

3.2.4.1 High-Rise Operations



YOUR ORGANIZATION
STANDARD OPERATING PROCEDURES/GUIDELINES

TITLE: High-Rise Operations

SECTION/TOPIC: Special Facilities-Target Hazards

NUMBER: 3.2.4.1

ISSUE DATE:

REVISED DATE:

PREPARED BY:

APPROVED BY:

X

Preparer

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Approver

These SOPs/SOGs are based on FEMA guidelines FA-197

1.0 POLICY REFERENCE

CFR

NFPA

NIMS

2.0 PURPOSE

This standard operating procedure/guideline addresses responding to and operating at emergency incidents in high-rise buildings.

3.0 SCOPE

This SOP/SOG pertains to all personnel in this organization.

4.0 DEFINITIONS

These definitions are pertinent to this SOP/SOG.

5.0 PROCEDURES/GUIDELINES & INFORMATION

5.1 Responding to and operating at emergency incidents in high-rise buildings:

This plan is intended to adapt Standard Operating Procedures and systems to a high-rise mode of operations.

High-rise fires present unique problems to fire fighters accustomed to operating at ground level, primarily those of access, rescue, fire control, exposure protection, ventilation, and personnel safety. Successful high-rise fire operations are initially offensive using aggressive positions and postures in all tactical tasks and functions.

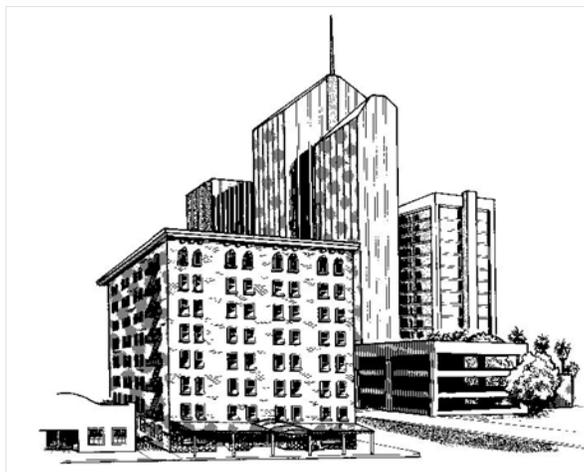
HIGH-RISE INCIDENT OVERVIEW

Access, to the building is complicated by the possibility of falling glass, by building setbacks, and is often limited to only one face of the building. Access to floors beyond the reach of aerials is limited to stairwells, that are typically closely spaced in the 'core' area of the floor. The location of the stairwells may, or may not be at the unburned portion of the floor, and may cause the fire fighters to enter directly into the fire rather than from the 'outside in' as we are accustomed.

Rescue of occupants trapped on the involved floor is slow, and if they are too high to be evacuated by aerials, rescue is compounded by the necessity of using the stairs and possibly going through the fire to reach them. If the occupants do reach the stairwells, a building population larger than the number of fire fighters on duty may be attempting to descend the same stairs from which we must stage, extend hose, and fight fire.

Fire Control is compounded both by the inevitable delayed response to the fire floor, and by increasingly more severe fire loads in larger, more open, and lighter weight structures.

Prior to the 1940's, high-rise floors were relatively small, utilizing operable windows for natural light and ventilation. These predominantly steel-framed structures were encased and subdivided with heavy masonry walls, (and the codes we use today for fire resistance of structural members were based on the then, normal fire loading of 8000 B.T.U.'s per pound of contents). The result was slow moving fires in small compartments with the building mass absorbing much of the energy of the fire.



Modern high-rises are as much as 75% lighter in mass than these earlier buildings. They are also

taller, with open landscaped floors as large as 20,000 sq. ft. The content loading in a modern high-rise can generate as much as 2-1/2 times the B.T.U. output of the fires from which the fire codes were derived.

These large, open floors provide ample oxygen and fuel, and high-rise fires are capable of reaching flashover in under 10 minutes. Couple this with a typical response time of 20 minutes to the fire floor and you may find a fire on arrival that is already beyond the ability of handlines to control, and beyond the limits of the structure to contain. There are other problems. Because high-rise buildings are tightly sealed to contain the conditioned air, they present a serious potential for backdrafts. Add to this a potential for open shafts, unprotected vertical openings in remodeled and new structures, electrical hazards, and unrelieved heat and smoke and it should be apparent how difficult the extinguishment of a high-rise fire can become.

The exposures are stacked vertically (the direction the smoke convection and heat conduction want to go), and the size of the lines used to effect control and protect exposures is limited to those that can be deployed and connected in stairwells. Multiple avenues of extension through the floors exist. Most will resist fire to some extent, but a serious fire will eventually find some opening to the upper (and lower) levels.

Placing multiple lines to cover the numerous exposure points on the floor above is a slow and cumbersome task. It is very difficult to get adequate resources above an extending fire in time to stop it.

Safety is a primary concern because of poor egress/escape, unforgiving fire behavior, excessive heat and smoke, panic of occupants, and fatigue of fire fighters.

Providing ventilation for attacking crews, without extending the fire to upper floors, is also very difficult. High-rise floors in City are tightly sealed, predominantly fixed glass compartments that are designed to resist the travel of smoke and fire to the upper levels. This is beneficial for limiting fire extension, but it also serves to impound the heat and smoke on the fire floor. We cannot ventilate vertically through the concrete slabs to the floor above, we can only ventilate horizontally and mechanically. Ventilation is usually accomplished by breaking the glass from the floor above. This exposes the floors above to flame, the fire fighters on the fire floor to unpredictable winds, and persons on the ground to broken glass. If ventilation is not accomplished, the fire gases and heat will eventually pressurize into the core and extend to other floors.

Even when ventilation is effected, it may be sometime before the heat is lifted and vision improves because the heat is impounded in the slabs above and below, and will continue to generate steam from water from the hose streams. A high-rise floor fire is like an above-ground basement fire, and the fire fighters must be prepared for a lengthy, punishing operation.

Resource Demand. Resources required to control and extinguish a high-rise fire are

substantial. Experience with major high-rise fire reflects the need for 200-300 fire personnel. In addition, a major support effort and Command structure is required to maintain a campaign fire fighting effort.

Evacuation policy

The evacuation route available to occupants of a high-rise building are normally limited to two stairways.

The stairways are also the prime access route for fire fighting forces to make an attack.

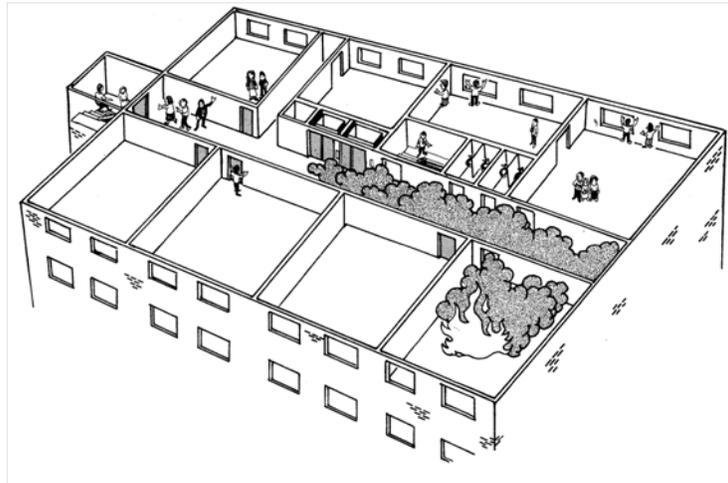
Occupants in the immediate fire area should first be evacuated as quickly as possible to three floors below the fire floor or other safe environment. Further evacuation should be based on risk to the occupants, since premature evacuation often hinders fire control efforts and adds to general confusion at the scene. The determination of risk and the decision to evacuate should be made by personnel on the floor and coordinated by Command.

Subsequent evacuations should be managed to avoid interference with operations as much as possible (see Evacuation Sector). If sufficient police personnel are available at the scene, they may be used to good advantage in assisting with evacuation. Police assistance may be most valuable in controlling evacuees in the Lobby and preventing re-entry.

HIGH-RISE TACTICAL OPERATIONS

The TACTICAL OBJECTIVES in a high-rise fire are:

- 1. Secure and maintain a viable exit stairwell.** We may not be able to control the fire in time to prevent extension to the remaining occupied floors. We must protect the way out and our way in.
- 2. Rescue any immediately threatened occupants.** An aggressive offensive, coordinated attack has proven to be the most effective tactical option in the majority of high-rise fire situations and rescue, in most cases, should be limited to those in immediate danger on the fire floor(s). The remaining occupants should be kept in or removed to safe refuge within the building.



3. Stop the production of life threatening heat and smoke by extinguishing the fire.

Continuous relief of heat and smoke and proper application of water on the fire floor(s) until extinguishment.

4. Manage the spread of existing heat and smoke throughout the building by pressurizing the stairwells, controlling the building H.V.A.C., and, if possible, cross ventilation of the fire floor.

As soon as possible relieve the pressure of heated, toxic gases to prevent them from moving into the core and onto other unoccupied floors.

5. Start Property conservation early and address loss control in all objectives.

Immediate Priorities

The **initial arriving units** to a fire in the tower should be concerned with:

1. Requesting additional resources if there is evidence of a fire.
2. Establishing Command and Lobby Sector. Assessing lobby conditions, verifying actual fire and fire location(s).
3. Providing, or verifying, a continuous water supply.
4. Supporting the sprinkler system (if present)
5. Identifying the fire floor.
6. Providing for the life safety of persons in immediate danger.
7. Obtaining keys from interior lockbox. Distributing keys, stair phones, and floor schematics to crews.
8. Recalling and assuming control of the elevators.
9. Assessing stairs, designating fire fighting/evacuation stairs.
10. Providing for search and extinguishment on the fire floor.
11. Providing for fire fighter safety, survival, accountability, and welfare.

Initial Attack

The Initial Attack should consist of at least three (3) companies preferably 2 engines and 1 ladder. The officer leading the attack will be responsible for selecting the method of ascent to the reported fire area (elevator, stairs) depending on conditions and safety concerns. The annunciator panel must be checked for additional information prior to ascending to fire floors.

As soon as the fire floor is reached and identified, the officer will give Command a progress report of conditions on the fire floor, immediate needs, and a confirmation of the actual fire floor(s) number. Command should then establish the fire floor as a Sector (Floor 16 = Sector 16).

When a building has multiple standpipes, the fire floor Sector Officer must advise Command where water is needed and Command will confirm the availability of pumped water to that particular riser.

At least one member shall remain in the lobby area as Lobby Sector and to gain control of all elevators using Emergency Recall or Fire Feature. Lobby Sector must maintain accountability for attack companies and their method of ascent.

The Initial Attack companies will go upstairs with only SCBA's, bottles, portable radios, flashlights, hose packs, and basic forcible entry tools. If access is via an elevator, an extinguisher should also be taken.

Other equipment will be pooled in the lobby until a Resource Sector is established (See Resource Sector).

Water Supply

Command or the initial engine on the scene should have an engine from the 1st assignment spotted on a hydrant sufficiently close to the connections for the standpipe/sprinklers to properly supply the system. In most cases, it is best to have the engine at a hydrant away from the risk of falling glass, but in very tall buildings the pumper must be located at the base of the tower to provide adequate pressures. If there are multiple standpipes, hose must be connected to each inlet. If the chosen hydrant is not close to the dedicated fire department access, then the crew and equipment can be dropped at the designated entrance and the Engineer continue to the hydrant to make the connections (the Captains and crew members may assume Lobby control functions in many cases). Dry standpipes should be pressurized according to standard hydraulic calculations. In wet systems, the lines should be wetted, but not pressurized until verification that the fire pump is not operating. Wet systems may require that the fire engine duplicate the systems pressure provided by the fire pump. Lobby may be able to verify the building fire pump operation from the Fire Control Room or by sending a crew member to the pump room.

The pump operator should take a position away from the hazard of falling glass until pumping operations are necessary. If available, hose should be protected from glass and debris by shields carried on the High-rise Tender (City FD). The pump operator should take shelter in engine cabs during pump operations to be protected from falling glass and other debris.

Access

Companies must use extreme caution when approaching the building due to the possibility of falling glass (expect falling glass and don't loiter outside). Access to the building should be through a predetermined door as close as possible to the Fire Control Room. If the building does not have 24-hour security, an exterior lockbox should be provided containing a key to the exterior door. An interior lockbox should be provided at, or in, the Fire Control Room containing elevator recall/operation keys and master keys to the building (at least four sets).

One set of keys, a stair phone, and a copy of the building floor plan should be issued to the officer going to the fire floor and a second set to the officer going to the floor above. At least one set of keys should be retained in Lobby to access fire pump rooms, main electric rooms, etc. Access to the upper floors should be by elevator if possible. Elevators provide a faster, less fatiguing method of getting to upper floors and permit more equipment to be carried.

Occupants may be exiting the stairs and impeding fire fighters. Most high-rises in City-Metro area have only two exit stairwells and both are required when an evacuation is in progress. A majority of the high-rise buildings in City-Metro area are equipped with A.N.S.I. Phase I and II elevator override functions.

If the elevators are inoperable or unsafe for use, then the ascent must be made by stairs. Fire fighters should utilize the least occupied stairs to avoid the crush of descending occupants. If the stairs are full of smoke, provide fan pressurization at the base to prevent the consumption of air bottles before reaching the fire floor. Crews should limit hand carried equipment to hose packs, forcible entry tools, and bottles.

Lobby Sector

- Open interior lockbox, remove keys, access fire control room.
- Distribute keys, stair phones, and pre-fire plans to crews.
- Identify fire location(s) utilizing alarm panel, witness reports.
- Recall and assume control of elevators. Assess for F.D. use.
- Verify fire pump is running (water may need to be flowing before pump is activated). If there is no fire pump, cause standpipe to be charged by communicating with Command.
- Identify attack and evacuation stairwells (Attack from the stairs with a roof opening, if possible, so that smoke entering the stairs through the door you enter with a hoseline can be exhausted.).
- Verify stair pressurization, if present. If not, fan pressurize attack stairs and evacuation stairs as soon as possible.
- Verify auto stair door unlocking.
- Verify air handler status. Shut down if not known to be beneficial.
- Direct Security, if available, to remove occupants exiting to the exterior through lobby or down stairs to a position away from the area of falling glass or debris.
- Activate building intercom, but do not silence alarm or direct occupants in a mode of evacuation until conditions are known -- until a size-up and report is made by crews on the fire floor and vertical extension is assessed on floor above.

- Verify emergency generator operation if building power is interrupted.
- Account for members going aloft. Only the 1st Alarm units will split crews, all other units operating in the building should remain intact. All units must be accounted for by Unit I.D. and PASSPORT. Any crew or individual operating in the building shall have full protective gear, radio, forcible entry, and/or keys, and where possible, spare air bottles.



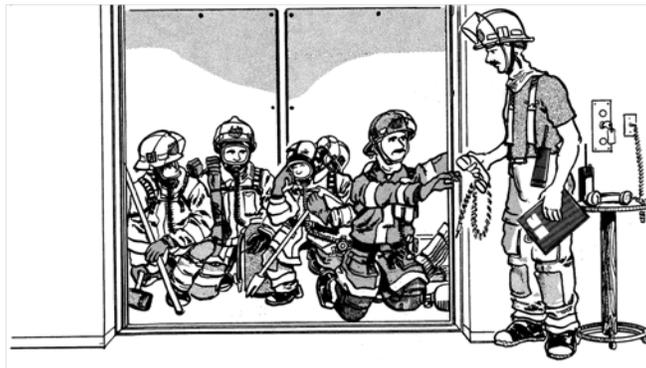
- Evacuate any occupants trapped in elevators at Lobby level.
- Divide the Lobby floor into areas for staging and treatment of occupants and staging of incoming fire fighters and equipment.

The tasks assigned to Lobby are numerous and demanding. Command should provide additional resources as necessary to assure that critical tasks are accomplished.

Elevators

To expedite time of arrival to the fire floor and to avoid the occupants descending the stairs, crews should utilize elevators whenever safe and possible. Erratic elevator operation, however, has been the cause of numerous fire fighters deaths, so the following conditions must be met before use.

- Only elevators having A.N.S.I. II 'fire feature' may be used for fire department operations (A.N.S.I. Phase I provides for automatic recall of elevators when designated alarms are activated. A.N.S.I. Phase II provides for key activation and use of the recalled elevator cars.).
- The shaft must be clear of smoke.
- Only members trained in the operation, use, and methods of escape from elevators will operate the cars.



- Only one crew (with the operator) and equipment at a time will use the car to avoid overload, and to permit room for emergency maneuvers in the car.
- Crew and operator must be fully dressed with S.C.B.A. facepieces in position for quick donning before ascent.
- A radio, forcible entry tools, step ladder, water extinguisher, and spare bottle should remain in the car with the operator.
- Elevators that travel through a blind shaft should not be used. A blind elevator shaft is defined as the portion of a shaft where normal landing entrances are not provided. If an elevator whose shaft terminates below the fire floor is present, use that car. If not, utilize an elevator that serves all floors, that is remote from the fire floor, such as a freight elevator.
- Elevators with door opening restrictors should not be used unless forcible entry tools are left in the car. At present City codes do not provide for side exiting and top hatches are bolted shut.
- Avoid using the radio in or near the elevator control room. It may disrupt elevator controls.
- Know where the stairwells are prior to entering the elevator.



Crews beginning the ascent should attempt to stop the car at the first typical tower floor, but not over five floors, to verify that the 'fire feature' is working. While stopped at that floor, note the relationship of the elevator to the closest exit stairs in the event the car does become erratic and the door opens into flame on the fire floor.

If the Lobby or Fire Control Room position indicator showed cars not returned to Lobby, it may be possible to combine the floor check with a search for the stalled cars on the way up. If the car performs properly, continue the ascent to two floors below the indicated fire floor, stopping every 5-7 floors to check the elevator operation. Check the shaft for smoke every time you open the door.



Emergency Elevator Conditions

Normal elevator operations, fire feature, and the interlock safeties are all electronic programs and can be made erratic or inoperative by excessive heat and smoke. No one should use an elevator in a fire situation who is not trained to self-extricate from the car under emergency situations.

If you see smoke under pressure, or an accumulation of smoke so great you cannot see the top of the shaft, exit the car at that point and climb the remaining floors. If the 'fire feature' is still operational, the operator should exit and allow the car to be recalled to Lobby on 'bypass'. If the shaft is still clear, continue the ascent. Should the car, at any time, become erratic and unresponsive to operator commands, activate the Emergency Stop (The rebound from this sudden stop might place the car in an overload condition were it loaded with two crews and equipment.). If the Emergency Stop fails, pry open the car door and trip the interlock. If that fails, put on your facepieces, get low in the car, and if the door opens onto the fire floor, move to the stairwell under whatever protection you can gain from the extinguisher.

The elevators should not be used for occupant evacuation until fire control is achieved, unless the shaft is made of concrete or masonry, and does not open to the fire floor. The occupants do not have self-contained breathing apparatus or turnouts to shield them from smoke flashing in the shaftway,

nor are they prepared to climb down the shaft, or make the drop to a misaligned floor from a stalled car.

The members of the technical rescue team and the (City Fire Department) high-rise teams, however, are trained in these operations and while elevator use at fires can be dangerous, the benefits of arriving at the fire floors fresh, in a fraction of the time, with a full tank of air, necessitates use of the elevators, when safely possible.

Stairwells

A first priority for Command/Lobby is the identification of the attack and evacuation stairwells and a sizeup of smoke conditions in each. If the stairs exit into the lobby, the size-up can be made by Lobby Sector.

If the stairs exit to the exterior, Command/Lobby must send runners with keys to assess each stair condition.

At the time of arrival to a significant fire, the occupants may be descending both stairs, as most high-rises require both stairs for effective evacuation. Any smoke in the stairwells at this point is probably the result of smoke pressure on the fire floor escaping into the stairs as the occupants exited the fire floor.

If the building is equipped with automatic stair pressurization, it may be effective at this point, if most of the other doors in the stairwell are kept shut. In practice, a mass evacuation will cause most of the doors to be open a substantial amount of the time, with result in a loss of pressurization and significant smoke accumulating in the stairs. It is doubtful that with the fire loading now encountered in a high-rise that the pressure created by building stair pressurization will be sufficient to contain the smoke pressure generated by a fully involved floor fire.

The purpose of built-in stair pressurization is to maintain a positive pressure in the stairwell and impound the smoke on the fire floor. Experience has shown that a small fire will be accelerated by the incoming air if the door is left open, but that most of the smoke will be held on the fire floor.

A primary objective of the first arriving units is to maintain a smoke-free exit way both for occupants leaving the building and for fire fighters staging and preparing to extend hose.

A large volume fan should be placed at the opening to all stairs to pressurize the stairwell and to provide an upward current of air. This will help to hold the smoke out of the stairs and will allow the occupants to descend into a cleaner environment with every step.

In buildings where the stairs continue to the basement level(s), the fans should be placed at that location to keep the noise out of the lobby. Gas fans placed in stairs without a roof opening should be replaced as soon as possible with electric fans to prevent an accumulation of carbon monoxide in the shaft.

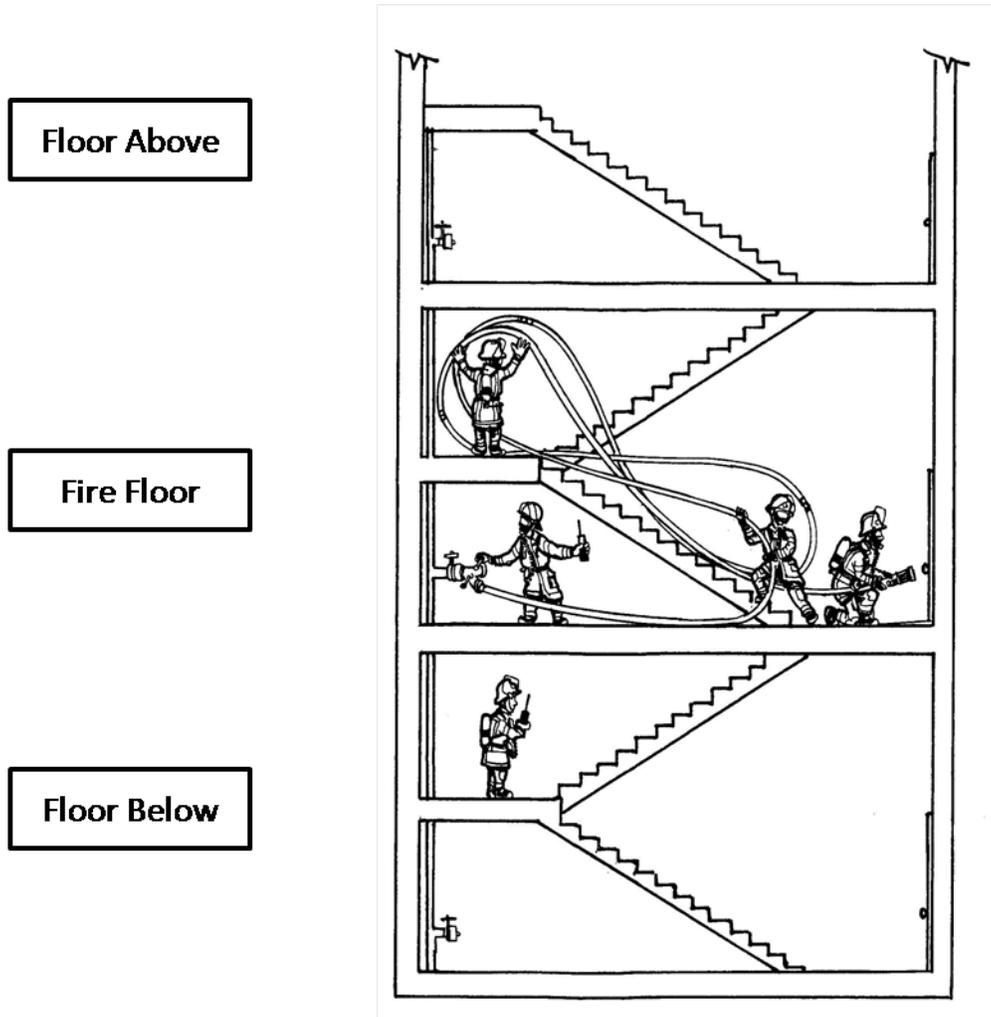
Evacuation of the smoke trapped in the upper stairwell requires a roof opening. If the building is not equipped with stair pressurization, but the stairwell is either open to air or has a dampened opening at the top, the smoke can be fan exhausted by fire department crews using P.P.V. with large volume (22,000 C.F.M.) fans. **Do not leave the fans unsupervised.**

A company with radio, keys, and spare bottles should be sent to the roof door as soon as possible as Roof Sector. Their task is to open the stair door or hatch at the roof and provide an outlet for smoke.

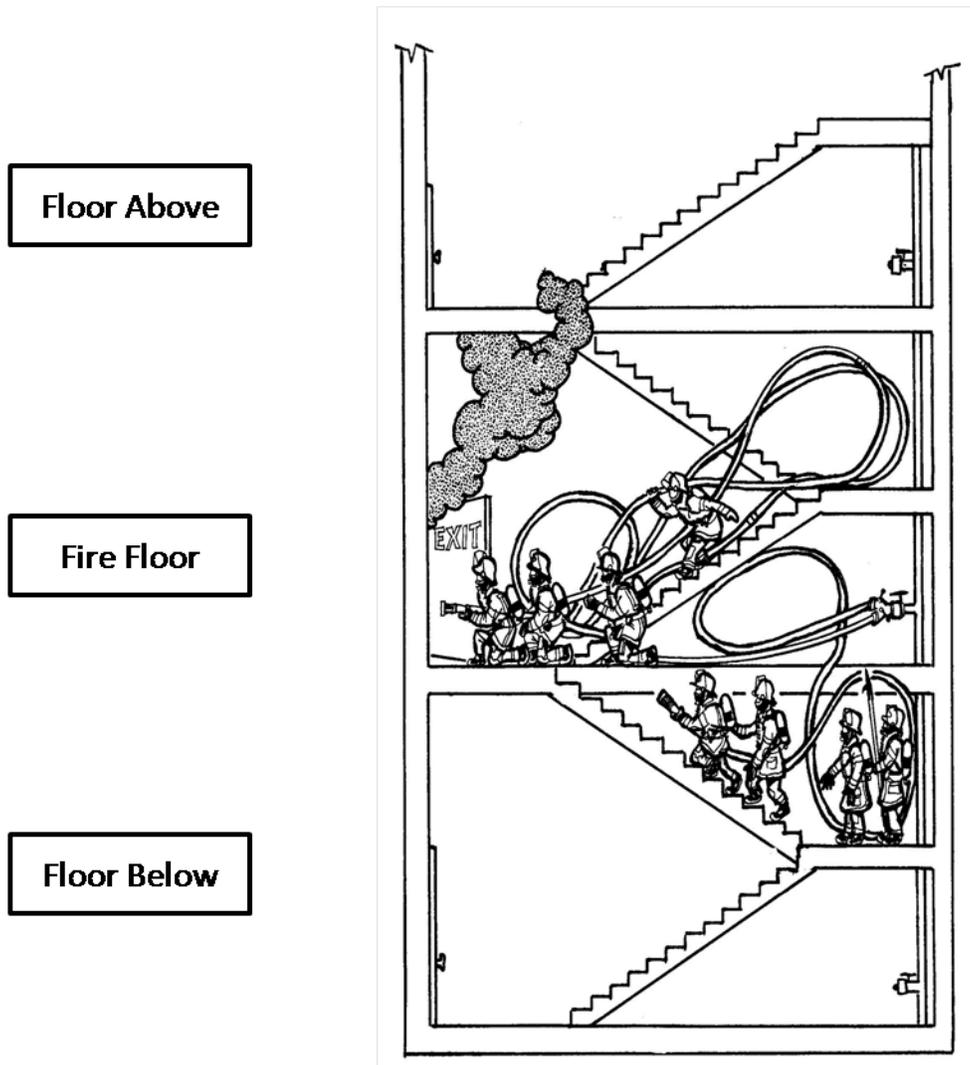
When fire fighters open the stairwell door to advance hoselines on the fire floor, significant smoke will enter the stairwell. Occupants descending from upper floors must be allowed to pass before opening the door and exposing them to hot gases and flame. Persons entering the stairwell after the door is opened and fire attack is initiated, should be directed across the building to the evacuation stairs when possible.

Extending Hoselines for Initial Attack

The possibility of backdrafts--the possibility of flare-ups from the sudden loss of windows--and the high probability of flashover temperatures all require that the initial attack line be charged before entering the floor. The easiest manner to extend hose onto a fire floor is to stretch it up the attack stairwell and pull it down as you advance onto the floor. Crews should layout the dry hose approximately 6" from the outside wall as they progress up the stairs.



When charged, the hose will expand against the wall without kinking. The fire fighters extending hose on the upper landings will be exposed should the fire flash out the stair door and up the stairs. A back-up line with a fog nozzle should be in place before opening the door to advance the attack line, both to protect the attack crew and the fire fighters in the stairwell.



Connect both the attack line and the back-up line to the gated wye on the fire floor and assume a position below the level of the stair door as the door is opened or forced.

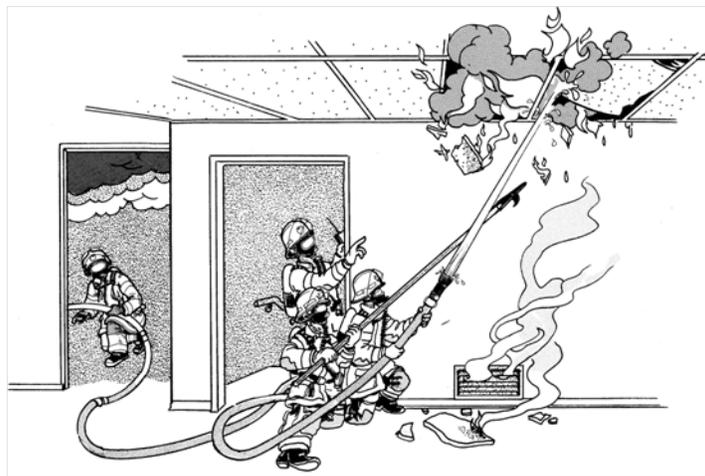
Heat from a fire near the stair door may have warped or expanded steel doors or jambs and they may have to be forced even though they are unlocked. Crews must insure that composite type stair doors are not consumed by the fire before occupants descending from above have passed. Protect these wood veneer, gypsum filled doors with fog streams.

The Initial Attack

Crews preparing to enter the fire floor should be aware of the floor layout, including the locations of elevators, stairs, and floor subdivisions or zones. They should also be aware of the distribution pattern of the supply and return air systems. Smoke and heat under pressure will migrate to the lesser pressure of open shafts and return air ducts, usually located in the core. Crews may be crawling

at floor level in limited vision, and the officer must select the most unobstructed approach, with the flow of heat away from the fire fighters as much as possible.

Crews will most likely be advancing from a stair located in the 'core' of the building. If the core is surrounded by an open, unsubdivided, floor plan, the potential for fire wrapping around the core exists. To protect against this, the officer in charge of the fire floor should create a back-up line in the opposing direction to protect the point of entry/egress. Fire can also communicate overhead in the plenum space above the dropped ceiling. An additional line may be required to cool and protect this area.



Crews advancing on a high-rise fire should employ a straight stream or narrow angle fog when possible. This is both to reduce the amount of local steam production and to provide the maximum reach and volume for hose streams. The objective of the attack line is to create the greatest amount of steam conversion at the point of fuel gas generation (the seat of the fire), benefiting from cooling and smothering at that point. Steam created by directing fog streams into other heated areas will serve to reduce the overall heat on the floor, but will also penetrate the turnouts and hoods of the fire fighters, making their progress toward the seat of the fire slower -- if not impossible.

For safety reasons, the initial line should be equipped with a fog nozzle. High-rise buildings are tightly sealed and present a great potential for backdrafts. In addition, the increasingly volatile loads created by synthetic furnishings and materials have accelerated the rate and intensity of burn.

At the same time the structures are becoming more lightweight and decreasing in total mass. The result is an increased potential for rapidly rising temperatures and flashover before arrival. The loss of windows can also suddenly accelerate the fire as driving winds bring new oxygen to the flame.

The plenum space above the dropped ceiling may represent the largest unobstructed space on the floor, as much as 25% of total floor volume. If fire conditions permit, crews should check the space for fire extension by pushing up one of the panels, but not in an area where impinging heat will impede

the progress of the attack line. If high heat prevents standing and visually inspecting this space, hose streams can be used to rip down the panels, but crews must assess whether this will aide or impede their attack.

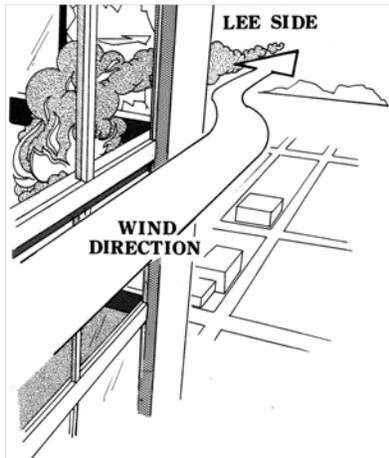
Fire fighters advancing on a fire may find their progress blocked by partial walls or other subdivisions of the floor. Space dividing panels sometimes can be knocked down, and permanent walls of gypsum on steel studs may be breached to provide nozzle access to the fire.

Where possible, crews should attempt to flank the fire and convecting gases. Core area fires are the most difficult because the fire often involves both stair areas. Fires near the exterior walls are easier to flank and confine, but are more prone to rapid extension to the next level through broken glass.

Rescue on the fire floor is most difficult when the core area is involved. The core fire may have prevented occupants from reaching the stairs. Fire fighters removing occupants may have to remove them through the flame back to the stairs.

Fire fighters should search any involved floor with a charged line and use it as a reference point when searching. If the smoke is dense, return to the line after sweeping each room or area to orient yourself.

Providing ventilation on the fire floor is extremely difficult. Every effort must be made not to break the glass with hose streams until knockdown is achieved or wind conditions are known, as the sudden addition of wind driven oxygen may accelerate the fire beyond the limits of the attack line. Building exhaust systems, if present, may be employed to some advantage and the windows may be broken from above or below in a coordinated manner after wind direction and intensity are verified or after fire control. Crews on the upper, or lower floors, are not moving in smoke and heat and can determine the location of the lee side of any winds by removing a panel. Ventilating on the lee side reduces the potential for gusts pushing flame into the attack crews, but winds acting upon a high-rise are unpredictable and frequently change direction and speed. Be cognizant of conditions in the building and achieve ventilation as soon as possible when crews are in hot, vulnerable tactical positions...or pull the crews out. Crews must use extreme caution, to protect against falling, if windows have been removed. Some glass panels extend to the floor level.



The severity of the heat in a serious fire may limit the time a fire fighter can be on the fire floor to ten minutes or less. Units in the first 2-1 should provide for rotation of crew from the less exposed positions on the floor above, and in the stairs, to taking a turn on the attack line. Command must provide for the immediate and continuous relief of these initial crews until fire control is achieved. Crews rotating off the floor and through Rehab can be assigned to the less demanding sectors and tasks remaining to be accomplished, such as beginning a property conservation effort on the floors below.

Floor Above

The objectives of the crews operating on the floor above are to evacuate the floor, to assess and control vertical extension of the fire, and when possible, to provide ventilation for the floor below. In a protracted fire, the floor above will be subjected to intense heat, and any occupants must be removed as soon as possible to safe refuge.

Vertical extension must be checked in:

- Elevator shafts
- Supply air ducts/return air ducts/make up air ducts
- Utility shafts (pipes, electrical chases)
- Dumbwaiter/trash chutes/mail chutes
- Auto-ignition through failed window glass or mullions
- Around floor slabs at spandrels
- Auto-ignition through floors or raceways and expansion joints or cracks caused by floor failure.
- Floor materials directly above fire area.

All rooms and closets on the floor above must be opened for inspection. Dropped ceiling panels should be removed to locate the supply/return ducts and observe conditions in the plenum. Hollow columns and pipe chases may be checked by making small holes with a halligan tool.

A hose stream must be introduced at each point of extension including flooding the floor if the fire

is communicating to the carpet and padding. *Caution must be observed in putting water into electrical distribution areas, including raceways in the floor.* Hoselines on the floor above can be introduced from the evacuation stairs if the floor is clear of smoke. If not, bring them down from upper landings in the attack stairway. The numerous points of possible extension require multiple lines. If present, hoselines can be utilized for areas requiring a reduced volume, such as duct shafts. Care must be exercised not to breach shaft openings, breach spandrel panels, or break glass until necessary and hoselines are in place. If fire extends through the lower windows and melts the mullions or breaks out a window on the floor above, direct a fog stream into the opening, but avoid hitting the remaining glass if possible. The sudden cooling would cause the loss of additional panes and expose the entire floor to flame impingement.

Before ventilating from the floor above, the fire fighters must first determine the direction of any winds. Winds at altitude can be many times stronger than at ground level and the introduction of wind gusts and new air on the fire floor could overwhelm the attack crews. The direction of wind at surface level may or may not be the same at higher elevations due to the effects of stratification, or disruptions in flow caused by other buildings.

If no wind is detected at ground level and the location of the fire on the floor below is known, then fire fighters should begin the ventilation operation directly over the fire.

Crews on the floor above should place pressure tape, if available, on the window to be broken (if not tempered), advise Command that glass will be falling, break the panel by tapping, and pull the majority of the glass onto the floor.

After verifying that no significant wind is present and checking with the officer on the attack line and Command, they may then break out the lower panels with specialized tools carried on the High-rise Tender, if available. Tempered and even double-pane, insulated glass is very difficult to break with lightweight tools such as a pike. Recessed windows and decorative screens will make this task even more

If strong winds are encountered at the upper level, crews must first locate the lee side of the wind by breaking out additional panels. If the lee side proves to be at the unburned end of the floor, it is inadvisable to vent until fire control is achieved, as smoke and heat will flow to the reduced pressure at the opening; quite possibly right over or through the attack team(s). Again, if ventilation is not possible and there is excessive heat on the fire floor withdraw the fire fighters.

Safety on the High-rise Incident

- Do not operate alone. A minimum for any task except the elevator person is two fire fighters with a radio. Maintain a PAR at all times.
- Maintain full PASSPORT accountability, PASS alert, and radio protocols.
- Wear full protective gear at all times. Conditions can change rapidly.

- Do not operate on an involved floor without a charged hoseline.
- Do not allow doors to lock behind you.
- Carry the necessary forcible entry tools.
- Be alert to backdrafts. High-rises are tightly sealed buildings. Feel metal jambs when assessing interior doors. A high-rise floor can have many compartments.
- Be cautious of open shafts or windows. Barricade all openings as soon as possible. Vision on the floor may be reduced even after ventilation because of impounded heat.
- Monitor your air closely. There is no diving out a window as at ground level. 'Out' may be a 100' crawl back to smoke-filled stairs.
- If you are sent into remote areas of the building, take a spare bottle. If you have not reached or completed your objective by the time the first bottle is spent, use the second to immediately leave.

You cannot dependably break an upper window for air in a high-rise--especially in winter time. Both the pressure of fire gases in the cores and the upward winter time stack will bring smoke to the opening.

- Maintain 200 foot clear perimeter around the building.
- Do not attempt to change bottles in smoke.
- Do not store bottles in the stairwell. You can trip and if the bottles get loose, they are dangerous to descending occupants.
- Use the hoseline as a reference point when searching in smoke. Return to it after sweeping each room. If you become disoriented, remember female couplings take you back to the stairs.
- Be cautious of your back-swing when forcing doors and windows in smoke. Especially, do not follow the tool out a window.
- Shut off the floor electricity as soon as possible at the sub panel or in the main electric room. Be cautious of the electricity when breaching walls or pulling ceiling. Do not direct streams into the sub panel room or closet. Water leaking under the door can disrupt power to the tower.

Accountability

PASSPORT accountability will be maintained in high-rise fires in the following manner:

- Initial Attack Companies. The initial companies to enter the high-rise building may leave their PASSPORTS on the dash of their apparatus.
- Lobby Sector Activation. Upon the activation of the Lobby Sector, all companies sent into the building will turn in their PASSPORTS to the Lobby Sector Officer (or designated Accountability Officer). The Lobby Sector Officer must retrieve any PASSPORTS left on apparatus of initial arriving companies already in the building. Companies arriving in Lobby without a PASSPORT must have a 'make-up' PASSPORT using tags from their helmets or other make-up tags.
- Resource Sector Activation. Once the Resource Sector is established, PASSPORTS of crews operating above Lobby will be delivered to the Resource Sector Officer. The Lobby Sector will maintain PASSPORTS of support crews not assigned to the hazard zone (i.e., fire floor).

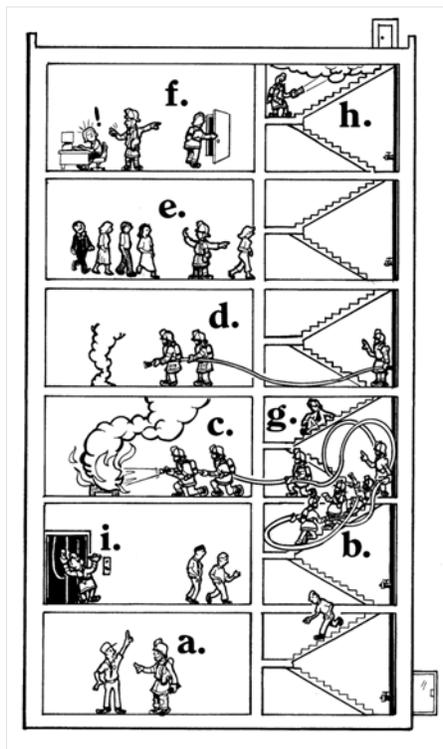
The Resource Sector Officer will assign Accountability Officers to the stairwell doors in Resource. PASSPORTS will be collected from crews leaving Resource to a hazard zone (i.e., fire floor) and returned to crews returning to the Resource Sector. Accountability Officers will monitor duration times of crews assigned to hazard zones and report any delayed/overdue crews. Standard PAR benchmarks will be utilized for high-rise operations.

Summary

The officers on the fire floor and the floor above the fire must continuously assess the progress of the fire.

If multiple lines are in place, and the control on the fire floor is marginal, a defensive position must be put in place on the next floor up in anticipation of fire extending to that level.

- A. Determine location & progress of fire.
- B. Backup line in place before fire door opened.
- C. Assess progress of attack crews.
- D. Defensive Line above fire floor.
- E. Consider full scale evacuation
- F. Initiate floor by floor search
- G. Relieve crews on attack lines.
- H. Check all upper floors for smoke & fire.
- I. Safety check elevators.



In the event the fire cannot be controlled, the officers must also advise Command that full scale evacuation should begin, as there can be no safe refuge in the building, especially above the fire, unless the fire floor is controlled.

Command, at this point, must provide for the integrity of the evacuation stairs and initiate a floor-by-floor search and evacuation of the upper floors. Flowing hoselines, however, cannot be abandoned and Command must also provide for continuous relief on the attack lines.

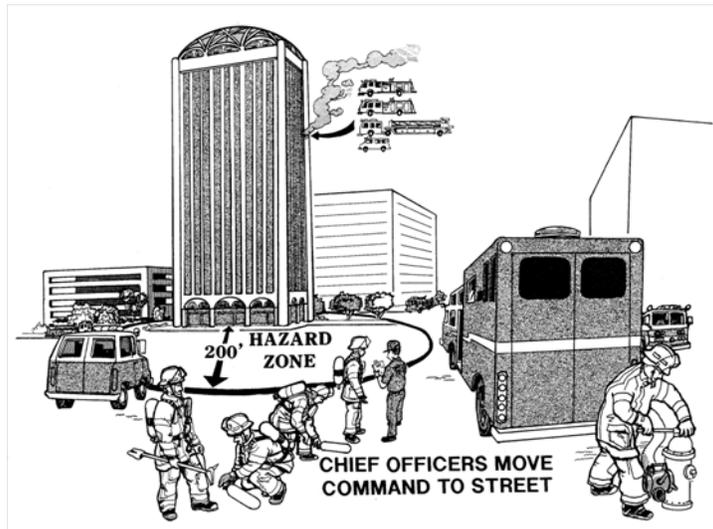
These procedures have outlined the critical objectives and tasks of the first responding units. They are intended to provide the best chance of stopping a serious fire, controlling extension of fire and smoke, and are designed to be placed in operation with the first assignment.

COMMAND STRATEGIES

The first arriving engine or ladder units are likely to be the most familiar with the specific characteristics of the involved building, and when they are the first to arrive, they should retain Command until the first Battalion Chief arrives. If possible, company level Command can be mobile. The logical place for the initial arriving Company Officer to establish Command in a high-rise is in the lobby. Most of the information needed by Command is available in the lobby/fire Control Room (verification of actual fire and fire location/s, number, and conditions of occupants exiting into lobby, location of elevators, status of fire pumps, stair pressurization, emergency generators, air handlers, etc.). By locating the initial company level Command in the lobby, much unnecessary radio traffic and confusion are eliminated. Command can communicate directly to crews on the fire floor by stair phone if portables prove unsatisfactory, and to the Alarm Room by outside line.

At the first indication of actual fire or smoke, Command should escalate the response to a minimum three alarms, with the 2nd and the 3rd alarms in level-two staging. Command must inform the Staging Officer what crews and equipment he/she wants in lobby and how many alarms to maintain in staging.

The first arriving Chief Officer will establish a Command location in the street. This location should provide the best visual advantage, but be clear of any falling glass and debris. The first arriving Chief Officer should relieve the initial incident commander of the Command function and assign that officer to Lobby only. The next arriving Chief Officer should report to the Command post and assume the Support Officer role.



The immediate priorities of the first Command Officer are:

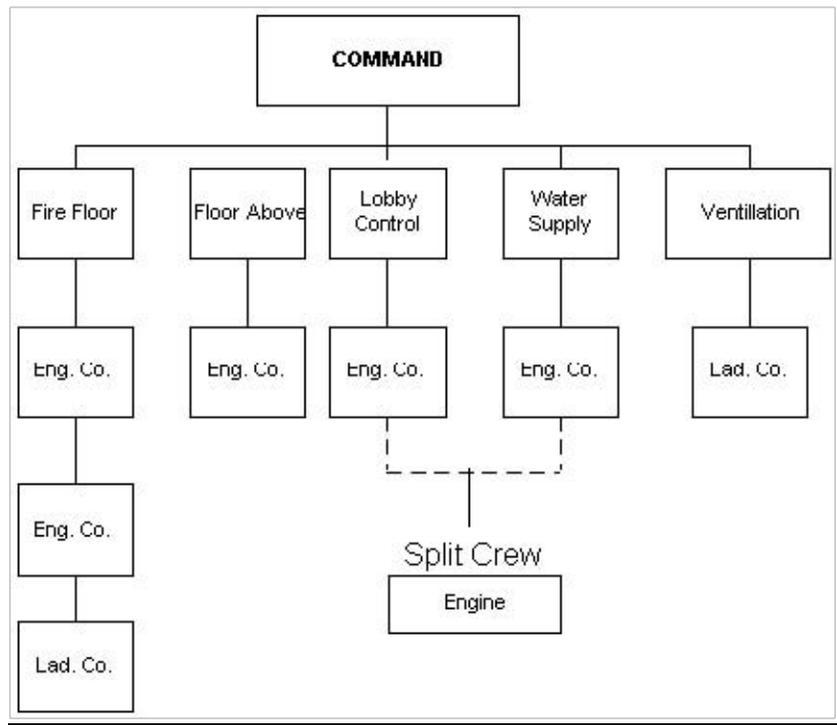
1. Establish strong Command position and transfer Command.
2. Verify that immediate priorities are being addressed.
3. Develop a strategic plan to address, rescue, fire control, and property conservation.
4. Provide for safety and accountability of fire fighters.
5. Develop a strong Command organization.
6. Call for additional resources as needed.

Chief Officers

First Alarm high-rise assignments will include four Battalion Chiefs. The first Chief Officer on-scene should establish an exterior Command Post. The second Chief Officer should assume Support Officer duties.

The third Chief Officer should be assigned to the Systems Branch. The fourth Chief Officer should be assigned to the fire floor sector. These assignments set the stage for the development of the Command structure outside and inside the building.

INITIAL ATTACK ORGANIZATION



EXPANDING THE COMMAND ORGANIZATION--WORKING FIRE

A working fire in a high-rise may not be controlled by the Initial Attack Companies. In such a case, the operation becomes prolonged and escalates into a major operation.

A strong organization is required to support a fire fighting force above ground. The principal objective of this supporting organization is to provide the fire fighting sectors with resources to operate effectively and to assist in solving some of the major problems involved in high-rise structures.

Command must start to identify and build this organization as quickly as possible after assigning units needed for Initial Attack. These elements can be expanded upon as the availability of personnel increases.

The major elements which need to be considered in most working high-rise situations are:

- Fire Floor Sector
- Lobby Control
- Floor Above (Extension)
- Systems Branch (fire panel, stairwell, phones/communications, elevators, keys, building R.P./engineer)
- Ventilation
- Resource Sector
- RIC crew(s)
- Level II Staging

- Floor Below (Property Conservation)
- Evacuation
- Rehab
- Safety
- PIO
- Occupant Services

In addition to these elements, many or all of the Sector functions associated with standard operations may be required.

STAGING

Standard Level I Staging will be used by all First Alarm companies. Level II Staging should be established by Command when requesting multiple alarms. Any apparatus parked in close proximity to the building, by companies assigned to the interior, should be moved to a Level II area as time permits.

No apparatus should be parked within 200 feet of the building.

All apparatus should remain in this Staging Area unless needed for a specific purpose. Enclosed vehicles may be employed to move personnel and equipment from the Staging Area to the building, unless they are providing a water supply.

RESOURCE SECTOR/BRANCH

Early establishment of a Resource Sector/Branch is essential to reduce the time-factor in placing fire crews in fire attack positions. As soon as a Resource Sector is established, fire fighting personnel and portable equipment (i.e., SCBA, hose, tools, etc.) should be immediately deployed from Staging to the Resource Sector.

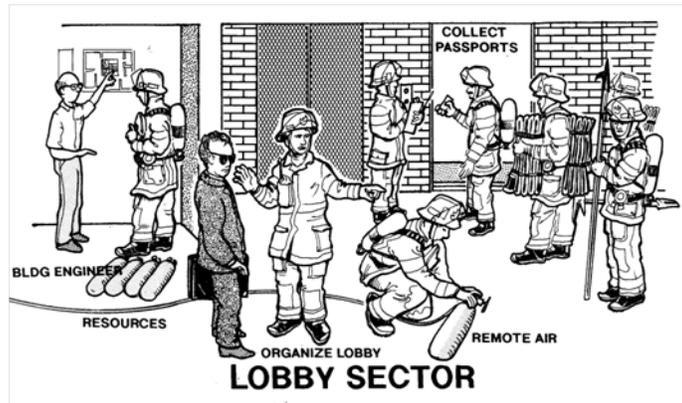
RAPID INTERVENTION CREWS

Rapid Intervention Crews (RIC's) will be maintained in the Resource Sector. At least one four-member company will be assigned this duty. Additional RIC's may be assigned to other locations as needed. (See Rapid Intervention Crews)

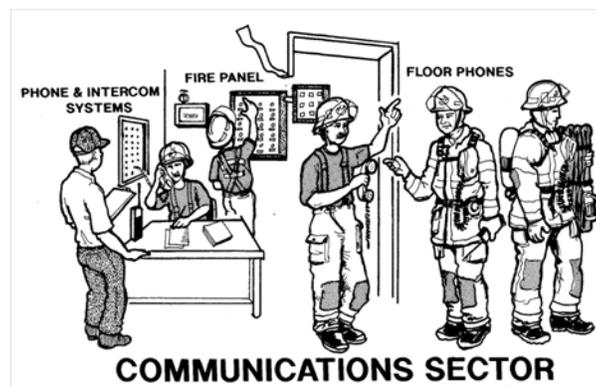
SYSTEMS BRANCH

The Systems Branch should be implemented early during a working high-rise fire. The Systems Branch Officer will be responsible for managing the following sectors:

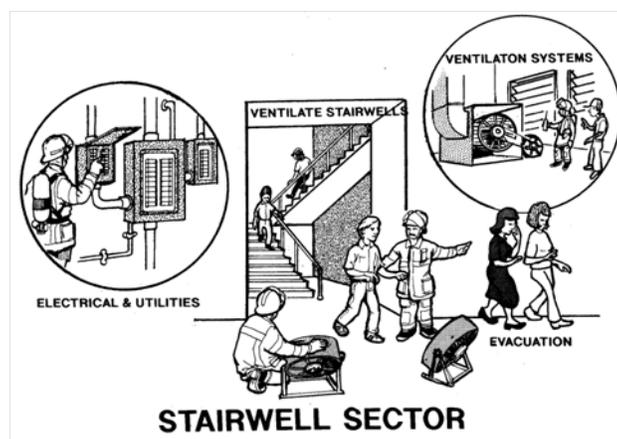
- Lobby Sector -- The Lobby Sector will be responsible for elevators (control and track), liaison with building engineers, organize lobby for transition of evacuation, resources, treatment and fire fighter access, remote air (utility trucks).



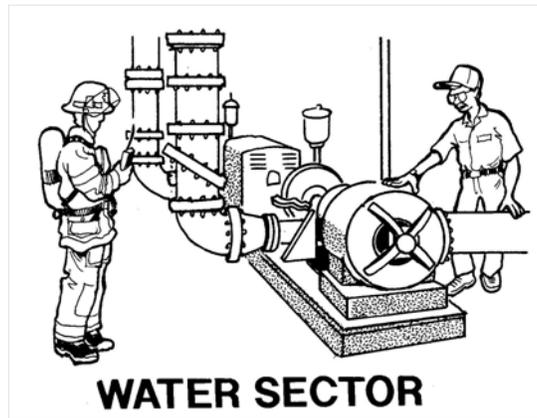
- Communications Sector -- The Communications Sector will be responsible for phone systems, intercom systems, fire panel, making sure all floors have phones where needed.



- Stairwell Sector -- The Stairwell Sector will be responsible for selecting evacuation and fire fighting stairwells, pressurization by building systems or fans, all electrical and other utilities to the building, all ventilation systems for building (HVAC), verify auto stair door unlocking.

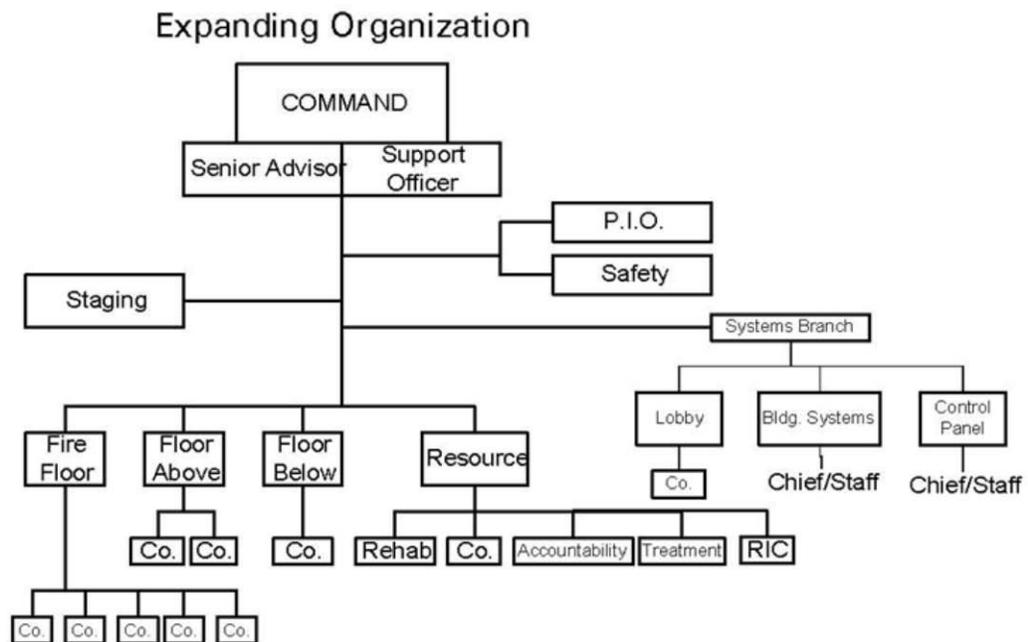


- Water Sector -- The Water Sector will be responsible for building fire pumps, all connections internal and external, generator, restrictors, and pressure reducers.



WORKING FIRE ORGANIZATION

WORKING FIRE ORGANIZATION



CAMPAIGN FIRE

Campaign situations are those incidents which require large forces of personnel and equipment to control and continue for long periods of time. A campaign situation in a high-rise fire would be a fire involving an entire floor or more. The commitment of personnel to fire fighting may require

several sectors for tactical supervision and a full array of supporting sectors, branches, and sections would be activated.

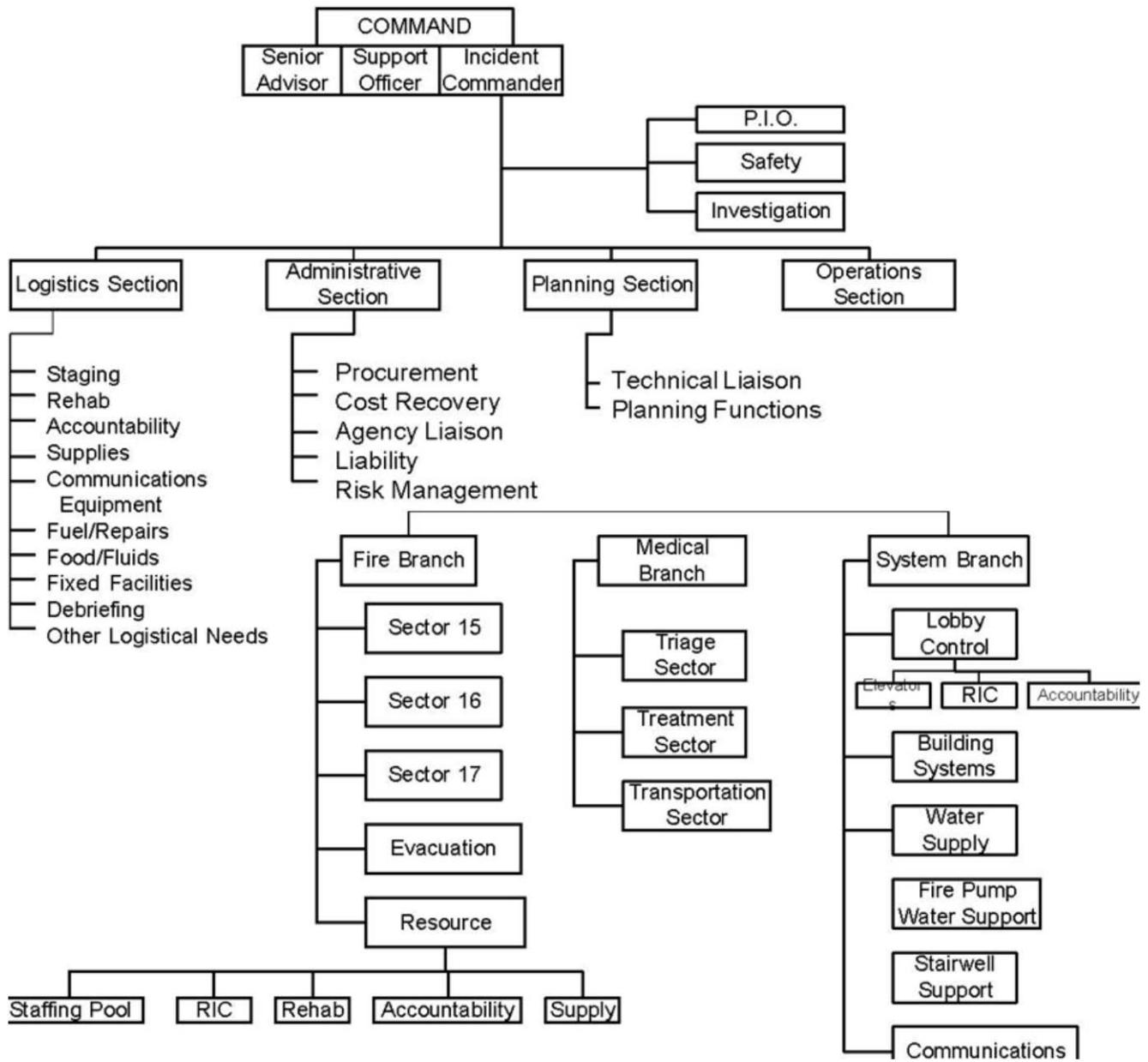
As the incident escalates to a campaign event, the Command organization must continue to expand. All Section level positions (Operations, Planning, Logistics, Administration) will need to be implemented and staffed. Furthermore, additional Branch levels may be needed.

A communications plan for channel allocation must be established. Logistics will require its own channel. Each Branch should have its own separate channel when practical. The Accountability Officers and each of the section level operations may require a separate radio channel. If separate channels are not possible, then components should be concisely grouped to provide for the most effective use of the channels available.

Chief Officers

Additional Chief Officers will be required as the incident escalates. Command must ensure that adequate Chief Officers are Special Called or re-called from off-duty status early.

In addition to these elements, a standard array of staff function sectors would be established and report to Command. Most of these (P.I.O., Safety, Investigation) are established automatically by arriving staff personnel. Senior Command Staff would provide support at the Command Post as necessary.



ORGANIZATIONAL CHART FOR A HIGH-RISE FIRE