Section 600.000  High Rise Firefighting

Fighting a high-rise fire is probably the most challenging of all firefighting incidents. Problems are numerous and complex in high-rise structures. Close coordination and tight control of all resources are demanded, yet difficult to achieve. The need to be proficient in the Rudiments of Incident Command will never be more apparent than at a high-rise fire incident. Communications that are so vital to achieve command and control are not always effective due to the construction of these type buildings. Without direction and proper coordination, confusion can develop rapidly and the risk to life safety increases considerably.

The following guidelines give predetermined direction during high-rise emergencies and will assist in minimizing disorder. These procedures are guidelines to be utilized during these incidents along with pre-fire plans, proper size-up of the incident, and familiarity of the construction features of the particular building. All are necessary elements needed for a safe operation. In addition, proper training and experience will play an important role in the successful management of these incidents.

A recent United States Fire Administration report identified 3 common problems encountered during high-rise fires. These were: 1) water supply, 2) functionality of fire protection systems, and 3) occupant evacuation. These procedures have been prepared to address these and to identify other significant operational requirements that face emergency personnel during high-rise fires. They should be used to enhance performance while on the emergency scene as well as used as a training tool in the preparation for these incidents.
601.000 **Terminology**

Atrium
See Lobby

Attack Team
Two companies working to stretch and operate a hose line for effective high-rise firefighting. One company should advance on the fire and the second company should be held in the stairway to relieve the first company.

Base Sector
This sector is located outside of, and a minimum of 200 feet away or an adequate distance from, the high-rise building. The Base Sector is responsible for staging apparatus and equipment, securing resources, storing resources, and dispersing resources. (This is not to be confused with the Staging Sector which is located inside the building, 2 - 3 floors below the fire floor.)

Center Core Construction
One of two common construction methods used in high-rise construction. This method of construction utilizes a central core area for elevators, stairways and utility shafts. This method has been used for hundreds of years and is still the most common method of construction today.

Center Hallway Construction
Utilizes a central corridor on each floor to access individual rooms, apartments, or offices.

Company
A company, for these procedures, can be an engine company, ladder company, squad, etc. (Example: Engine 15 and Ladder 15 are each individual and separate companies.)

Division
A group of sectors and/or floors, under the command of one officer. An example would be, Sectors (floors) 10 - 12 may be under the command of "Division 3".

Fire Control Room
A room within a high-rise building that provides specific information on the alarm(s) that has been activated and the status of the fire protection systems within the structure.
High-Rise Building

A building is considered to be a high-rise structure if one or more of the following criteria are met:
- The height of the structure makes it impractical to evacuate all inside occupants within a reasonable time.
- The potential of a stack effect is created by the structure's height.
- When ground based operations are not sufficient to fight a fire and rescue victims.

Lobby (or Atrium)

An area in a high-rise structure that is normally just inside the building's main entrance. Lobbies must have a smoke removal system and fire sprinklers installed (if ceiling height is not too high) to protect occupants from fire and smoke.

Lock Box

A box located at a building that contains keys, pre-plans, or other pertinent information about the building. If a lock box is present, its location should be noted on the pre-plan of the structure. Some buildings do not utilize lock boxes.

Logistics Section

This section, if established, is responsible for providing additional support for the incident in areas such as additional personnel, equipment, facilities, and other resources that may be needed for the incident. Sectors that would fall under this section might include the Base Sector, Stairwell Support, Communications, etc.

Operations Sector

The Operations Sector is responsible for directing all tactical activities at the incident. The Operations Officer should typically be located one floor below the fire floor. This allows for effective coordination between the Fire Attack Teams and the Ventilation Teams.

Pipe and Duct Shaft

A vertical or horizontal enclosed passageway housing service utilities, piping, ducting, etc.

Plenum

A contained area of a heating, ventilating, and air conditioning (HVAC) system in a structure that encloses a volume of air under a lower pressure (return side) or higher pressure (supply side) than the atmosphere.
surrounding that area. Sometimes, spaces above suspended ceilings in a structure are used as plenums.

Poke-Thru Construction
After the concrete has set in a building, holes are sometimes cored in the concrete to allow the passage of various utility lines or equipment between floors. This procedure is called "poke-thru" construction. Poke-thru construction, if not properly sealed around the cored holes, can seriously diminish the fire resistiveness of the floor.

Pressure Reducing Valve or Device
A valve or device installed at each standpipe outlet, which is pre-set to provide the proper outlet pressure for that location.

Pressurized Stairwell
A stairwell that is pressurized by fans to prevent smoke from entering during a fire so that the stairwells can be used by occupants to exit the structure. Fans in the stairwell are usually activated by smoke detectors or fire alarm systems. Pressurized stairwells are usually found in newer structures and cannot be used for ventilation until the pressure is relieved. After all occupants are evacuated, the fans must be shut down before smoke can be routed up the stairwell and out of the building.

Rapid Intervention Team (RIT)
A team of firefighters (minimum of 2, preferably 3 - 4) that has the responsibility to rescue other fire personnel who may be lost or down. This team will not be utilized for any other purpose other than to stand by and be immediately available for such emergencies.

Recon Team
A team consisting of at least 2 personnel whose assignment is to locate the fire and report a size-up to the Incident Commander.

Rescue Team
A team that consists of at least 3 personnel whose function is to locate and evacuate people from a structure.

Roof
Roofs on high-rise structures are required to be at least two-hour fire resistive and in most cases exceed this because almost every roof is constructed of concrete. The roof configuration should be given careful consideration during the pre-plan inspection in terms of stair shaft exits, machinery rooms, and other obstructions. Certain activities on the roof will be limited. Fire Rescue
personnel should know which stair shafts will exit onto the roof. This is a critical factor when considering evacuation of occupants, smoke removal, or if the stair shafts could provide fire personnel a top down approach to firefighting or interior rescue. Consider roof obstacles and possible slope of the roof.

Scissor Stairways
Two stairways in the same stair shaft that serve alternate exits or alternate floors. Scissor stairways may or may not include common landings.

Sector
Each floor of a high-rise building will be referred to as a sector. For example, the 15th floor would be referred to as "Sector 15". Levels below the first floor will be referred to as sub-sectors. For example, "Sub-Sector 2" is located 2 levels below the first floor.

Smoke Tower
An enclosed stairway adjacent to a structure that is accessible to each floor only through balconies or walkways open to outside air. Smoke and fire will not normally spread into a smoke tower even when doors are left open.

Stack Effect
The accelerated effect of the movement by convection of heated air that is enclosed, as in a smokestack or chimney. Stack effect is a phenomenon caused by the vertical spread of heat, smoke, and fire gases throughout a high-rise building.

Staging Sector
This sector is responsible for the staging of personnel and equipment usually 2 - 3 floors below the fire. It is directly responsible to Command or the Support Operations Sector, if established. It is here that crews will rotate to the fire floor. Officers in charge will develop a log to keep track of all personnel that enter and leave the Staging Sector. A Rehab Sector may be established here as well, monitoring the condition of personnel and providing liquids, food, oxygen, etc.

Stratification
Stratification, or layering, will occur with smoke that has cooled and lost its natural buoyancy. The smoke will no longer move vertically in the structure.
The successful management of any emergency incident requires careful consideration of strategies based upon complete and up-to-date pre-plans or building surveys. Facts that should be gathered and recorded on the surveys for high-rise considerations should include the following:

A. Accessibility - The exterior of building should be surveyed giving considerations to the placement of aerials for rescue or fire streams on lower floors.

B. Air Handlers (HVAC) - Air handlers circulate conditioned air within a building and will intensify fire and spread smoke if not shut down quickly. Eighty to Eighty Five percent of the air in a high-rise structure is recirculated. Under fire conditions, smoke and heat can enter the HVAC system on the fire floor and if the system is allowed to continue in operation, it can quickly fill other parts of the building with smoke that are remote from the fire, putting occupants in jeopardy.

C. The spread of fire products throughout the building through the HVAC system is extremely critical in terms of life safety. The best approach to take if there is any doubt or concern that the system is contributing to the spread is to shut the system down. More often than not, there will be an air handler on each floor. Most air handlers shut down automatically by heat rather than smoke. Consequently, it should not be a surprise to find air handlers still running when fire personnel arrive. Some buildings have a central disconnect as well as individual disconnects on each floor. The pre-plan should indicate the locations of each disconnect. Also, it is important to know whether the particular air handling system can be used to exhaust smoke.

D. Automatic Sprinklers - The history of high-rise fires shows that automatic sprinklers are the most effective way to prevent a small fire from becoming a major high-rise fire. All areas and floors that are protected by sprinklers need to be identified. Systems must be supplemented to insure water supply when fire originates in or threatens a sprinklered area. Some systems have their own fire pumps and connecting to that system may in fact rob the system of pressure. Some systems share sprinkler and standpipe systems. The correct Fire Department Connection that supplies the sprinkler system must be identified. Check the location of the OS&Y and PIV valves. Some valves may control only specific floors (for example, floors 12 through 20).

E. Buildings Under Construction - While these structures are under construction, pre-plan surveys need to be initiated. Hazards are extreme, and continued surveillance and updating of pre-fire plans are needed as buildings progress through their various stages of construction. Almost every firefighting operation is adversely affected when there is a fire in a building that is under construction. Areas that need to be watched during construction are:
1. Access around the structure for aerial apparatus to provide heavy fire streams and access to upper floors. Construction equipment and building materials usually obstruct avenues of travel.

2. Access to fire department connections for standpipes. They will usually be covered, blocked, or missing.

3. Installation of nipples with threaded connections in standpipe valves on each floor. Many times the plumbers have not yet installed them. Without them, handlines to the standpipe cannot be connected.

4. Is the standpipe riser properly capped at uppermost level? If the riser is not capped, it will be impossible to supply water at adequate pressures.

F. Ceiling Assemblies - Ceiling assemblies in high-rise buildings are usually the suspended type with metal grids holding ceiling tiles that are held up, or suspended, by metal wires attached to the floor system above. In a high-rise fire, the area above the ceiling may be exposed to heat which can weaken the wires which are holding the ceiling assembly in place. If the ceiling falls, this can obstruct fire personnel and cause them to become entangled in the wires and grids.

G. Construction Features - High-rise buildings are usually constructed in one of two ways, center hallway construction or center core construction. Center hallway construction utilizes a central corridor to access individual rooms, apartments, or offices. Center core construction utilizes a central core area for elevators, stairways, and utility shafts. Keep in mind that some of the difficulties in firefighting in these type of structures may include:
   1. Normally high life hazard.
   2. Marginal building conditions often exist.
   3. Immediate smoke problems due to a common hallway.
   4. Fires in center hallway occupancies are like fighting fires in a tunnel.
H. Electrical Systems - Electrical systems in high-rise buildings can be extremely complex and very hazardous under fire conditions. The amount of electrical power required for these types of structures and the complexity of the distribution system delivering this power must be considered when fires occur. Fire personnel are not to turn power on or off on these complex distribution systems. Always have the building engineers handle this task! Randomly throwing switches in these systems can be extremely dangerous. Turning off power may cause emergency generators to begin to operate and this could energize systems or machinery that were thought to be turned off.

During pre-planning inspections, be sure to determine if the building has emergency power sources. Be aware of what it supplies and how to activate it if necessary.

I. Elevators - Detailed information about elevators is highly essential because of the potential danger of their use during fires and because they aid the logistical needs of high-rise buildings. Fire personnel must know the type of elevators (hydraulic or traction/hoist type), where elevator keys are kept and how to switch-over and operate elevator cars manually. Recall points and the floors served by each elevator bank should be determined during the pre-plan.

J. Entrance - It should be predetermined where building personnel will meet arriving fire companies. Some buildings have many entrances. The designated entrance can be changed after business hours. To avoid confusion and lost time, correct entrances need to be known by responding fire companies.

K. Exterior Walls - The exterior walls on modern high-rise buildings are normally lightweight, prefabricated walls. This outer "skin" is usually constructed of decorative material such as aluminum, stainless steel, or lightweight concrete with larger areas. They are non-loadbearing and are referred to as curtain walls. They are usually attached by being bolted to metal clips which are attached to the structural frame or slab. In pre-plan surveys while construction is going on, investigate the method of attachment of this outer skin. Usually there are several inches of space between the floor and the exterior wall and fire codes provide that this area be sealed. If this sealing fails or is ineffective, this is an avenue for fire and smoke to advance to the floors above or water to fall to the floors below.

L. Fire Control Room - Fire codes require that newly constructed high-rise building contain a Fire Control Room (or station) within the building that provides specific information on alarms that have been activated, the status of the fire protection systems, and other information on other essential systems within the building, such as, elevators and emergency generator status. The Fire Control Room also may contain communications capabilities such as intercoms systems and telephone systems that Fire personnel can use to communicate with the Fire Control Room from stairwells and/or
elevator lobbies on each floor of the building. The information available at this location can be extremely useful in determining the exact location of a fire and the current status of the fire protection systems that may have been activated.

M. Fire Pumps - Most large buildings will have an electric fire pump to boost pressure on standpipe/sprinkler systems in case of fire. These must be located and checked as soon as possible during an alarm. As soon as possible, Command must determine the fire pump's status and identify the location of all control valves to the system.

N. Post Stressed Concrete Construction - A fire in the forms, which support the upper floors during construction, is extremely dangerous. There is a chance that if support of the forms is lost, the floor(s) will collapse causing a pancake collapse of the building.
1. Do not commit personnel inside the building if the forms are on fire.
2. Use deluge sets and/or ladder pipes and keep personnel 100 feet or more away from the building. Allow for a large collapse zone.

O. Pressurized Stairwells - Pressurized stairwells that may be found in newer building cannot be used for ventilation until the pressure is relieved. Fans to pressurize the stairwells are usually activated by smoke detectors or the alarm system. After all occupants are evacuated, the fan(s) must be shut down before smoke can be routed up the stairs and out of the building.

P. Roofs - Roofs on high-rise buildings are required to be at least two hour fire resistive. In most cases, they exceed this two hour rating since they are predominately constructed of concrete. Careful consideration should be given to high-rise roofs during pre-fire planning. Location of stair shafts which exit onto the roof should be noted for purposes of top-down firefighting and rescue. Locations of machinery rooms, obstructions, or any other feature which could aid or hamper firefighting efforts must be noted.

Q. Stairways - Pre-plan surveys will determine whether or not swift movement of fire personnel is possible in the building. Locked stairways hinder operations. Keys for stairway doors and the roof hatch should be available when fire personnel arrive. Locating the stairways that penetrate the roof and noting which are pressurized are also matters of importance. Locating the switches that deactivate the pressure fans for the stairwells also need to be noted.

Many new high-rise buildings are constructed with "scissor stair shafts" that feature two sets of stairs in one common shaft. In some cases, the scissor stair may serve every floor, but entry points are at alternate floors are on different sides of the center core. Some are odd numbered floors while the other stair serves the even numbered floors. These subtle differences may not seem significant, however under fire conditions; they can be responsible for fire personnel approaching the fire from a less than desirable
location or can result in fire personnel going to the wrong floor.

R. Standpipes - Standpipes are sometimes divided vertically in taller buildings and should be identified during the building survey. Location and identification of Fire Department Connections and the areas in which they supply must be understood. It must be determined which connection supplies the higher and the lower system(s). Additionally, the divisional height of the systems must be identified. Standpipe systems are frequently interconnected within a building and there must be some way to isolate a ruptured pipe if it should occur, otherwise firefighting would be stopped until hose lines are stretched from the street or other locations. OS&Y valves permit shutdown of a riser and the location of all valves must be identified during the building survey. OS&Y valves are many times hidden from public view due to their unattractiveness.

During pre-planning inspections of high-rise buildings, the settings of pressure reducing valves and/or devices should be checked to insure that they will supply the proper pressure and flow required for the length of hose line and the type of nozzle which will be used.

S. Windows - Fire personnel should determine whether the windows are operable or fixed. This will be helpful in rescue and ventilation considerations. Many fixed window buildings have windows that are identified as "FOR RESCUE" and, if present, should be noted. If windows are operable, the method of operation and location of any window keys are to be noted. Many buildings have fixed windows, and the panes must be broken in order to ventilate or use as an avenue for rescue. All glass must be struck in the corners in order to be broken. Be aware that glass fragments can travel long distances (up to 200 feet) and can cause serious injury to those outside. Coordinate the removal of windows through the Incident Commander. Hose lines on the ground below the windows may need to be removed or protected from falling glass.
603.000 Initial Command Procedures

The establishment of Command carries a complexity of responsibilities. Identifying the actual functions of Command along with their options will help in minimizing confusion and aid in the development of a strong foundation on which to build the remainder of the incident.

603.001 Command Responsibilities

The Incident Commander is responsible for the completion of tactical priorities. The four primary responsibilities are:

A. Remove endangered occupants and treat the injured.

B. Stabilize the incident and provide for life safety.

C. Conserve property.

D. Provide for the safety, accountability, and welfare of personnel. This is ongoing throughout the incident.

603.002 Primary Functions of Command

A. Assume and announce Command and establish an effective operating position.

B. Rapidly evaluate the incident (size-up).

C. Initiate, maintain, and control the communication process.

D. Identify the overall strategy, develop an incident action plan, and assign companies and personnel accordingly.

E. Develop an effective Incident Management Organization.

F. Provide tactical objectives - on major incidents, have them written down for all command personnel. They can be referred to and assist in assuring that these objectives are being met.

G. Review, evaluate, and revise (as needed) the action plan.

H. Provide for continuity, transfer, and termination of command.
603.003 Command Options

The responsibility of the first arriving unit to establish and assume command of the incident has several options dependent upon the initial size-up of the situation. The following command options define the company officer's direct involvement in tactical activities and the mode of command that may be utilized.

A. Nothing Showing Mode - Officer investigates the incident by checking with management and/or engineering personnel, checking control room and alarm panels to assist in identifying the location of the incident. The officer may remain with the crew to investigate the building further. All other units will standby at Level 1 Staging.

B. Fast Attack Mode - Utilized when the company officer's direct involvement is needed to take immediate action in order to attempt to control the incident. In these situations, the officer remains with the crew and enters into the building further. Some examples are:

1. Offensive fire attacks (especially in marginal situations).
2. Critical life safety situations (i.e. rescue) that must be achieved in a short amount of time.
3. Any incident where the safety and welfare of fire personnel are of major concern.
4. Obvious working incidents that require further investigation by the company officer. (When fast intervention is critical, use of the portable radio will allow the officer's involvement without neglecting command responsibilities. This mode should not last for more than a few minutes. If the incident is not resolved or stabilized, the officer must withdraw and establish a command post or pass command to another officer.)

C. Command Mode - Certain incidents, by virtue of their size, complexity, or potential for rapid expansion, require a strong command presence. Therefore, the initial Command Post usually will be identified and placed in the lobby or other highly visible location. After passing command to a higher ranking officer, Command may be relocated outside the structure at a minimum of 200 feet or an adequate safe distance from the building.
604.000 Initial Strategic and Tactical Considerations

Notification of a high-rise fire alarm will come from one or more sources, usually from an automatic fire alarm and/or a verbal report. The appropriate dispatch of equipment and personnel shall be as is included in Communications Procedures. Dispatches shall be based on whether incident information is received as an automatic alarm (no verbal confirmation) and/or the verbal report of a fire.

Any additional alarms will be at the discretion of the Incident Commander. The Incident Commander must specify what type and amount of equipment is needed. Do not hesitate to call for additional equipment and personnel.

604.001 The Initial Response

The first-in unit will establish Command and follow the Rudiments of Command.

A. Establish a visible Command Post. Initial Command Post will be in the lobby of the high-rise if possible. Later arriving higher ranking officers may relocate and re-establish the Command Post to the exterior of the building, preferably 200 feet from the building. Personnel in the lobby may remain and serve as the Lobby Sector.

B. Advise Radio and incoming units of a size-up and the establishment of Command. Proper communication will be critical throughout the entire incident. All radio traffic should be precise and to the point, with a minimum of traffic.

C. The Command organization must develop at a pace, which stays ahead of the tactical deployment of personnel and resources. Critical factors will need to be addressed. Initial considerations the Incident Commander will have to consider are as follows:

1. Lobby Control - Initial location for Command Post
   a. Check control room for alarms and systems check, assign personnel with radio.
   b. Elevator control.
   c. Meet building personnel and/or building engineer (have contact person).
   d. Prepare for possible shut down of utilities.
   e. Maintain list and control all personnel that enter the building.
   f. Coordinate incoming units.
   g. Coordinate with Evacuation Team on established routes for evacuation of occupants allowing for a minimum of conflict with advancing firefighting equipment.

2. Recon Team - The primary function of this team is to locate the fire as soon as
possible. No operations can be undertaken until the Incident Commander receives size-up information. Keep in mind that it may take a considerable amount of time for the Recon Team to reach the fire floor if they have to climb many floors of stairs. For safety and accountability reasons, this team must continuously report to the Incident Commander their location and status.

Equipment needed by the Recon Team
a. Full protective clothing and SCBA
b. Portable radios
c. Hand lights
d. Halligan tool and short pike pole
e. Life line (equipment rope)
f. A minimum of one spare SCBA bottle per person.

The Recon Team can attempt to extinguish small fires with extinguishers or standpipe hose if the officer in charge of the team feels it is safe and appropriate to attempt to do so. The Recon Team officer must realize he/she is the most important link to Command in establishing the strategy and tactics needed to control the incident. The Recon Team officer must decide the following:

a. What is the Tactical Priority?
b. Rescue (Life safety, including their own)
c. Fire Control
d. Property Conservation
e. How much and what size hose will be needed to extinguish the fire? How far will the fire travel, allowing the time for handlines to be advanced to the fire floor?
f. Are there fire extension considerations? How can the fire be confined?
g. After the Recon Team gives its size-up, it will be reassigned by the Incident Commander as needed. Options include retreating to a safe area to wait for the Fire and Evacuation Team, dependent upon direction of the Incident Commander.

3. Rescue and Evacuation Team - Evaluate need for rescue and evacuation of occupants, keeping in mind evacuation may only involve moving occupants to another floor instead of out of the structure. In some cases, an entire structure may need to be evacuated and this may involve very large numbers of people.

4. Fire Attack Team - Will take initial attack lines into the building and prepare for attack along with the Recon Team. The Fire Attack Team will consist of a minimum of 6 members (2 companies). The equipment needed by this team is as follows:

a. Full protective clothing with SCBA
b. Minimum of 2 portable radios
c. Hand lights
d. Halligan tool
e. Life line
f. Pick head axe
g. 6 ft. pike pole
h. High-rise hose pack
i. Min. of 100' of 1 3/4" hose with nozzle
j. 15’ section of 2 1/2" hose. Use 50' section if necessary.
k. Water thief
l. Spanner wrenches
m. Minimum of one spare SCBA bottle per person.

The Fire Attack Team consists of two companies. One company should advance the line and attack the fire while the second company is held in reserve in the stairwell. Once the first company has retreated for rehab, low air, etc., the second company will relieve them.

It is important that the Fire Attack Team provides frequent size-up information. If the size of the fire is beyond the resources of the initial Attack Team, the Incident Commander will initiate further sectoring and resources to attempt to control the incident. On large scale incidents, the Fire Attack Team will be under the command of an Operations Sector which will typically be located on the floor below the fire.

Hoselines should be charged prior to making entry onto the fire floor from the stairwell. The initial attack line will be connected to the standpipe connection below the fire floor. The hose needs to be flaked out in a manner so that it will be looped up the stairs above the fire floor and back down again to the door to the fire floor. A backup line will be connected to the standpipe connection on the fire floor, conditions permitting. The initial attack line may be connected to the standpipe on the fire floor if the officer in charge feels that it would be safe and effective to do so.

The initial door entering the fire floor should be opened slowly to minimize the possibility of a back draft that could occur if the fire has been smoldering for some time. It may not be necessary to flow water immediately upon entering the floor unless active fire is observed. Moving a charged line on a hot, smoky floor will be considerably more difficult, but would be immediately available if the unexpected should happen. The water would be available for protection as well as having a hose line to follow out in case of an emergency.

Other Considerations on Attack Operations
a. Life lines should be used during search and rescue operations. Use house hose if rope is not available. (Use caution, some of these lines charge automatically when removed. In this case, you must turn the valve off inside the cabinet.)
b. Try to limit the amount of smoke that may enter into the stairwell.
c. Fog streams in most cases should be avoided. With inadequate ventilation, this will drive heat, smoke, and steam down on the attack team. Straight streams are more effective and safer.
d. Fire personnel should always be prepared for heavy involvement when entering a floor or corridor from a stairwell.
e. The Fire Attack Team should always have the third member of the team remain behind them, to observe conditions and to advise them of safety concerns.
f. When a fire has gained considerable headway, 2 1/2" hose lines should be used for the initial attack line.
g. Maintain a means of access and egress. There is an old saying, "hold the stairs and save the building."
h. Push the fire to involved areas. Avoid a two direction attack if possible. Consider a stationary line while the initial attack line progresses. Avoid pushing the fire towards a stairwell that you are using to evacuate or to move fire personnel and equipment.
i. One team must check the basement and one team must check the top floor for any fire.

5. Water Supply Considerations for Standpipe and Sprinkler Connections

The second-in engine will automatically be assigned to the sprinkler/sprinkler connection. Dependent upon pre-plan information, the engine will connect to the sprinkler/standpipe connection provided it will not be robbing pressure from the system. Otherwise, the engine will connect to the system. The engine will be on standby in case there is an electrical failure and the fire pump fails. The third-in engine will connect into the standpipe system if the systems are separate. Other personnel on these engines (officers and firefighters) should be used as needed for other assignments.

605.000 Command Considerations

Incidents that are identified by the Incident Commander as being beyond the capabilities of the initial response teams will be considered as a full-scale incident. A full-scale incident maybe considered when there is:

A. Verbal confirmation of fire.

B. Moderate smoke on floor(s) with no signs of fire.

C. Fire that is beyond the capabilities of an extinguisher or a house line.
D. Amount of fire that the Recon Team or Fire Attack Team deems beyond their immediate capabilities.

The need to upgrade a response from an automatic alarm response to a full high-rise response needs to be immediate. Recognition of problems within the critical factors, and the need for clear and concise communications are important.

A full-scale high-rise incident presents one of the most complex incidents that an officer may face. The following is a description of the development of such an incident. The various sectors will be identified with their individual responsibilities as well as some of the complex command considerations that need to be addressed.

606.000 High-Rise Incident Management

Incident Commander
The Incident Commander is ultimately responsible for the successful management of the incident. Immediately under his/her command are the following:

A. Strategic Functions (Command Post functions)
   1. Strategic Planning
   2. Technical Support
   3. Liaison
   4. Police
   5. Other outside agencies
   6. Public Information
   7. Logistics
   8. Base Sector - additional personnel, equipment, food, supplies, etc.

B. Tactical Functions
   1. Fire Operations Sector - controls all fire operations from within the high-rise, usually located on the floor below the fire.
      a. Attack Teams
      b. Rescue and Evacuation Teams
      c. Ventilation Teams
      d. Salvage Teams
   2. Medical Operations Sector - Will secure a suitable operating area as needed.
      a. Triage
      b. Treatment
      c. Transport - including staging of Rescue Units
   3. Support Operations
a. Water Supply  
b. Staging Sector - 2 to 3 floors below fire  
c. Lobby Control  
d. Rehab - (within Staging Sector)

Functions of Individual Sectors under Support Operations.

A. Water Supply Sector - The Water Supply Sector Officer shall be responsible for all operations concerning water supply. Some of the responsibilities consist of:  
1. Knowing the diameter of the water mains utilized and available.  
2. Supply sprinkler and standpipe systems.  
3. Identify next nearest water source, private and public water systems.  
4. Make sure that private fire pumps that are connected to the private fire protection system(s) are working properly.

B. Staging Sector - The Staging Sector is located 2 - 3 floors below the fire floor (if possible). The Staging Sector Officer is responsible for the following:  
1. Securing resources  
2. Storing resources  
3. Dispersing resources - A Resource Status Log will be kept identifying personnel and equipment that is dispersed to the Operations Sector.  
4. The Base Sector (located outside) will be responsible for the coordination of getting supplies up to the Staging Sector. Fire personnel may need to be placed every 2 to 3 floors to expedite the movement of equipment with the least amount of exertion.

C. Lobby Control Sector - The Lobby Control Sector is a geographical sector and shall be in the area known as the lobby. This is usually at street level. When different levels are serviced from different streets, the lobby will be at the level containing the Fire Control Room and the level the Fire Service Elevators come down to and open when their Fire Services Controls are operated.

The Lobby Control Sector Officer will be responsible for, but not limited to:  
1. Controlling the entrances/exits.  
2. Controlling the elevators.  
3. Controlling the access to stairways.  
4. Controlling the Fire Control Room.  
5. Securing the Building Manager and the Building Engineer. They should remain at this sector for technical advice as needed.  
6. Securing all utilities, if appropriate.  
7. Checking the enunciator panel for further indications of trouble.  
8. Securing HVAC systems.  
9. Coordinates ventilation system and pressurized stairwells.
10. Keeps log of all personnel who enter and leave the building.
11. Establishes alternate routes of travel in and around the building.
12. Instruct the occupants early into the incident via the phone, P/A System, etc, as to the actions they should take.
13. Controls the phones.

D. Rehab Sector - The Rehab Sector Officer will be responsible for establishing a safe area while remaining relatively close to the Operations Area. The Rehab Sector's responsibilities consist of, but are not limited to:
1. Providing fluids and food to operational personnel when applicable.
2. Provide oxygen and blood pressures for personnel as needed.
3. Coordinate teams rotating through Rehab, keeping track of teams that are available to go back to Operations Sector when ready. When individuals or teams have been rotated twice through Operations and/or have used two air cylinders, they should be taken out of the rotation temporarily. If space allows, they may remain in the Rehab area, or they may be required to report to another designated area, such as another floor, the Lobby Sector, Base Sector, etc.
4. Restroom facilities may need to be made available.

Time factors play an important role in control operations at high-rise fires. At any fire, it takes time to transform orders into actions, and at a high-rise fire, time becomes an even more critical element.

Waiting for things to happen before requesting additional resources, or waiting to move on-scene resources in close proximity to the fire area can be disastrous for command officers. The impact of time factors can be greatly reduced by placing personnel and equipment in the Staging Sector (2-3 floors below the fire) as quickly as possible. Being proactive is the key; anticipate what may happen and move resources before the need is actually there to use them.

It is also important to be aware of how long it takes to perform critical operations during these incidents and how long personnel can realistically be expected to operate before requiring some form of rehabilitation.

607.000 Rules and Procedures for Elevator Use

The use of elevators is a calculated risk, but a necessary risk if fire personnel are to reach upper floors quickly and in condition to work immediately. Observance of safety rules and procedures, coupled with certain knowledge of elevator operation, should minimize the danger presented in the use of elevators in burning buildings. Preplanning the particulars on elevators in each structure is a must. Elevators in newer buildings will have a Fire
Emergency Operation function, usually referred to as the Firefighter's Service. This mode of operation prevents occupants from operating the elevators in case of fire. It also provides important safety features for fire personnel. Fire personnel should have a clear understanding of the emergency operation and how it works. There are normally two switches, a Lobby Switch and a Car Switch, that control these cars during emergency operations. These switches must be used in conjunction with one another to assure safe and proper operation.

Lobby Switch - The lobby switch is a three position switch (on, off, and bypass) which is located in either the main elevator lobby, usually with or near the hall buttons, or in the Fire Control Room. In case of fire in some buildings, the Lobby Switch must be manually operated by fire personnel. Some systems are keyed automatically "on" by the alarm system, or by building personnel. All elevators will return non-stop to a designated floor and open, forcing all occupants to use the stairs as an evacuation route. The elevators will no longer respond to calls from other floors.

Car Switch - The car switch is a similar three position switch (on, off, and bypass) located on or adjacent to the operating panel inside each elevator car. The fire personnel turn it to "on". The correct floor button is signaled and the doors will close. Doors open and close by continuous pressure on the buttons.

CAUTION - Heat from the fire or water flowing into the hoistways may short circuit the elevator, preventing it from working. Also warped hoistway doors from heat may prevent the movement of the car, possibly on a fire floor - a deadly situation.

Rules and Procedures for Use of Elevators

A. The exact location of the fire/fire floor must be known before using elevators.

B. Check the hoistway initially and periodically for smoke and fire. This can be done by looking between the hoistway and the car or by opening the elevator car's emergency access door. (Keep in mind that the elevator may stop and become inoperative whenever the emergency access door is open.)

C. NEVER take the elevator car to the fire floor. Always exit at least two floors below the reported fire floor.

D. Never move an elevator car more than 5 floors without stopping and checking for full control over the car.

E. Never pass the fire floor.

F. Never use the elevators unless it has been determined that the Firefighter's Switch has
been activated.

G. Always activate the emergency stop switch before escaping a stalled car.

H. Always carry a forcible entry tool to escape the car in an emergency.

I. Elevator use by Fire personnel should be limited to 6 per elevator car.

J. Due to the potential hazards of elevator use, elevators generally should only be considered for use for fires above the 4th or 5th floor.

608.000 Ventilation Considerations

In high-rise firefighting, the removal of smoke and heat can be a major problem. Successful ventilation decisions are dependent on the extent and location of fire coupled with the design, construction, and layout of the high-rise structure. The Incident Commander must have immediate access to pertinent information concerning the building. The building engineer or other informed individual must be available at all times. These individuals should remain at the Lobby Sector or other known location during the course of the incident.

When air handling systems cannot be used for ventilation and heavy smoke and high heat conditions are encountered, the Incident Commander must take immediate action utilizing whatever opportunities present themselves in a precise and coordinated effort.

Some natural avenues for ventilation that should be considered are:

A. Stairwells

B. Elevator Shafts

C. Windows

Stairwells that go from the lobby through the roof can be used if several precautions are followed:

A. Do not open the stairwell door at the fire floor until the stairwell is clear of occupants and fire personnel. Once the stairwell door is open, every effort must be made to insure this stairwell is not used.

B. The door at the top of the stairs must be removed if possible, not just propped open.
C. Open the door at the lobby level to provide the air, which will assist the ventilation process.

D. If a pressurized stairwell is used, insure the fans that pressurize the stairwell have been shut down.

E. It is of extreme importance that the building engineer does not shut down the fans operating the pressurized stairwell until the Incident Commander calls for it.

F. Keep in mind the possibility of the smoke stratifying and not reaching the top of the stairwell.

Using Elevator Shafts for Ventilation, this should be used as a last resort.

A. Be sure all elevator cars in the shaft selected are at their lowest point.

B. A firefighting team must check the top of the shaft to ensure it is opened to the outside. They must be certain that the smoke and heat will not affect the other banks of elevators being used to transport fire personnel, equipment, etc.

C. Teams of personnel should be stationed every third floor above the fire floor to report any significant smoke leakage.

D. Windows and Horizontal Ventilation

The utilization of windows for horizontal ventilation should be done with caution. In some cases, it may cause more problems than it resolves. The use of windows may be an option if the following conditions are present:

A. There are no stairwells that exit through the roof.

B. Elevator cars are stalled in hoistways, or hoistways do not exit to the outside.

C. Stratification of smoke has occurred.

When utilizing horizontal ventilation, consider the following:

A. Wind direction. This is extremely important! It often changes, pushing fire and/or smoke back on attack crews. It can be unpredictable when surrounded by other high-rise buildings.

B. Danger of large pieces of glass falling to the street. A study by the City of Los
Angeles determined that glass may travel distances outward of up to 200 feet.

C. The fire may increase in size, beyond the extinguishing capabilities of hose line(s) being used at that time.

609.000 Communications

The efficient coordination of incidents, particularly in high-rise buildings, requires prompt, complete and frequent reports. Almost continuous reports from the Recon and Fire Attack Teams are essential. Properly functioning portable radios are necessary for good communications. There may be the need for a supply of spare batteries at the Staging Sector and the Base Sector. The construction of some high-rise buildings may present communication problems for portable radios. This must be identified early in the pre-fire planning stage. An alternate method for communicating must be identified. Attempting the use of "Talk Around" mode on radios may serve as a viable option. In the near future, cellular phones may serve as a communications avenue.

One or more of the following options are usually found in most high-rise structures.

A. Telephones

B. Fire Service Telephones - These are usually located in stairwells and/or elevator lobbies. Can be used to link sectors or teams with the Fire Control Room. This system will also allow for communication to the Fire Control Room.

C. Public address system - Now required in new high-rise buildings and connects the Fire Control Room to every floor of the building.

610.000 Summary

It is important to remember that time is the enemy at high-rise fires. Nothing is accomplished in a moment’s notice. Intuition, planning, experience, and foresight are your greatest allies as an Incident Commander or Sector Officer. High-rise fires require an extraordinary amount of personnel and equipment. The City of Los Angeles states that most small high-rise fires require a minimum of 80 air cylinders. It can be agreed upon nationwide that the average fire in a high-rise utilizes a minimum of 50 fire personnel!

This logistical nightmare can best be handled by a strong presence of Command coupled with a well-trained and organized force of fire personnel. Communications, coordination and teamwork will be critical factors in the overall success of the operation.
## Typical High-Rise Assignments

<table>
<thead>
<tr>
<th>Unit order of arrival</th>
<th>Duties</th>
</tr>
</thead>
</table>
| **1st Company**       | * Establishes command.  
* Check annunciator.  
* Obtain elevator keys.  
* Investigate fire floor.  
* Give size-up.  
* Initiate suppression/rescue/evacuation.  
* Set up Operations Sector.  
* If 1st ladder, stage apparatus on fire side for possible rescue/ventilation/exposures. |
| **2nd Company**       | * Apparatus to sprinkler connection.  
* Officer becomes Lobby Control Sector and Incident Commander after conferring with 1st-in officer.  
* Check preplans.  
* Place personnel in Fire Control Room.  
* Recheck annunciator panel.  
* Control elevator at lobby.  
* Control environment/HVAC.  
* 2nd ladder set up opposite side of fire for ventilation and rescue. |
| **3rd Company**       | * Apparatus to standpipe if needed.  
* Stage two floors below fire floor.  
* Back up 1st company with rescue if needed.  
* Carry air bottles and/or hose line if needed.  
* 3rd ladder assist with ventilation - stairwells. |
| **4th Company**       | * Establish Staging Sector 2 - 3 floors below fire.  
* Carry additional equipment and air bottles.  
* Staging Sector Commander will rotate additional units in order of arrival.  
* Next assignment will be Operations Sector or other sectors as assigned. |
| **5th and other Companies** | * Rotate from Staging Sector as needed. |
### Incident Commander

<table>
<thead>
<tr>
<th>Strategic Operations</th>
<th>Tactical Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Planning</strong></td>
<td><strong>A. Fire Operations</strong></td>
</tr>
<tr>
<td><strong>B. Technical Support</strong></td>
<td>• Attack teams</td>
</tr>
<tr>
<td><strong>C. Liaison</strong></td>
<td>• Rescue and Evacuation Teams</td>
</tr>
<tr>
<td>(outside agencies)</td>
<td>• Ventilation Teams</td>
</tr>
<tr>
<td><strong>D. P.I.O.</strong></td>
<td>• Salvage Teams</td>
</tr>
<tr>
<td><strong>E. Logistics</strong></td>
<td><strong>B. Medical Sector</strong></td>
</tr>
<tr>
<td>• Base Sector</td>
<td>• Triage</td>
</tr>
<tr>
<td></td>
<td>• Treatment</td>
</tr>
<tr>
<td></td>
<td>• Transport</td>
</tr>
<tr>
<td></td>
<td><strong>C. Support Operations</strong></td>
</tr>
<tr>
<td></td>
<td>• Staging Sector</td>
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<tr>
<td></td>
<td>• Rehab Sector</td>
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<tr>
<td></td>
<td>• Water Supply</td>
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<tr>
<td></td>
<td>• Lobby Sector / Control</td>
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</tbody>
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Example of the Incident Management System for Large Scale Incidents

<table>
<thead>
<tr>
<th>Strategic Operations</th>
<th>Tactical Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Planning Section</td>
<td>A. Fire Operations</td>
</tr>
<tr>
<td>* Resources unit</td>
<td>* Division 1</td>
</tr>
<tr>
<td>* Documentation unit</td>
<td>- Sectors 1 - 5</td>
</tr>
<tr>
<td>* Finance unit</td>
<td>- Attack Teams</td>
</tr>
<tr>
<td>B. Technical Support</td>
<td>- Rescue and Evacuation</td>
</tr>
<tr>
<td>C. Liaison</td>
<td>- Ventilation Teams</td>
</tr>
<tr>
<td>D. Logistics</td>
<td>- Recon Teams</td>
</tr>
<tr>
<td>* Base Sector</td>
<td>* Division 2</td>
</tr>
<tr>
<td>* Communications Sector</td>
<td>- Sectors 6 - 8</td>
</tr>
<tr>
<td>* Stairwell Support</td>
<td>- Attack Teams</td>
</tr>
<tr>
<td></td>
<td>- Rescue and Evacuation</td>
</tr>
<tr>
<td></td>
<td>- Ventilation Teams</td>
</tr>
<tr>
<td>* Medical Sector</td>
<td>* Support Operations</td>
</tr>
<tr>
<td></td>
<td>- Staging Sector</td>
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<tr>
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<td>- Rehab Sector</td>
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<td>- Water Supply</td>
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<tr>
<td></td>
<td>- Lobby Sector / Control</td>
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<tr>
<td></td>
<td>- Air and Light Teams</td>
</tr>
<tr>
<td></td>
<td>* Rapid Intervention Team (R.I.T.)</td>
</tr>
</tbody>
</table>
Typical High-Rise Layout and Sector Locations

BASE SECTOR (LOCATED OUTSIDE)