

BOSTON FIRE DEPARTMENT

STANDARD OPERATING PROCEDURE NO. 1

HIGH-RISE BUILDINGS

S.O.P. # 1

HIGH-RISE BUILDINGS

Procedures for fighting fires in high-rise buildings are divided into three categories, namely:

- I. Completed Structures
- II. Buildings under Construction
- III. Use of Portable Radios in High-Rise Buildings

1.1 DEFINITIONS

HIGH-RISE BUILDING

A building having the following features of construction not usually found in older type structures:

- a. Over seventy (70) feet in height;
- b. Core type construction;
- c. Extensive elevator systems;
- d. Building fire pumps;
- e. Sophisticated wiring systems;
- f. Central air conditioning;
- g. Standpipes;
- h. Sealed windows;
- i. Emergency generators;
- j. Computer areas;
- k. Plenum areas;
- l. One in which complete evacuation is not practical;
- m. One in which the fire must be fought internally due to the height of the building.

BUILDING SECURITY CENTER

A pre-designated area established for each building (preferably the Central Control Room) where the building superintendent will be present, and information relative to the following shall be available to the Incident Commander:

- a. Air conditioning system;
- b. Fire pumps;
- c. Emergency generator;
- d. Elevators;
- e. Central communication system;
- f. Alarm system controls;
- g. Security force;
- h. Location of stairways;

- i. Necessary keys for elevators, windows, doors, etc.

MAIN COMMAND POST

The Main Command Post shall be located as directed by the Incident Commander. The Fire Alarm Office shall be notified as to its location. The Command Post shall be under the control of the Incident Commander and staffed by such personnel as deemed necessary.

UPPER COMMAND POST

An operating area established two (2) or more floors below the fire floor and under the control of a chief fire officer. This area will be used for supplying special equipment, additional hose, air masks, oxygen and air cylinders, tools, radios, and keys. Consideration must be given to a possible electrical power failure and all essential equipment should be sent up while power is still available.

EVACUATION CHIEF

Evacuation procedures will be established by the Evacuation Chief under the direction of the Incident Commander. The Evacuation Chief will establish an evacuation channel through the Fire Alarm Office. The Evacuation Chief will monitor the evacuation channel. The Evacuation Chief's Aide will monitor the fireground channel.

Duties of the Evacuation Chief Include:

1. Evacuation (horizontal and vertical).
2. Stairway search and control.
3. Elevator search and control.
4. Refuge areas.

Also refer to S.O.P. #2A for a more complete description of the Evacuation Chief's responsibilities.

I. COMPLETED STRUCTURES

1.2 The following operational procedures are intended to assist the Incident Commander. Nothing in these procedures shall prevent the Incident Commander from taking any action deemed necessary.

1.3 Response Assignments to High-Rise Buildings - FIRST ALARM RESPONSE:

- 3 Engine Companies
- 2 Ladder Companies
- 1 Rescue Company
- 1 Tower Company (1st alarm response area only)
- District Fire Chief
- Safety Chief
- Deputy Fire Chief (Division Commander)

A “confirmed fire” shall be defined as a report from the Incident Commander that there is smoke or fire in a high rise building. When the Incident Commander Reports this condition the Fire Alarm Office will dispatch the following:

- Air Supply Unit (W-12)
- Evacuation Chief
- Special Unit (H-2)
- Tower Company (outside 1st alarm response area)
- Mobile Command Post
- A High Rise Engine Company (Only if a High Rise Engine is not on the 1st Alarm)

1.4 All engine companies shall carry three (3) donut-rolled 2-1/2" hose, one playpipe with combination nozzle and 1-1/8" straight tip, one Halligan tool or axe, and all required personal safety equipment (masks, lights, gloves etc.).

1.5 Rescue and ladder companies shall be equipped with power saws, tools, including the hydraulically operated forcible entry tools, resuscitators with extra bottles, and all required personal safety equipment (masks, lights, gloves etc.).

1.6 Members shall open cylinder valves to air masks before leaving lobby for upper floors. This is essential for safety in the event of smoke inversion.

1.7 In buildings equipped with "in-house" portable radios or jack phones, Company Commanders arriving on the first alarm will pick up this equipment from the building personnel or at a pre-determined location. If in-house repeaters are present, they will be activated by a first alarm company.

1.8 The first engine and ladder company to arrive shall, in the absence of the establishment of the Main Command Post, initiate actions to locate the fire and get the first line advanced into the most advantageous position. This will include securing the elevators (including the service elevator), and the necessary keys for windows, elevators, doors, etc.

The first arriving engine company shall get off the elevator two or more floors below the fire, use the stairway to go one floor below the fire, connect to the fire department standpipe and

advance their line to the fire floor. Engine Companies shall familiarize themselves with the operation of Pressure Regulating Valves (PRV's) being used in high-rise buildings in their first alarm area. One member shall remain at the valve to control proper pressure. Valve openings shall be gradual so as to prevent bursting of hose and injury to members. Building fire pumps may be operating at extremely high pressures and sudden opening of the valve could be dangerous.

The first arriving ladder company, accompanied by a rescue company if available at the scene, shall gain entrance to the fire floor using keys or forcible entry if necessary. They shall get off the elevator two or more floors below fire floor. **Under no conditions shall the elevator be taken to the fire floor.** Stairways shall always be used by first arriving companies for incidents located in the basement or sub-basement.

Second and third arriving engine companies, also subsequently arriving ladder companies, shall be equipped as referenced in 1.4 and 1.5, and report to the Main Command Post for assignment.

1.9 Loss of electrical power to elevators presents additional hazards. Every elevator must be checked for occupants (firefighters or civilians) who may be trapped in stalled elevators. All members shall be familiar with S.O.P. #9 "Emergency Removal of Passengers from Elevators".

Loss of elevator service for whatever reason in a high-rise building will require additional help to transport equipment to upper floors.

As the procedure for carrying equipment to upper floors is strenuous and fatiguing, personnel assigned to this duty need wear only the minimum amount of protective clothing and equipment necessary for safety.

1.10 Company Commanders shall have a member who is equipped with a portable radio remain with the elevator until the arrival of the District Chief's Aide who shall assume and remain in control of the elevator. When members have been taken to the Upper Command Post, the member operating the elevator will return to the main lobby.

1.11 The District Fire Chief shall check the building security center and establish the Main Command Post until the Deputy Fire Chief (Division Commander) arrives, then proceed to the Upper Command Post with balance of first alarm fire companies and assume command of the Upper Command Post.

1.12 The Deputy Fire Chief (Division Commander) shall assume command of the Main Command Post upon arrival. The Deputy Fire Chief's Aide shall locate building security center and maintain contact with the Incident Commander until relieved.

1.13 The Safety Chief (H-1) shall report to the Incident Commander and shall be directed to assume command of safety operations. H-1's Aide shall accompany H-1. The H-1 chief shall operate on the fireground channel; H-1's Aide on the evacuation channel, and they shall maintain mutual contact.

1.14 The Air Supply Unit, Special Unit, and Tower Company shall report to the Incident Commander at the Main Command Post for assignments.

1.15 The Incident Commander and the Fire Alarm Office shall be notified of the stairway being used for fire attack.

1.16 The "Fire Fighter's Elevator Key Switch" should always be used upon response to an alarm of fire where the use of elevators becomes a factor. Elevators should be used at minor incidents to familiarize personnel using them. Failures found and corrected will make it more dependable when a serious emergency exists.

Fire department personnel shall not depart for upper floors in buildings having the "Fire Fighter's Service" until the lobby key switch has been activated and the elevators are under fire department control.

Note: Most high-rise buildings have more than one bank of elevators serving different floor levels. These may be LOW-RISE, INTERMEDIATE-RISE, HIGH-RISE, etc. The INTERMEDIATE and the HIGH-RISE banks are in blind shafts from the lobby to the lowest floor served. Each bank of elevators has a separate "Fire Fighter's LOBBY Switch". The feasibility of using blind shaft elevators for the evacuation of occupants to a safe location and the movement of firefighters and equipment to upper floors should be determined by a careful analysis of fire conditions by the Evacuation Chief so as to remove any risk to the people involved.

Note: For more detailed information on "Fire Fighter's Elevator Key Switch", see S.O.P. #1A.

1.17 Ten Engine Companies (Engines 3, 4, 7, 8, 10, 22, 28, 33, 37, 42) have been designated as High-Rise Companies. Each of these Engine Companies have been equipped with 200 feet of 3 inch double jacketed hose. Whenever it becomes necessary to pump into a standpipe system at high pressures (Over 200 p.s.i.) only the 3 inch double jacketed hose will be used.

Pump operators, on arrival at a high-rise building, shall connect their pumps to the nearest hydrant, High Pressure, Post, or Lowry, that is adjacent to the siamese connections of the building. Reference is made to S.O.P. #50 on the operations of the various hydrants.

Pump operators, after connections have been made, shall remain with their pumps and be alert for orders to supply water into the building's systems.

Pump operators of subsequently arriving companies shall assist each other to ensure that all pumps are connected.

1.18 SUPPLY: When the pumps are connected to High Pressure hydrants they shall be supplied by two or more 2-1/2" lines. A Morse gate shall be attached to each outlet on a High Pressure hydrant before lines are connected. Reference is made to S.O.P. #50.13.

1.19 DISCHARGE: Two or more 3" lines shall be stretched from the discharge side of the pump and connected to the building's siamese/triamese connection.

1.20 Example of how to deliver water for firefighting purposes to a high-rise building standpipes when using post hydrants:

- a. When taking water from hydrants, make sure the hydrant and Morse gates are fully opened.
- b. Two engine companies (Engine A and Engine B) will be used in order to create sufficient pressure for buildings of high elevation (high-rise buildings).
- c. Using the "rule of thumb" method (5 psi back pressure for each floor, 25 psi friction loss in standpipe, 15 psi friction loss in 100' of 2-1/2" hose with a 1-1/8" tip and 50 psi of nozzle pressure), it is necessary that an engine pressure of 400 psi be used to produce a standard fire stream from 100' of 2-1/2" hose on the roof of a 62 story building.
- d. At high-rise fires the "Jaffrey" valve shall be removed from Pumper A located at the high-rise building in close proximity to its siamese connection and replaced with a 4" Stortz x 4-1/2" female NST threaded adapter.
- e. Place Pumper A within 50' of building siamese, after laying a 4" line from hydrant equipped with HAV. Place Pumper B at the hydrant mentioned above, properly connected to the HAV.
- f. Method of delivering water into building's siamese/triamese connection:
Run two or more lines of 3" hose from Pumper A's discharge outlets into building's siamese/triamese inlet.
- g. Discharge lines shall be secured with rope hose lines at the Pump connection, at the buildings siamese/triamese connection and at any couplings. This is done to prevent physical or property damage in the event a coupling blows off.
- h. If it is necessary to augment the water supply to the standpipe of a high-rise building, the following procedure will be used:
Pumper B takes suction from hydrant via HAV and then delivers water through 4" hose to Pumper A located in close proximity to building's siamese connection. When it is determined what water pressure is needed to supply water to the fire floor, the pumper at the hydrant (Pumper B) will be instructed to deliver water to Pumper A (at the building) at a certain pressure and Pumper A will increase or decrease the pressure it is receiving from Pumper B to satisfy the firefighting requirements of the fire situation.

It must be remembered that a pressure of:

100 psi will raise water 230'

200 psi will raise water 460'

300 psi will raise water 690'

400 psi will raise water 920'

Currently, the tallest building in the City of Boston is 790'. Section 1.20, sub-paragraph c., may be used as a guide.

1.21 Plenum areas must be given careful attention when entry is made onto a fire floor. Under fire conditions these areas provide for free travel of fire and smoke and can become avenues for fire to travel beyond the point of origin.

1.22 SECOND ALARM RESPONSE:

One (1) additional District Fire Chief

One (1) Network District Chief (permanent grade)

Regular second alarm apparatus response

Public Relations/Information Officer

The one additional second alarm District Fire Chief and his/her Aide shall report to the Incident Commander for assignment (e.g., logistics, etc.).

The Network Chief and his/her Aide shall report to the Incident Commander at the scene and establish a Communication Network as outlined in S.O.P. #2.

Accounting for fire personnel during operations in a high-rise building is very important. The Network Chief at a high-rise building incident will keep a record of all company assignments (e.g., upper Command Post, Evacuation Chief, etc.). The chiefs in charge of evacuation, Upper Command Post, etc., shall keep a record of the location in the building of companies assigned to their command.

Fire companies shall report to the Main Command Post for assignment and must report as a group, properly equipped as referenced in 1.4 and 1.5. All companies reporting for assignment on multiple alarms shall bring all spare air cylinders (30 minutes and 1 hour) with them to the Main Command Post.

The Public Relations/Information Officer shall respond and report to the Incident Commander. The Public Relations/Information Officer shall assist the media throughout the incident.

1.23 THIRD ALARM RESPONSE:

Fire Commissioner
Chief of Operations
Headquarters (on duty) Deputy Fire Chief
Regular third alarm apparatus response

The Fire Commissioner responds and assumes command (Incident Commander). The Chief of Operations responds to the Main Command Post and assumes the duties of the Operations Chief. The Deputy Fire Chief (Division Commander), after being relieved at the Main Command Post, shall proceed to the Upper Command Post to assume command of the fire floor and floors of operation. The Headquarters (on duty) Deputy Fire Chief shall report to the Incident Commander for assignment.

II. BUILDING UNDER CONSTRUCTION

1.24 A standard operating procedure for high-rise buildings while under construction will necessitate some departure from those procedures promulgated for high-rise buildings which have been completed. Lack of adequate private fire protection and inaccessibility are the principal reasons for this departure.

1.25 If a fire is at lower levels or accessible to and can be reached by fire department ladders, procedure for fighting fires in buildings other than high-rise can be followed.

1.26 In establishing standard operating procedures for buildings under construction, only the first alarm response is taken into consideration.

1.27 The first arriving officer or acting officer shall obtain as much information as possible as to the location of the fire and prevailing conditions from the project superintendent or other responsible construction official at the site, in addition to any information previously received from the Fire Alarm Office. Such information shall be given to the chief officer upon arrival at the scene.

1.28 The Main Command Post shall be set up at ground level where the Incident Commander shall control the deployment of companies.

1.29 When the location of the fire has been determined, all construction workers shall be ordered to leave the area of and approaches to the fire to avoid interference with the operations of the fire department. Private fire brigades shall be ordered to report to the Incident Commander.

1.30 If fire pumps, standpipe outlets and valves have been installed and are ready for use, a responsible employee should activate the pumps. A member of the first arriving ladder company shall be assigned to see that this is done.

1.31 If a fire is on upper floors, the personnel elevator shall be used to take firefighters and equipment two (2) or more floors below the fire, and advance to fire floor via stairway or ladder. The posted weight in elevators should not be exceeded by firefighters and equipment.

1.32 **IMPORTANT: Elevators used only for construction materials shall not be used by firefighters.**

1.33 The first engine and ladder company to arrive shall, in the absence of the establishment of the Main Command Post, initiate actions to locate the fire and get the first line advanced into the most advantageous position. This will include securing the elevators (including the service elevator).

The District Chief's Aide shall remain with the elevator and take over the controls in the event that smoke or fire conditions make it unwise for the elevator operator to remain in the elevator. The elevator shall not proceed upward until all members are equipped as provided in sections 1.4 and 1.5.

The Incident Commander and the Fire Alarm Office shall be notified of the stairway being used for fire attack.

1.34 The first arriving engine company shall be used to locate and initiate the attack on the fire while the pump operator positions the pumper in close proximity to the standpipe connection.

The second arriving engine company shall be used to lay lines into or assist the first pumper in connecting lines and supplying water to the standpipe system.

Pump operators, after connections have been made, shall remain with their pumps and be alert for orders to supply water into the building's systems.

In the event a fire is located at a high elevation in a "building under construction", the procedure outlined in section 1.19 for supplying water to a standpipe shall be used.

1.35 First arriving engine company shall be equipped as provided in section 1.4, take the elevator to two (2) or more floors below the fire, advance to the floor below the fire and connect to the standpipe outlet and take the stairs or ladder to the fire floor. A fire fighter shall be positioned to slowly open the valve at the 2-1/2" standpipe outlet until sufficient pressure appears at the nozzle. This will help avoid excessive pressure and possible injuries to personnel in the event pressure reducers have not been installed.

1.36 First arriving ladder company shall be equipped as provided in section 1.5 and proceed to the upper floors with the first arriving engine company.

1.37 Procedures for remainder of first alarm companies will be governed by conditions existing at the time and at the discretion of the Incident Commander.

1.38 DANGERS TO FIRE FIGHTERS DURING FIREFIGHTING OPERATIONS IN BUILDINGS UNDER CONSTRUCTION

1. Excavations - falling into these due to temporary bridging and loose planking.
2. Tripping over utility lines that are lying loose, i.e., electrical wires, piping, etc.
3. Debris being uplifted by hose streams and becoming flying objects.
4. Failure of temporary stairs (makeshift ladders between floors).
5. Shock from bare wires used with power tools or run as extensions of electrical service.
6. Tripping over reinforcing rods extending above floor level.
7. Falling into shafts, due to weak, temporary guardrails, or from edge of building.
8. Danger of temporary elevators dropping due to excessive weight. (Include weight of tools and appliances when computing number of people elevator can safely carry.)
9. Possibility of falling, particularly on upper floors, due to loss of balance caused by sudden, strong gusts of wind.
10. Danger from LP gas leak due to tripping over hose, causing breaks or explosions from LP gas.
11. Danger of acetylene tanks being dislodged and falling, causing fire or explosion, if tanks not secured at location of work.
12. Danger of an exposure fire when construction is in close proximity to adjacent building.
13. Explosion from stored volatile liquids.
14. Temporary flooring slipping from position.
15. **Fast spreading fire cutting off members.**
16. Excessive nozzle pressure on hand lines connected to the standpipe if pressure reducers are not installed in standpipe valves.
17. Power tools causing injury due to not being disconnected by workers during fast evacuation of premises.
18. Physical exhaustion of members when elevators are not available and tools and appliances have to be carried to considerable heights.
19. Slipping and falling due to icy conditions.

20. Danger of toxic gases and fumes from the fire load of the occupancy in building before completion of project.
21. Danger of fighting fire at close proximity due to inadequate water pressure at high levels.
22. Danger of oxygen deficiencies in basements, sub-basements, etc., due to lack of ventilating facilities.
23. Danger to members from LP, oxygen and acetylene tanks being propelled as projectiles when subjected to heat.
24. Danger of members being trapped in permanently installed elevators if heat of fire causes insulation on wires to melt, making contact and short circuiting.
25. Danger of derricks (cranes) on the uppermost floor falling if construction material is weakened by the heat of the fire.
26. Danger of permanently installed elevators stopping at the fire if heat melts the insulation of the "call" button wires, making contact and calling elevator to the fire floor.
27. No warning if steel members fail. Wooden beams would "creak" or "splinter", giving warning that the support member was weakening.
28. Cuts from flying glass when windows are broken during venting or from heat of the fire.
29. Respiratory exhaustion due to short duration of breathing apparatus, time consumed while wearing apparatus to reach fire, fighting fire, and need for rapid evacuation.

III. USE OF PORTABLE RADIOS IN HIGH-RISE BUILDINGS

1.39 The use of a large amount of steel in high-rise buildings can have an adverse effect on radio transmissions between forces on the street and those above, also from one floor to another floor within a building. To improve communications, a number of satellite receivers have been installed around the city.

Where difficulties with portable radio communications are encountered, the following actions may be taken:

1. Activate in-house repeaters installed in designated high-rise buildings.
2. Use Mobile Command Post and/or the Fire Alarm Office as a relay agent.
3. Operate unit in direct mode.
4. Take a position as near a window as possible.
5. Portable radios should not be used with the microphone attached to the antenna as this will weaken the signal.
6. Members should refer to S.O.P. #7 for overall information on radio operations.