Elevators Used for Evacuation During an Emergency

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Elevators Used for Evacuation During an Emergency

- ASME Workshop – March 2004
- Two Task Groups established
  - Use of Elevators for Occupant Egress
  - Use of Elevators by Firefighters
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- Task Group process:
  - Review the suggestions from the 2004 Workshop
  - Develop prioritized list of issues
  - Conduct a Hazard Analysis of the prioritized list of issues
  - Draft code revisions or recommendations
  - Summary of Recommendations sorted by type:
    - Elevator, Building, Electrical, Life Safety, Firefighters, Accessibility
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Hazard Analysis

Investigation of use of elevators during emergencies for evacuation of occupants in an occupied high-rise office building prior to activation of Firefighters Emergency Operation Phase I Recall
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Occupant Evacuation Operation (OEO)

• Proposed new definition and requirements in ASME A17.1/CSA B44 – 2013 Code:

**Occupant Evacuation Operation:**

“The operation of an elevator system for occupant evacuation under emergency conditions”
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**Occupant Evacuation Operation (OEO)**

- Elevator operation for egress from *five* affected floors to the elevator discharge level
  - Floor with active alarm, two above and two below
- Non-mandatory requirement
- When elevators are provided for Occupant Evacuation, all passenger elevators shall meet the requirements
Occupant Evacuation Operation (OEO)

• Fire Alarm Interface:
  – Fire alarm system provides signals to the elevator system indicating the floors to be evacuated
  – **OEO** activated upon activation of an automatic Fire Alarm Initiating Device (FAID) in the building in any area which does not initiate **FEO** Phase I Recall in the group
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• Fire Alarm Interface (cont’d):
  – If activation of an automatic FAID occurs on an additional floor(s) at any time while Occupant Evacuation Operation is in effect, evacuation zone is expanded:
    • all floors with an active alarm
    • all floors between the highest and lowest floor with an active alarm
    • plus two floors above the highest floor with an active alarm and two floors below the lowest floor with an active alarm
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• Fire Alarm Interface (cont’d):
  – Manual initiation by authorized or emergency personnel permitted
  – Option for Full Building Evacuation, manually initiated in Fire Command Center
    • Fire alarm system provides signal to elevator system that all floors to be evacuated
  – “Real-time” signage on all floors to inform building occupants whether or not to use the elevators on a given floor
Elevators Used for Evacuation During an Emergency

- Traditional Signage
- Not to be used in buildings with OEO
**Elevators Used for Evacuation During an Emergency**

**OEO signage:**

- “**ELEVATORS AVAILABLE FOR EVACUATION. NEXT CAR IN ABOUT 2 MINUTES**”
- “**ELEVATORS TEMPORARILY DEDICATED TO OTHER FLOORS**”
- “**ELEVATORS OUT OF SERVICE. USE STAIRS TO EVACUATE**”
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Occupant Evacuation Operation (OEO)

- Signage at the designated landing advising people to not use the elevator
  - “ELEVATORS DEDICATED TO EVACUATION. DO NOT ENTER ELEVATOR”

- Signs in cars giving passengers instructions
  - “EXIT ELEVATOR ”

- “Real-time” voice announcements to elevator lobbies and cars
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Occupant Evacuation Operation (OEO)

- When OEO is actuated:
  - Landing calls outside of evacuation floors cancelled and disabled
  - Security systems overridden
  - Landing calls within the affected floors will call an elevator
  - Floor with active alarm given highest priority
  - At other floors, evacuation priority assigned in sequence received
  - Highest calls given highest priority in Full Building Evacuation unless there are calls at affected floors
  - Car calls disabled except for elevator discharge level
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Occupant Evacuation Operation (**OEO**)  

- When **OEO** is actuated:  
  - Unoccupied cars move to a floor being evacuated and park with doors closed until a landing call is registered  
  - Occupied cars proceed directly to elevator discharge level, then proceed directly to a floor being evacuated  
  - New landing calls are registered immediately and assigned to another car  
  - New landing calls shall not prevent a loaded car from leaving  
  - Cars with 80% of load shall start to close doors and proceed to elevator discharge level  
  - Cars with over 100% load will not leave the floor, doors will open and remain open  
    - Voice and visual signal notification
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Occupant Evacuation Operation (OEO)

• Once the affected floors have been evacuated:
  – Indicated by a 60 second period in which no landing calls are registered
  – One car shall park with its doors closed at the lowest floor of the affected floors ready to answer subsequent landing calls
  – Rest of cars shall park with doors closed at the elevator discharge level
  – Car parked at the elevator discharge level shall replace the car at the lowest floor of the affected floors which has answered a landing call
  – OEO terminated by
    • FAIDs or keyswitch initiating FEO Phase 1; or,
    • reset of Fire Alarm system
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Occupant Evacuation Operation (OEO)

- Firefighters can manually recall one or more cars and leave other cars on OEO
  - GROUP FIRE RECALL
    - Red or contrasting with red text
  - CAR FIRE RECALL
    - Black text on yellow background
- Key switches required for OEO are operable by the universal FEO-K1 key
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Occupant Evacuation Operation (OEO)

- CAR FIRE RECALL turned to “ON” position terminates OEO on that car only
  - FEO Phase 1 Recall initiated on that car only

- GROUP FIRE RECALL turned to “ON” position terminates OEO on all cars in the group
  - FEO Phase 1 Recall initiated on all cars in the group
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• Occupant Evacuation Operation
  – Appendix on Building Requirements:
    • High – rise business occupancy complying with Building Code
    • Protected lobbies (25% floor population) and stairwells with direct access
    • Pressurized hoistways, lobbies and stairwells
    • Automatic sprinkler system per NFPA 13 except hoistways and machine rooms (no shunt trip)
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- Occupant Evacuation Operation
  - Appendix on Building Requirements:
    - Building smoke detection system
    - Voice alarm/communications system per NFPA 72
    - Protected Emergency Power (2 hr) to elevators, signage/voice systems, pressurization systems, ventilation
    - Water flow protection of hoistways
Elevators Used for Evacuation During an Emergency

• Occupant Evacuation Operation
  – Appendix on Building Requirements:
    • Building Fire and Evacuation Plan
      • Procedures for evacuation using stairs and elevators
      • Building occupant training and drills
      • Use of floor wardens
      • Routine integrated testing

• Requirements for “OCCUPANT EVACUATION ELEVATORS” (OEE) included in ICC International Building Code – Section 3008
Elevators Used for Evacuation During an Emergency

Intelligent Building Technology Integration

Detection and Alarm

Fire Alarm System

HVAC System

Security System

Evacuation Control System

Content Server

A/V Displays

A/V Sources

Command Centre

Elevator System

Mobile Devices
USE OF ELEVATORS by FIREFIGHTERS

• **Hazard Analysis**

An investigation of enhancing the use of elevators by firefighters during emergencies in an occupied high-rise office building. Could elevators be more robust to enhance firefighters effectiveness?
USE OF ELEVATORS by FIREFIGHTERS

• *Fire Service Access Elevator* is one that will provide greater protection allowing the elevator to continue to operate for the firefighters to complete their operations

• Requirements included in International Building Code (IBC) Section 3007

• Minimum two FSAEs required in all High-Rise buildings with occupied floor > 120 ft (36.6 m)

• Minimum capacity 3500 lb (1588 kg)
USE OF ELEVATORS by FIREFIGHTERS

• Fire Service Access Elevator enhancements include:
  – Protection from water
  – Protection from smoke and heat
  – Protection of primary and backup power supplies
  – Direct access to protected lobby and stairwell containing standpipe
USE OF ELEVATORS by FIREFIGHTERS

Fire Service Access Elevator

• Protection from water
  – No sprinklers in Machine/Control Rooms, Machinery/Control Spaces and Hoistways
  – Sprinkler Monitoring
  – Approved system to prevent water inflow to hoistway from automatic sprinklers outside the enclosed FSAE lobby
  – Shunt Trip (removal of power) not permitted on FSAEs
  – Structural integrity of hoistway specified
USE OF ELEVATORS by FIREFIGHTERS

Fire Service Access Elevator

• Protection from smoke and heat
  – Hoistway Enclosure
  – Hoistway Lighting when Firefighters Emergency Operation is active
  – FSAE Lobby
    ▪ Direct access to stairway
    ▪ One hour fire-rated barrier
    ▪ Rated doors
    ▪ > 150 ft² (14 m²) with min dimension 8 ft (2440 mm)
USE OF ELEVATORS by FIREFIGHTERS

Fire Service Access Elevator

• Protection of primary and backup power supplies
  • Standby power required for
    – Elevator Equipment
    – Elevator Hoistway lighting
    – Ventilation and cooling equipment
    – Elevator car lighting
  • Wires or cables located outside the hoistway and machine room providing normal or standby power, control signals, communication with the car, lighting, heating, air conditioning or ventilation and fire-detecting systems protected by:
    – Construction having a 2 hour fire-resistance rating
    – Circuit integrity cable having a 2 hour fire-resistance rating
USE OF ELEVATORS by FIREFIGHTERS

Fire Service Access Elevator

- Direct access to protected lobby and stairwell containing standpipe
  - Without passing through FSAE lobby
- Other Requirements:
  - FSAE to be continuously monitored at Fire Command Center
    - Location within the hoistway
    - Direction of travel
    - Whether they are occupied
  - Identification of FSAEs at lobby
USE OF ELEVATORS for EVACUATION and by FIREFIGHTERS
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