are however, limited resources including probably one truck company and at the most three engine companies. Los Angeles County will send help, but they have limited numbers of equipment in our vicinity. Our biggest and most immediate help is the Los Angeles City Fire Department, who is our Area "A" coordinator and has come to our rescue on more than one occasion.

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III. Conclusion

There is now way to control the major campaign high rise fire with out large numbers of firefighters and equipment. The best we can hope for is that through restrictive codes and ordinances requiring built in fire control systems, good training of both occupants and firefighters, good prefire planning, an aggressive attack at the seat of the fire, that we can keep the fire small. If any of this fails we will need large numbers of mutual aid firefighters and equipment to do the job. When it happens, hopefully we will have done our homework well and have an ICS system in place that all of the firefighters can relate to and work with. The only other options that I can see is catching up with the fire on the downward side of the GPM curve when it is starting to burn itself out. That kind of scenario doesn't do a lot for you ego and as my Chief once told me, "When the fire is starting to burn down to lower floors and you can't stop it, you start looking foolish."

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SPECIFIC OPERATIONS

LOBBY CONTROL

I. RESPONSIBILITIES

A. Manage All Lobby Control Activities: Elevators; Air Handling Systems; Stairwell Access; Priority Equipment Movement; Building Engineer Contact

II. ESTABLISH LOCATIONS

A. Elevators
B. Stairwells
C. Equipment Area

III. STRATEGY

A. Obtain Lock Box Keys
B. Check Elevators

1. Safety
2. Designate Elevators For Use
   (a) Personnel
   (b) Equipment Only

C. Designate Stairwell Use

1. Direct Incoming Companies

D. Air Handling System
E. Move Priority Equipment

1. Coordinate With Base And Staging

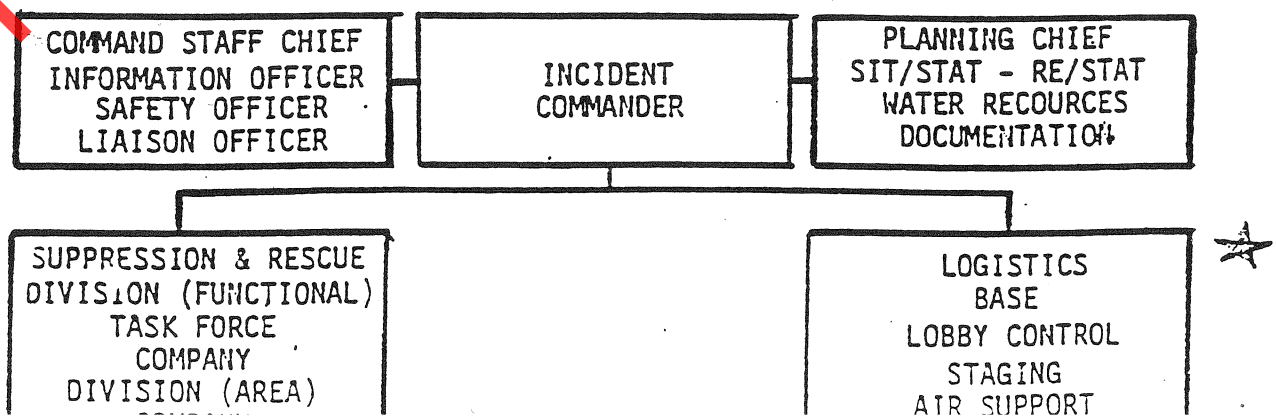
F. Maintain Records

1. Assign Specific Personnel

G. Coordination

1. With Base
2. With Staging

IV. ORGANIZATION, COMMUNICATIONS



RETIRED CURRICULUM

SPECIFIC OPERATIONS

COMMAND POST - INCIDENT COMMANDER

I. RESPONSIBILITIES

A. Manage All On Scene Operations
B. Establish Command And Functional Organization
C. Determine Adequacy of Resources

1. Command Post Personnel
   (a) Plans (Water, Documentation)
   (b) Command Staff (Info, Safety, Liaison)
2. Suppression And Rescue
3. Logistics
4. Special Assignments (Helicopters, Multiple Injury - Disaster, Etc.)

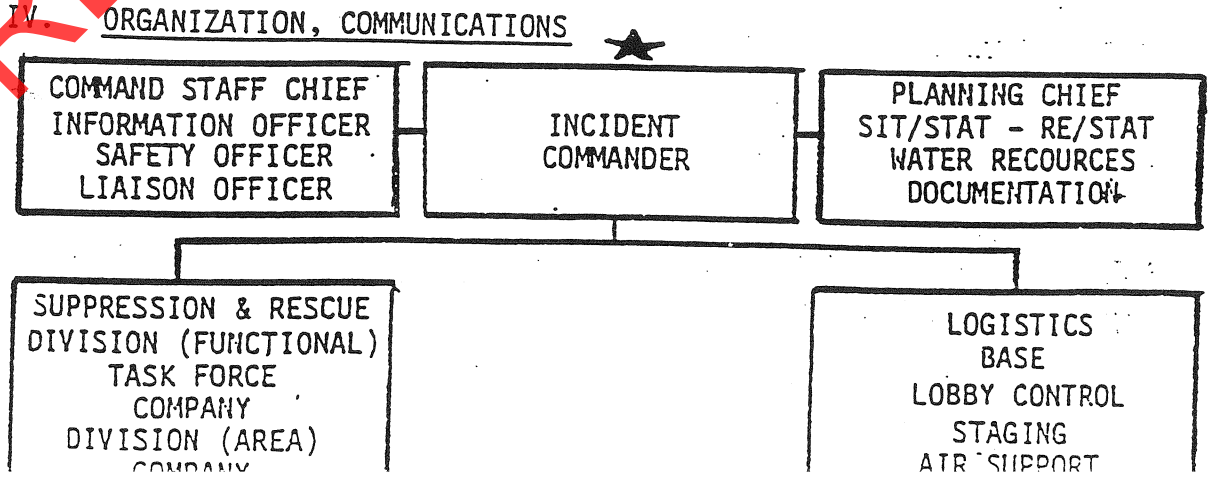
II. ESTABLISH LOCATIONS

A. Command Post
B. Base - "Dispatch All Units To This Location"
C. Staging
D. Air Support
E. Others.

III. STRATEGY

A. Consult With Suppression And Rescue, Plans, Logistics, Overall Strategy:
   1. Fire Attack
   2. Rescue/Evacuation
   3. Fire Behavior-Spread, Lapping Fire Load, Etc.
   4. Ventilation
   5. Salvage
   6. Resources: Relief, RA/Medical, Special Companies, Etc.
      Maintenance of Reserve:
      (a) Base
      (b) Staging
   7. Communications Methods - Radio, Field Phone, Etc.
B. Wrap-Up
   1. Investigation - Probable Cause
   2. Demobilization
   3. Overhaul

IV. ORGANIZATION, COMMUNICATIONS



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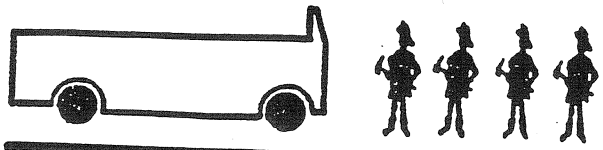
HIGH-RISE OPERATIONS
PRIORITY OF ASSIGNMENT
--COMPANIES-

1st COMPANY

FIRE ATTACK/INVESTIGATION



2nd COMPANY

START
LOBBY CONTROL
and
STAGING

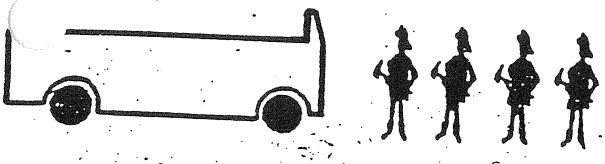
3rd COMPANY

REPORT TO
STAGING, ASSIST
IN FIRE ATTACK

SUCCEEDING COMPANIES

ASSIGNED AT DISCRETION
OF INCIDENT COMMANDER

E.G. - EMERGENCY FUNCTIONS
LOGISTIC FUNCTIONS



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