FIRE AND RESCUE DEPARTMENTS OF NORTHERN VIRGINIA
FIREFIGHTING AND EMERGENCY OPERATIONS
MANUAL

ELEVATOR AND ESCALATOR EMERGENCIES
Second Edition

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INTRODUCTION

An elevator is a platform or enclosed platform that is capable of moving vertically; it has the capability of being raised and lowered in a vertical shaft with the ability to carry people or freight. The elevator with its operating equipment, motor, cables, and accessories travels by cables, pistons, or steel ropes.

An escalator is a moving stairway. An escalator consists of steps, which rotate on a track to either move people up or down to different elevations. A chain drive motor is used to move the stairs.

This manual will review the features of elevators and escalators, their operation, and the safe and effective tactics that should be used to deal with the variety of emergencies fire departments may encounter.

Elevators have been in use since the 3rd century BC. They were either operated by human, animal, or water wheel power. Beginning in the mid-19th century, power elevators were operated by steam in order to move freight. These elevators were found in mines, factories, and warehouses.

The elevator, as we know it today, was first developed during the 1800s and relied on steam or hydraulic plungers for lifting capability. In the latter application, the cab was affixed to a hollow plunger that lowered into an underground cylinder. Liquid, most commonly water, was injected into the cylinder to create pressure and make the plunger elevate the cab, which would simply lower by gravity as the water was removed. Valves governing the water flow were manipulated by passengers using ropes running through the cab; the system was later enhanced with the incorporation of lever controls and pilot valves to regulate cab speed. The "granddaddy" of today's traction elevators first appeared during the 19th century in the United Kingdom; a lift using a rope running through a pulley and a counterweight tracking along the shaft wall.

Figure 1: Early elevator concept.
The power elevator debuted mid-19th century in the United States as a simple freight hoist operating between just two floors in a New York City building. Elevators were not safe for human transportation until Elisha Graves Otis, of Yonkers, New York, invented the first elevator brake in 1853. Early elevators were hoisted by ropes, and if the rope failed, the car would drop. Elisha invented a brake using a steel wagon spring that meshed with a ratchet. During his demonstration of the brake, Elisha stood on top of the car as his assistants chopped all of the hoisting ropes with an axe. The elevator held fast and the passenger elevator industry was on its way. This invention made skyscrapers a practical reality. By 1857, the country's first Otis passenger elevator was in operation at a New York City department store, and, ten years later, Elisha's sons went on to found Otis Brothers and Company in Yonkers, NY, eventually to achieve mass production of elevators in the thousands. Various other elevator designs appeared on the landscape, including screw-driven, rope-geared, and hydraulic models.

The key changes in the Second Edition of *Elevator and Escalator Emergencies Manual* are as follows:

- The addition of a new glossary section and the subsequent elimination of the elevator components section.
- Content added to describe the steps for developing an action plan for elevator operations.
- Expanded content on standard operating procedures for non-emergency elevator and escalator responses.
- Content added to describe the steps for locating stalled cars in elevator hoistways.
- Expanded the section on opening of hoistway doors.
- Minor language changes in the emergency operations section.
DEFINITIONS

The following definitions describe terminology used throughout this manual.

**Brake:** An electro-mechanical device used to prevent the elevator from moving when the car is at rest and no power is applied to the hoist motor, Figure 2.

**Brake Shoe:** Moving member(s) of a brake, lined with friction material which, when in contact with the brake drum, holds the elevator at floor level, Figure 2.

![Figure 2: Brake and brake shoe.](image)

**Brush:** A device, usually of composed of carbon or graphite, used to connect a circuit with the rotating or moving portion of a DC motor, generator or other electrical device. It carries current to and from the non-moving parts of connections.

**Buffer:** A device which will stop a descending car or counterweight moving beyond its normal limit of travel by means of storing or absorbing and dissipating the kinetic energy of the car or counterweight. When a normal or final terminal stopping device fails, the car will stop on a buffer. Buffers are either oil or spring type, Figure 3.

![Figure 3: An example of a buffer.](image)

**Callback:** In contract service, a customer request that requires a check of an elevator other than the regularly scheduled maintenance.
**Car (elevator):** The load-carrying unit, including its platform, frame, enclosure, and car door or gate. The elevator car provides passengers and cargo transportation to the various floors of multi-story buildings. Most passenger elevators are enclosed. The floor or platform will be made of steel or fireproofed wood. The interior components consist of automatic self-closing doors, emergency telephone or intercom, lights, fan, roof or side hatches, floor indicator, direction of travel panel, and a floor selection control panel. The floor selection control panel will consist of firefighter service (Phase II), emergency alarm, door controls, floor selection buttons, and fan and light switches.

**Car Doors:** The moveable portion of the car entrance that closes the opening from the car to the landing. Doors may be bi-parting, single slide, center opening, two-speed, or two-speed center opening.

**Counterweight:** A set of weights roped directly to the elevator car of a winding-drum type installation. In practice, this weight is equal to approximately 70 percent of the car weight. It is designed to reduce the work required by the electric motor to move the elevator car, Figure 4.

![Figure 4: Example of a counterweight.](image)

**Car Operation Station:** A panel mounted in the car containing the car operating controls, such as call register buttons, door open and close, alarm emergency stop and whatever other buttons or key switches are required for operation, Figure 5.

**Code:** A system of regulations pertaining to the design, manufacture, installation and maintenance of elevators, dumbwaiters, and escalators and moving walks. The most widely recognized and used is ANSI A-17.1, which is sponsored by the National Bureau of Standards, the American Institute of Architects, The American Society of Mechanical Engineers, and published by ASME. It has been adopted by many states. Some states and cities have written their own codes, most of which are based on the ANSI A-17.1.
Figure 5: Example of a car operation station located within the elevator car.

Controller: A device, or group of devices, which serves to control, in a predetermined manner, the apparatus to which it is connected. In this case the direction, speed and safety mechanisms on the elevator. Some controllers will indicate the elevators location in the hoist way, Figure 6.

Figure 6: Controllers can denote elevator location within a hoistway.

Compensation Chain: Weights that balance the load of an elevator car. The hollow, black flexible tubes in Figure 7 are connected to the elevator car and the counterweights. They are filled with solid metal balls. The weight of these cables balance the load of the elevator car.

Cylinder: The outermost lining of a hydraulic jack; Figure 7 displays the hydraulic cylinder and the connection to the bottom of the elevator car.

Direct Current (DC): An electric current flowing in one direction only and substantially constant in value.

Door Lock: Any type of mechanical lock designed to prevent the opening of a hoistway door from the landing side.

Door Operator: A motor-driven device mounted on the top of the car which opens and closes the car and hoistway doors, Figure 8.
Figure 7: On a hydraulic elevator personnel can expect to find cylinders located on the bottom of the elevator car.

Figure 8: The door operator (the two large, chain-driven wheels) will open and close the elevator doors.

**Drive Machine**: The power unit which applies the energy necessary to raise and lower an elevator, material lift, or dumb waiter car or to drive an escalator, an inclined lift or a moving walkway, Figure 9.

Figure 9: A drive machine which applies the energy to activate/move an elevator.
**Drive Sheave:** The grooved wheel of a traction-type hoisting machine over which the hoist ropes pass, and by which motion is imparted to the car and counterweight by the hoist ropes.

![Figure 10: A drive sheave.](image)

**Electric Traction Elevator:** In a building over 60 feet in height, an electric traction elevator is typically required. The electric traction elevator has ropes or belts that are attached to the top of the elevator car at one end, travel around a sheaves, and attached to a counterweight at the other end.

![Figure 11: The operation of an electric traction elevator.](image)
Elevator Door Vane: A piece of steel mounted on the car cab door that runs between the hoistway door two rollers as the elevator goes up and down the hoistway, Figure 12. When the elevator stops at a floor and the car door opens, the car door vane pushes against one of the rollers, tripping the hoistway door lock open and moving the hoistway door together with the car door.

![Elevator Door Vane](image1.png)

Figure 12: Elevator door vane.

Emergency Stop Switch: A device located in the car which, when manually operated, removes electric power from the driving machine motor and brake of an electric elevator. Also it will remove power from the electrically operated valves and/or pump motor of a hydraulic elevator.

Final Limit Switch: A switch located in the elevator shaft, which prevents the elevator from descending or ascending too low or too high in the shaft. When tripped by the elevator it cuts power to the elevator motor.

![Final Limit Switch](image2.png)

Figure 13: The final limit switch assist the car in arriving to the designated floor at the correct location.
**Emergency Recall Service:** Phase I emergency recall occurs when a device or group of devices provide a signal for the immediate recall to a designated landing in order to remove cars from normal use. This typically located in the elevator lobby. Phase II emergency recall permits special operation for firefighters or other authorized emergency personnel; Phase II occurs when firefighters enter the car and activate the manual controls from within the car.

*Terminology Note:* There are many ways of referring to firefighter service on elevator systems. It may also be referred to as fireman’s service, firefighters’ operation, or fireman’s operation. The *International Fire Code* and *Virginia Fire Code* uses the term *Emergency Recall Service*, therefore, this manual will use this term for consistency.

![Figure 14: The Phase I emergency recall panel located in the elevator lobby (left) and a firefighter activating Phase I emergency recall of the elevator by recalling the elevator to the lobby location (right).](image)

**Geared Traction Machine:** A traction machine in which the power from the motor is transmitted to the drive sheave through reduction gears.

**Gearless Traction Machine:** A type of elevator hoisting machine on which the hoist ropes pass over a traction drive sheave which is an integral part of the armature; it is called gearless because no geared reduction unit is used.

**Governor:** A governor is a small device typically located in the penthouse that will apply a brake to cable which moves the elevator car; it serves as a mechanical speed control mechanism, Figure 15. They can also be present on escalators. For elevators, it is a wire rope-driven centrifugal device used to stop and hold the movement of its driving rope. This initiates the activation of the car safety device. It opens a switch that cuts off power to the drive motor and applies a brake to the car if it travels at a speed over the preset in the down direction. Some types of governors will also open the governor switch and cut off power to the drive motor and brake if the car over speeds in the up direction. On escalators, a direct-driven centrifugal device which, when activated by over speed, cuts off power to the drive motor and service brake.
Figure 15: Example of a governor.

**Governor Rope:** A wire rope attached to an elevator car frame that drives the governor and, when stopped by the governor, initiates setting of the car safety.

**Guide Rails:** Steel T-section with machined guiding surfaces installed vertically in a hoistway to guide and direct the course of travel of an elevator car and elevator counterweights. Figure 16 shows the rollers riding the T Guide Rail.

**Hall Lantern:** A corridor mounted signal light indicating that an elevator car is approaching that landing and the direction in which the car is to travel, Figure 17.

**Handrail:** The moving handhold provided for escalator passengers, which moves over the top of the balustrade and newels. It can also be a railing serving as a support.

**Handrail Guard:** A guard, usually made of rubber that fits over the outside of the handrail at a point where the handrail enters or leaves the balustrade; it is designed to keep a person’s fingers out of the handrail opening.

Figure 16: Guide wheels guide and direct the course of travel for the elevator.
Hoisting Machine: In electric traction elevators, the traction hoisting machine operates by the interaction of a traction sheave, driving motor, and motor brakes. For hydraulic elevators, the machine consists of a hydraulic pump, electric motor, and reservoir.

Hoistway (shaft): A shaft way for the travel of one or more elevators, dumbwaiters, or material lifts. It includes the pit and terminates at the underside of the overhead machinery space floor or grating or at the underside of the roof where the hoistway does not penetrate the roof. Hoistways are constructed of non-combustible material and should have a two-hour fire rating. The material may be concrete block, reinforced concrete, brick, gypsum, terra cotta, or a combination of these. The code allows for no more than four elevator cars per hoistway. The hoistway must also be ventilated.

Hoistway Door: The door which is located at each floor to enclose the hoistway. The hoistway is a shaft way for the travel of one or more elevators, dumbwaiters or material lifts. It includes the pit and terminates at the underside of the overhead machinery space floor or grating or at the underside of the roof where the hoistway does not penetrate the roof. There are several types of hoistway and car doors that may be found:

- Hoistway doors that are bi-parting or center opening: A door consisting of two panels which move away from each other when opening and toward each other when closing, while each panel is traveling in the horizontal direction.

- Two speed center opening doors: a double set of center opening doors that move away from each other when opening and towards each other when closing.

- Hoistway doors, single-sliding: A door which slides horizontally either to the left or to the right.

- Hoistway doors, two-speed, double-sliding: A set of doors which slide horizontally either to the left or to the right. One door slides faster than the other.
Figure 18: An example of two-speed, double-sliding doors.

- Hoistway door, swing: A door, which swings about a vertical axis.
- Vertical bi-parting door (on some freight elevators): A door consisting of two panels which move vertically away from each other when opening and toward each other when closing, while each panel is traveling in the vertical direction.

Figure 19: An example of a large vertical bi-parting door.

**Hoistway Blind:** The portion of a hoistway that passes floors or landings where no normal landing entrances are provided. (Also referred to as a blind shaft.) These are typically found in taller buildings where it would be unreasonable for a single elevator to service all 30 or more floors; one elevator services floors 1 through 15 and another services 15 through 30. They may also be found as an express elevator to a roof top penthouse or restaurant.

**Hydraulic Elevators:** A power elevator where the energy is applied, by means of a liquid under pressure, in a cylinder equipped with a plunger or piston. Hydraulic elevators are typically found in buildings less than 60 feet. There are three types of hydraulic elevators, the holed, the holeless (often referred to as telescoping), and the roped hydraulic.

- The holed hydraulic elevator obtains motion through the application of force from liquid under pressure into a cylinder that lifts a plunger attached to the bottom of the elevator
car. Returning the hydraulic oil from the cylinder into the oil reservoir lowers the car. A hydraulic valve controls movement.

- The roped hydraulic is cost-effective, environmentally safe, above-ground elevator. This system is designed for buildings up to 60 feet and eliminates drilling. The elevator with a sheave at the top of its plunger or piston connected indirectly to the car by means of two or more wire ropes.

- The holeless hydraulic elevator system eliminates the need for well-hole or buried piping. This elevator is suited for two-story buildings with less than 14 feet of travel between floors.

Figure 20: A holed hydraulic elevator.
Figure 21: A roped hydraulic elevator.

Figure 22: A holeless hydraulic elevator.
**Inspection Station (inspection controls):** A control panel on top of an elevator car which, when activated, removes the car from normal service and allows the car to run at inspection speed from the car top station only.

![Image of an inspection station](image1)

*Figure 23: An example of an inspection station.*

**Interlock:** An electro-mechanical device on the hoistway door, which locks hoistway doors. Usually found on the header beam over the hoistway opening. It prevents the elevator car from moving until it locks the hoistway door. It also prevents opening of the hoistway door from the landing side unless the car is within the landing zone and is either stopped or being stopped. The elevator key and or Rescue tool are designed to trip this mechanism.

![Image of an interlock](image2)

*Figure 24: An interlock serves as a safety device for the elevator door.*

**Landing Zone:** The area of the hoistway, which extends from a point 18 inches below and 18 inches above the landing.
**Leveling:** The movement of an elevator toward the landing sill when it is within the leveling zone. When the word leveling is used, the inference is that the process of attaining a level or stop position (the platform level with the landing sill) is performed completely automatically.

**Machine Room:** The room or space in which the driving machine, controller, and electrical disconnect for an elevator (or group of elevators), dumbwaiter, or escalator (or group of escalators) is located. They are typically found on the roof for traction elevators. The mechanisms found in the machine room for the hydraulic elevator include the electric main line disconnect, a controller, the auxiliary electric panel, a hydraulic pump, an electric motor, and the hydraulic fluid tank/reservoir.

![Machine Room Image](image1)

**Figure 25:** The machine room houses many of a mechanical and electrical items that power and move the elevator car.

**Machine Room (hydraulic):** The room or space containing the elevator electrical disconnect, pump, controller and hydraulic reservoir tank. Typically found on the lowest floor.

![Machine Room Image](image2)

**Figure 26:** The hydraulic machine room will be at the lowest floor and houses the large oil reservoir for the elevators.
**Machine Roomless Elevator:** A new type of electric traction elevator came that is designed by Otis Elevator. It is a traction elevator that does not require an elevator machine room. Designed initially for buildings between two and 20 stories, this system employs a smaller sheave than conventional geared and gearless elevators. The reduced sheave size, together with a redesigned motor, allows the machine to be mounted within the hoistway itself — eliminating the need for a bulky machine room on the roof.

Otis’ elevator, The Otis Gen2™ machine roomless elevator system, moves elevators using flexible, flat, polyurethane coated-steel belts instead of stiff metal cables. The belts are about 30 mm wide (1 inch) and only 3 mm (0.1 inch) thick, yet they are as strong as woven steel cables while being far more durable and flexible. The thinness of the belts makes for a smaller winding sheave. As a result, the system requires a machine only one-quarter of the size of traditional technologies, eliminating the need for a bulky machine room at the top of the elevator shaft. Developers and owners realize savings from the energy efficient machine and the elimination of the rooftop structure. Passengers enjoy the ride quality and reliability previously available only in high-rise towers.

**Figure 27:** The use of the belts eliminates the need for cables and led to the creation of the machine roomless elevator.

**Main Line Disconnect:** An electrical disconnect usually found inside the machine room near the entrance door. When the side lever is pulled down, it removes all operating power from the elevator. In Figure 28, the main line disconnects are the six large electrical disconnects on the left. The six smaller electrical disconnects on the right control power to the elevator car lighting and ventilation.
Figure 28: An example of main line disconnects for an elevator.

**Motor Generator:** Converts a building's alternating current to direct current used by electric traction elevators.

**Over Speed Governor Switch:** Part of an escalator machine that is actuated by centrifugal force and trips a switch when the motor speed has increased 20 percent over its rated nameplate speed.

**Pit:** The bottom of the elevator hoistway (shaft) is known as the pit. No personnel shall enter the pit area unless power has been disconnected to all elevators in that hoistway.

**Preventive Maintenance:** Inspections, tests, adjustments, cleaning and similar activities carried out on elevator and escalator equipment with the intention of preventing malfunctions from occurring during operation. It is designed to keep equipment in proper operating order and is done on a schedule basis. It is also referred to as schedule maintenance.

**Relay:** An electric device that is designed to interpret input conditions in a prescribed manner and after specified conditions are met, to respond and cause contact operation or create change in associated electric control circuits.

**Rope:** Hemp rope saturated in lubricant and wrapped in steel wire. They are typically 5/8 inch in diameter. Each rope has the ability to support the weight of the elevator car plus 10%.

**Rescue Tool (Poling Tool):** A device used by fire and rescue personnel to unlock the elevator interlock which opens the hoistway doors. This tool would typically be used on hoistways doors where no key access is available or no key is available. It is a two-section device in order to extend reach if required.
Figure 29: Examples of a Rescue Tool, which is also known as a Poling tool.

**Selector:** A device, which starts, stops, opens, and closes elevator doors at designated hoistway.

**Sheave:** A wheel mounted in bearings and having one or more grooves over which a rope or ropes may pass. The sheave is powered by an electric motor, as the wheel turns the counterweights and elevator car move up and down the hoistway.

Figure 30: A sheave located in the elevator machine room.

**Specifications:** Detailed itemized description of the plans, materials, dimensions, and all other requirements proposed for the installation of the equipment.

**Step:** The moving platform on which an escalator passenger rides.

**Traction Machine:** An electric machine in which the friction between the hoist ropes and the machine sheave is used to move the elevator car.
**Traveling Cable:** A cable made up of electric conductors which provides electrical connection between an elevator or dumbwaiter car, or material lift, and a fixed outlet in the hoistway or machine room. A device which will stop a descending car or counterweight moving beyond its normal limit of travel by means of storing or absorbing and dissipating the kinetic energy of the car or counterweight. When a normal or final terminal stopping device fails, the car will stop on a buffer. Buffers are either oil or spring type.
ELEVATOR INCIDENTS AND EMERGENCIES

Fire department operations fall into two categories: emergency and non-emergency. Persons who are not injured and are only inconvenienced are considered non-emergency situations. A true emergency may include: persons stuck in an elevator during fire operations; injured, ill, or panicked persons in a stuck elevators; and victims who have fallen into the shaft. Based on the situation, consider requesting a technical rescue response.

When an emergency exists, it may become the function of the fire department to safely remove any persons from a stalled elevator car or hoistway. At no time will any member of the fire department repair or reactivate an elevator that has been deemed unsafe.

Upon arrival at any elevator incident, the OIC shall request assistance from a qualified elevator mechanic. This shall be accomplished through the building management personnel. In an emergency, this should not delay the actions of the fire department and the safe removal of victims prior to the arrival of an elevator mechanic.

It is not uncommon for people to be stuck in a stalled elevator. Removing the occupants should be a simple operation. Elevator malfunctions are, for the most part, due to electrical difficulties. An elevator contains many electric safety devices that are in place to protect the passenger. These same electrical devices fail and cause the elevator to stall.

In order for the OIC to make a sound risk assessment and determine the best action plan:

- ID the type of elevator (traction, belted, hydraulic).
- Locate the position of the car relevant to the hoistway opening.
- Determine the condition of the occupants and communicate that FD personnel are working to mitigate the situation.
- Can the occupants self-rescue with power remaining on?
- Locate the machine room.
- Determine the car number.

Once these items have been determined, the next step should be to determine if car movement is present.

- If car movement is present, turning off the power may cause uncontrollable motion of the car. The car may travel upward until the counterweights reach their terminal position, striking the buffers. Occupants of the car may be severely injured or killed.
- If there is car movement and no emergency exists, you must await an elevator mechanic.
- If car movement exist, no fire department members shall get on or into the car.
- Once the elevator car has stopped moving, the power may be secured and the occupants removed.

In situations when the OIC determines a rescue shall be performed, such as when an elevator mechanic will be delayed for an extended period of time, a sequence of actions must be followed to ensure a safe removal of occupants:
- Locate the stalled elevator car.
- Communicate with the occupants of the stalled car.
- Attempt a self or assisted rescue with the power on.
- Ensure the car is not moving.
- Shut down and secure power to stalled elevator.
- Gain access to the hoistway.
- Gain access to the stalled car.
- Assist occupants out of the stalled car.
- Secure the scene to prevent further use of the problematic elevator.

**Locating the Stalled Elevator Car**

Upon arrival, make contact with the person who reported the incident, or the building representative. This person may be able to inform you of the location of the stalled car and the status of the occupants.

A mechanic from the elevator company that services these elevators should be dispatched to the scene.

Locate the stalled elevator by the following methods:

- Information given to dispatch from the 911 caller.
- Make contact via cell phone or elevator car phone often found in the fire control room.
- Talk to civilians already on the scene.
- Check the floor indicator in the lobby (Hall Lantern).
- Check the floor indicator in the fire control room.
- Take an adjacent car to the stalled car and stop at each floor. Using a light look across the narrow space between the car and hoistway wall to locate the stalled car.
- Take an elevator to the highest floor and try to make contact with the occupants by talking loudly through the elevator hoistway doors. Walk down each floor using the same method until contact is made.
- In older installations and freight elevators, the hoistway door may have a glass panel. Using a light, look for the car or the location of the counterweight. The location of the counterweight can be used to approximate the position of the car. For example, in a ten-story building, if the counterweight were located on the 2nd floor, the car would be near the 8th floor.
- Checking the level of the hydraulic fluid may give you an idea where the car is located.
- The controller, located in the machine room, may indicate the location of the stalled car. Newer installations have a LED indicator, which will locate the car, while older installations have a dial or arrow traveling left or right along a metal rod to show the location.
Figure 31: Examples of controllers (newer on left and older on right) that are located in the machine room.

To look up, down or across the hoistway, you may remove the power to an adjacent elevator, open that hoistway door and look up, down or across to locate the stalled car. Personnel must have a lifeline attached when working near an open hoistway door. In some cases, particularly if a stalled car is not far from the hoistway landing, you may see the stalled car by simply looking between the car and hoistway door of an adjacent elevator.

After the stalled car has been located, communication with the occupants is the next priority. Once communication has been established, convince and reassure the occupants that fire department personnel are working to mitigate the situation as swiftly and safely as possible. You can also communicate with occupants to obtain information on the number of occupants, establish if they have any special needs, and instruct them on techniques for a possible self-rescue.

On some incidents, the occupants may have activated the emergency stop switch. This activation removes power to the hoisting machine and activates a loud alarm. Unless needed, advise them not to activate this button. The alarm has the tendency to cause panic, confusion, and hampers communication. It would also prevent a self-rescue (e.g., pushing floor buttons, ensuring the car doors are shut, and fire service recall).

Non-Emergency Procedures with Power On to the Elevator Car

Unless there has been a general power outage in a building, a stalled elevator generally is the result of electrical part failure. It is common for dust to interrupt electric contacts. There are several maneuvers that may be attempted in order to restore power to the system and that would allow the occupants to safely exit the elevator at a landing.
Common electric failures may include:

- Faulty interlocks on hoistway doors,
- Blown fuses,
- Shorted electric cables,
- Open switches, and/or
- Breaks in operating circuits.

The following procedures should be attempted to move the elevator while the power remains on:

- Press the lobby call button.
- Activate the firefighter service (Phase I) in the lobby or fire control room. This may return the car to the main lobby.
- Instruct the occupants to engage and disengage the emergency call button several times. Advise them that a loud bell will ring.
- Instruct the occupants to engage the door open button and floor button. At the same time have a fire department member at the closest floor landing to the stalled car press and hold the hallway call button. If the elevator door vane on the car is in the landing zone it will engage the roller and the car door and the hoistway door may open.
- Have the occupants ensure that the car doors are completely closed by pushing the door to the fully closed position. Have the occupants shake the interior doors; this may loosen any dust blocking electric contacts.
- Have fire department members shake the hoistway door on the floor the last occupant entered the car, and the doors closest to where the car is currently located.
- Have fire department members physically check to ensure all hoistway doors of the stuck elevator are closed. Air currents may have opened a hoistway door and tripped the interlock cutting the power to the car. If this is not successful shake all hoistway doors in the shaft that service the stalled elevator.

The above procedures (except the last bulleted point) will only work if the emergency stop button is not activated. If activated, the occupants must be instructed to deactivate the alarm.

**Non-Emergency Procedures with Power Off to the Elevator Car**

Once the car has been located, communication with the occupants accomplished, and attempts to remove the occupant(s) with the power on have failed, the power off procedures shall be initiated.

Confirm that the car is motionless. If the car is moving up, down or erratically, you must wait for a professional elevator service mechanic. Shutting the power off may cause the elevator car to suddenly rise, striking the top of the hoistway and causing injury or death to the occupants.

Once the car is confirmed to be motionless and all attempts to remove the occupants with the power on as described in the paragraph above have been exhausted, power to the stalled elevator driving motor must be removed and tagged.
Turning the power off is accomplished by sending a member to the elevator machine room and removing power from the main line disconnect for the problem elevator. Once power has been removed, the disconnect must remain off until a certified elevator mechanic restores the elevator to proper working order. To ensure this power stays off, the breaker must be locked out by padlocking the switch. If no padlock is available, a member with a radio shall remain at the panel until the rescue has been completed.

![Danger Tag and Padlock](image)

**Figure 32:** Example of a tag and a padlock for marking an elevator out of service and padlocking the power switch.

There are two power sources for each elevator. The main line disconnect, which delivers power to the driving motor, is usually found inside the machine room near the entrance door. When the lever is pulled down, it stops the car and removes operating power from the elevator. It does not remove the lighting or ventilation power. The other power source is an auxiliary system, which delivers power to the car lights, fan, and music. The auxiliary circuit breaker panel frequently resembles the normal breaker box found in most homes. During elevator rescue this auxiliary power system should be left on to prevent panic of the occupants.

![Electrical Disconnects](image)

**Figure 33:** Two sets of electrical shut off s for two elevators. The large disconnect boxes marked 1 and 2 (on left) are the main line disconnects and the small disconnect boxes marked 1 and 2 (on right) are the auxiliary electric shut offs. Moving the lever from the up position to the down position will disconnect the power.
If there is a problem with the fan or lights (e.g., electrical fan component smoldering) and you need to remove the power from the lights and fans, you should warn the occupants that it will become dark in the elevator car when the power is turned off.

Each elevator will have its own set of electric panels and shut offs for the main line and auxiliary power. It is imperative that the power to the stalled elevator is shut down. Elevator power switch boxes and motors are required to be labeled in a manner that relates motor to switch (e.g., Switch #1, Motor #1). Elevator hoistways are required to be numbered. The numbering system starts with the first hoistway on the left of the main building entrance and continues clockwise. If any doubt exists, open as many elevator power switches as required to ensure safe operation. Allow passengers to exit any properly operating car before removing power.

Once power has been removed from the stalled elevator, gaining access to the elevator car is the next step. On hydraulic elevators, the elevator may be lowered to the nearest landing using the manual-lowering valve by fire department and/or elevator mechanic personnel specifically trained in this operation.

The hoistway door that is closest to the stalled car needs to be accessed and opened. One or more of the following methods may be used to open the hoistway doors:

- Using elevator key(s),
- Breaking the photoelectric eye,
- A pole down operation,
- A pole across operation,
- A pole up operation,
- Glass panel access,
- Using an elevator pick tool,
- Lowering to nearest accessible landing (hydraulic only), or
- Forcing entry.

The tool use and proper techniques for opening the hoistway door will be explained at the end of this section.

With the hoistway door open, the elevator door will open with a minimum amount of pressure. The door may be opened by physically exerting pressure towards the door opening, overcoming the friction from the mechanical door motor located on top of the car. Some doors may require that you push the drive chain wheel of the door motor (located on top of the car). Use a tool for reach and gently turn the wheel a few inches as another firefighter applies pressure to open the car door.

Once the door is open, assist the occupants in exiting the stalled car. Elderly, handicapped, and children may need assistance in exiting the car so fire department personnel may need to enter the car to assist. In some cases a folding ladder may be needed to facilitate the removal.

When the occupants have been removed, the hoistway and car doors must be shut and a fire department member must ensure the hoistway door locking mechanism has engaged. If the hoistway and car doors cannot be closed, auxiliary power to the car should be shut off from the
car or elevator penthouse. This will make the car dark and obvious to civilians the elevator is out of service.

At no time will firefighters leave an open hoistway door if the elevator car is not in front of the landing; an unknowing citizen could fall down the open hoistway causing severe injury or death.
OPENING HOISTWAY DOORS

The following procedures and techniques can be used to open hoistway doors.

**Elevator Pick Tool**

The elevator pick tool, Figure 34, is a hand tool used to open sliding type elevator hoistway doors to gain access to the elevator shaft or to an inoperative car. With the point of the tool parallel to the hoistway door, insert the tool between the doorjamb and the top of door. Rotate the tool 90 degrees so that the point of the tool is perpendicular to the hoistway door. Move the tool toward the leading edge of the hoistway door to locate the locking arm.

![Figure 34: Elevator pick tool.](image)

There are several items which may be encountered as the tool is moved along the top of the door. Trial and error will result in locating the locking arm. The location of the emergency keyhole on a hoistway door in the same elevator shaft will aid in locating the locking arm.

While keeping the point of the tool perpendicular to the hoistway door, swing the handle of the tool so the tool is at a 45-degree angle to the plane of the locking arm. Push up on the tool, raising the locking arm and disengaging the hoistway door lock. Open the hoistway door by pushing it away from its leading edge. Attempt to open a sliding hoistway door with this tool before resorting to forcible entry. This tool is very effective if the locking arm mechanism can be reached.

**Glass Panel Access**

The glass panel was designed to view the shaft to determine the location of the elevator car and to give access to the door interlocks. To release the interlock, unscrew the molding or knock out the glass panel on the hoistway door. Reach in and push the rollers or locking arm together to unlock door. A poling tool may be needed to accomplish this task if the distance is out of reach. This scenario works on passenger and freight elevators.
Figure 35: Some elevator hoistway doors may have a glass panel that can be removed for access to the interlock.

Pole Down

Using the elevator key, open the hoistway door at the highest level that has a keyhole. This will gain access to the interior of the hoistway. The hoistway doors on each floor below must be opened. Secured by properly anchored lifeline, a fire department member lying in the prone position or in kneeling position and using the poling tool or pike pole pushes the rollers or locking mechanism together on the floor below, Figure 36. They are located on the upper portion of the hoistway door. This action will release the safety interlock that keeps the doors locked. Another member on the floor below opens and chocks the doors open from the hallway, Figure 37. This scenario is repeated until access to the stalled car is accomplished.

Poling down is less dangerous than poling up. Lifelines must be used while working around an open shaft, Figure 38. To ensure safety, no open hoistway will be left unattended. When any hoistway door is closed, you must ensure that the lock has engaged by gently applying pressure to attempt opening.

Figure 36: Use the poling tool or pike pole to push the rollers or locking mechanism together (located on the upper portion of the elevator door).
Figure 37: When the hoistway doors are to be entered for a poling operation, a door chock should be placed in the door frame to secure it in the open position.

Figure 38: After being properly secured, firefighters begin a poling down operation.
**Pole Up**

Using the elevator key, open the hoistway door at the lobby. This will gain access to the interior of the hoistway. The hoistway doors must be opened on each floor above. Secured by lifeline, a member using the poling tool or pike pole pushes the rollers or locking mechanism together. They are located on the upper portion of the hoistway door. This action will release the safety that keeps the doors locked. Another member on the floor above opens and chocks the doors open from the hallway. This scenario is repeated until access to the stalled car is accomplished. Extreme caution must be used when poling up. Although anchored lifelines secure the member, leaning out into an open shaft is dangerous. This access procedure should be one of your last options. To ensure safety, no open hoistway will be left unattended. When any hoistway door is closed you must ensure that the lock has engaged by physically trying to pull the doors open.

![Image: Properly secured firefighters working as a team, performing a poling up operation.](image)

**Figure 39:** Properly secured firefighters working as a team, performing a poling up operation.

**Pole Across**

There are two ways to pole across. These operations may be performed from either the interior of the rescue car or from the top of the rescue car. Operations from the interior rescue car should be used for non-emergency operations. The car top poling rescue will be discussed in emergency procedures and should only be performed under emergency conditions. Because of limited space between the hoistway and car doors, it is best to use a poling tool instead of a pike pole.

Ride an adjacent elevator (in the same hoistway) to the landing closest to the stalled car. Open the car and hoistway doors of the car which fire and rescue personnel occupy (rescue elevator). If space permits, slide the elevator rescue tool between the car door and the hoistway door to
access the hoistway door interlock of the stalled car next to you. A firefighter should be stationed directly in front of the stalled car’s hoistway door to prevent civilians from climbing or jumping from the stalled car.

![Image](image_url)

**Figure 40: A firefighter using an unoccupied car to perform a poling across operation.**

If there is not enough space between the car door and elevator door to operate the elevator rescue tool you should ride the rescue elevator to the nearest landing of the stalled elevator. The main line disconnect to the rescue elevator must be shut off. Chock open the doors to the rescue elevator. A member, standing in the door opening using a light and a poling tool, connects the interlock rollers together of the stalled elevator. Depending on the direction of travel of the door, the locking mechanism either needs to be pulled or pushed to connect. A member located in the hallway at the stalled elevator opens the hoistway door for the stalled elevator. It is safer to remove the occupants through the hoistway door to the floor above rather than the floor below.

**Elevator Key(s)**

If the stalled car is near the landing zone and the hoistway door has keyhole access the rescue is simple. If the driving vane and the rollers are inline, using the key, the car and hoistway doors will open.

**Drop Over Key**

There are two types of drop over keys, the single drop over and the double drop over, Figure 41. The operation is the same for both. Insert the tool until the leading edge drops behind the hoistway door. Turn the tool away from the leading edge of the hoistway door until resistance is met. Apply pressure against the resistance to disengage the hoistway door lock, Figure 42. Open the hoistway door by pushing it away from its leading edge.
On elevators equipped for use of the drop key, attempt to open the hoistway door by use of the key before resorting to forcible entry. If the single drop over will not entirely go into the keyhole, the car may be blocking its access. The double drop over key will normally pass without interference.

**Lunar and T-shaped Keys**

This type of key is inserted at an angle with the leading edge of the tool down. Push the tool in until resistance is met. By pulling down the lock is released and the hoistway doors can be opened.
Lowering a hydraulic elevator. After the main line disconnect has the power removed, position a member on the next lower landing from the stalled car. Instruct occupants to stay away from the door. This member will open the hoistway doors after the stalled car has been lowered. Locate the manual lowering valve on the pump. The valve normally is found on a manifold at the oil reservoir; it is a T-handle on top of the manifold, Figure 44. Turn the valve until fluid can be heard returning to the reservoir. The stalled car is lowered to the landing and the member in the control room turns the valve off. Open the car doors and remove occupants. **Do not lower the car past the lowest floor landing and the final limit switch.**

![Manually lowering valve T-handle.](image.png)
EMERGENCY OPERATIONS TO PERFORM A RESCUE

The following sections address advanced rescue techniques often carried out in conjunction with an onsite elevator mechanic. Fire department personnel shall not attempt these techniques unless specifically trained and authorized to do so by their respective departments. Inclusion of these techniques in this manual is intended to increase regional awareness and does not serve as a directive in lieu of advanced training.

Poling Across with Members on Top of the Rescue Car

This procedure should not be performed during an emergency situation unless you have been trained and authorized by your department to do so; many people have been severely injured or killed as a result of using the inspection service without proper training.

The rescue car is taken to one floor below a hoistway door that has elevator key access. The power to the rescue elevator must be shut down. Using an elevator key to open the hoistway door, a rescue crew of two will enter the hoistway and step onto the top of the rescue car. Once on top of the rescue car, crew members should secure themselves to the car by locking into the cables with lifebelts provided there is no pulley on top of the car.

The rescue elevator must be placed in the inspection service mode before the main line power can be restored. On top of the car, the electric control, Figure 45, is switched from normal to inspection service and the stop switch engaged. Placing the car in the inspection mode will reduce the traveling speed of the elevator from up to 2000 feet per minute to 150 feet per minute. Power to the main line is restored and the elevator is taken to the stalled elevator. Pull the stop button to activate inspection power. To move either up or down, the direction button and the common button, which are momentary touch buttons, must be depressed. These buttons are a safety feature to prevent accidental movement.

Remember the counterweights travel in the opposite direction of the car. They travel within inches of the car and are silent as they move in the hoistway. One member must be assigned to
watch for the counterweights while the car is in motion. Additionally, all members on the car top shall be secured by lifebelts.

A member on the car top using a light and a poling tool connects the rollers or locking mechanism together of the stalled elevator. Depending on the direction of travel of the door they either need to be pulled or pushed to connect. A member located in the hallway at the stalled elevator opens the hoistway door for the stalled elevator. As stated before, it is safer to remove the occupants through the hoistway door to the floor above rather than the floor below.

**Forcing Entry**

Forcing entry into a hoistway and elevator can be a very costly approach and may not achieve the desired results. Repairs after forcing a door may cost several thousand dollars. Power to all cars in the affected hoistway must be removed and all other cars in that hoistway evacuated.

Any type of spreading tool that will fit into the opening may be used to force the door. The tool must be inserted as high as possible to apply a more direct force to the linkage and locking mechanism. Forcing a door may push the door off or out of its tracks. It is possible for the doors to free-fall into the hoistway. Once the doors have been forced, it will be impossible to properly secure the hoistway opening before leaving the scene. This approach should be used as a last resort and only be used under emergency circumstances.

**Top Escape Hatch**

Access to the top of the stalled car should be through the hoistway from the floor above the stalled car, Figure 46. Open the top escape hatch and lower a ladder into the hole. On some elevators the folding attic ladder may be too short and a roof ladder must be used. A member will enter the car to assist the occupants out. Lifelines shall secure all persons in the hoistway – this includes occupants and rescuers.

![Figure 46: Escape hatch.](image)

If access to the top of a stalled elevator cannot be made thru the hoistway door from above (a blind hoistway), an alternate means of access must be considered. There are several ways to gain
secondary access to the rooftop of the stalled car. If in a multiple hoistway access may be accomplished by taking an adjoining car to the stalled car's location. This procedure should not be performed during an emergency situation unless you have been trained and authorized by your department to do so; many people have been severely injured or killed as a result of using the inspection service without adequate training. The rescue car is taken to one floor below a hoistway door that has elevator key access. The power to the rescue elevator must be shut down. Using an elevator key to open the hoistway door, a rescue crew of two will enter the hoistway, step onto the top of the rescue car. The rescue elevator must be placed in the inspection service mode before the main line power can be restored. Use a ladder to bridge between cars.

If a car is in a single hoistway, this is not an option. Your only option may be forcing entry through the hallway wall to gain access to the stalled car or using a rope rappel or lowering system. This should only be used if all other options are exhausted and it is absolutely necessary to access the car.

Firefighters may find the top hatch bolted, padlocked, or welded shut to prevent unauthorized access.

**Top/Side Escape Hatch**

This procedure should not be performed unless you have been trained and authorized by your department to do so and you are under the direct supervision of a certified elevator mechanic. An adjacent rescue car is taken to the stalled car. This method will not work if any structural beams block access to the stalled car or if the rescue car cannot be brought to the same level as the stalled car.

Remove power to the rescue car. Open the side access panel to the rescue car and the stalled car. Planks of sufficient length (6 feet or longer) are used to bridge the area. A member enters the stalled car to assist with removal. A member in each car holds the ends of two 8-foot pike poles to form handrails. Another member assists the occupants. Lifelines shall secure everyone, including firefighters who enter the open hoistway.

The following are precautions and suggestions that will assist in a safe evacuation of occupants from the stalled car.

- The side and roof access hatches shall only be used as a last resort.
- Before gaining access to any hoistway (stalled elevator and rescue elevator), the main line disconnects must be used to cut the power off.
- Lifelines shall be used to secure members and occupants in any hoistway. Each member should use a safety belt and short section of rope.
- Once the stalled cars location is determined, you will need to restore power to the rescue car if required for a side hatch operation.
- In many cases you can perform a top hatch removal from a hoistway landing and will not need a rescue car.
- Check the hoisting cables on electric traction elevators. If there is any slack in the cables the car may move without any warning. Wait for assistance from an elevator mechanic before removing any occupants.
- Check that the car is not moving. If the car is moving call an elevator mechanic and wait for his/her arrival.
- Folding attic ladders may assist with the occupant removal.
- The elevator shall never be jacked up or moved in an upward direction. This action may free the car safeties causing the car to move either upward or downward depending on the live load in the car.
- When passengers are removed from a car between floors they should be taken up and out of the car if practical. This eliminates the possibility of a passenger falling down the shaft after exiting the elevator. If they are removed to the lower landing, the shaft opening must be protected; a backboard works well to cover the opening. If the opening cannot be secured, all members and occupants should be secured.
- If hoistway doors cannot access a stalled car in an express elevator, breaching of the shaft wall maybe needed to facilitate the rescue. In most new occupancies the party wall between the shaft and the hallway is double thickness drywall.
- Only a certified elevator mechanic will release the machine brakes. No adjustment to or prying of the elevator machinery brake shall be attempted. The brake will be in a safe position and should not be tampered with.
- All work areas shall be secured and well lit.
- Do not over crowd the top of the car. The recommended maximum number of personnel is three.
- Do not stand on emergency hatch cover unless absolutely necessary.
- Avoid wearing loose fitting clothing.
- Wear helmet and gloves.
- Do not stand too close to edge of elevator car.
- Do not stand too close to moving parts such as car door pulley.
- Avoid standing where oil or other material may cause poor footing.
- If the rescue elevator does not return to normal service after restoring power, it may be necessary to place the elevator in Phase I fire-fighter service and then turn back to normal service.

If working with an elevator mechanic and it is decided that the best rescue option is to move the car while riding topside:

- Disconnect power to other cars in the same hoistway.
- Wear helmet and gloves.
- All members shall be secured when a car is moving.
- Do not stand too close to the edge of the elevator car.
- Do not stand too close to moving parts such as car door pulley.
- Avoid standing where oil or other material may cause poor footing.
- The car should move slowly when utilizing the inspector’s topside controller.
- Watch out for counterweight assembly when car is moving.
- Do not grab hold of hoisting cables if 2:1 roping is used.
- Do not run the car beyond terminal landings.
FIRE OPERATIONS

This section outlines strategies for handling fire emergencies involving elevators.

Fires in the Pit Area

Normally fires in the pit are small in nature. It is suggested that the first-arriving engine bring a portable water extinguisher along with the standpipe pack. However, on a hydraulic elevator pit fire involving the hydraulic fluid, a Class B extinguisher or foam line may be needed.

The elevators shall be secured in the hoistway where the fire is located. The occupants must be removed before disconnecting the main line power. If the building is in alarm the elevators may have been recalled prior to your arrival. If the fire alarm was activated and the elevators have been recalled the affected car may need to be moved to an upper floor. This may require the use of Phase I and II emergency recall service (fire-fighter service). Once the car has been taken to the desired floor, power shall be removed at the main line disconnect.

In most cases, firefighters should be able to extinguish small elevator pit fires from the lowest hoistway door using a handheld extinguisher. This method prevents firefighters from going into the pit area.

If necessary, firefighters can gain access to the pit by lowering an attic ladder though the lowest possible hoistway door, only after disconnecting electrical power to all elevators in that hoistway. A firefighter should be designated as a safety person to monitor any car or counter weight movement. Additionally, the safety person can monitor wind currents, identify any flow paths, and be aware of stack effect within the elevator shaft as smoke can move swiftly to upper floors affecting a greater area of the building.

Fires in an Elevator Car

Although uncommon, fires can occur in elevator cars. The elevator car may have lacquered wood walls, wood flooring, and moving pads secured to the walls for protection during tenant moving. If a fire occurs while a tenant is moving, it is possible that the occupants have stacked the car with goods leaving only room for the operator to stand, and, thus, the elevator may have a heavy fire load. There have also been deliberate acts involving flammable liquids which were used inside an elevator car and the car was sent to a specific floor to create a serious problem. Keep in mind there is no sprinkler protection inside the elevator car.

The elevator rope (cable) consist of cold rolled steel wrapped around lubricant soaked (hemp) rope. Failure can occur at temperature above 800 degrees Fahrenheit.

The hoistway doors are typically two-hour fire rated but offer minimum smoke penetration protection.

Smoke and heat entering the shaft may enter the control room and could perhaps disrupt normal operations. Unless a building has two separate banks of elevators, separate control rooms, and
you can be absolutely sure of which bank is safe to use, access to the fire floor shall be made up the stairwell.

Stairwells adjacent to the elevator shaft may be within close proximity to each other, Figure 47. Using that stairwell for fire attack may jeopardize the stairwell with intense heat and smoke. When possible use an alternate stairwell for attack. If using a remote stairwell, you may have to add hose to the standpipe pack to make the stretch.

![Figure 47: Notice the close proximity of the stairwell to the elevator shaft.](image)

All floors must be checked for fire extension and open hoistways. The fire may have started on an upper floor, warped the hoistway doors open, and elevator recall may have sent the car to a distant location. Experience has shown that an elevator fire on a lower floor will result in heavy smoke conditions on the upper floors. Stack effect will cause smoke to stratify at various levels in high-rise buildings. Caution must be taken around hoistways. Firefighters have been killed by falling into elevator shafts from smoke-filled hallways.

Elevator components may have been damaged in high heat fires. Personnel shall not enter car until deemed safe by an elevator mechanic. As in any elevator emergency, the power must be removed from the main line disconnect in the control room.

Unique situations that may be encountered:

- The elevator floor and walls may be constructed of wood and maybe weakened by fire.
- The open shaft may have easily spread the fire vertically.
- The elevator car may have moved from floor to floor.
- Smoke and heat may effect elevator operations.
- Heat may have damaged the hoisting cables or brakes.

**Elevator Use during Fire Operations**

In any building, if the fire is on the sixth floor or below, the stairs must be used to access the fire floor. If the fire is above the sixth floor, the first-arriving company must evaluate the elevator
and make sure that the elevator is operating properly and the shaft is free of smoke, fire, or water. If deemed operational, fire department personnel may use the elevators for operations.

Some notes about the use of elevators in fire operations:

- Independent service is not to be confused with emergency recall service. In independent service, the elevator car doors will open automatically when arriving at the specified floor and is typically used by maintenance staff and/or person(s) moving in or out. In emergency recall service, the doors will not open until the door open button has been activated.

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

- If the building elevators have emergency recall service (fire-fighter service), the elevators could automatically be recalled to the lobby level by alarm activation, depending upon the type and location of the device. If there has been an activation of an alarm device at the lobby level, the elevator cars will be recalled to an alternate floor. Due to the fact that most modern high-rise buildings alarm the fire floor as well as the floor above and below the fire floor, this alternate location may be two floors above or below the lobby. The location of the elevators in this instance must be confirmed.

- Smoke detectors will normally be found in elevator lobbies, machine rooms, hoistways, and pits. The activation of any smoke detector in these areas will cause the activation of firefighter emergency operations system which is reflected by the flashing of the firefighter helmet or ‘Flashing Hat’ on the panel in the elevator car and on the lobby panel.\(^1\) If this symbol is flashing, fire department personnel should not use the affected elevator car.

- Heat detectors are normally found in elevator machine rooms and hoistways. The activation of a heat detector in these areas will cause the removal of power to the elevator before the application of the sprinkler system. It should be noted that emergency recall (fire-fighter) service will not work if a heat detector alarm is received for the elevator machine room or hoistway. In the event of a fire alarm is triggered by heat detectors in the elevator machine room or hoistway, the fire alarm system must immediately stop the elevator, even if it is between floors. A conventional, zoned fire alarm system accomplishes this by assigning a zone to the shunt trip condition or by the use of dual-contact heat detectors. An intelligent, addressable fire alarm system accomplishes the same thing through programming and an addressable relay.

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

Upon arrival, obtain keys for the elevator. If the building is in alarm, you should find the elevators in Phase I. If the building is not in alarm you must manually recall the elevators. In

\(^1\) ASME A17.1 Section 2.27.3.
both conditions you should insert the key in the elevator lobby and turn switch from off to on, Figure 48. All elevators are then recalled to the lobby for your control. If an elevator is not recalled, the doors for the car may have not closed for some reason or the elevator was placed in the inspection mode (by an elevator mechanic) prior to alarm.

**Figure 48:** To initiate Phase I emergency recall, fire department personnel will use the controls at the lobby level.

Once the elevator arrives, take the key out of the hallway switch and place the key in switch inside the car, Figure 49. Turn the key from off to on and Phase II emergency recall service is activated. In the Phase II you must hold the buttons for opening and closing until the desired action is complete. If you release the button prior to fully opening or closing the door, it will return to its last position.

**Figure 49:** To initiate Phase II emergency recall, fire department personnel will activate the controls inside the elevator car.

Prior to using the elevator, crews shall visually inspect the hoistway by looking between the car door and hoistway door. If there is evidence of fire, smoke, or water, elevators in that hoistway WILL NOT be used.

Do not overload the elevator. Each person with tools and equipment weigh well over two hundred pounds each. Each elevator has a nomenclature plate stamped with the maximum load limits. Given the space and weight restrictions, no more than two companies should use an elevator at one time. Additionally, personnel should remain cognizant of space within the car and
ensure they have room to move freely into and out of the elevator, and conduct a forcible exit if the car malfunctions.

Crews can take the elevator, stopping at intermediate points to confirm control of the car and to check the shaft for smoke or water. **Companies shall stop at least two floors below the fire floor and use the stairs for the remainder of their ascent to the fire floor.**

If the elevator is needed at the location two floors below the fire to assist with victim removal or to make sure you are on the correct floor, then leave the key in the on position. If the elevator is not needed, turn the key off, leaving the key in the slot. The elevator will return to the lobby as designed by Phase I emergency recall (fire-fighter) service. This will allow other companies and lobby control to use the elevator. For specific instructions on lobby control actions, refer the most current edition of *High-rise Building Fires.*


BUILDING FIRE ALARM AND ELEVATOR OPERATIONS

This section describes the operation of elevators during building fire alarms in buildings that are equipped with emergency recall (fire-fighter) service.

An elevator traveling away from the street floor or from its lowest landing floor when a building goes into alarm will reverse direction at the next landing without opening its doors, and return non-stop to the street lobby or terminal floor unless the activated alarm is received from the elevator lobby or terminal floor. In such case the car will go to an alternate landing.

Also upon alarm activation, doors opened at any floor will immediately close and the elevator will return non-stop to the street or terminal floor. Power-operated door opening devices, which may be affected by smoke, heat, or flame to prevent door closure, shall be rendered inoperative except for those mechanically activated by a safety edge.

Emergency Stop buttons will be rendered inoperative in Phase I emergency recall.

When the elevator car reaches its recalled location, one of the following will occur:

- All car and hoistway doors open. The doors remain open for at least eight seconds and no more than one minute and then close.
- All car and hoistway doors open. The emergency recall (fire-fighter) service elevator car and hoistway doors remain open with the car lights remaining on. Non-emergency recall (fire-fighter) service elevator cars and hoistway doors close between eight seconds and one minute after opening and will be unavailable.
- All elevator car and hoistway doors open and remain open. The car lights in the emergency recall (fire-fighter) service elevator cars remain on and the lights in the non-emergency recall (fire-fighter) service equipped cars go off.

In the lobby, leave the switch in the emergency recall (fire-fighter) service on position and remove the key. Note the location of the closest stairwell keeping in mind that floor plans on upper floors may be different. Then enter the car and insert the key in the emergency recall (fire-fighter) service control.

Located inside, on the cars operating panel, the emergency recall (fire-fighter) service key switch has three positions, Figure 50. On some installations only one car in the bank will have the Phase II emergency recall (fire-fighter) service and in other buildings all cars in the bank have Phase II emergency recall (fire-fighter) service.

- **Off position** is the normal non-emergency operation.
- **On position** allows the member to operate the car in Phase II emergency recall (fire-fighter) service.
- **Hold position** will keep the elevator car at the landing with the doors opened. The elevator will not operate until the in-car switch is returned to the on position.
- **By-pass position**, in some older installations instead of the hold, the elevator car had a by-pass selection. This was placed in the elevator car to quickly remove a car from a dangerous area. By placing the car in by-pass the car would descend in the shaft while the
doors were open. This operation if not used properly could severely injury firefighters and is being phased out.

- If the fire helmet icon is flashing, a smoke detector activation has been received from the elevator machine room, hoistway, or pit. Firefighters shall not use the elevators in that hoistway.

![Image of elevator control panel]

**Figure 50:** In Phase II emergency recall, there are typically three commands available: On, Hold, and Off.

Turn the key to the on position. While en route to the desired floor (two floors below fire floor), test the elevator controls. Press the door close button and select a floor one or two levels above your current location. The car should stop at the selected floor and the doors should not open automatically. They need to be manually opened by holding the door open button.

If the car fails to stop at your test floor, press the stop button. The stop button doesn’t work in Phase I, but does work in Phase II. If the car does not stop at the next available floor, attempt to stop the car by forcing the car doors open, thus interrupting the interlock relay switch. Slowly open the doors in order to stop the car at or near a landing so the personnel can evacuate the car. Notify the officer in command and initiate emergency evacuation procedures.

To check the floor selection buttons, press floor call buttons on several levels to ensure their operation. If the car stops at the selected floors, observe the location of the closest stairwell, continue to the desired floor.

If the car is operating normally when you reach the selected floor, press the door open button. You must keep your finger on this constant pressure button until the door is fully open, otherwise the door will close on its own. This is a built in safety feature.

If the doors open to heat and smoke, the simple removal of the finger from the door open button should enable the doors to close. If they fail to close automatically, press the door close button and manually assist the closing. If the car doors still fail to close, don SCBA face piece, evacuate the elevator and proceed to the nearest safe stairway. Denoting the location of stairwells at the level firefighters enter the elevator is vital if they have to evacuate the elevator at a fire with fire or smoke conditions.
When the elevator doors have fully opened, the elevator car will remain at the selected floor, with the doors open. The elevator car shall not be returned to the lobby street floor until the officer has determined that the unit has arrived at the proper location. Due to internal building security, it may be necessary to force your way out of an elevator landing into a stairwell or other floor areas, either for reasons of safety or in order to operate. Someone should stay with the elevator, to see that it is not moved from the floor, until safe access to the fire stair or fire area is assured.

To move from any floor, the door close button must be pushed, and another floor selected.

Once you have arrived at your final departure location (usually two floors below the fire) exit the car and turn the Phase II emergency recall (fire-fighter) service off and leave the fire service keys in the switch. This will return the car back to the lobby for additional firefighters to use.

**NOTE:** Once a firefighter service car has been placed in Phase II emergency recall (fire-fighter) service, it will continue in Phase II operation, regardless of the position of the lobby keyed switch. This feature may be used to restore other cars in the elevator bank to normal operation, while the fire department continues to use the emergency recall (fire-fighter) service car or cars. The lobby switch is turned from the on position to the bypass position.

If the Phase I emergency recall (fire-fighter) service was initiated automatically by the activation of a fire alarm device, the elevator cannot be returned to normal operation until the device has been cleared. In order for the occupants to use the elevators while the building is still in alarm, place the keyed switch in the lobby to bypass. This will allow normal operations until the fire alarm system is reset.

### Controls for Phase II

The following controls are used in Phase II service.

**Door close button:**

- It is a momentary touch type button.
- Once fully opened the elevator car doors close only in response to the door close button.

**Floor selection button:**

- When the car is in firefighter service, the car responds only to the floor selected by the floor selection button in the car.
- All elevator landing call buttons are rendered inoperable on landings served by this elevator.

**Call cancel (reset) button:**

- The call cancel button allows the operator to change floor selection or direction of travel prior to reaching the original selected floor.
- When the call cancel button is operated, the elevator car stops at the next available floor landing (i.e., the first floor, in the direction of travel, that the elevator is electrically and mechanically capable of serving). The doors remain closed. A new floor selection must then be made.
- It is recommended that the call cancel button be pressed whenever a member enters a car on emergency recall (fire-fighter) service to clear the floor selection panel of any previous floor selection that may have been made. This could be very important if someone had pressed the fire floor, or higher location button.

![Figure 51: An example of a panel inside of an elevator car when fire department personnel implement Phase II emergency recall.](image)

**Door open button:**

- The elevator door opens only when the door open button is pressed, regardless of hallway call signals.
- The door open button must be held until the doors are fully opened.
- If the door open button is released before the doors are fully opened, the doors return to the closed position. This feature is provided so that the release of the door open button will automatically close the doors in the event the car inadvertently stops at the fire floor.
- Members leaving the elevator car must verify that the doors are fully opened. If the member leaves the car before the doors are fully opened, the door will close behind him, isolating the car and placing it out of service.

**Emergency stop button:**

- The emergency stop button is rendered inoperative during the Phase I operation.
- The emergency stop button should be operational during Phase II operation.
- Activation of the emergency stop button in Phase II will quickly stop the elevator car.
In Phase I the car will return to the lobby uninterrupted, if the occupants attempt to activate the emergency stop button it will not activate. During Phase II the button will activate to allow firefighters to quickly stop the car if an emergency arises.

**General Procedures during Fire Operations**

The use of elevators during actual firefighting operations is considered a calculated risk. Statistical data from FDNY shows a relatively high rate of elevator failures during actual working high-rise fires, but there are also significant operational disadvantages and safety risks in expecting firefighters to climb 20 or more floors and extinguish a fire; reflex time and firefighter exhaustion would certainly become a critical factor.

When using elevators during fire operations:

- Account for all elevators that serve the fire floor, checking them for victims.
- Inspect the hoistway. If there are any signs of smoke, fire or water in the hoistway, do not use that hoistway!
- Note what elevator car number you are entering. Most elevators are numbered clockwise. The first elevator on your left is number one, and so on.
- All members riding in an elevator during fire operations shall have SCBA, have the emergency recall (fire-fighter) service turned on, and have their SCBA face piece in the ready mode.
- There must be a member with a radio in each car.
- Do not overload the elevator.
- A set of forcible entry tools shall accompany any moving elevator car.
- Stop the elevator one to two floors above floor of entry to verify emergency recall service is working. After ensuring the elevator is working properly, stop every fifth floor to ensure the car is responding to commands and to recheck the shaft for smoke, fire, or water.

If the car stalls, the following procedures should be followed:

- Check emergency stop button, if engaged reset to normal position.
- Get down to floor level.
- Do not go on air unnecessarily, conditions may get worse and you may need it later.
- Communicate a Mayday to command if necessary.
- Attempt to open the car door (most older car doors are not locked) you may find that you can reach the hoistway door locking mechanism and escape the car to a floor landing.

In an EXTREME EMERGENCY, your crew may have to be lowered or rappel down to a lower floor. Gain access to the car top thru the top scuttle hole. If no rope is available, fire department hose can be used to slide down to the floor below. If more than one length of hose is used, first tie the lengths together, and couple them.

If the car stops at a location where heat and smoke are encountered:
- Remove finger from door open button (door should close).
- Push the door close button.
- Force the door closed.
- Select a lower floor on the panel.
- Turn the Phase II emergency recall (fire-fighter) service off – this should automatically recall the elevator to the lobby.

Mayday considerations:

- In addition to a possible redeployment of attack lines, consideration should be given to forcing open hoistway and car doors with power tools. Doors may have warped due to heat and may not operate normally.
- Positive pressurization of the elevator shaft containing the stalled car may provide some relief to the trapped members and facilitate the rescue.
- Application of hose streams into the shaft may also be necessary to provide protection until the rescue is completed. Cooling of the cables may also be necessary in areas above the stalled car.
ESCALATOR EMERGENCIES

The escalator system is a basic concept of a conveyor belt. It is chain driven system that rotates treads (stairs) in an enclosed loop rail, Figure 52. The system can travel in either direction and can be vertical or horizontal. A 100 horse power electric drive motor rotates a drive gear that rotates a guide chain that the treads are connected. This same drive motor also powers the handrail. The handrail and tread system are designed to rotate at the same speed to provide stability to the rider.

Although rare, there are usually only two types of escalator entrapments. Adults, but more commonly children, will get their fingers caught in the moving handrail or their feet caught in the step at the bottom of the landing. The second type of incident is one in which clothing becomes entangled in the moving parts. An exceptional type of incident would be for an elevator mechanic being caught in a gear mechanism. If you are responding to a known entrapment, request an elevator/escalator mechanic while en route to the scene.

Shutting off the power to the unit is the first thing to accomplish on any escalator emergency. The emergency shut off is located at the bottom of the escalator under the handrail. Some installations may have an extra shut off at the top of the escalator.

To remove power lift clear cover and depress button, Figure 53.
To remove an entrapped foot at the landing plate, remove the screws holding the plate or comb plate and lift the plate out, Figure 54. If the screws cannot be removed, the foot stairs may be broken to access the entrapped foot. By hitting the step tread in the middle of the plate the cast metal will break into large pieces. Step treads are made of die cast aluminum. Some treads may have steel reinforcement and cutting down the middle of the tread may be required. The circular saw with the metal blade is the tool of choice for this course of action. (Note: emergency shut off located to the right handrail in Figure 53.)

To remove trapped fingers from the handrail, disassemble or loosen the wheel that controls the handrail. The location of the handrail motor is the same location as the motors that drive the entire escalator.

It would be unwise to try and reverse the direction of any escalator without the assistance of a mechanic. Escalators have many safety control devices that prevent the machine from running backwards.