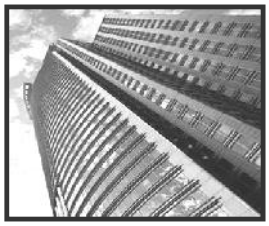
Dragon Rescue Technology

Westbury
Fire Department



Handling Elevator Emergencies

Operational
Level
Training

SHARING INFORMATION

References

- A.S.M.E. A17.1 – Safety Code for Elevators & Escalators
- A.S.M.E. A17.4 – Emergency Evacuation of Passengers from Elevators
- N.E.I.E.P. – Training Modules
- F.D.N.Y. - Training Bulletin/Emergencies 1/Elevator Operations/March 15, 1997
- Howstuffworks.com/How Elevators Work
- YouTube.com
- Otis.com
- Elevatorbob.com

A.S.M.E. – American Society of Mechanical Engineers
N.E.I.E.P. – National Elevator Industry Educational Program
F.D.N.Y. – Fire Department City of New York

Elevator Intro

- Most common form of transportation
  - Travel millions of miles
  - Reach great heights
  - Can be found anywhere
- Safest form of transportation
  - Occasionally present a problem
  - Needs immediate attention
  - Not always an emergency

WAIT FOR ELEVATOR MECHANIC
IF POSSIBLE!

Elevator Intro

What prohibits waiting for mechanic ?

- Emergency situation (fire, medical, panic)
- Availability & response time of mechanic
- FD apparatus availability & call volume

Elevator Intro

If this is the case, rescuers must be familiar with elevator:

- Components & operation

Elevator Intro

- The main focus for this training program is to provide the necessary information needed to free a victim from a stalled elevator.
- It is not intended to turn rescuers into elevator mechanics, but only to provide information on how to safely remove the victim from their unfortunate situation.

Topics Covered

- Nomenclature
- Elevators (101) & Safety
- Manually Moving a Hydraulic Elevator
- Elevator Safety Devices
- Machine Room-less Elevator (MRL)
- Possible Equipment Needed
- Initial Response Steps

Topics Covered

- Lock-out/Tag-out
- Removing Passengers from Stalled Elevators
- Elevator Doors
- Use of Hoistway Door keys/Pick Tools
- Poling
- Fireman's Service

Why Do Elevators Stall?

- Human error
- Equipment malfunction
- Electrical & mechanical safeties
- Power failure
- Relay's & switches in the control panel
- No preventive maintenance
- Overloading

Elevator Terms

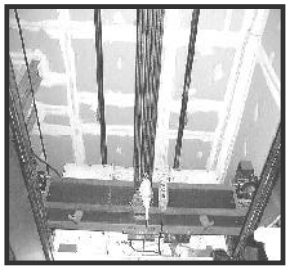
Hoistway:
Emergency stop switch:
Position indicator:
Door lock:
Interlock:
Interlock release key:

Elevator Terms

Counterweights:
Guide rails:
Hoist Cable (Rope):
Guide Roller/Guide Shoe:
Main line disconnect:
Top escape hatch:

Elevators (101) & Safety

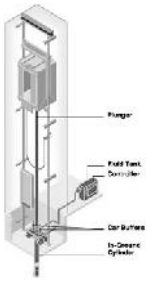
Two most common types of elevators



The Hydro
(4-types)

Holed Hydro

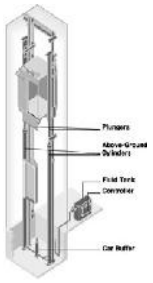
- Jack & piston are installed below ground
- Found in low-rise buildings (up to 60 feet)
- Motor room is generally located at the lowest landing (adjacent to the shaft)
- Reach speeds between 100-150 fpm or 1-1.5 mph



The Hydro

Hole-less Hydro

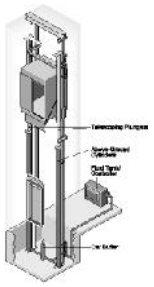
- Jack & piston (1 section) are installed above ground
- Found in low-rise buildings (up to 20 feet)
- Motor room is generally located at the lowest landing (adjacent to the shaft)
- Reach speeds between 100-150 fpm or 1-1.5 mph



The Hydro

Telescoping Hydro

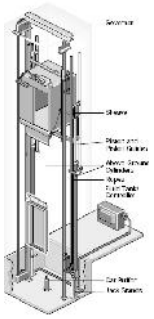
- Jack & piston (max. 3 sections) are installed above ground
- Found in low-rise buildings (up to 40 feet)
- Motor room is generally located at the lowest landing (adjacent to the shaft)
- Reach speeds between 100-150 fpm or 1-1.5 mph

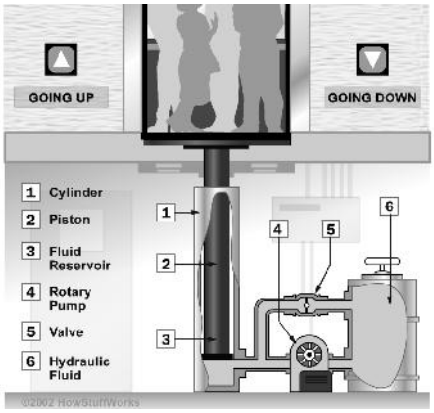


The Hydro

Roped Hydro

- Jack & piston are installed above ground
- The cable extends the height of the elevator travel to 60 ft.
- Found in low-rise buildings
- Motor room is generally located at the lowest landing (adjacent to the shaft)
- Reach speeds between 100-150 fpm or 1-1.5 mph





The Hydro

The Pit (hazards)

- Inadequate refuge space
- Inadequate lighting
- Improper access
- Tripping hazards
- Unsafe or lack of pit ladders
- Moisture/water/oil
- Moving equipment

Do Not step on the pipe!

The Hydro

Motor Room (hazards)

- Electricity
- Moving Parts
  - Avoid wearing turnout gear
- Communication problems
- Hot hydraulic oil

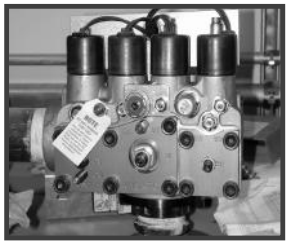
The Hydro

Top of Car (hazards)

- Inadequate lighting
- Overhead clearances
- Tripping hazards
- Oily surfaces
- Extreme falling hazard
- Moving equipment
  - Adjacent car
  - Door motor
- Top escape hatch

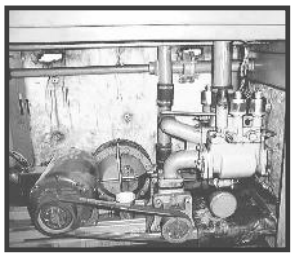
The Hydro

New style (motor room)



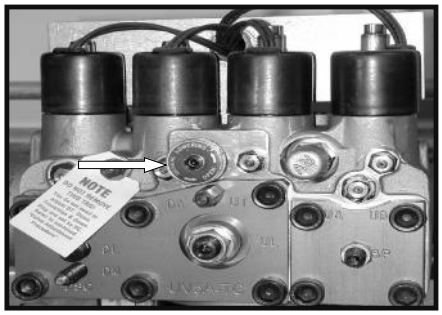
The Hydro

Old style (motor room)



Manually Moving a Hydraulic Elevator

Manually Moving a Hydraulic Elevator



Manually Moving a Hydraulic Elevator

IMPORTANT

- This procedure should only be performed when an emergency exists...
  - Fire
  - Medical
  - Panic
- This procedure should only be performed by personnel trained to the operational level or under the direct supervision of an elevator mechanic...

Manually Moving a Hydraulic Elevator

Locating the valve & Manual Lower (ML) device

Valve Locations

- Inside tank (most common)
- Below tank
- Outside tank

Types of ML devices

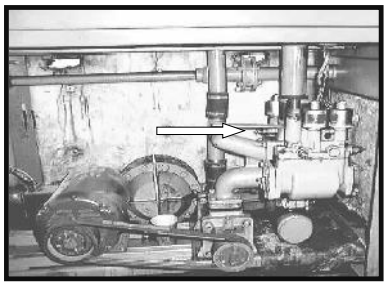
- "T" shaped
- Wheel type
- Spring loaded push type

Manually Moving a Hydraulic Elevator

Remove cover

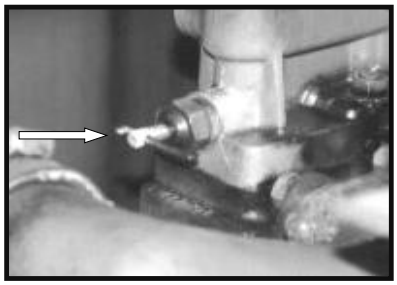
Manually Moving a Hydraulic Elevator

Under tank



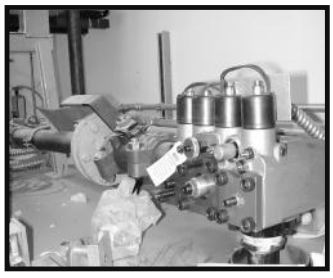
Manually Moving a Hydraulic Elevator

"T" valve



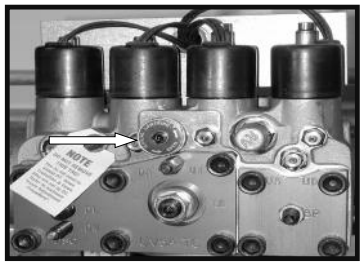
Manually Moving a Hydraulic Elevator

Outside the tank



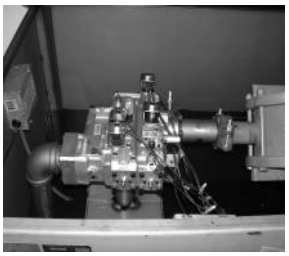
Manually Moving a Hydraulic Elevator

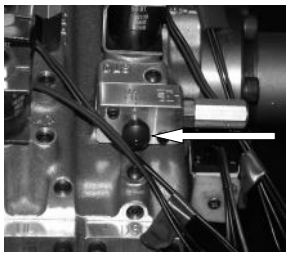
Wheel type



Manually Moving a Hydraulic Elevator

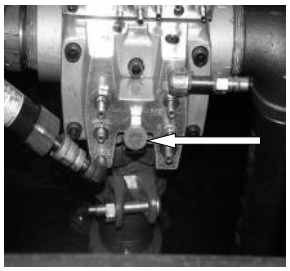
Spring loaded push type (inside tank)





Manually Moving a Hydraulic Elevator

Spring loaded push type (inside tank)



Manually Moving a Hydraulic Elevator
(Procedure)

- Kill the power (lock/out-tag/out)

Manually Moving a Hydraulic Elevator

- Establish communication w/ passenger & instruct them to stay away from the doors
- Let them know you are attempting to move the elevator

Manually Moving a Hydraulic Elevator

- Send two rescuers to motor room & locate manual lowering device
- Establish constant/ clear communication between lowering team & spotter
- Do Not open valve until given the OK from spotter

Manually Moving a Hydraulic Elevator

- Open valve, on command of spotter, until hydro oil can be heard flowing into the tank
- Keep hand on the valve, ready to stop procedure, at a moments notice

Manually Moving a Hydraulic Elevator

- A member must be at the landing where car is relocated to spot the car & assist passenger off the elevator

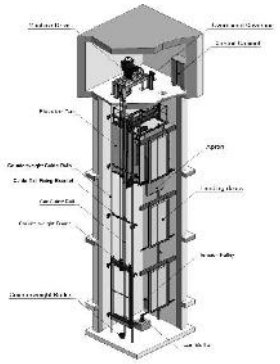
Manually Moving a Hydraulic Elevator

- Lower the elevator to a floor that has a key hole or the lowest landing
- Close manual lowering device
- Do Not restore power to the elevator

Warning:

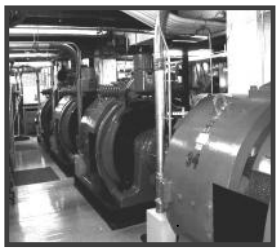
If the elevator does not move with the ML device in the open position, stop immediately and find another way to remove occupant!

Traction Elevator



Traction Elevator
(Two Types)

Geared & Gearless (overhead installation)



Traction Elevator

Geared

- Reach speeds up to 450 fpm or 5 mph
- Generally found in buildings under 20 stories
- Motor room is generally located directly above the last stop or in a separate structure on the roof

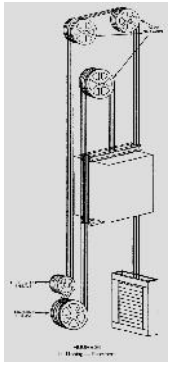
Traction Elevator

Gearless

- Operating speeds are 450 - 3000 fpm or 5 - 34 mph
- Found in buildings 20 stories or more
- Motor room is generally located directly above the last stop or in a separate structure on the roof

Traction Elevator

Basement traction (geared or gearless)



Traction Elevator

Steel Wire Hoist Cable (Rope)

- Usually a 4 to 5 cable configuration
- One cable is rated to support the car at full capacity
- Number of cables info found on Data Tag

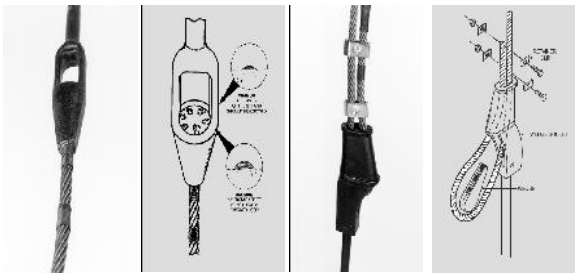
Traction Elevator

Data Tag

Traction Elevator

Steel Wire Hoist Cable (Rope)

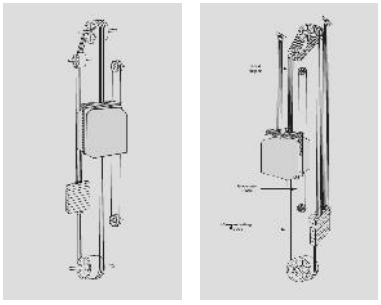
– Connected to car via shackles



Traction Elevator

Cable Configuration
(2 types)

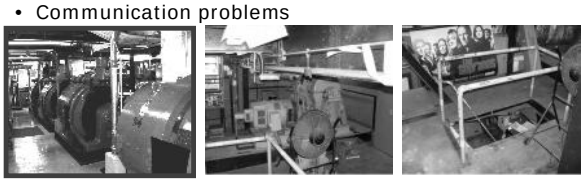
- 1:1 roping
- 2:1 roping



Traction Elevator

Motor Room (hazards)

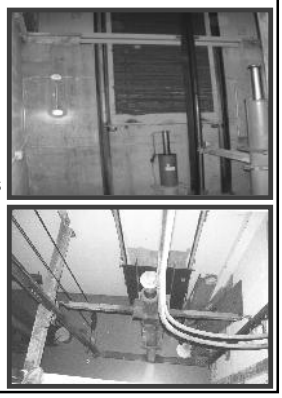
- Electricity
- Moving Parts
  - Avoid wearing turnout gear
- Falls from secondary levels
- Tripping hazards
- Low clearances
- Communication problems



Traction Elevator

The Pit (hazards)

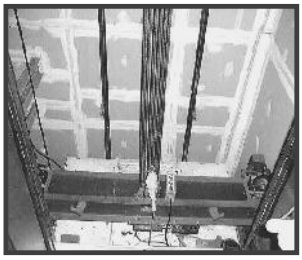
- Inadequate refuge space
- Inadequate lighting
- Improper access
- Tripping hazards
- Unsafe or lack of pit ladders
- Moisture/water/oil
- Moving equipment
  - Counterweight
  - Sheaves



Traction Elevator

Top of Car (hazards)

- Slacked or broken cables
- Inadequate lighting
- Overhead clearances
- Tripping hazards
- Oily surfaces
- Extreme falling hazard
- Moving equipment
  - Counterweight
  - Sheave (2:1 roping)
  - Adjacent car
  - Door motor
- Top escape hatch



Elevator Safety Devices

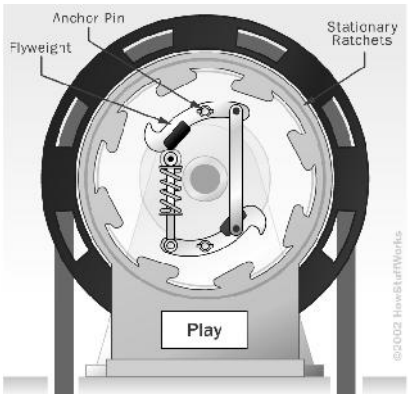
The Governor

Monitors the speed of the car in the down direction

Two types:

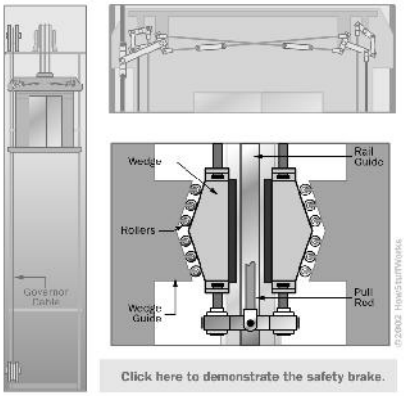
- Centrifugal (most common)
- Fly-ball

FIGURE 22
Flyball Governor

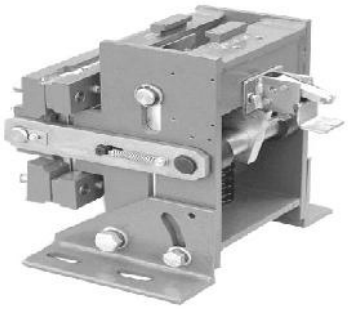


Elevator Safety Devices

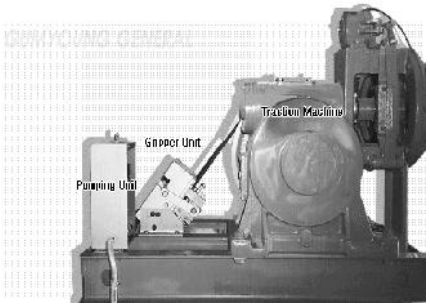
Car safety



Rope Gripper



Rope Gripper



Elevator Safety Devices

Door protective and re-opening device

Mechanical

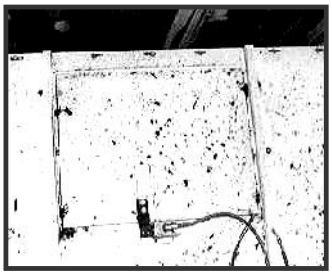
Infrared

Elevator Safety Devices

Door restriction device

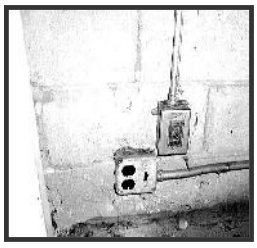
Elevator Safety Devices

Open door sensors



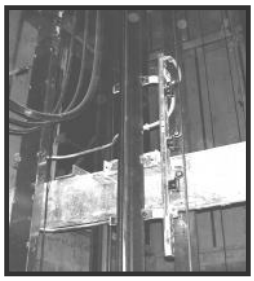
Elevator Safety Devices

Electric current safety switch

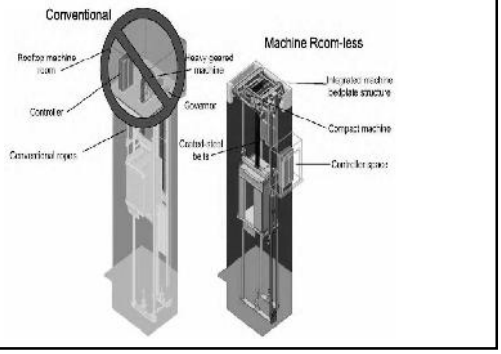


Elevator Safety Devices

Safety devices in the hoistway



Machine Room-less Elevator (MRL)



Machine Room-less Elevator (MRL)

- MRL- intent is to replace the hydro (EPA concerns)
- Usually found in low to mid-rise buildings (reach travel speed up to 450 fpm)
- Typical motor room is not required
- Hoist machine & governor is located in the shaft
- Controller & main-line disconnect is located in a room usually at the top floor

Elevator Doors

- The Car Door (components)
  - Door panel(s)
  - Door clutch (vain)
  - Safety edge
  - Door motor swing arm
  - Gate switch

•Door panel(s)
•Door clutch (vain)
•Safety edge

•Door motor
•Door motor swing arm
•Gate switch

Elevator Doors

- The Hoistway Door

Elevator Doors

- Hoistway Door (4 common types)
  - Single speed, side-sliding
  - Two speed, side sliding
  - Single speed, center opening
  - Two speed, center opening

Elevator Doors

- Single speed, side-sliding

Elevator Doors

- Two speed, side sliding

Elevator Doors

- Single speed, center opening

Elevator Doors

- Two speed, center opening

Elevator Doors

- Hoistway Door (cont.)
  - Generally, hollow lightweight metal construction
  - Fire protection rating (2 hour min.)

Elevator Doors

- The Hoist-way Door (components)
  - Door lock/ Interlock
  - Door closure
  - Keyhole
  - Door rollers
  - Door Track(s)

Use of Hoistway Door Keys and Pick Tools

Possible Equipment Needed

Possible Equipment Needed

- Short extension

Possible Equipment Needed

- Attic ladder

Possible Equipment Needed

- Interlock release keys

Possible Equipment Needed

- Lock-out/tag-out Kit

Possible Equipment Needed

- Radios

Possible Equipment Needed

- Harnesses

Possible Equipment Needed

- Rope

Possible Equipment Needed

- Forcible entry tools

Possible Equipment Needed

- Hand lights

Possible Equipment Needed

- Poling device

Possible Equipment Needed

- Extinguisher

Possible Equipment Needed

Initial Response Steps (Upon Arrival)

- Contact elevator mechanic/building manager
- Obtain knox box keys
- Verify which elevator is stalled
- Locate the elevator

Initial Response Steps (Upon Arrival)

<u>Locating the elevator</u>

- Position Indicator
- Open lobby door
  - See car
  - Counterweight position
- Adjacent Car
- Motor room
  - Look down shaft-way (traction car)
  - Controller (floor selector)
- Laser Tape

Initial Response Steps

- Make verbal contact w/passengers once car is located
- Have the passenger cycle the stop switch a few times, to ensure the switch is not in the stop position
- Have the passenger push a couple of floor buttons

Initial Response Steps

- Have the victim push close the car door
- Make sure all hoistway doors are fully closed(front/rear/side)
- Activate phase 1 switch in the lobby

<u>Caution</u>

* Victim must be notified before activating phase 1*

Initial Response Steps

- Cycle the main line

Lock/out - Tag/out Procedures

Lock/out - Tag/out Procedures

This procedure is designed during elevator rescue operations to ensure that power has been removed and to prevent the unauthorized restoration of power.

Lock/out - Tag/out Procedures

Procedures

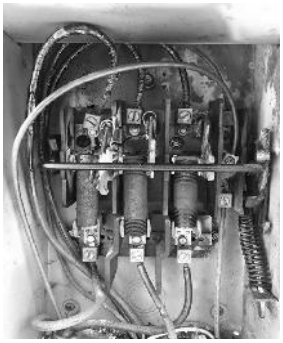
- Understand the equipment and its potential hazards.
- Open the mainline power disconnect switch to shut off the power, when ordered by the IC.
- Do not stand directly in front of the mainline disconnect when operating.
- Apply a lock and a "Do Not Start" tag.

Lock/out - Tag/out Procedures

Procedures

- Verify that power has been removed.
  - After initiating lock-out/tag-out, the lighting circuit will still be energized.
  - Position Indicator
  - Open Controller Cabinet, look for lights.
  - Push a hall button (single car).
  - Wait until DC generator stops.

Lock/out - Tag/out Procedures



Removing Passengers from Stalled Elevators

Four most important points (review)

- Safety
- True emergency (Incident vs. Emergency)
- Kill the power! (Lock-out/Tag-out)
- Do not restore power! (Stalled elevator)

Removing Passengers from Stalled Elevators

Safe Order of Removal:

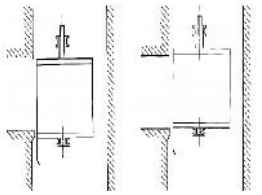
1. Floor level/normal entranceway (safest)
   - Use initial response steps
2. Floor above/normal entranceway
   - Minimizes falling hazard
3. Floor below/normal entranceway
   - Must barricade opening to shaft-way
4. Top escape hatch
   - Fall arrest system required

Removing Passengers from Stalled Elevators

- 4 elevator rescue conditions
  - Car at or near the landing (within 18 in.)
  - Car within 3ft. of the landing (above or below)
  - Car more than 3ft. from the landing (above or below)
  - Car more than 3ft. of the landing (Top escape hatch removal)

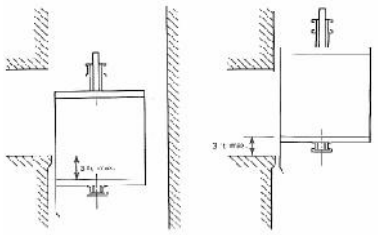
Removing Passengers from Stalled Elevators

Car at or near the landing



Removing Passengers from Stalled Elevators

Car within 3ft. of the landing (above or below)



Removing Passengers from Stalled Elevators

Car more than 3ft. of the landing (above)

Removing Passengers from Stalled Elevators

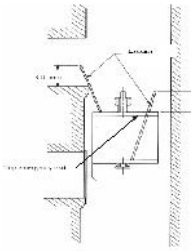
Car more than 3ft. of the landing (below)

Use a ladder!

Removing Passengers from Stalled Elevators

Car stalled more than 3 feet of the landing (Top escape hatch removal)

Fall arrest system is Required!

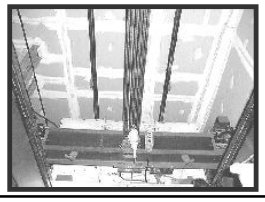


Removing Passengers from Stalled Elevators

Warning

Check the elevator car top for slack, broken, frayed or missing cables before stepping onto the elevator

Good Cables



Bad Cables

Removing Passengers from Stalled Elevators

Safety Concerns:

- When ever possible remove trapped occupant from the floor above (minimizes falling hazard)
- If the opening through the normal entranceway has less than 3 feet of clearance, remove occupant via an escape hatch

Removing Passengers from Stalled Elevators

Fireman's Service

Quick terms

- Lobby: every landing or floor the elevator stops.
- Main lobby: main elevator lobby.
- Designated level: the landing that the elevator will return to, when phase I is activated.

Fireman's Service

Quick terms

- Alternate designated level: the alternate landing that the elevators will return to, when phase I is activated.
- Phase I switch : the switch located outside the elevator on the designated level.
- Phase II switch: switch located inside the car.

Fireman's Service

Fireman Service is activated Automatically or Manually

Fireman's Service (Phase I Operation)

Automatically

Fireman's Service (Phase I Operation)

Phase I is activated automatically by the Fire Alarm Initiating Device (FAID)

FAID Locations:

- Lobby landing's
- Shaft-way
- Motor room

Fireman's Service (Phase I Operation)

Manually

- Turn key to "On" position

Fireman's Service

- Phase I switch (3 position switch)
  - Off (normal operation)
  - On (activates system)
  - Reset

Bypass has been replaced with Reset
(ASME A17.1 – 2004)

Fireman's Service

- Phase II operation

Fireman's Service

- Phase II switch (3 position)
  - Off (normal operation)
  - On (activates system)
  - Hold (keeps car at landing)

Fireman's Service

Operating Procedure

- Look at fire hat on panel
  - If flashing, FAID in motor room or shaft is activated
  - Recommended not to use elevator
- Insert key & turn to "On" position
- Press desired floor button
  - Two floors below fire floor
- To cancel floor selection, press "Call Cancel"

Fireman's Service

Operating Procedure

- Press & hold "Door Close" button
- Make several stops before arriving at the destination floor, insuring proper operation
- To open door press & hold "Door Open" button
  - Check doors for heat and/or smoke before pushing "Door Open" button

Fireman's Service

Operating Procedure

- Check shaft for smoke and/or water
- To hold car at floor turn key to "Hold" position
  - Make sure doors are fully open
- To return car to Recall Floor, turn key to "Off" position
  - Make sure doors are fully open

Fireman's Service

Resetting the elevator

- Return elevator to recall floor
- Turn "Phase II" switch to the "Off" position & remove key
- Insert key into "Phase I" switch & turn key to "Reset"/"Bypass" position, then turn to "Off" position

THE END

- If you have any questions or encounter an oddball elevator or escalator incident, please contact us ASAP. It would be our pleasure to assist you and can use the info in future presentations.

STAY SAFE!!

Michael A. Dragonetti
President
PO Box 22
Hawthorne, NY 10532
(914) 747-2210
Web-site: www.dragonrescue.com

Professionals
Training
Professionals