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High Rise Building Fires

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FIREFIGHTING AND EMERGENCY OPERATIONS MANUAL
VOLUME II - STRUCTURAL FIREFIGHTING
BOOK IV - HIGH-RISE BUILDING FIRES

1 INTRODUCTION

1.1 BACKGROUND

1.1.1 Fires in high-rise buildings everywhere have the potential to be one of the most challenging incidents to which we respond. The potential for loss of life is high. Fires can burn for extended periods of time before operations can begin. The reflex time involved is extended due to the additional time required to reach the fire area. It is not uncommon for 15 or 20 minutes to elapse after the arrival of the first unit before fire attack can actually commence.

1.1.2 A fire in a high-rise building requires a high level of coordination. Members should anticipate a large commitment of resources. High-rise fires have historically proven to be some of the most demanding a department can face.

1.1.3 Members must realize that the majority of high-rise buildings in Northern Virginia have built-in fire protection systems. These systems include sprinkler systems, standpipes, fire detection systems, and fixed fire suppression systems. Only with proper preplanning, will familiarity with the response district be possible.

1.1.4 There are still a significant number of high-rise buildings, both residential and commercial, that have nothing more in terms of fire protection than a standpipe. Northern Virginia alone has several thousand high-rise buildings, and many more are under construction or in the planning stage. Each of these presents its own set of problems and challenges in the event of a fire.

1.2 THE PURPOSE OF THIS BOOK IS:

1.2.1 To describe the differences between residential and commercial high-rise buildings.

1.2.2 To identify the construction features and firefighting problems associated with fires in high-rises.

1.2.3 To establish priorities for firefighting operations during high-rise incidents.

1.2.4 To identify known risks and hazards unique to high-rise buildings that must be known by members engaged in operations at these buildings.

1.2.5 To reiterate the priorities of life safety followed by property conservation.

1.2.6 To define how chief officers are to be deployed and the responsibilities as tactical commanders, in addition to those of the incident commander.

1.2.7 To provide guidance to company officers in directing and coordinating fire attack and all support activities.

2 DESCRIPTION

2.1 DEFINITION

2.1.1 A high-rise building is defined as a building six or more stories, or 75 feet above the lowest fire department access to the highest floor level intended for occupant use. In February 1976, the Virginia Uniform Statewide Building Code was modified to require a fire control room in buildings having occupied floors located more than 75 feet above the lowest level of fire department vehicle access. Members must understand that problems characteristic in high-rise buildings are not limited to structures that meet this definition. Fires that occur in structures with fewer floors, or lower building height can still present the same challenges experienced in much higher buildings. A building four stories or more with at least one standpipe and one elevator, may require most of the same tactical considerations as a high-rise but some will not have the same built-in fire protection systems.

2.2 CHARACTERISTICS

2.2.1 High-rise buildings are present throughout Northern Virginia. These buildings vary greatly in height ranging from only six or seven stories, to structures that exceed 30 stories.

2.2.2 Fire-resistive construction is the method typically found in high-rise buildings.

2.2.3 These high-rises will house occupancies including assisted living, hospitals, business offices, apartments, and hotels. Depending on the occupancy, personnel may encounter a floor with many compartments, or in the case of an office setting, have several thousand square feet of open cubicle workstation area.

2.2.4 High security features may be found in many government and private technological type occupancies. These features can include vaults with lead-shielded walls and doors, and raised floors to accommodate computer and communications wiring as well as special locks.

2.2.5 Located throughout many of these buildings are: community rooms, restaurants, gymnasiums, swimming pools, parking garages, trash rooms and chutes, compactors, dumpsters, and mercantile occupancies. Typically these areas/rooms are located on the lower floors. Restaurants, bars, or clubs may also be located on the top floor of any high-rise.

2.2.6 A large portion of the building likely willbe beyond the reach of aerial apparatus.

2.2.7 The potential exists for stack effect and reverse stack effect as well as stratification related to the movement of smoke and heated gases.

2.2.8 Prolonged reflex time and evacuation times can be expected.

2.2.9 Dependency on internal fire protection systems is required.

2.2.10 Due to modern furnishings, the characteristics of fire resistive construction and reflex time involved, high heat conditions can be expected when battling fires in these structures.

2.2.11 Because of the amount of steel and concrete in the structure, officers and firefighters may have difficulty transmitting via portable radios.

3 CONSTRUCTION

3.1 Modern high-rise buildings are of two basic occupancy designs:

- High-rise buildings with living and sleeping quarters may be hotels, apartment buildings, condominiums, hospitals, or other assisted living facilities. These occupancies are characterized by center corridors, numerous interior compartments such as rooms, closets, etc. and 24-hour occupancy.

- Commercial high-rises are characterized by center core construction, circuit corridors around the core of the building, and relatively large, open expanses on each floor. Occupancy loads are usually greater during normal business hours.

3.1.1 There are basically two types of high-rise buildings found in the region. Those constructed before February of 1976, when modern high-rise requirements were enacted, and those that were constructed after the code change.

3.1.2 A high-rise building constructed during and after 1976 in the Northern Virginia region will be of fire resistant construction with related fire protection features including:

- Fully sprinklered or compartmented.
- A class III standpipe system. The outlets on this system will be 2 ½ inches in diameter and have 1 ½ inch reducers. Buildings may or may not be sprinklered. A compartmentation option existed for buildings built prior to April of 1991, however, the vast majority of our high-rise buildings in the region are partially or fully sprinklered.

- Fireman's service to the elevators
- HVAC system capable of exhausting smoke
- At least two approved means of egress from each floor
- A local fire warning system
- A building communications system
- A fire control room
- Standby and emergency power systems

3.1.3 Fire resistance is intended to provide resistance to collapse of structural members and floors, and resistance to the passage of fire through floors and horizontal barriers. Fire resistance itself is not concerned with life safety or control and movement of toxic combustion products.

3.1.4 Buildings of older construction in the Northern Virginia area (1950s-1975) range from earlier era steel and concrete, to modern, lighter-weight construction.

3.1.5 Buildings that were constructed before the 1976 code requirements took effect could have a wide variety of design features and systems. At a minimum, all occupied high-rise buildings in Northern Virginia have:

- At least two approved exits from each floor
- Enclosed stairwells (except in a few of the older buildings)
- Some type of smoke control or compartmentation. Either windows that can be opened, tempered glass panels on at least two sides of the building that can be broken out, or a modified HVAC system that can exhaust smoke to the outside without contaminating other floors.

3.1.6 Most are non-sprinklered, without fire control rooms and modern alarm and elevator control systems. Some of these buildings have been, or are in the process of being retrofitted to meet modern standards. There are both office and residential occupancies that meet this description.

3.1.7 Some of the features in the older structures may include:

- Compartmentalized office and residential spaces with mazelike corridors. (Long hose stretches and attempts to locate the fire can be confusing when operating in smoke filled corridors.)Lack of central HVAC systems
- Conventional windows that may be opened
- Lack of suspended ceilings, less hidden void space
- Steel structural members encased in concrete
- Exterior walls of masonry and directly tied into each floor
- Pre- or post-tensioned concrete floors
- Reinforced concrete columns

3.1.8 Newer style high-rises include the use of lighter weight materials, larger open floor spaces, and suspended ceilings. More of these buildings, especially commercial occupancies, are of core type design. Elevators, stairwells, and mechanical rooms are located in the middle core of the building. The office or residential space makes up the perimeter of the floor.

3.1.9 Within the parameters of these construction types, there are many unique configurations and fire protection systems. Company officers must see that all personnel are given the opportunity to get familiar with their response district and become familiar with the building layouts, and alarm and protection systems. Preplanning is paramount in anticipation of high-rise fire fighting.

3.2 ROOFS

3.2.1 The roof may be of much lighter construction than the floors. It may consist of a typical insulated metal deck roof or be of the same construction as the floors below, but with a weather barrier installed.

3.2.2 A common type of flat roof construction utilizes composite Q deck with a rubberized or tar and gravel top layer (built-up roof [BUR]).

3.2.3 Facades that give the appearance of a decorative pitched roof or an additional floor, may surround flat roofs. These may protrude high above the actual roofline, such as mansard style facades.

3.2.4 Access to the roof area will normally be through a hatch or a bulkhead at the top of the stairwell(s) or through the penthouse machine room areas. These must be indicated in the first due company's preplan.

3.2.5 HVAC units may be found on the roof area or on each floor. Shut-off switches will be found adjacent to these units and possibly in the fire control room. The building may also have HVAC units at a midway point of the structure if exceptionally tall.

3.2.6 Elevator control rooms are found at roof level in most cases. The control panel (shut off) for each elevator is in this room.

3.2.7 Vertical ventilation shafts for the occupancies below terminate at the roof level.

3.2.8 Roof areas may contain helicopter pads, communications equipment, antennae, microwave dishes, and guy lines.

3.3 ATTICS AND CEILING AREAS

3.3.1 High-rise buildings do not have an attic. However, often the top floor or penthouse will consist of mechanical and elevator rooms. Companies must be familiar with these areas and realize that they could be found fully charged with smoke, as a result of a fire many floors below.

3.3.2 In older as well as newer construction the presence of suspended ceilings is prevalent. The steel truss and ceiling assembly provides an inherent and useful void. In older buildings, a suspended ceiling may be added to provide a passage for the new additions of piping, wiring for communications, and other building support systems.

3.3.3 Slab concrete floors don't have this inherent void. Because these voids are useful, they are be created by the use of drop ceilings and then connected through poke-through's and vertical utility shafts, providing avenue for vertical fire extension. This can create a void area that may account for up to 25 percent of the volume on a given floor. Suspended ceilings are more prevalent in commercial occupancies but are also found in many residential buildings.

3.3.4 The plenum area created by these voids is extensive, lacks fire stopping, and is often used for the return air side of the HVAC system.

3.4 WALLS

3.4.1 The interior walls of a residential high-rise, and when present in office use, will typically be of gypsum board. The gypsum is most often mounted on metal studs. There are some masonry interior walls in a limited number of buildings in the Northern Virginia.

3.4.2 Gypsum and masonry walls are used to enclose stairway, elevator, and other shafts. These will have two hour fire resistance ratings.

3.4.3 Many of the newer constructed buildings have exterior curtain walls constructed of glass or pre-cast panels.

3.4.4 Due to the way curtain walls are mounted to the floor sections or frame of a building, gaps of 6 to 12 inches are common. Fire-stops are required, however, the efficiency of this barrier is questionable at best.

3.4.5 Expect vertical extension between these curtain walls and floor sections. Downward extension should be anticipated as well, including into the plenum on the floor below.

3.5 FLOORS

3.5.1 Construction of floors can be reinforced or post-tensioned, cast-in-place concrete, or it may be of reinforced or pre-tensioned, pre-cast concrete.

3.5.2 Another type floor found in high-rise construction actually forms both the floor and the ceiling area for the level below. This is a composite "Q" floor assembly. Francis Brannigan describes; "The whole assembly including the ceiling, hangers, electrical fixtures, floor joists, left -in-place form-work for the concrete floor (corrugated steel), air ducts, and diffusers, and the concrete floor, make up the entire floor/ceiling assembly."

3.5.3 Fire officers and their crews should be aware that in buildings built prior to 1980, the presence of sprayed on asbestos fiber, used in the "direct application" method of fireproofing steel support members, could exist.

3.5.4 Other examples of fire resistive measures for floor support systems are direct application of intumescent coating and suspended ceiling assemblies, known as membrane fireproofing. The membrane fire protection is prevalent in many of the office high-rise buildings encountered.

3.5.5 The effectiveness of fireproofing depends on the installation and the original building inspection. Fire department members should take note and document any compromise of these systems while on regular building familiarization visits.

3.6 BASEMENTS

3.6.1 Basements or below grade areas contain a multitude of uses. Parking garages, trash compactors, mail rooms, dumpsters, storage areas, and utility rooms or tunnels, are just some areas which may be located in the basement.

3.6.2 Parking garages present a number of problems. The garage may extend out beyond the main structure and even serve the area below an adjacent structure. The covering slab of concrete may be designed to carry only the weight of automobiles. Apparatus access to this area may be restricted or not possible at all.

3.6.3 All parking garages may not be sprinklered. A dry standpipe may be all that is present.

3.6.4 A fire condition in any of the areas identified above can lead to a smoke polluted building. An example of this potential, is the explosion in 1993 in a below-grade parking garage in New York's World Trade Center.

3.7 WINDOWS

3.7.1 Many buildings have windows that can not be opened. These are primarily found in newer constructed, office-use buildings. Heating and air conditioning concerns by the architect lead to fixed windows to control the loss of treated air.

3.7.2 Most of the windows in an office high-rise are covered with a sun-screening plastic coating, and may run from floor-to-ceiling and surround the building. These windows typically are plate glass, tempered glass, or Lexan.

3.7.3 Some of these windows may be opened with special keys or devices.

3.7.4 Many buildings with windows that can not be opened are required to be fitted with windows that can be broken in the event of an emergency. The windowpanes that CAN be broken are indicated or marked with a Maltese cross or a fire helmet etched in the lower corner of the pane.

3.7.5 Buildings with windows that can be opened, are primarily residential occupancies. These can include casement and double-hung windows.

3.8 DOORS

3.8.1 Doors that separate the various occupancies within the high-rise are fire-rated metal or wood in metal frames. These are inward opening; that is, the door swings into the apartment or office from the hallway. The presence of outward opening doors indicates an electric or telephone room, or other type of closet. Doors from the stairwell to the hallways swing into the stairwell. Members should keep this in mind as they plan a hose advance from the standpipe. Door chocks should be available.

3.8.2 Doors leading from the stairwell to the hall, roof, or mechanical room, may be locked above the lobby or first floor level. The first engine, truck, or rescue company proceeding to the fire floor should be equipped with keys and always have forcible entry tools available.

3.8.3 Locked stairwell doors in buildings with fire control rooms and electric locks usually unlock automatically when the system goes into alarm. Once the alarm system activates, all stairwell doors on all levels of the building unlock to provide unimpeded access. Keep in mind that the doors will lock again if the alarm system is reset. If the doors are locked, and members enter the stairwell from any floor above the first, it will be necessary to return to the main lobby level in order to exit the stairwell. A stair door unlock switch should be in the fire control room.

3.8.4 In occupancies such as hospitals, hotels, or assisted living facilities, sections of hallways are usually divided into compartments by self-releasing, fire-rated doors. These doors are usually held open by electromagnetic devices, and may be closed by manual means or by fire alarm activation.

3.8.5 Exterior doors at the entrance level of the commercial or residential high-rise are typically aluminum-style type construction with a mortise-type lock.

3.8.6 In buildings that contain balconies, the door from the office or residential unit is predominantly a sliding-glass type.

3.9 STAIRWAYS

3.9.1 Several different types of stairways can be expected in high-rise buildings.

3.9.2 Isolated stairs usually have individual entrances. Stairs access only one section of the building.

3.9.3 Wing stairs access only one wing of the building.

3.9.4 Transverse stairs connect to a common hall on each floor and are located at points remote from each other. Firefighters can go from one stairway to another via the hall, on all floors of the building.

3.9.5 Return stairs maintain the same relationship or location to each floor.

3.9.6 Scissors stairs may be found in core type construction, although rare. These stairs are simply independent stairwells on either side of the core. However, in some cases, each stairwell will only serve every-other-floor. In other words, one of the stairs may serve the even-numbered floors and the other the odd-numbered floors.

3.9.7 Access stairs are an open, unprotected stairway leading from floor-to-floor within a single occupant's space. These are also known as accommodation stairs, or convenience stairs.

3.9.8 In buildings constructed after 1976, the stairways should contain hard-wired communications with the fire control room. These are usually in the form of a red box containing a telephone handset and labeled, "Fireman's Use Only".

3.9.9 Openings for ventilation may be found at the top of some stairwells, and some will be equipped with fans that will pressurize the entire stair.

3.9.10 In the event of an alarm or fire, some stairwells may contain fans that are activated by manual means only, and some may not be equipped with fans at all.

3.9.11 Each fire station shall ensure that preplans exist for the high-rise structures in their area. A copy shall be placed in the fire control room at each building that has such a room. The stairwells in the building shall be clearly identified on the preplan and indicate whether natural openings are present for ventilation purposes.

3.10 STANDPIPES AND SPRINKLER

3.10.1 Automatic sprinklers systems are in place in high-rise buildings constructed after 1976, unless the compartmentation option was chosen.

3.10.2 In earlier constructed buildings, the presence of sprinklers is intermittent. Companies must know prior to the alarm whether a particular building is sprinklered.

3.10.3 Some older structures are equipped with dry standpipes. Be aware of added time requirements and the potential for foreign objects in the connections, when charging these systems with water. The majority of standpipes found in interior applications at a high-rise, are wet systems.

3.10.4 For those buildings with standpipe and sprinkler systems, there is either a combination Siamese hookup, which will supply both systems, or individual hookups for each system. There have been instances where these connections have been incorrectly marked. Preplan and become familiar with the system.

3.10.5 Generally, a hydrant should be located within 100 feet of the standpipe and sprinkler intake connections.

3.10.6 The location of standpipe outlet connections in stairwells can vary depending on the stairwell type and location. Some stairwells may lack standpipe hookups due to the proximity to other risers in the building.

3.10.7 Depending on the floor area and stairwell location, standpipe hookups may be located at midpoints in the hallways.

3.10.8 Sprinkler control valves for each floor may be found at stairwell landings.

3.10.9 There are pressure-reducing valves (PRV) on some of the standpipe connections in the region, although many were removed in the early 1990s. These can severely restrict flow for fire streams being deployed in the fire attack. If possible, these must be bypassed for fire department use.

3.10.10 Individual characteristics shall be identified in the first due company's preplan. Members must be familiar with the high-rises in their area as far as systems, locations, and the unique features of each.

3.11 ATRIUMS

3.11.1 A common feature in newer constructed hotel and office high-rise buildings, is the atrium. These are typically located at the main entrance and are the focal point of the structure.

3.11.2 The atrium presents difficulty in the control of smoke conditions. Many floors can be simultaneously exposed to smoke and fire conditions.

3.11.3 Normal requirements for buildings with atriums are full sprinkler protection and smoke exhaust systems.

3.12 HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

3.12.1 Central air conditioning within a high-rise may interconnect ten to twenty or more floors. Ducts, shafts, and poke-through holes penetrate fire resistive floors, walls, and ceilings. This allows smoke to spread throughout the floors.

3.12.2 HVAC ducts at perimeter windows of the building may be fed fresh air from the ducts located in the ceiling of the floor below. This permits rapid extension through this path.

3.12.3 Many modern systems have full exhaust capability, dampers controlled by fusible links that control fire spread through the ducts, and duct smoke detection systems which automatically shuts down the HVAC system.

3.12.4 Department officers must work with building engineers and fire prevention members to become familiar with all the features of HVAC systems in their respective buildings

3.13 STACK EFFECT, REVERSE STACK EFFECT, AND STRATIFICATION.

3.13.1 A natural occurrence, whose effects become multiplied in the presence of a high-rise building, is known as stack effect.

3.13.2 Stack effect is the natural movement of air within a relatively tightly sealed building due to the temperature difference between the air on the inside and outside of the structure.

3.13.3 Stack effect is more prominent in winter due to the potentially great difference between inside and outside temperatures. Hot air is less dense than cold, and tends to rise through stairways, elevator shafts, and utility chases. The common fireplace utilizes this effect to vent the by-products of the fire.

3.13.4 This effect can be reversed due to the outside temperature being higher than that inside. Such is the case in tightly sealed air-conditioned buildings during summer. This reverse stack effect is less significant because the amount of stack effect is proportional to the differences between the two temperatures. The temperature differences between inside air and outside air are far less in the summer months than winter.

3.13.5 Stratification may occur in sealed buildings when the temperature of the smoke produced is not sufficient to cause it to rise all the way to the top of the building.

3.13.6 The products of combustion rise until the temperature is reduced to ambient temperatures, at which point it begins to settle, or stratify.

3.13.7 Sprinkler activation in a high-rise should be taken into account when considering reverse stack effect and stratification. “Cooler” lower-lying smoke characterizes fires brought under control by sprinkler systems.

3.14 ELEVATORS

3.14.1 Elevators in high-rise structures are of electric traction type. Control rooms are located at the top of the elevator shaft. Some shorter buildings may contain hydraulic elevators.

3.14.2 Elevator shafts and doors have a minimum two hour fire rating.

3.14.3 Express elevators, which bypass a portion of the building via a blind shaft, are found in many of the high-rises throughout the area. A blind shaft is one that has no openings at all onto specific floors, but serves a specified portion of the building.

3.14.4 Elevators shall be identified and have car number designations in the preplan of the building. The fire control room in newer core type construction, or lobby level will typically have a master locator panel for the elevator banks.

3.14.5 "Fireman’s service” may or may not be present. First-in companies shall not use the elevators, if not equipped with fireman service controls.

3.14.6 Independent service is not to be confused with fireman's service. The elevator car doors, when in the independent mode, will open automatically when arriving at the specified floor. Whereas, the doors in the car under fireman's service will not open until the "door open" button has been activated.

3.14.7 There are two phases associated with fireman's service control. Phase 1 is when the system has been activated to recall the elevators to the lobby level, (if a smoke detector has activated at the lobby level, the cars will stop at an alternate floor). Phase 2 is when the fire department members take possession of, and operate the elevator car.

3.14.8 Communications to the fire control room is present in cars installed after February 1976.

3.14.9 Freight (oversized) elevators may be present in an area remote from the main bank. Freight elevators should not normally be used during emergency operations. However, if the freight elevators are located in an area not affected by the fire, smoke, or products of combustion, officers can exercise judgement as to their use.

3.14.10 Post 1976 buildings should automatically recall the elevators to the lobby level or other recall level upon the system going into alarm. If there has been an activation of the smoke detector at the lobby or levels below due to fire, the elevator cars will stop at an alternate floor. Due to the fact that most modern high-rise buildings alarm the fire floor as well as the floor above and below the fire floor, this alternate location may be two floors above or below the lobby. The location of the elevators in this instance must be confirmed.

3.14.11 Fire, heat, and water can cause elevators to malfunction. This can, and has occurred regardless of fireman's service control. Firefighters should expect that if an elevator has been subjected to any of these conditions, there would be a malfunction. Even the smallest amount of water running into the shaft has the potential of causing elevator malfunction.

3.14.12 Members must also use caution not to mistakenly utilize the "independent service" function during alarm conditions. Independent service allows a car to be used for special service. This is often used when occupants are moving in or out of the building and need to retain possession of the elevator car. Independent service does not provide the safety characteristics, as does "fireman service", or "fire service control."

3.15 FIRE CONTROL ROOM AND ALARM SYSTEM FEATURES

3.15.1 The introduction of sophisticated electronics, sensors and control mechanisms, has altered the monitoring and suppression capabilities in the high-rise building. These features are incorporated throughout the building and terminate at the fire control room. A fire control room is used for any system in a high-rise where detection, fire protection, communications, and air handling systems are centralized for fire department use. Status boards indicating operational modes for the systems present in the building are in the fire control room. These rooms are required in high-rises constructed after 1976.

3.15.2 Fire control rooms are usually located near, or at the main lobby entrance, typically at an outside wall.

3.15.3 Fire control rooms are required to be marked with a sign. However, companies must know the location from pre-incident planning and familiarization.

3.15.4 Annunciator panels indicate the location and type of detection. The panel indicates the area of the fire floor.

3.15.5 Telephone communication systems, known as “fire phones,” consist of a system distributed throughout the building for fire department communications. Phones are located in elevator cars, floor lobbies, and stairwell landings on each floor. When a fire phone is taken off of the hook in the building, it will annunciate by floor or elevator, in the fire control room.

3.15.6 Public address and alarm systems are connected. This is designed to allow the fire control room to talk to any single floor, combination of floors, or the total building. Speakers are located in hallways, elevators, stairwells, rooms or tenant space exceeding 1000 square feet, and all dwelling units. In addition to the use of the public address system, individual floors can be placed into alarm to assist in the evacuation operation.

3.15.7 Stairwell pressurization systems, if present, will activate upon alarm of the building.

3.15.8 Corridor pressurization is present in some buildings. This utilizes fans to pressurize the fire floor hall to prevent the entry of smoke into the common area from the involved unit.

3.15.9 Elevator pressurization is also an additional feature found in some high-rises. The elevator shaft becomes pressurized to prevent the entry of smoke.

3.15.10 Stairwell smoke ventilation systems. Some stairwells are equipped with smaller exhaust fans to compliment the larger pressurization fans, at the base of the well. This will remove any smoke that has entered the stairways.

3.15.11 Emergency elevator recall occurs when the building goes into alarm. This makes the cars unavailable for occupant use.

3.15.12 Air handling and exhaust systems. These can be controlled to assist in removing areas of smoke during an incident via H.O.A (Hand-Off-Auto) switches in the fire control room.

3.15.13 Auxiliary power generators provide emergency lighting and power when needed. The generators are designed to operate the elevators one at a time in order to bring each car to the lobby and open the doors in the event of a power failure.

3.15.14 A fire pump installed in the building is designed to assist with water flow for standpipes and sprinklers.

3.15.15 Automatic door unlocking systems activate when the building goes into alarm. These electric locks must also release with loss of electrical power and under manual override. This includes those corridor doors held open by electromagnetic devices.

3.15.16 Fire control rooms are designed to receive an alarm from any manual pull box, sprinkler flow switch, smoke detectors, and heat detectors located throughout the building.

3.15.17 Upon receipt of alarm:

3.15.18 A prerecorded announcement is broadcast to the floor issuing the alarm, the floors above and below, and all elevators and stairs. Occupants are directed to exit through the nearest stairs.

3.15.19 Elevator recall is initiated and activates the flashing signs near all elevator landings. Elevators are programmed to return to the main lobby floor level, or a secondary floor, if the lobby is in alarm. If the lobby itself is the source of the alarm, the elevators will go to the secondary floor and the entire building will be placed into alarm.

3.15.20 Stairwell pressurization is activated (if this feature is present).

3.15.21 Shut down or change in mode of HVAC on the floors in alarm.

3.15.22 Alarm is transmitted to a central monitoring system or 24-hour security, if present in the building.

4 HAZARDS

4.1 LIFE HAZARD TO OCCUPANTS

4.1.1 Life hazard to occupants varies greatly with the type of occupancy as well as with the location and extent of fire within the building. Fires in commercial type occupancies have the ability to involve an entire floor, or large portion thereof, since often there is little or no compartmentation. This feature is due to the use of workstations rather than separate, divided offices. Fires that occur in either hotel or residential occupancies have the advantage of a greater level of compartmentation and therefore have significantly less potential for both horizontal and vertical fire extension.

4.1.2 Experience has shown that potential for a high loss of life is possible in any high-rise building. This has been demonstrated in buildings of various occupancies. Fires in both office and hotel situations, such as the MGM Grand fire in Las Vegas, have had disastrous outcomes.

4.1.3 The Los Angeles City Fire Department's Emergency High-rise Operations manual lists three sources of danger to occupants in high-rise buildings.

4.1.3.1 Direct exposure to fire. “This is most likely to occur in residential high-rise buildings through careless activities, e.g., smoker fires, etc. These fires are generally confined to the unit of origin. Direct exposure to fire could also result from a fast spreading fire sweeping through a public area of a high-rise building.”

4.1.3.2 Panic is the second threat. “…Panic could result from the knowledge or belief that a fire is in progress in the building. Occasionally, individuals will react to a high-rise fire situation in an irrational manner and may show some degree of panic. The best defense against this situation is public education. People who have been trained to do the right thing are much less susceptible to panic or irrational actions under stress.”

4.1.3.3 “The third and by far the gravest threat to building occupants in high-rise fires is exposure to smoke and the products of combustion. Building design features such as compartmentation, pressurized stairwells, and elevator vestibules are intended to minimize smoke travel within the building. However, these efforts may not be entirely successful. Smoke may be transmitted through the air handling systems of older buildings lacking automatic shutdown devices. Smoke will also communicate through elevator shafts, stairwells, utility alleys, or almost any vertical or horizontal opening. Smoke could also escape the building and be carried back in at other levels by exterior air currents.”

4.1.4 Evacuation alone of a high-rise building requires the commitment of a large amount of resources. If a large-scale evacuation is necessary, a Search and Evacuation Branch should be established with a chief officer in charge. An evacuation of a smaller scale may only require the use of an evacuation group.

4.1.5 Often times, the best way to accomplish control of occupants and maintain their safety will be to “protect in place.” That is, a total evacuation will not normally be initiated, rather a controlled movement of occupants on floors where fire is present or directly above the fire.

4.2 COLLAPSE

4.2.1 Collapse of high-rise buildings, or portions of these structures, have not been a significant problem. Even with the fire that occurred at One Meridian Plaza in Philadelphia, when engineers advised the Incident Commander that interior operations should be discontinued due to their concern for a compromise of structural stability, there was no collapse. Fire resistive construction has proven to withstand incredible fire involvement without collapse. There have been instances where portions of a ceiling, including the Q-decking, has dropped in a localized area after intense fire exposure, however, collapse of the building did not occur.

4.2.2 Members should not view a high-rise as being impervious to collapse hazards. The collapse of just a suspended ceiling with its spider web-type maze of cross tees will trap firefighters, rendering escape impossible. If the membrane of the suspended ceiling has been compromised, firefighters should expect at least a partial failure of the ceiling assembly.

4.3 SMOKE MOVEMENT

4.3.1 Awareness of the probability of a panic situation is imperative for units responding to high-rise fires. Building occupants who are self-evacuating are obviously already aware of the fire and trying to escape. Problems for fire crews moving up the interior stairs while evacuees are trying to move down may be substantial. Gaining early control of this situation is necessary, and as mentioned earlier, will require heavy commitment of resources.

4.3.2 Smoke contamination of stairwells is reason for identification of evacuation routes to enable the safe and orderly movement of building occupants to locations below the fire.

4.3.3 Smoke entering elevators and other vertical shafts will cause panic to those individuals in the elevators being recalled to the lobby. This vertical extension can also result in smoke contamination of any floor above the level of the fire. Smoke entering any floor will likely cause occupants to attempt self-evacuation. Communication via the public address system, if available, can help to allay some of the fears of the occupants. Firm direction from the fire department is crucial.

4.3.4 The evacuation process in itself can present hazards to the building occupants. Fire department supervision of the movement of evacuees down the stairways is imperative. Firm and clear direction must be given all the way to the point of assembly. Members must be aware that excited building occupants, particularly those in a residential setting, will begin to stop and talk with acquaintances when exiting a stairwell into the lobby or other point of exit. This must not be allowed to occur. These people must be continually guided to a safe place of assembly. This may include provisions being made for safe passage away from the building to avoid undue confusion in a lobby, falling glass, or other debris.

4.4 BACKDRAFTS AND FLASHOVER

4.4.1 A backdraft or flashover can occur in any structure. In a high-rise, hazards associated with these phenomena high-rise are primarily related to contents, but can include interior finishes.

4.4.2 Although fire codes have changed over the years to more closely regulate what interior finishes can be used, situations that allow rapid fire spread over wall and floor coverings may still be encountered.

4.4.3 The contents of the building, particularly those in office type occupancies, provide a moderate to heavy fire load. The heat released from the extensive use of plastics and other petroleum-based products can be more than twice that of true “class A” materials. While “class A” materials release about 8000 Btu per pound of burning material, the materials encountered today can easily produce twice that amount of heat. Thus, the fires burn hotter and grow more rapidly. This situation leads to the possibility of flashover early in the incident. The added fact that high-rise structures tend to be built more tightly increases the possibility of flashover or backdraft. Crews must be cognizant of the fact that either of these events can occur at any time.

4.4.4 Since ventilation of almost any area of a high-rise is difficult, if not impossible, it is imperative that the overhead is cooled with hose streams. This is the most effective method for controlling and preventing flashover. Additionally, since crews are dealing with enclosed or confined spaces, even if somewhat large, straight or solid streams must be used.

4.4.5 In office or other commercial situations, much of the fire loading is exposed due to the lack of compartmentation. An advancing fire quickly heats the products that have not yet ignited which leads to rapid fire spread. Since the area is often not vented, nor able to be, temperatures within the involved area rise rapidly. As the contents continue to be heated, large amounts of smoke and other fire gases are produced. As these ignite, rollover extends outward from the seat of the fire, in turn causing radiant heat to expose much more of the contents, quickly leading to flashover conditions. Since the area is often undivided, this phenomenon is self-perpetuating until a large area is involved. This can rapidly spread over an entire floor, depending upon the layout.

4.4.6 Members must also be cautious and aware that a backdraft can occur in any enclosed area within a structure. The area above a ceiling is one possibility.

4.5 FIRE EXTENSION

4.5.1 Horizontal fire extension in commercial occupancies can quickly involve a large portion of a floor area since there may be little or no separations. The use of workstations rather than individual wall-separated offices has resulted in these large open areas. Tenants pay high rent per square foot and the workstation makes more use of available floor space than does the office concept. However, this approach sets up a situation where instead of having many small rooms within the tenant's area of operation, the entire space is undivided. Since floor areas of 15,000 square feet per floor and larger are not uncommon, if a fire goes unchecked by sprinklers or early extinguishment by other means, fire involvement of large areas is likely.

4.5.2 Vertical fire extension can occur by several means: fire lapping out of windows and extending into windows above; fire extending up through unprotected or compromised void spaces; fire extending up the space between the floor and curtain wall; fire entering elevator and other shafts; and fire extending upward within an occupancy that occupies more than one floor and has installed an access or convenience stairway.

4.5.3 It is recognized that fire resistive construction is designed to limit the spread of fire and not contribute to the fire load. Additionally, the extensive use of sprinkler systems in Northern Virginia minimizes the threat of large-scale fires. However, the concern is for those situations where, for whatever the reason, the sprinklers do not control the fire or are turned off. Contents of these buildings have a rate of heat release that can allow a fire to double in size about every 90 seconds!

4.5.4 An even greater hazard for fire spread is obviously present in the remaining buildings where sprinklers are not present or non-existent. The reaction time involved for fire to be discovered, the alarm turned in, dispatch and response time, verification of fire location and units to get into position to operate, can allow fire to increase in size exponentially.

4.5.5 Fire extension can also be a high concern if the fire is located in the lower two or three floors of a hotel high-rise. In hotels, mercantile occupancies including restaurants, bars, sundries, hair salons, gift shops and even clothing stores may be present. Meeting rooms, ballrooms, storage areas, and recreation areas may also contribute to the fire problem that is more similar to a commercial situation than what would be confronted on the floors containing the guestrooms. Fires in these areas can be quite severe, as the fire loading is higher than the light load in the guestrooms. For this reason, locating the fire and identifying what is involved is paramount in making strategic and tactical decisions. These same occupancies can occasionally be found in some office buildings.

4.5.6 In residential high-rises, many of the same problems listed above in 4.5.6 may also exist. These various occupancies are often viewed as amenities for the occupants of the complex, yet add a different dimension to the fire problem than would be expected in the residential part of the building. Since these occupancies may have a greater fire load, units must be prepared for rapid fire extension in larger undivided spaces than on the floors that are highly compartmentalized.

4.6 HAZARDS ASSOCIATED WITH HOSELINE ADVANCEMENT

4.6.1 Most hose line operations in high-rise buildings will involve the use of standpipes. However, crews stretching lines for fires that are located on the first or second floor or below grade will most often not use the standpipe, but stretch directly from the apparatus. In his book “Fire Officer’s Handbook of Tactics,” John Norman states that “just because the fire is in a standpipe-equipped building does not mean that the first hose line should be stretched from the standpipe. In many cases, notably fires on the ground floor, it may be better to have the first hose line stretched off the apparatus rather than the standpipe. Normally, the routine handline stretch will be much faster, especially if pre-connected lines are used, than if standpipe lines are used. An evaluation should be made of the locations of the fire in relation to the access.” (Norman, 2nd ed. p. 143-144). The hazard is that crews may not be able to get to the standpipe connection if the fire is between them and that connection. Whenever the stretch will be made from the apparatus and not the standpipe, this must be communicated to other units. Later hose lines may indeed be deployed from the standpipe as the need for more lines is identified.

4.6.2 Crews must drill on the deployment and use of standpipe lines. Standpipe packs provide the officers a great deal of flexibility in deciding the appropriate line for the attack. Lines that are deployed and charged in the stairwells must be deployed in such a way as to allow the line to be advanced onto the fire floor as easily as possible. Hose lines in stairwells are a tripping hazard, but a necessary part of the operation, and one with which members must contend. This is also a reason for clearly identifying what stairwell is being used for fire attack and which for evacuation.

4.6.3 In some circumstances, such as in commercial (office) buildings, the fire area can be several thousand square feet. At least 100 feet of 2 ½ inch hose will be part of every pack in these occupancies in order to ensure that proper flow and nozzle pressure is delivered. More members will be needed to handle a large attack line than a smaller one, and intense manual labor can be expected. Command officers will need to ensure that two engine crews are paired up to deploy and operate 2 ½-inch hose lines.

4.6.4 Although not required, officers should give strong consideration to 2 ½-inch lines in advanced fires or fires above the 20th floor in residential high-rises. A significant fire will require the use of 2 ½-inch lines and command officers will need to ensure that two engine crews are paired up to deploy and operate 2 ½-inch hose lines.

4.6.5 Crews must also deal with the obstacles encountered in the various floors and rooms while advancing the lines. Office layouts using workstations will present a maze of furniture and partitions around which crews will have to negotiate. Fires that are located in other areas can present a myriad of obstacles that include stored and stacked furniture, stock, food handling carts, and bell station luggage carts.

4.6.6 Firefighters advancing hose lines into areas with suspended ceiling assemblies should always check for fire in the plenum above. The hazard here is the possibility of the ceiling assembly dropping on the crew resulting in their being trapped in the maze of cross-tees, hanging wire and electrical cable. Firefighters have died in situations where a suspended ceiling assembly dropped and escape was impossible.

4.7 OTHER HAZARDS

4.7.1 Floor length windows. Some buildings have windows that extend from floor to ceiling. These can be found in any occupancy type. Cases have been documented where windows have either failed or were taken out by firefighting crews. Members operating in these areas have nearly crawled right out of an open space. Extreme caution must be exercised when visibility is significantly reduced or non-existent. Members must be aggressive in their operations, while at the same time exercising caution, ensuring they do not crawl or walk out of an opening such as this.

4.7.2 If roof operations are required, beware of the presence of communications equipment, antennae, microwave dishes, and guy lines. Firefighters must be extremely cautious not to walk off the roof.

4.7.3 Open shafts. Open shafts have unfortunately led to serious injuries and firefighter fatalities. Similar to the situation outlined in 4.7.1, members must again be vigilant while carrying out their assignments in low or zero visibility environments. This caution must be exercised at all locations and floor levels in the building.

4.7.4 Grease ducts. Grease ducts may be present anywhere there is a food processing operation. Restaurants may be located off the lobby or mezzanine levels as well as the top of the building. However, other kitchen areas may be present for food preparation for banquet halls and ball room facilities. All of these will have grease ducts leading to the outside. In some cases, these ducts may run great distances, including the full height of the building exiting at the roof level. A fire in such a duct can lead to fire extension far removed from the cooking area should the duct be compromised or combustibles be close enough to be ignited.

4.7.5 Laundry, trash and mail chutes. These building features exist for the convenience of building occupants. However, they also provide an unobstructed path for fire travel upward. Cigarettes and other tobacco products sometimes are placed into one of these chutes, whether intentionally or not, and a fire results. Smoke can then spread to any level in the building and the alarm turned in to the fire department can be very misleading. Smoke may be reported on a floor far removed from the actual location of the fire, which is most likely in the basement or first floor loading dock area. An additional problem with laundry and trash chutes is the possibility of a bag of clothing or trash becoming suspended in the shaft. If this occurs just at or below the access door to the shaft, fire could enter the floor area if the door is opened to investigate. Sprinklers protect some of these shafts. Smoke from one of these fires will be cold and may show in some unexpected places as a result of its loss of buoyancy.

4.7.6 Utility shafts. As with other vertical shafts, utility shafts often run the entire height of the building. Plumbing and electrical components must enter and exit every floor level and these voids provide this access. Should fire or smoke enter these areas it can be transmitted upward, but may also move downward as well. In particular, fires involving kitchen and bathroom areas should be a signal that extension into one of these shafts is a possibility.

4.7.7 Dumpsters and compactors. These containers can be a particular hazard when attached to the building. Often, trash chutes allow rubbish to be deposited from any floor level and the shaft leads directly into the dumpster or compactor. A fire in such a container can contaminate a large part of the building with smoke and gases from the burning of anything that may have found its way into the container. While the possibility of fire extension exists, smoke and gas being communicated into the structure is the greatest concern.

4.7.8 Hazardous storage. Due to the wide variety of occupancies found in high-rises, many different products are often found within these structures. However, the greatest concern is for the storage of products used in the operation of the building and its amenities. Many hotel and residential high-rise buildings have pool facilities and the storage of the associated chemicals is just one example of what may be encountered. Additionally, paints and janitorial supplies are likely to be present at various locations in the building.

4.7.9 Access or convenience stairways. Stairways which are installed for the convenience of its occupants traveling from floor-to-floor, are referred to as “accommodation stairways” and are installed for those tenants which may occupy more than one floor. These stairs allow the tenant to move throughout their occupied space without using public stairwells or elevators. There is no requirement for these stairs to be enclosed. Should fire occur within this type of occupancy, it can easily spread to all the floors serviced by these stairs. Obviously, this hazard is most significant if the fire occurs on the lower floor of the specific tenant space.

4.7.10 Electrical vaults. These rooms may be present almost anywhere within the building. High-rise buildings are obviously large structures, and the infrastructure necessary for these buildings is quite extensive. High voltage electrical vaults are necessary to service the vast electrical needs of high-rise buildings. Firefighters operating in obscured visibility must be extremely careful not to inadvertently enter one of these rooms. Firefighters that come across a metal door that opens toward them should suspect one of these type rooms. While most have been removed, members must continue to beware of the possibility of the presence of PCBs.

4.7.11 Falling glass and debris. As fires become more severe and the outer skin of the building is compromised, great care must be exercised in the protection of firefighters, evacuees, and spectators from falling materials. Shards of glass have been known to travel great distances in windy conditions and can be extremely dangerous. Protection must be provided for firefighters operating apparatus, hose lines and those entering and exiting the building.

4.7.12 Buildings that are under construction. Units that respond to fires in high-rise buildings under construction must carefully evaluate the stage of completion of the building.

4.7.12.1 If concrete work is still underway and the formwork is in place and burning, members must not be committed to the interior for operations. Every effort must be made to fight the fire from exterior positions as the formwork holding the not yet cured concrete up is being destroyed.

4.7.12.2 Heavy caliber streams will probably be necessary if the fire is located on upper floors. Use of tower ladders, ladder pipes and squirts is recommended. A severe hazard associated with this situation is falling debris. Construction materials, tools, and other items not attached may be washed off the building by these streams. Officers must ensure that the perimeter of the building is secured to avoid injury from these falling items.

4.7.12.3 Members must also consider the possibility of propane cylinders being involved. In addition to the possibility that cylinders are the source of the fire, explosion hazards and the threat of cylinders dropping off the building, must be considered.

4.7.12.4 The potential collapse of walls or portions of walls must also be taken into account. Buildings under construction often have sections or pieces of the outer skin of the building fastened into place along the floor lines. Fire impinging on these wall sections can cause the connections to fail and drop the section.

4.7.13 High security areas. Various businesses and agencies have the need for high level security. Accessing these areas for search or fire attack may be challenging and forcible entry may be necessary. Additionally, due to security needs, occupants of these areas may be very stubborn in evacuating even though the fire department deems it to be in their best interest.

4.7.14 Radio communications. Many companies will be conducting operations at a high-rise fire. Communications between these operating units and command functions is imperative for a successful outcome. However, due to construction of the buildings, fire department radios often do not function as well as they might under normal circumstances. This must be recognized and addressed as best as possible. Use of the other building communication systems, when available, can enhance our ability to communicate.

5 FIRE OPERATIONS

5.1 STRATEGIC FACTORS

5.1.1 High-rise fires present the same needs as most other fires in structures. However, there are many more problems that are unique to these buildings and the demands placed upon our operating forces in order to manage one of these fires. As with other building fires, officers must always assess the risks and benefits associated with each operation. Certainly, we are willing to take a greater degree of risk to save a life than we would once civilian life hazard has been negated.

5.1.2 A study of operating procedures used by several metropolitan fire departments reveals that there are common needs that must be met in battling a high-rise fire and managing the operation of the fire department units. As Francis Brannigan points out, the chief is NOT in charge of the fire. The chief is in charge of the fire department's efforts to suppress the fire. However, chief officers must realize that the unit assignments outlined in this document are based upon typical common tasks in a priority order. This in no way relieves the chief of making adjustments to any assignment as is deemed necessary based upon the specific problems encountered at the incident.

5.1.3 Los Angeles, Philadelphia and New York City fire departments have all developed extensive operational procedures for these fires. Common among all is the identification of key assignments for chief officers that are critical to the success of an operation. In addition to overall command, chief officers may also be used in tactical command positions that include directing operations on the fire floor, lobby control, search and evacuation, planning and logistics, and others as needed by the incident commander. While not every one of these assignments will be needed or made at every high-rise fire, each must be considered by Command and implemented early as indicated.

5.1.4 Due to the need for an unusually high commitment of resources, the process of control and accountability of each unit is of even more significance and this is a function of not only the incident commander, but the command structure that is implemented. **An exceptionally high level of discipline will be required of all officers and members during high-rise operations. Failure to follow any portion of the operational plan can lead to a break down of the entire operation and could result in firefighter casualties.**

5.1.5 The operational plan for high-rise fires must consist of five basic points:

- Determine fire floor.
- Verify fire floor.
- Control occupants.
- Control of building systems.
- Confine and extinguish the fire.

5.1.5.1 Determine the fire floor from information on dispatch, information from building occupants, and by checking annunciator panels or fire control room indicators.

5.1.5.2 Units must investigate to verify the exact location of the fire, including the specific location on the fire floor and the extent of fire involvement.

5.1.5.3 If necessary, evacuation of the immediate fire area may be needed as well as facilitating movement of people already in the stairwells. Size-up may also indicate that control of occupants will be accomplished by protecting in place. If there are more than two occupied floors above the fire, a Search and Evacuation Group or, if needed, Branch should be established.

5.1.5.4 Building systems must be brought under the control of the fire department. At a minimum, this must include control of the elevators, fire pump, and air handling system(s).

5.1.5.5 The fire must be confined before being extinguished. Obviously, putting the fire out accomplishes both but a rapidly extending fire may make this impossible. The critical point is identifying the extent of fire, and stopping it from gaining more headway once operations begin.

5.1.6 Chief officers should be assigned to tactical command positions early into an incident in order to establish and build the proper command structure that efficiently and safely manages the incident. This enables the incident commander to keep company officers out of command level roles and allows them to supervise their company's activities. This also keeps each company functioning as a complete unit, improving the ability to carry out the long list of tasks in the operation.

5.1.7 Fire load characteristics are also a consideration and knowledge of those characteristics provides an understanding of fire behavior in high-rise environments. The 17th edition of the NFPA Fire Protection Handbook states that fire load in general office space is about 7.7 pounds per square foot. A conference area is about 5.9 but a file area jumps to over 16 pounds per square foot! All of these are typically higher in government buildings, of which there are many. The useable floor space on each floor of one of these buildings can easily exceed 25,000 square feet. The combustibles involved can release 16,000 to 18,000 Btu per pound. It is possible for these fires to double in size in as short a time as 90 seconds. A tremendous amount of heat is generated in a very short amount of time and is confined because of the energy efficient nature of high-rise construction.

5.1.8 Exposure protection not only involves checking the floor above, but also requires companies to be assigned to check areas extremely remote from the fire floor. Fire can extend via hidden voids and break out many floors away from the original fire. Additionally, exposure protection includes minimizing fire extension on the floor of involvement itself.

5.1.9 Ventilation, forcible entry, and fire attack must be coordinated. A significant fire may be present on a floor that has confined itself to that floor but also prevented any heat and smoke from venting to the outside. Punishing conditions should be expected.

5.1.10 Wind conditions, in terms of force and direction, must be determined near the fire. At high-rise fires, wind conditions at the level of the fire can be much different from what is happening at ground level.

5.1.11 At residential occupancies, ventilation is more likely to be performed than at commercial occupancies. In residential high-rise fires, companies that are assigned to vent the fire floor should take the time to open a window on the same side of the building as the fire and check the wind conditions before opening the fire floor. Engine crews should not open doors into the fire area until this information is relayed to them, or, risk being driven off the floor or seriously injured should fire be blown over them. (Please refer to the horizontal ventilation section of the truck company operation book).

5.1.12 Members must understand and accept the fact that while aggressive fire attack, ventilation, and search is crucial, considerably more time will be necessary to coordinate and carryout the various tasks correctly. Communication is essential for units to operate in concert with one another.

5.1.13 While it is also recognized that high-rise fires tend to be thought of as being out of the reach of exterior master streams, this is not always the case. Further, use of heavy caliber streams inside is also possible and has actually been done at major high-rise operations.

5.1.14 Consider the time needed to assess the situation upon arrival of the first units, gather information from annunciator panel or fire control station and building personnel, identify and confirm fire floor, proceed to that floor, locate the fire on the floor, and prepare to operate. All members must realize that this time frame can easily exceed 10 or 15 minutes, depending upon the size of the building and complexity of the situation. For example, at a fire on the sixth floor of an office high-rise, only eleven minutes elapsed from the time the fire department received the call until fire was out the windows! By the time crews got into position, only five floors above ground level, two 2½-inch lines could not advance on the fire.

5.1.15 The first chief at the scene must establish Command. Other chief officers will be engaged in tactical command positions. The second due battalion chief will assume the first of these positions. In most cases, this will be as the chief in charge of fire attack on the fire floor(s). Other chiefs should be placed in command of major undertakings such as evacuation, lobby control, staging, or planning.

5.1.16 As with every IDLH situation, a Rapid Intervention Team must be established. The R.I.T. must be located at a minimum at Staging, two floors below the fire. The optimum location for the R.I.T. is the attack stairwell one floor below the fire floor and within contact of the attack officer, thus enabling rapid deployment when and if needed. This must be no farther away from the floor of operations than Staging at two floors below.

5.2 RESOURCES FOR FIRES IN HIGH-RISE BUILDINGS.

5.2.1 The minimum initial alarm assignment for a high-rise fire consists of:

- 4 engines
- 2 trucks
- 1 rescue
- 1 EMS unit
- 2 battalion chiefs

5.2.2 Companies shall position and report as follows unless otherwise directed by the incident commander:

5.2.2.1 The first due engine should park in proximity to the building so as to not block access by other apparatus, abandon the rig, and all members proceed to the lobby to continue size up. If a fire is confirmed, Command shall be assumed by the **third due** engine or the first due chief, whoever is on the scene first. Officer and crew shall then proceed to the reported fire floor, along with the crew of the first due truck or rescue, to verify the location and extent of fire and commence firefighting operations. If the truck or rescue is delayed, the engine should proceed up to the reported fire floor. The officer must exercise his or her discretion on committing to an attack position prior to any other company arriving on the fire floor.

5.2.2.2 The second due engine shall establish water supply. The remaining crew reports to the fire floor immediately to assist the first engine.

5.2.2.3 The third due engine should ensure that all four sides of the building are viewed, if possible, and report that information via radio. If the chief has not yet arrived, the officer shall assume Command and establish a command post in the lobby at the fire control room or station if one exists. The crew shall be deployed to establish lobby control and assist with control of elevators and other building and communication systems. Once the chief assumes Incident Command, the officer of the third engine should then be assigned to assume command of the lobby control function.

5.2.2.4 The fourth due engine should establish water supply to secondary standpipe inlets if present. If so, the driver will have to remain with the apparatus. The crew should then proceed to the floor above the fire. This engine will work with the second truck company checking for extension and for occupants.

5.2.2.5 The first due truck should park on side “A” unless fire location can be readily identified. If so, the truck should then park on the fire side of the building if it is accessible.

5.2.2.5.1 If smoke or fire is showing in a residential or hotel occupancy, and the fire area is within reach of the aerial device, the aerial should be raised and placed to a location accessing the unit involved. The ladder should NOT be placed to a window or balcony showing fire unless there is someone at such a location in need of rescue. If the apartment or unit is totally involved, then the aerial should be raised to an adjoining unit. If there is no need for the aerial, or if the fire floor is out of reach, the crew goes in together.

5.2.2.5.2 Several factors should be considered when the officer makes the decision to use or not to use the aerial:

- The various irregular shapes (H, T, Y, L, etc.) of these buildings make it extremely difficult to locate the truck near the fire apartment without some visible indication of smoke or fire from the outside.
- The vague information normally provided in the initial reports of smoke on one or more floors is often inaccurate until the first units actually go to the reported floor to confirm the location and extent of the fire.
- If the original location is not correct, tiller trucks require two members to relocate if necessary. These trucks also usually require two members to set the jacks for aerial operations.
- The interior responsibilities of the truck on the fire floor or as the R.I.T., are critical and in most cases require at least three members.

5.2.2.5.3 When the truck crew is required to operate utilizing the aerial, as might be the case in an obvious rescue situation, Command **must** be advised. A SECOND ALARM SHOULD HAVE BEEN TRANSMITTED AND IT IS IMPERATIVE THAT THE INCIDENT COMMANDER ENSURE THAT OTHER TRUCK OR RESCUE COMPANIES ARE ASSIGNED TO SUPPORT THE ENGINES OPERATING ON THE FIRE FLOOR(S).

5.2.2.5.4 If the first due truck is a tower ladder, the unit should be positioned as above. However, the crew may ride the bucket up to the fire floor. The officer will have to determine whether to enter the building directly into the involved unit, based upon fire conditions and obvious rescue needs, or to enter by way of an adjoining apartment. This MUST be communicated to the first engine and the battalion chief!

5.2.2.5.5 If the building is office or other commercial occupancy, the entire truck crew should enter the building and go up with the first engine.

5.2.2.6 The second due truck should also position to utilize the aerial to fire floor if within reach. The first truck, prior to arrival of the second, should communicate this information.

5.2.2.6.1 Again, if the building is of residential or hotel occupancy and the fire is within reach of the aerial, it should be raised to the level of the fire floor. This aerial should remain ready for specific placement as needed.

5.2.2.6.2 If the second due truck is a tower ladder and operating with a crew of three, the operator should provide power to the bucket, enter the bucket, and raise the tower to the level of the fire and remain ready for placement as needed. **The operator shall not raise the bucket to a point above the fire except to make an immediate rescue!** If the tower ladder has a crew of four, the officer can split the crew into interior and exterior teams to accomplish the same objectives.

5.2.2.6.3 The crew of the second due truck proceeds to the floor above the fire and will work with the crew of the fourth engine.

5.2.2.6.4 If **immediate** rescues are indicated and within reach of the ladders, one or both truck crews may have to engage in removal operations. **THIS MUST BE COMMUNICATED TO COMMAND!!!!**

5.2.2.7 The rescue company must park away from the building and entire crew proceeds to the attack stairwell one floor below the fire floor as the R.I.T. If this unit arrived before any truck, the crew goes to the fire floor WITH the first due engine. (See note below). The rescue company's vehicle must NOT park close to the building as access for engines getting in to supply systems, trucks positioning for aerial use and ambulances moving in and out of the area with patients, must be maintained. The crew should take their tools and walk up to the building. If a truck is on the scene, the rescue shall proceed to the attack stairwell just below the fire floor to assume R.I.T. duties.

NOTE: IF THE RESCUE COMPANY ARRIVES ON THE SCENE BEFORE THE FIRST DUE TRUCK, THE RESCUE OFFICER MUST CONFIRM BY RADIO THAT THE RESCUE WILL TAKE THE TRUCK'S DUTY ON THE FIRE FLOOR AND THE TRUCK WILL BE R.I.T. TO AVOID CONFUSION OR MISUNDERSTANDING. THIS CHANGE IS TO BE INITIATED BY THE RESCUE OFFICER AND ONLY AFTER THE RESCUE IS PHYSICALLY ON THE SCENE AND CONFIRMS THAT THE TRUCK HAS NOT YET ARRIVED.

5.2.2.8 The EMS crew should be assigned to initial EMS duties. The crew should assemble their EMS equipment onto a stretcher and proceed to the lobby. If the EMS unit is staffed with members trained as firefighters, the crew should have their protective clothing and SCBA with them. If an EMS supervisor has responded, he or she shall report to the command post. Should multiple patients be encountered, the EMS supervisor should be appointed to the EMS Branch position.

5.2.2.9 The first due chief shall immediately gather all available information from companies already at the scene and assume Command. If a fire control room is present and the third engine has arrived, initial Command by a company officer should have been set up. The chief must exchange information and then assume Command setting the command post at the chief's vehicle. The chief can elect to use an area of the lobby near the fire control room as the command post ***if*** there is a large lobby where control of the area at the command post can be achieved.

5.2.2.10 The second due chief shall proceed to Command for briefing and then go to the fire floor. It is expected that this chief will assume command of the fire attack operations on the fire floor, unless directed otherwise by Command.

5.2.3 Experience has shown the need for early escalation of resource commitment when a fire is confirmed in a high-rise. If smoke or fire is showing, or once a fire is confirmed within the structure, requests for additional resources must be considered quickly. Experience has also indicated that a routine fire in a high-rise building will require more resources than a similar fire in other structures. Additionally, the reaction time for units to move into operational positions is longer in a high-rise. Requests for additional alarms must be based upon information as to the severity of fire conditions as well as the occupancy involved. Smoke showing from the balcony of a residential occupancy does not necessarily indicate a major fire within the building. The incident commander should evaluate anticipated additional resources and make requests for additional alarms commensurate with the seriousness of the situation. It is also recognized that a serious fire in a high-rise can rapidly engage a large amount of resources. **Due to the nature of fire spread; size of individual floors; and the time required to carry out tasks such as forcible entry, search for victims and extension of fire, fatigue, and heat conditions, a working fire in a high-rise can be expected to require a greater alarm, and occasionally, several alarms. Command officers also should consider requesting an additional rescue company to supplement the operation.**

5.2.3.1 A working fire in a high-rise often is not apparent from the exterior of the building. A serious fire can develop in a location that is remote from the exterior skin of the structure. A report of "nothing showing" needs to be aggressively investigated. Additional signals that are received on the annunciator panel(s) in the fire control room are a strong indicator of an advancing fire.

5.2.4 Every alarm after the first alarm will bring at least three engines, one truck, and one battalion chief. Additional response may also include deputy or assistant chiefs, light and air units, and other special response units as needed.

5.2.5 The incident commander is responsible for ensuring a R.I.T. is assigned. This is one reason for the request for a second rescue company. Strong consideration also should be given to assigning a R.I.T. task force or at least an engine company along with the rescue company to the R.I.T. at a serious high-rise fire.

5.2.5.1 The need for the commitment of these additional resources has been demonstrated at high-rise building fires in Northern Virginia and around the country. A long list of staff-intensive assignments is identified and described in Section 8. A serious fire in a high-rise building could easily exceed a third alarm assignment.

6 ENGINE COMPANY TACTICS

6.1 FIRE BEHAVIOR AND FIRE LOADING

6.1.1 Fires in high-rise buildings vary greatly depending upon the nature of the occupancy as well as floor layout. Due to the high degree of compartmentation in residential or hotel high-rise buildings, fires are less likely to involve the entire floor. This is due to the high degree of compartmentation characteristics of these occupancies. Even though compartmentation helps control fire spread, extreme caution must be exercised when "making" a hallway as fire can rapidly move down a corridor if an entrance door to an involved occupancy is open. Fire occurring in ballroom or conference room areas may involve a much larger undivided area, and should the building contain retail or other commercial space, a fire in these areas will take on the characteristics more commonly associated with mercantile locations. The difference is that the fire still exposes the rest of the building, and smoke and other products of combustion could be carried to any part of the structure.

6.1.2 Fires that occur in office-type occupancies are more likely to involve a very large open area that can be as large as 15,000 square feet. One floor in a high-rise can easily exceed 30,000 square feet! If there is no sprinkler protection, or if sprinkler protection for whatever reason fails to control the fire, high rates of heat release and rapid extension of fire should be expected.

6.2 ENGINE COMPANY RESPONSIBILITIES

6.2.1 It is the responsibility of the engines to deliver sufficient water in the correct amount and configuration, which will suppress the fire. This includes supply to sprinkler and standpipe systems, proper selection and advancement of hose lines, correct nozzle and stream selection, proper assignment of members on the hose to ensure its ability to advance, and to provide relief for the nozzleperson.

6.2.2 Use of the standpipe pack will most often be the manner in which engine crews operate hose lines . However, at the officer's discretion, if the fire is located on the first floor or below grade, lines stretched directly from the apparatus may be quicker. Often, the engine can be positioned at or near an entrance that provides quick and easy access to the fire, without taking the time to find and connect to a standpipe outlet. The fire itself might be closer to the entrance than to a standpipe outlet and may block standpipe access. Once crews reach the fire area, access to standpipe connections for additional lines can then be determined. Therefore, it is imperative that the standpipe system still be supplied, even if the initial attack is made with hand lines stretched directly from the apparatus.

6.2.3 If the fire is in a residential or hotel type of building, use of 1 ¾-inch hose on the working end of the standpipe pack is preferred. This line provides 185 to 210 gpm and one or two lines of this size should be sufficient to handle the fire load expected in residential settings. It is also more mobile, which is necessary to negotiate all the turns that are inherent to compartmentation. Consideration should be given to the option of deploying 2 ½-inch lines. Should the fire be on the windward side of the building, and the door to the fire apartment be blocked open, extremely heavy fire conditions may be present in the public hallway. In this case, the higher flow from the larger line may be required just to overcome the conditions caused by the wind blowing into the fire apartment. If your position is questionable, use the larger line.

6.2.4 If the fire occurs in a commercial occupancy, engine companies should be paired up and 2 ½-inch lines used for attack. Command must provide two engines per line when using 2 ½-inch lines. Once the fire is knocked down or reconnaissance reveals that the fire is not well advanced, engine officers can choose to use the 1 ¾--inch option of the standpipe pack. Great care must be exercised in making this decision. If the fire is not quickly controlled, it can rapidly overwhelm the capability of the flow and reach of the stream from the smaller line. Remember that the fire load in commercial occupancies is considered to be moderate, and therefore requires a fire flow of 20 gpm per 100 square feet of involved area.

6.2.5 Fires may be easy to access, but may also be very difficult. This will be dependent upon the fire location, and intensity and amount of obstacles. Arrival of the first two engine crews at the fire floor is necessary to ensure that the deployment of the first line can be accomplished.

6.2.6 Conditions and location of the fire will dictate whether the standpipe connection is made on the fire floor, or on the floor below. Engine officers may also consider the option of stretching over ladders rather than an interior advance if the building is residential and the fire is at the fourth floor level or lower. If the stretch is made over a ladder rather than via the interior, **COMMAND MUST BE NOTIFIED.**

6.2.7 It is hazardous to open a door in a high-rise, as in any structure, that is separating crews from the fire without a charged line. Wind conditions need to be considered as well as whether or not the fire has self-vented.

6.3 FIRST DUE ENGINE COMPANY

6.3.1 The first due engine shall ascertain as much information as possible, both by a visual check of the structure when approaching, as well as by gathering information from building occupants and any fire control systems that may be present. Security personnel, employees of the building engineer, and maintenance personnel, may all have information as to where the fire is located and its extent. It is this officer's responsibility to identify the fire floor as well as to verify the fire floor. The officer should also advise if the entry level is other than the first floor, or if the floors have an odd configuration. Taking a moment to quickly gather this pertinent information will save time in the long run.

6.3.2 Any evacuation that has commenced needs to be reported to Command. Also, the status of elevators and HVAC systems should be checked. Prior to entering the building, the crew should also take note of wind direction and strength.

6.3.3 The first engine, along with the first due truck crew or rescue company, shall proceed together to the reported fire floor. At a minimum, and in addition to the standpipe pack, this crew shall also take the accessory bag, radios, and hand lights.

6.3.4 If elevators are equipped with fire service controls, the shaft shall be checked for smoke. If clear, the crews can take the elevator, stopping at intermediate points to confirm control of the car and to check the shaft again for smoke. Companies shall stop at least two floors below the fire floor and utilize the stairs for the remainder of their ascent to the fire floor. Crews most not crowd the elevator cars. The size of the car will dictate how many people with gear and equipment can enter at once. Firefighters may need to take action in the event of an emergency and need room to work. If the fire is reported to be on the sixth floor or lower, these crews shall walk up.

6.3.5 Elevators that do not have fire service control shall not be used until the first engine, and truck or rescue has climbed the stairs and has assessed the fire floor situation. The first engine officer will advise Command if the elevators can be used.

6.3.6 The first due engine, truck, and rescue company officers must understand the importance of working as a team. Unless there will be a significant delay in the arrival of the truck or rescue on the fireground, the engine officer is expected to proceed to the fire floor along with the crew of the truck or rescue. Once on the fire floor, the truck or rescue should commence reconnaissance operations locating and identifying the extent of fire. The engine crew should be prepared to connect to the standpipe outlet, but must be disciplined enough to be able to relocate to a different stairwell once the exact location of fire is determined. The attack must normally begin from the stairwell closest to the fire that contains a standpipe. Failure to do so can result in the hose line failing to reach the fire area. Wind conditions blowing fire within the building may necessitate using a different standpipe outlet that also requires a longer hose stretch.

6.3.7 The officer of the first engine shall communicate the information gained prior to going up to the location of the fire. This officer shall also announce via radio to which floor the crew has gone and the stairwell used to get there. The crew should expect the arrival of the second engine's crew to assist with the deployment and operation of the first hose line and the second engine should utilize the same stairwell. This should not be delayed if fire attack is ready to begin, and the second engine has not arrived.

6.3.8 The officer of the first engine, in conjunction with the officer of the truck or rescue company, shall identify the standpipe outlet that is closest to the fire. The stairwell that contains this outlet shall them be announced that it is the attack stairwell. ALL companies and chief officers must know what stairway has been identified as the "attack" stairs. Those assigned to evacuation must then use a different stairwell that shall also be clearly identified as the "evacuation" stairwell.

6.4 SECOND DUE ENGINE COMPANY

6.4.1 Upon arrival, the driver shall establish water supply and stretch 3-inch or larger lines into the standpipe and sprinkler connections. (Refer to the book on “Standard Engine Company Operations” for further details on pressures and when lines are to be charged). All intakes at the sprinkler or standpipe siamese in use shall be supplied. If there are siamese connections at other locations on the building, Command must ensure they are also supplied.

6.4.2 The officer shall obtain keys, if available, and check the status of the fire control station or annunciator panel(s) to note any changes that may have occurred since the first engine checked, and proceed to the location of the first engine.

6.4.3 The crew shall take their standpipe pack, and be prepared to assist the first engine deploy the initial attack line. It may also be necessary to deploy their own line as either a back up or a second attack line. This determination will be made after meeting with the officer of the first engine.

6.4.4 The officer should be positioned at the standpipe outlet if the crews are paired up on one line. This will provide communications between the officer supervising the line, and the officer at the outlet to ensure proper nozzle pressure. One firefighter should work at the door from the stairwell to feed the hose as it moves. Another firefighter should be positioned at the first hose coupling to help keep the line moving forward.

6.4.5 Once the first line is operating, members of the second engine may be utilized in different roles depending upon the needs of the situation. They may provide the staffing to manage the first line if 2 ½-inch hose is being operated, or, standby in the stairwell preserving their air supply and ready to relieve the first crew and provide a rescue team until another crew is assigned to this duty. They could also be assigned to advance their own line onto the fire floor as a second attack line or back-up line. This decision will be made as determined by the officer of the first engine, unless the chief in charge of fire attack has arrived at the fire floor.

6.4.6 In order to comply with OSHA and NFPA requirements, the officer from the second engine stationed at the standpipe outlet in the stairwell, and a firefighter from that engine, also in the stairwell, be available as a rescue team in the event that is needed. These two persons are not committed to tasks that could not be stopped if the initial hose team got into trouble. At that point, hose line advancement would be stopped and these two members could move in to assist those in trouble.

6.5 THIRD DUE ENGINE

6.5.1 The third due engine shall proceed to the lobby area. If a chief has not yet arrived, the officer shall assume command of the incident. The crew shall commence lobby control operations. At a minimum, they should take control of at least one elevator, if fire service control is available, and a radio-equipped member assigned to operate this elevator. Communication with the crew(s) who are already on the fire floor(s) is necessary to confirm which stairwell is the "attack" stairwell. Units that enter the lobby from this time forward will need to be tracked by unit identification, number of members, where they are going, and the time they went up. If a fire control room or station is present, a member will need to be assigned to that location to monitor building systems.

6.5.2 Once the engine officer has been relieved of incident command by the chief, he or she should be assigned to assume command of lobby control.

6.6 FOURTH DUE ENGINE

6.6.1 The fourth due engine should proceed to the floor above the fire, using the attack stairwell, and operate in conjunction with the truck crew also assigned to that floor. The objective is to check fire extension upward and evaluate the occupant situation.

6.6.2 Fire conditions on the fire floor may dictate the need to deploy the fourth engine to that floor instead of the floor above. The incident commander will have to make this decision based upon information from the first unit(s) upstairs. Orders to this engine could include stretching additional lines to the fire floor to augment the attack, or to approach the fire from a different direction, as may be necessitated by floor layout. If the first line deployed were 1 ¾-inch hose, the officer would need to ensure that line was delivering fire flow sufficient enough for conditions. If so, subsequent lines can be 1 ¾-inch as well.

6.7 GREATER ALARM ENGINES

6.7.1 Normally, a staging area is to be established by the first due engine on the second alarm. In a high-rise fire situation, this area will be designated as “Base” and will simply become a parking area for fire apparatus. If not already identified, that officer should announce this location. Crews from this alarm are going to be put to work. The first officer to this area should NOT remain there, but instead go with the crew. In order to establish a Base officer, it is suggested that the DRIVER of the first engine to arrive at Base, become the Base Officer. It is expected that Command will later assign an officer to this position as the command structure is built.

6.7.2 The first and second due engine crews on the second alarm should proceed to the area of the command post. (The driver of the first due 2nd alarm engine should remain at Base). The officers alone should check in with Command for assignment. The officer shall take the accessory bag and the crew takes their standpipe pack and at least two spare air cylinders. They should anticipate being sent on up to Staging. STAGING WILL BE SET UP *AT LEAST* TWO FLOORS BELOW THE FIRE FLOOR. Command will need to assign an officer to establish “Staging” at this point.

6.7.3 Subsequent engines should park at the designated location and be prepared to take additional equipment to Staging when called for. It is possible, that one of these units may be the first unit to establish Staging, which will be two floors below the fire floor. Unless these units receive specific orders, sections of their standpipe packs, spare air cylinders, and hand lights shall be taken to the front of the building, outside the lobby. This equipment should be separated as needed by Staging, and the stairwell support group will then shuttle that equipment up for use.

6.7.4 If an air and light unit is included with the second alarm, it will need to be positioned at a forward position for stairwell access to staging. Most of these units are equipped with a 250-foot air hose, as well as extra air cylinders that will be required at staging. Incident Commanders should consider calling for multiple air and light units as well as other sources of spare cylinders, if a major operation is underway.

7 TRUCK AND RESCUE COMPANY TACTICS

NOTE: The rescue and truck company's functional duties on fire calls closely parallel one another. Tasks assigned such as a search for victims and location of the fire, forcible entry, ventilation, and control of utilities, may be carried out by either of these units. Assignments specific to the truck would involve laddering; whereas the rescue might be called to advance additional attack lines, use extrication and cutting tools or specialized equipment carried on the apparatus. The truck and rescue companies perform vital functions on the fire ground. Success in preserving life and property hinge on the proficiency of the members performing these duties.

7.1 TRUCK AND RESCUE COMPANY RESPONSIBILITIES

7.1.1 Trucks and rescues are responsible for the same activities as any building fire. However, a high-rise fire presents challenges to accomplishing these tasks not found elsewhere. Locating the fire, if not readily apparent is but one of the tasks that may be assigned to these units. Additionally, evacuation of a portion of one of these structures, in addition to victim rescue, is very time consuming, difficult, and staff-intensive. Minimum staffing for each of these companies is three, and tasks will have to be carefully prioritized in order to maximize available resources. Duties expected from these units include locating the fire, R.I.T., search, evacuation, forcible entry, horizontal and vertical ventilation, elevator control, and control of utilities.

7.2 FIRST DUE TRUCK OR RESCUE

7.2.1 View as much of the structure as possible. Conduct a preliminary check of the exterior of the building for persons in distress, smoke or fire showing from the skin of the building, or the need for any exterior operations. Prior to entering the building, the crew should also take note of wind direction and strength, count the number of floors to the building, and identify the number of floors from which smoke or fire can be seen. If the fire is on the upper half of the building, it may be quicker to identify the fire floor(s) as the number of floors down from the roof.

7.2.2 The first due truck should position on side A (Alpha), or the side of the building with fire showing. Rescue companies must park out of the way of other incoming apparatus and proceed with their compliment of tools to the fire floor.

7.2.3 Bring rapid entry keys, access the building's lock box, or building keys in fire control room, and bring the minimum tool complement of radios, handlights, set of irons, hydraulic door opener, hook, 2 ½ gallon water can, thermal imaging camera if available, and rope lifeline pack.

7.2.4 Be prepared to force entry in the event the entrance doors are not equipped with electronic locks which open upon activation of a fire alarm.

7.2.5 Assist the officer of the first due engine in gathering information at the fire control room. Check the annuciator panel for what has been activated; manual pull station, heat, smoke, or duct detector, water flow, or more than one device. If building maintenance or security is present, have they been on the reported fire floor(s) above or below? If the structure is a commercial high-rise, check the building directory located in the lobby for the type occupancy on the floor(s) involved. A copy of the floor layout should be available in the fire control room, and shall be reviewed quickly before proceeding up.

7.2.6 If smoke conditions are found in the lobby, this company must determine if the fire is located on the lobby level or possibly on a floor below, or in the elevator pit. Elevators equipped with automatic recall will stop at an alternate floor above this area. The location of these cars must be determined and the car checked for occupants.

7.2.7 With the engine company OIC, identify all stairwells and elevator banks. Recall all elevators. Determine the elevator and stairwell that is used to proceed to the fire floor and confirm that the doors from the stairwells to the floors above are in fact unlocked. Often these doors can be unlocked from the fire control room, and in most cases, this becomes the attack stairwell. This information must be communicated to the incoming companies and battalion chief.

7.2.8 If elevators are equipped with fire service controls, the shaft shall be checked for smoke. If clear, the crews will take the elevator, stopping at an intermediate point to confirm control and check the shaft for smoke. Companies shall stop at least two floors below the fire floor and utilize the stairs for the remainder of their advance to the fire floor. Once conditions are evaluated, and it is determined elevators can be used, it should be reported to Command that the elevators are cleared to a specific floor. If the fire is reported to be located on the sixth floor or lower, the stairwell is to be used not the elevators.

7.2.9 Always be prepared for the unexpected, especially when using the elevators.

7.2.10 Elevators that do not have fire service control shall not be used until the first engine and truck have climbed the stairs and assessed the fire floor situation. The first engine officer will advise Command if the elevators may be utilized.

7.2.11 Proceed to the floor below the reported fire floor with the first engine. Whether the stairs or elevator has been utilized, the companies shall conduct a quick assessment of the floor below noting the layout of the entire floor, type of contents, location of the mechanical rooms, window type, and presence of access stairways. This step is not necessary if the floor below the fire is the lobby level as it will serve little, if any, purpose. Conditions on the floor below the fire should also be communicated. If the building is residential or hotel occupancy, the apartment or room below the fire unit can be entered to get an idea of the layout of the involved unit.

7.2.12 Once the fire floor is confirmed, conditions need to be evaluated. If the location of the fire is not readily apparent on that floor, the truck or rescue crew should advance to determine the location, while the engine prepares the line to be stretched.

7.2.13 Do not assume that it is a false alarm if fire is not found on the reported floor. A fire on an adjacent floor may have activated detectors on the floor that is being investigated, or a malfunctioning system has incorrectly reported the involved floor. The floor below should be checked when the layout assessment is conducted. The floor above must now be checked.

7.2.14 If smoke and heat are encountered in the stairwell, its origin must be determined. Once the fire floor is confirmed, a quick check of the conditions on the floor above must be made and communicated to Command.

7.2.15 Before the attack commences, take into consideration the possibility that occupants may be present in the stairwell above your point of attack. Once the door to the fire floor has been opened and the line advanced, the door will remain open and the stairwell will become polluted with smoke. This area should be confirmed clear of building occupants prior to commencing attack, if at all possible.

7.2.16 If the door to the fire floor is hot to the touch, or if fire and heavy smoke conditions is expected, the attack line should be charged prior to opening the door. Remember also that if the location of the fire is known, use only the amount of hose necessary to reach the fire.

7.2.17 The truck or rescue shall open the ceiling on the fire floor to expose the plenum area, if one is present, to check for fire before the engine begins the attack. Crews should not advance under fire in this area. It must be knocked down as the attack commences.

7.2.18 It is hazardous to open a door in a high-rise, as in any structure, that is separating your members from the fire without a charged line. Wind conditions and whether or not the fire has self-vented, needs to be considered. This can often be done on the floor below the fire in residential occupancies. There is the potential of being caught in a horizontal chimney.

7.2.19 Where there is indication of a working fire, truck and rescue crews (see training bulletin on team and tag line search) should consider utilizing a search line. The engine officer is basing his/her attack line deployment on the information received from the truck or rescue company. (At this point, the engine crew is the rescue team for the truck, if needed). Use of a tag line is more a necessity in commercial occupancies.

7.2.20 Once the fire is located and the line is preparing to be advanced, the truck or rescue crew must begin search of the rest of the floor for victims in a residential occupancy. In residential occupancies, search priority should be given to the fire unit, next to the exit hallways, and then to the adjacent units and the unit(s) across the hall from the involved unit(s). The second engine should be in position to act as the interim RIT at this point.

7.2.21 This truck or rescue crew is crucial to the engine being able to operate safely. In the case of apartments or hotel rooms, the compartment containing the fire must be accessed. Additionally, forcible entry should quickly be accomplished on the adjacent occupancies. If the fire is on the windward side of the building and winds are strong, it may not be possible to conduct the attack through the apartment entrance door. Assessment of the wind's potential effect and control of the door to the fire area is imperative. This door may have to remain closed and the attack mounted from an adjoining apartment through a hole breached through the wall. To attempt the attack otherwise, may lead to loss of control of the entire hallway.

7.3 SECOND DUE TRUCK

7.3.1 View as much of the exterior of the building as possible. Conduct a preliminary check of the exterior of the building for persons in distress, smoke or fire showing from the skin of the building, or the need for any exterior operations. Communicate any previously unreported conditions.

7.3.2 Position on the side opposite the first truck, if possible, unless otherwise directed.

7.3.3 Prior to entering the building, the crew should also take note of wind direction and strength.

7.3.4 Bring minimum tool complement of radios, handlights, set of irons, hydraulic door opener, hook, thermal imaging camera, and rope lifeline pack.

7.3.5 Check in through lobby command, obtain a set of keys from the fire control room, and proceed to the floor above the fire. The crew should expect to assist the fourth due engine with forcible entry, search, and evacuation.

7.3.6 If not yet identified, the officer should also ensure that a stairwell has been identified as the “evacuation” stairwell, and that it is indeed clear of smoke.

7.4 RESCUE COMPANY TACTICS

7.4.1 The rescue is normally assigned to take a position in the fire attack stairwell at the floor immediately below the fire as the R.I.T. The standard tool complement of radios, handlights, set of irons, hook, and hydraulic door opener, should be taken by the members. If the battalion chief is on scene, the RIT pack, if available, should be retrieved and taken up with the rescue.

7.5 GREATER ALARM TRUCK AND RESCUE COMPANIES

7.5.1 Type of occupancy, fire conditions and severity of the evacuation problem, will dictate the assignment of these later arriving companies.

7.5.2 Truck or rescue companies will need to be assigned to cover the floors above the fire for search and evacuation operations. Checking for further fire extension is required, as is control and direction for occupants who are being protected in place. If large-scale evacuation is indicated, several units are required to quickly begin in this operation.

7.6 SEARCH CONSIDERATIONS AND PROCEDURES

7.6.1 High-rise buildings, whether of commercial or residential occupancy, potentially involve a large number of occupants that must be carefully managed during a fire situation. Commercial occupancies typically have the highest population during normal work hours. Residential highrises will normally have higher occupancy during the evening and nighttime hours.

7.6.2 Search of smoke-filled floors above the fire can be time consuming and anticipation of the need for multiple crews per floor, should be anticipated. Information on smoke and fire conditions must be relayed to the appropriate command officers to ensure that informed decision making is possible.

7.6.3 The primary search shall be conducted on a priority basis beginning with the immediate fire area and floor, the floor above the fire area, and the top floor including the hallways, stairwells and elevators leading to these areas.

7.6.4 Crews operating on the floor above must search for signs of life as well as vertical extension, and communicate findings.

7.6.5 Floors between the floor above the fire and the top floor are next in priority.

7.6.6 Members must know the location of the evacuation stairwell for both ambulatory and non-ambulatory occupants that must be removed.

7.6.7 Search lines shall be used in commercial occupancies regardless of how small the fire might be, conditions can change rapidly (see “Search with Rope” in the Truck Company Operations Book).

7.6.8 Primary search efforts are labor intensive due to the large area to be covered.

7.6.9 It is extremely important that all areas compromised by smoke are searched. The following system shall be utilized to avoid duplication of effort. All personnel shall be equipped with chalk or crayon in order to apply this search identification system.

7.6.9.1 An “X” shall be used to indicate that a search has been conducted in an apartment, room, office, etc. Carpenter’s chalk or crayon shall be used.

7.6.9.2 When a crew enters an office or apartment off a central corridor, or enters a room in an apartment or office, a single slash shall be made, either on the door or adjacent to the door upon entry for search.

7.6.9.3 After the search is complete, the crew shall make another slash, completing an “X” upon exiting the room.

7.6.9.4 As the entire apartment, office, or room search is complete, the “X” will be completed and the unit designator (T411, R418, etc) is written next to the “X”.

7.7 VENTILATION

7.7.1 Ventilation is an important and difficult task that must be accomplished on a high-rise fire incident. It is critical that that this operation is coordinated with attack, search, and evacuation activities. Communication to the Incident Commander is key. Command may identify the need to establish a ventilation sector.

7.7.2 Steps will have to be taken to remove the heat and smoke that build up during the evolution of the fire. There are several tactical options available to accomplish this task. In choosing one of these options, fire officers must consider the impact wind and stack effect will have on the operation.

7.7.3 The three basic ventilation tactics include horizontal through the windows, vertical through stairwells, and utilization of the building’s HVAC system.

7.7.4 Units conducting horizontal ventilation must exercise extraordinary care when engaged in this operation. Opening windows must be done in lieu of breaking them as much as possible to avoid the hazards associated with glass flying great distances. Residential high-rises are where this tactic is most frequently employed.

7.7.5 Horizontal ventilation in a commercial high-rise is not a prudent tactic in most incidents. Therefore, **horizontal ventilation in a commercial high-rise while the fire is active should not be used. Window size and construction, the square footage of the fire floor, unpredictability of the wind, and the likelihood of increasing the intensity of the fire makes this a poor option.**

7.7.6 Wind direction must be known and units must limit the number of windows that are taken out. It is extremely important that the basic guidelines associated with horizontal ventilation be observed; opening windows on the leeward side first and windward side last. Isolation of any areas that are not smoke contaminated should also be achieved during the operation.

7.7.7 Wind at the upper levels of a high-rise can be very strong. Venting windows on the windward side can have a disastrous effect. The only way to accurately determine wind direction and its effect is by truck or rescue companies duplicating the situation on the floor above or below the fire.

7.7.8 Breaking windows is dangerous for crews and citizens entering and exiting the building, due to falling glass. The operation shall not be initiated until the IC has been contacted and has taken the appropriate measures to evacuate the area below.

7.7.9 When possible, the glass should be struck from the outside with a tool driving the glass onto the floor area. If the area to be vented is out of reach of the aerial devices on scene, truck and rescue companies should vent from the floor above when conditions permit.

7.7.10 The truck or rescue company operating on the floor above the fire will open the window, assess wind conditions, and communicate conditions to the attack crew prior to ventilating.

7.7.11 Crews performing these ventilation operations must be aware of wind currents creating strong drafts in or out of the opening. Members need to back each other up or secure each other with rope tag lines.

7.7.12 Horizontal ventilation can be affected by the stack effect. In a normal stack effect situation, the heated smoke and gases escaping into a stairwell will proceed up and out. If windows have been opened, this effect may violently blow fire toward the stairwell without smoke going out the vented window. Nothing is gained in this situation.

7.7.13 Incident Commanders must factor in temperature differences between inside and outside the building and the correlation with stack effect when considering ventilation in the high-rise.

7.7.14 Stairwells provide natural channels for the removal of smoke and gases. When openings are created at the top and bottom of stairwells, a natural upward flow of air will develop.

7.7.15 The best method is to utilize the stairwell closest to the fire that has a suitable opening at the top, exhaust fan at the top, and doors that open to the interior or exterior on the ground floor. Pressurizing other stairwells help push smoke across the floor and into the intended stairwell for venting.

7.7.16 It is possible that the attack stairwell may be needed for ventilation efforts. This will hinge on the stage and volume of fire. This must be coordinated with the attack officer to avoid fire coming back onto advancing crews. **However, members must remember that a stairwell that is still in use as an evacuation stairwell cannot be used for ventilation.**

7.7.17 Crews advancing to the top floor(s) must assess the stairwells for the presence of occupants. That will help to determine which would be suitable for pressurization and evacuation.

7.7.18 The ventilation stairwell must have a suitable opening at the top, that must be secured in the open position.

7.7.19 Trucks or rescues may be called upon to pressurize the stairwell utilizing the building system if present, or apply PPV fans at ground levels and electric fans at intermediate levels, as necessary.

7.7.20 The exhaust stairwell should have the pressurization system shut down, if so equipped.

7.7.21 HVAC in the affected area should be shut down.

7.7.22 All crews operating in the building must be made aware of the ventilation strategy, and the location of ventilation and pressurization stairwells.

7.7.23 Only doors to the stairwells on the affected floors should be open.

7.7.24 Vertical ventilation using elevator shafts is the least desirable of choices. The openings at the top of the shaft are typically inadequate, and on higher buildings, the shaft may not extend to the top of the building. Open shaft doors on affected floors create an additional hazard for firefighters and occupants. Additionally, the mechanical room for the elevators is located at the top of the shaft, and the smoke will have to be moved up and through this room to get out of the building.

7.7.25 If this method is used, ensure that there is an adequate opening(s) at the top, move the elevator car below the floors to be vented, open and secure the hoistway door(s) on the floor(s) to be vented, and secure ladders across the front of open hoistway doors.

7.7.26 Some buildings contain sophisticated HVAC systems. These should shut down in the area under alarm if the systems are set in the “auto” mode in the fire control room. The HVAC settings and status should be noted by the first due truck officer prior to ascending to the fire area.

7.7.27 If any company on the fire floor or floor above detects that the system has remained on, this must be communicated back to Command in order that the system be shut down. Otherwise, the rate of smoke and fire extension is greatly increased.

7.7.28 These systems can be placed in the exhaust mode to remove smoke on one or more floors. If the IC has elected to utilize the system in this manner, it would be wise to receive assistance from the building engineer.

7.7.29 Truck and rescue companies in the building must be advised when the systems are placed in service for this method of ventilation. Conditions must be monitored and the IC kept informed.

7.8 ELEVATORS, PROCEDURES AND GENERAL INFORMATION

7.8.1 Buildings with fire control rooms and some older buildings are equipped with fire service control. In buildings with fire control rooms, all elevators are recalled to the main lobby, upon receipt of the alarm. If the alarm is at the lobby level or below, the car will recall to an alternate location, usually two floors above. The master elevator panel in the fire control room should be checked for possible car location. This is designed to protect the occupants. In a few older buildings with fire control rooms, the elevators will only recall if the smoke detector in the elevator lobby area on any of the floors is activated. In either case, in a building with fire service control, company members must ensure that all elevators are recalled to the lobby manually with the fire service controls, or verify they have automatically returned. The elevator cars themselves must also be checked for occupants.

7.8.2 Water and smoke conditions can adversely affect the operation of the elevators. Companies operating on a high-rise incident must be cognizant of the possibility of elevator malfunction. Members must remain cognizant of elevator status. In one study of 180 high-rise fires, approximately 30 percent of the incidents were due to some form of elevator malfunction. For this reason, companies must be familiar with elevator operations for escaping, should that be necessary.

7.8.3 Fire Service Control

7.8.3.1 Verify that the elevators have been automatically recalled, or recall with fire service control in the main lobby.

7.8.3.2 Buildings with fire control rooms should have sets of keys available. The switch is activated with the fire service control key. Once the key is inserted, and turned to the ON position, the elevators are returned to the lobby, the doors will open, and the car will not respond to normal commands for use.

7.8.3.3 Once the fire service key switch is turned on, the key may be removed. The key is then taken into the elevator, inserted into the fire service switch, and turned to the ON position. The car is now controlled for fire department use.

7.8.3.4 The emergency stop button does not work when in the fire service control mode.

7.8.3.5 The “DOOR OPEN” and “DOOR CLOSE” buttons may have to be utilized for door control when in fire service control.

7.8.3.6 After a company has arrived at the proper floor, the fire service control switch in the car is turned off and the key removed.

7.8.3.7 In some systems, the car will automatically return the car to the lobby. This is due to the fire service control switch in the lobby remaining in the “ON” position.

7.8.3.8 In other systems, a member would have to accompany the car back down due to the requirement that the “DOOR CLOSE” button be pressed for the car to begin descending.

7.8.3.9 The keyed switch in the main lobby shall not be returned to the “NORMAL” position until all fire department operations have terminated, and the Incident Commander has ordered that building systems be restored.

7.8.3.10 Before members enter the elevator car, SCBA shall be donned and ready to go on air. Location of the closest stairs in relation to the elevator must also be noted.

7.8.3.11 Only fire department members shall use the elevators during fire incidents.

7.8.3.12 No more than two companies shall be permitted in the car at one time.

7.8.3.13 Minimum complement of tools shall accompany the companies.

7.8.3.14 The elevators shall be stopped, either on the initial trip or on any subsequent trips, at least two floors below the fire floor.

7.8.3.15 Staging is established two floors below the fire floor to pool equipment and staffing.

7.8.3.16 All elevator use will terminate at the floor level of Staging.

7.8.3.17 In the event an elevator is malfunctioning, it shall immediately be placed out of service and Lobby Control or the Incident Commander advised.

7.8.3.18 The car must be stopped at an intermediate point(s) to confirm control and to avoid being taken directly to the fire area.

7.8.3.19 Should a company be ascending to staging and discover control of the elevator car has been lost, the doors of the car can be opened with approximately 30 pounds of force. This action serves to open and activate the interlock, which stops the car.

7.8.3.20 **Anytime water is observed in the elevator shaft by members operating elevator cars, Command must be notified. These situations will likely lead to the loss of the elevators and Command should be making preparations for a Stairwell Support group.**

7.8.3.21 All cars in the elevator bank may not run on fire service control. In some situations, members may find that only one of the cars is so equipped. It is important to gain control of **ALL** elevators to prevent occupants from using them during emergency operations. This can be accomplished by shutting off the power to those cars not in use at the pit switch, inspection station on top of the car, or in the elevator machine room. Preplanning should make companies aware of this situation, but careful observations prior to operating is still necessary.

8 TACTICAL COMMAND CONSIDERATIONS

8.1 The Incident Commander is faced with a number of needs when managing a high-rise incident. It is for this reason, that the additional alarms mentioned in 5.2.3 are recommended. In addition to direct supervision of the fire attack by, if possible, a chief officer, the following jobs may need to be assigned based upon the specific needs of the incident:

- Rapid Intervention Team(s)
- Lobby Control and Elevator Operations
- Fire Control Room Operations
- Search and Evacuation
- Stairway Support
- Base
- Staging
- EMS Branch or Group
- Safety
- Rehabilitation
- Logistics
- Planning
- Reconnaissance for fire extension and smoke migration

8.2 Tactical command of the fire floor(s) is an assignment that normally falls to a chief officer early in the incident. Most often, this is the second due chief from the first alarm assignment. As the officer in direct control of the attack, this position is responsible for coordinating the companies operating on the fire floor(s). Initially, the group or division officer can expect a minimum of two engine companies and a truck or rescue company on the fire floor.

NOTE: The officer responsible for command and control of the operations in this area is referred to as the fire attack officer. This is a description of the responsibilities and not a title required to be used by the Incident Commander. The use of a division or a group designation shall be determined as appropriate to the situation. References to “fire attack officer” are intended to refer to the position, and not the individual’s rank. However, it is strongly recommended that this officer be a chief officer whenever possible.

8.2.1 The fire attack officer must obtain an aide. This enables the officer to link up with companies on the fire floor and gain first-hand information as to the fire situation and the progress of the operation. The aide shall remain in the stairwell in a clean environment for accountability purposes. It is also expected that the fire attack officer position in the stairwell on the fire floor in order to communicate with the operating units and to direct units moving up to that area. It is CRITICAL that the officer confirm the identification of the attack stairwell, communicate that confirmation to Command and Lobby Control. Units that are moved up via elevator, shall go no closer than two floors below the fire, and know what stair to use to proceed up to the fire attack officer. For example, the officer should transmit to Command, "Battalion 404 is in position on the 14th floor establishing Fire Attack Group. Stairwell B is the attack stairwell. I have engines 410 and 208, truck 105 and rescue 426 operating on the fire floor. Engine 403 and truck 204 are operating on the 15th floor." All units initially assigned to the fire floor and the floor above are under the command of the fire attack officer. As with any portion of the command structure, this can later be subdivided as needed.

8.3 RAPID INTERVENTION TEAM. The R.I.T. function is addressed as the incident progresses. With the assignment of the first two engines to the fire floor, several tasks can be accomplished. The first duty of these crews is to get the first attack line into service. As the line is being stretched, the officer of the second due engine should be positioned at the standpipe outlet in radio contact with the officer of the line. One of the firefighters should be positioned at the door moving hose out of the stairwell as the line advances. These two people constitute the rescue team prescribed by the "two in, two out" rule. Once that line is stretched, the crew of the second engine is to retreat to the stairwell. This crew is now in position to function as the initial R.I.T. for the engine and truck crews beginning to operate on the fire floor. Since relief is a constant factor during the operation, Command must ensure a crew is assigned to assume R.I.T. duties. The initial R.I.T. will likely be the first due rescue company. The exception is when the rescue arrives before the first due truck. In that case, the rescue will operate on the fire floor and the first-due truck becomes the R.I.T.

8.4 LOBBY CONTROL AND ELEVATOR OPERATIONS. The lobby control function is vital to the success of any high-rise operation. This job will initially be assumed by the crew of the third due engine company. This function may need to be expanded and require the addition of another company in order to carry out its tasks. Lobby Control is responsible for elevator control, staffing the fire control room or station, directing civilians to designated holding areas, directing fire department units to the proper stair or access point, and track units as they move in and out of the building. Lobby control is not an accountability point, but is responsible for logging what units go up into the building, their destination and time of departure. It is the responsibility of ALL officers to pass through Lobby Control when leaving the building.

8.4.1 Elevators, General Information and Procedures

8.4.1.1 Buildings with fire control rooms and some older buildings are equipped with fire service control elevators. In buildings with fire control rooms, all elevators are recalled to the main lobby upon receipt of an alarm. This is designed to protect the occupants. In a few fire control rooms, the elevators will only recall if the smoke detector in older buildings with the elevator lobby area on any of the floors is activated. In either case, the Lobby Control company must ensure that all elevators are recalled to the lobby manually with the fire service controls or verify that they have automatically returned. The elevator cars themselves must also be checked for occupants.

8.4.1.2 Water and smoke conditions can adversely affect the operation of elevators. Companies operating on a high-rise incident must be cognizant of the possibility of elevator malfunction and members must remain cognizant of elevator status. In one study of 180 high-rise fires, there was some form of elevator malfunction in approximately 30 percent of the incidents. For this reason, companies must ensure familiarity with procedures to escape from a stalled elevator, should that be necessary.

8.4.1.3 Controlling the elevators will initially entail assigning one member to take control of and operate one elevator as a hoist for members and equipment going aloft. The reason for committing a firefighter to this task is to ensure that we maintain use of at least one elevator. The assignment is to take the elevator up, drop the members off at the proper location, and return to the lobby for another trip. If the elevator is not staffed, problems may be encountered in getting the car returned for use. If the incident is a major event, additional members will likely be assigned to operate additional elevator cars.

8.4.1.4 If water from sprinklers or firefighting operations migrates into the elevator area on any floor above the lobby, this information must be relayed to Lobby Control and Command. Once this occurs, loss of the elevators should be anticipated and steps to establish a stairwell support function should be initiated by Command. If the elevators continue to operate, that is to our advantage. However, high-rise fire experience has shown that water entering the elevator shafts is likely to cause loss of the cars.

8.4.2 Fire Service Control (Fireman's service)

8.4.2.1 Verify that the elevators have been automatically recalled, or recall them using fire service control in the lobby or fire control room.

8.4.2.2 Buildings with fire control rooms should have sets of keys available. The switch is activated with the fire service control key. Once the key is inserted, and turned to the ON position, the elevators are returned to the lobby. (Phase 1)

8.4.2.3 Once the fire service key switch is turned on, the key may be removed, leaving the switch in the "on" position. The key is then taken into the elevator and inserted into the fire service switch, and turned to the "on" position. The car is now controlled for fire department use. (Phase 2)

8.4.2.4 The emergency stop button does not work when in the fire service control mode.

8.4.2.5 The DOOR OPEN and DOOR CLOSE buttons will have to be utilized for door control when in fire service control.

8.4.2.6 After a company has arrived at the proper floor, the fire service control switch in the car should be turned off. The car should then return to the lobby. This is particularly important until Lobby Control is established and operating the elevators in buildings where there are only one or two cars equipped with fire service control.

8.4.2.7 The key switch in the main lobby shall not be returned to the NORMAL position until all fire department operations have terminated, and the Incident Commander has ordered that building systems be restored.

8.4.2.8 Before members enter the elevator car, they shall have SCBA donned and ready to go on air. The location of the stairs, closest to the elevator, must also be noted.

8.4.2.9 Only fire department members shall use the elevators during fire incidents.

8.4.2.10 No more than two companies shall be permitted in the car at one time. Of course, officers must determine if there is sufficient room for even that number of members when SCBA, hose, and other gear are considered. Weight in the car is also a factor. If in doubt, then only one crew at a time should be permitted in a car.

8.4.2.11 Minimum complement of tools shall accompany each crew up, meaning at least a set of irons, lights, and radios must be in the car every trip.

8.4.2.12 The car must be stopped at intermediate points to confirm control and to avoid being taken directly to the fire area.

8.4.2.13 The elevators shall be stopped, on the initial trip and on any subsequent trips, at least two floors below the fire floor.

8.4.2.14 Staging should be established two floors below the fire floor to pool equipment and personnel.

8.4.2.15 All elevator use will terminate at the floor level of Staging.

8.4.2.16 In the event an elevator is malfunctioning, it will immediately be placed out of service and Lobby Control and Command advised.

8.4.2.17 Should a company be ascending to Staging and discover control of the elevator has been lost, the doors of the car can be opened with approximately 30 pounds of force opening and activating the interlock, which stops the car.

8.4.2.18 All cars in the elevator bank may not run on fire service control. In some situations, members may find that only one of the cars is so equipped. Preplanning should make companies aware of this situation, but careful observation prior to operating is necessary.

8.5 FIRE CONTROL ROOM OPERATIONS. Staffing the fire control room or station involves three major areas of responsibility. Monitoring the status of fire alarm systems, the status of fire control systems, and monitoring and utilizing building communication systems. In addition, the air handling system status and elevator status must be observed. One means of accentuating any lights on the annunciator panels in the fire control room is to momentarily turn off the overhead lights. This helps locate the indicator lights on the panels, which will be illuminated.

8.5.1 Fire alarm systems must be checked and any indications should be recorded. Any changes in components of the fire alarm system are critical, and this information must be provided to the Incident Commander. For example, when you first enter the fire control room, a smoke detector indicator is illuminated for a location on the 15th floor. Additional detectors begin activating. This information should immediately be relayed the officer of the first engine upstairs and Command. Once units arrive at the area of alarm activation, this information becomes less critical. However, if the system begins to show activation in areas remote from the area of operation, such as on another floor, that information MUST then be relayed to Command.

8.5.2 Fire control systems include sprinkler systems, standpipes, fire pumps, stairwell pressurization fans, and any other fire suppression system that may exist in the building that is either monitored or controlled from the fire control room.

8.5.2.1 Sprinkler system status should be checked first. If a sprinkler activation is indicated, particularly if a detector is also activated, it is likely that an actual fire exists in that area. CONSIDER THIS TO BE CONFIRMATION OF A FIRE AND CONSIDER TRANSMITTING ADDITIONAL ALARMS. Also, if multiple detectors have activated and the sprinkler system is showing a trouble indicator, no sprinkler flow, and perhaps a tamper switch indication, it is highly likely that not only is there an active fire, but the sprinkler system may be turned off to the area of involvement. This information should also be relayed to Command. It is possible that companies going to the fire floor can open the zone valve to provide water to the fire. If this is successful, water flow indicators should illuminate in the fire control room. ANY changes to the status of the sprinkler system that are indicated should be relayed to Command.

8.5.2.1.1 **SPECIAL NOTE**: *If a unit has responded to an alarm and more than one detector of any kind is indicated as activated, the request for a full alarm assignment shall be made*.

8.5.2.2 If water is flowing from the sprinkler or standpipe system, ensure that there is an indication that the fire pump is operating. (This is true even if the building has a wet standpipe and no sprinklers in the area of the fire.) If the fire pump has not started, Command again must know.

8.5.2.3 Scan the fire control panels for indications of any other system that may be present and monitored within the building. If one is present, advise Command of its current status and any changes that are indicated.

8.5.2.4 Stairwell pressurization fans should be operating, if present, once the building alarm system is activated. Confirm that these fans are indeed operating and remain operating, unless ordered shut down by Command.

8.5.3 Building communication systems can be of great value in high-rise fires. Radio communication may be difficult, and as the incident escalates, radio traffic will increase dramatically. While the command structure is considering the use of multiple radio channels, the use of building communication systems can greatly enhance the ability of units to communicate effectively and reliably.

8.5.3.1 Fire service telephones are hard-wired telephones within the building for the specific purpose of fire service emergency communication. The phone stations are typically located in the elevator lobby on each floor, in or near the stairwell on each floor, and sometimes in the elevator cars. There should also be a phone in the fire pump room, mechanical rooms and elevator control rooms. Fire service telephones have an associated indicator light in the fire control room or station that shows the location of the phone. Should someone lift the handset at a fire service telephone station, the light in the fire control room will illuminate and an audible signal will be heard. Lifting the receiver in the fire control room will allows direct communication to the caller. Note: in order to speak into a fire service telephone, the “push-to-talk” button on the receiver must be depressed. The phones can be utilized not only between the fire control room and each phone station, but also between each phone station.

8.5.3.2 The building’s public address system (P.A.) is a second means of communications available in the fire control room. This system can be utilized to provide direction to occupants of the building, and make selective or general announcements to our members operating in the building. The P.A. can be used to tell someone or a unit to go to a fire service telephone and contact the fire control room, or other location. Two-way communications can be facilitated as well. An example might be that the P.A. is used to tell both Fire Attack Group and Staging to pick up a fire service phone to communicate with each other.

8.5.3.3 The outside telephone system is another option for handling some communication needs and that phone number should be provided to the command post. Should Command decide to do so, an open line can be established between the fire control room and Command. Although this would necessitate someone staying on the line on each end, the need to use the radio between these two locations would be eliminated.

8.5.4 Elevator system status must be monitored.

8.5.4.1 If a building alarm system has activated, the elevators should have been automatically recalled to the lobby. Of course, if the fire or smoke has contaminated the lobby, the elevators will be recalled to another location. This information must be relayed to Command. Also, if the elevators were not recalled, or if elevators are stopped at a location other than where they should be, Command again must be notified. A search of any car that does not recall will need to be initiated and the priority of the search will be based upon the car's location in relation to the fire floor. If the car is below the fire, the search of the elevator is not an immediate priority.

8.5.4.2 There are a number of high-rise buildings that do not have fire control systems that recall the elevators or fire service control of the elevators. In those cases, we should not utilize the elevators for our operations and lobby control should stop and hold any elevator car that arrives at the lobby to prevent further use.

8.5.5 Air handling systems (HVAC) have many different designs. Mechanical rooms may be found at the bottom or top of the building. Some systems may have mechanical rooms that only service one or several floors. These systems may be operating, and can transmit heat, smoke, and fire to areas remote from the original fire area. For the safety of our members, HVAC systems that are operating when there is an active fire in the building are to be SHUT DOWN. No HVAC system component should be restarted without specific orders from Command. If requested by Command, the building engineer, or a building representative with intimate knowledge of the system, should be utilized to operate the system.

8.6 SEARCH AND EVACUATION. A Search and Evacuation Branch or Group should be activated if there are <u>more than two floors above the fire</u> that still contain building occupants. At least one company must be assigned to each of these floors to assess smoke and heat conditions, size of the floor area, and the potential number of occupants. Based on the assessment of the first company additional units may be needed to carry out proper search and evacuation.

8.6.1 If available, a chief officer should be assigned to command the search and evacuation operation. This officer should set up the Search and Evacuation post at least two floors above the highest fire floor. This should be located inside the floor, and near the evacuation stairwell. The location of the Search and Evacuation Command post shall be announced once it is established. The location must be specific as to what floor it is on and near what stairwell, e.g. “Battalion 401 to Command, the Search and Evacuation post is located on floor 15 (one-five) at stairwell C.”

8.6.2 ALL UNITS OPERATING UNDER THE SEARCH AND EVACUATION BRANCH OR GROUP SHALL USE THE “EVACUATION” STAIRWELL TO ASCEND AND TO REMOVE VICTIMS. THE STAIRWAY DOOR TO A FIRE FLOOR SHALL **NOT** BE OPENED INTO THE EVACUATION STAIRWELL. THE EXCEPTION WOULD BE TO CARRY OUT THE RESCUE OF A TRAPPED OR INJURED FIREFIGHTER!

8.6.3 The evacuation stairwell must be kept clear of as much smoke and heat as possible. This will facilitate the evacuation operation and prevent evacuees from becoming patients once that stairwell is entered. It should also help to reduce their already high anxiety level as a result of the circumstances they are in.

8.6.4 If a Search and Evacuation Group or Branch is established, the officer in charge of that function shall report directly to the IC. In the event an Operations Section is designated, Search and Evacuation will then report to Operations

8.6.5 The Search and Evacuation Branch or Group will need equipment at the Search and Evacuation post. Items such as portable radios, extra air cylinders, hand lights, pens and paper, grease pencils or markers and a command board, should be available.

8.6.6 The establishment of a Search and Evacuation Branch or Group should not imply that a complete evacuation of the floors above the fire is imperative. Rather, the officer in charge of this operation is responsible for the control and safety of occupants above the fire floors. This officer shall make decisions on evacuation or protect in-place tactics based upon conditions on each individual floor, progress being made on the fire itself, and through consultation with Command.

8.6.7 The purpose of the search and evacuation operation is to control occupants. To do so, members operating in this assignment are responsible for preventing panic, controlling evacuation, and ensuring that primary and secondary searches are properly completed. Additionally, changes in conditions regarding smoke, heat, or fire must be monitored and reported through the Search and Evacuation post to Command.

8.6.8 The Search and Evacuation Officer should use the fire service telephones to communicate with the fire control room or station. By doing so, information and directions can then be announced by members in the fire control room using the P.A. to building occupants on selected floors. This is one more tool that is available to assist in the control of the occupants.

8.6.9 Any evacuation or rescue that is necessary shall be facilitated by way of the "evacuation" stairwell. Using the fire attack stairwell for evacuation will undoubtedly lead to greater problems. The attack stairwell above the fire will be contaminated with smoke, heat, and fire gases.

8.7 STAIRWELL SUPPORT. Stairwell Support is a function that should not only be anticipated on the incident, but may be one of the highest priorities during the early stages of the event. If the fire occurs in a building where we cannot use the elevators, or use of the elevators being used is lost, Stairwell Support becomes the "lifeline" to the operation, at and above the fire. If available, tower ladders may be used to transport equipment to upper floors.

8.7.1 A fire that involves more than one apartment, or that occurs in an office high-rise, will require a large amount of resources to be moved up. At a minimum, stairwell support will need a firefighter positioned every two floors.

8.7.2 Air cylinders are a priority. We should anticipate no more than 15 to 20 minutes, per air cylinder during firefighting operations. The first alarm units will not be able to take up spare cylinders. This means the Incident Commander MUST take immediate steps to begin moving air cylinders and their equipment upstairs.

8.7.3 In addition to air cylinders, extra standpipe packs, lights, forcible entry tools, hooks, rope, and medical equipment will need to be moved up to the resource area at staging.

8.7.4 Shuttle of equipment by elevator is ideal. However, elevators will be at a premium, if they can be used. Elevators will be used to take companies up and every effort must be made for companies going up after the first alarm units, to take spare cylinders.

8.7.5 The Stairway Support Unit may also have personnel operating on the exterior of the building. This function will be moving equipment from the Base area through the lobby and then up. This will require a significant commitment of staffing. At a major fire, an entire extra alarm assignment could be needed just for this operation.

8.7.6 An officer should be assigned to at least every four floors. Their responsibility is to supervise operations, keep equipment moving, and monitor the physical condition of members. Fatigue will become a factor and relief of these personnel may be necessary.

8.7.7 The Stairwell Support Unit will report to the Logistics Branch. If that has not been established, they will report to the IC. If Stairwell Support is activated, Logistics must be established by Command as soon as possible.

8.8 STAGING. Staging is the area for assembling resources close to the operations on the fire floor. An officer should be designated as the Staging Officer by Command.

8.8.1 As the incident escalates, it is likely that companies will be put right to work. However, the need for establishing Staging cannot be ignored and must be assigned. This may be delayed until a unit from the second or third alarm can be assigned, but does not diminish its importance.

8.8.2 The Staging area will be a point of significant activity. It is here that air cylinders, hose, tools, EMS equipment and the like will need to be assembled.

8.8.3 The Staging officer will need to assemble and maintain a pool of available firefighting crews. Once Staging is established, a minimum of 4 engines and 2 support units (trucks or rescues), shall be maintained ready at this location.

8.9 MEDICAL UNIT. The Medical Unit is responsible for the care and treatment of our members. The Medical Unit is also responsible for the development of the Medical Plan, which should include a rehabilitation component. The Medical Unit may be located on the same floor as staging (space permitting), or one floor below. The REHAB manager reports to the Medical Unit leader. Rehab is responsible for ensuring members are rested and readied to return to an assignment.

8.9.1 Medical Unit and Rehabilitation Unit (REHAB). The rehabilitation function occurs under the direction of the Medical Unit. Companies will begin to be rotated to rehab after approximately 15 minutes of work. Rehab should be at a location that is safe and clear of the fire, yet within a reasonable distance. The advantage of having Rehab on the same floor as staging is that units can receive necessary medical treatment and rest. As firefighters are available for reassignment, they can then move back into Staging.

8.9.2 An EMS supervisor should be assigned to manage the Medical Unit. In addition, at least one Medic Unit should be assigned to work the Rehab unit. The responsibilities of this unit are no different than any other fire and rescue incident.

8.10 BASE. Base is the area where incoming fire apparatus and other vehicles park. Crews working in the Logistics Section may be sent to retrieve tools and equipment from the rigs parked in base. The first officer assigned to Base should begin organizing units by function, and parking them in an orderly fashion. This would include parking units on diagonals along one side of the street to allow for easy egress, and to keep a travel lane open. Parking all the engines, trucks, medics, and rescue in groups of like vehicles, helps facilitate the operation. Initially, the first person coordinating activity in Base may be the driver of the first engine that arrives at Base without being assigned by Command to go directly to work. Using the driver for this job keeps the officer and the rest of the crew available for other duties. Equipment should be taken from the apparatus, particularly air cylinders, and assembled for movement up to the fire building as needed.

8.11 EMS BRANCH. EMS Branch is responsible for managing all **civilian** patients. If units encounter civilian patients upon arrival that is a good indication of more patients to come. At a fire in an occupied high-rise where patients are found by the first due units, additional EMS resources should be ordered to the scene.

8.12 SAFETY. Safety Officer reports directly to Command. At the vast majority of high-rise incidents, this is the responsibility of the duty Safety Officer.

8.12.1 Safety on the fire ground is a responsibility of every officer and member. However, the Safety Officer is a specific need with overall fire ground safety responsibilities. This is a function that is critical to every operation. However, its complexity can be quite different at a high-rise fire.

8.12.2 Depending upon the complexity of the fire, the Safety Officer may have to be expanded to a Safety Unit and include assistants. The IC may assign a chief officer as the Safety Officer. Additionally, fire companies may also be assigned to operate under the command of the Safety Officer.

8.12.3 Exterior safety issues include concerns such as building perimeter control. Danger from falling glass and other objects must be evaluated, and access to the danger area controlled or denied as necessary.

8.12.4 The protection of members and hoselines from falling objects at the point or points of entry to the building as well as where water supply connections are made is a major safety concern.

8.12.5 Protection for pump and ladder operators must also be addressed.

8.12.6 There are many interior safety concerns to consider. Even though Lobby Control should have checked and taken control of the elevators, this must be confirmed. Safety must also ensure that use of elevators has been cleared by Command. Members assigned to operate elevator cars must all have portable radios.

8.12.7 Safety shall also assist with the control of building occupants. Some may have self-evacuated and their movement needs to be controlled to prevent injury, and to ensure our safety with relation to crowd control within the building.

8.12.8 Safety must also confirm that “attack” and “evacuation” stairwells have been identified and announced by radio. It must also be ensured that Lobby Control and Command both have the same understanding, as to which is which. Confirm that stairwells on the entry level are marked on the outside and inside of the stairwell entrance door with a marker, e.g. ATTACK or EVACUATION.

8.12.9 In the area of the fire floor, Safety should evaluate the conditions at the Staging area. This area must have adequate room for at least 6 companies of personnel as well as an area for assembling tools and equipment.

8.12.10 Safety should monitor the air quality in the areas below the fire where members are in staging, rehab, or other activities. Additionally, crews from the Safety Unit might also be requested by Search and Evacuation to evaluate conditions on floors above in order to make proper decisions on evacuation, or protect in-place actions for building occupants. Strong consideration should be given to making a request through Command for the HazMat team to function under Safety in providing some of these services.

8.12.11 Safety must constantly be checking for hazardous conditions that operating crews need to know about. Situations such as open elevator or other shafts or windows that are broken out flush with the floor, are two examples.

8.13 LOGISTICS. The Logistics Section is a command post function. This position must be assigned early in a high-rise incident. The Logistics and Planning functions might be shared by one officer initially. However, as the incident develops, they will need to be separated.

8.13.1 Logistics is primarily responsible for ensuring that adequate personnel and equipment are available. One of the most important tasks of this section is to establish, staff, and supervise the Stairwell Support Unit. This role is crucial to ensure that operations on the fire floor(s) and above are sustained.

8.13.2 In addition to supporting the operational needs of the incident, supporting services must also be addressed. Operations that are extended over several hours or more may require that meals, fuel, and additional relief personnel be provided.

8.13.3 Logistics must consider the needs of the building occupants. Different occupancies will impose different challenges. Residential, hotel, and commercial occupancies needs will create different problems, however, some may overlap. For example, an office building may include a child care facility for the employees' children during work hours.

8.13.4 Water supply is another concern that Logistics may need to address. If multiple attack lines are being used, problems may be encountered with the ability of the standpipe system to provide the volume of water that is needed. Alternative means of getting supply up to the fire area may have to be considered. As buildings continue to be built taller and taller, this becomes an even greater challenge.

8.14 PLANNING. The Planning Section is another command post function that must be staffed for serious high-rise fires. It is important to recognize that a high-rise fire is one in which the Planning Section must be implemented early. The Battalion Aide or EMS Supervisor will normally serve as the initial Plans Section Officer.

This book has been developed with the knowledge that a high level of discipline on the part of all officers and members is required at a high-rise fire. Even a small fire in one of these buildings presents a vastly different set of circumstances than would otherwise be encountered in a building of just several floors, and lesser square footage. Officers must ensure that all members become and remain familiar with the contents of this book, as well as with all the firefighting books.