



Elevators, Fire, and Accessibility

***Papers presented at:* The 2nd Symposium on Elevators, Fire, and Accessibility
Baltimore, Maryland
April 19 – 21, 1995**

Sponsored by:

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HIGH-RISE BUILDING EMERGENCIES

Education Evacuation by Elevator Firefighter's Elevators External Platform

by Larry Holt

An excerpt from the Fire Commissioner's report to the Mayor read as follows:

"Planning for such a skyline fire dates back almost 20 years. When buildings began to grow taller and taller in Manhattan, the fire department began to concern itself with how well it would be able to handle a sizable blaze high up in a tall building. . . ."

The Commissioner's name was Walsh, the Mayor was La Guardia, the year was 1945. The report concerned the 300 mph crash of a U.S. Army bomber into the north face of the Empire State Building between the 76th and 79th floor (FIREHOUSE). Almost 50 years later the question is: Are we able to handle a sizable blaze high up in a tall building?

INTRODUCTION

With each high-rise emergency, be it fire; bomb scare; or earthquake; we are offered another view of the many unforeseen deficiencies relating to building evacuation and access by emergency personnel. As it is, present code requirements concerning elevator emergency service operation have been brought about by a history of past failures (ASME, 1990). Realizing the multitude of insurmountable problems, the elevator industry has again acted responsibly by calling for a 2ND SYMPOSIUM ON ELEVATORS, FIRE, AND ACCESSIBILITY.

In America's zeal to mainstream the high-rise community elevators have been the accommodating factor. However, during building emergencies it may appear the special needs of mobility impaired people have been dangerously placed on the back burner. Although refuge areas have been designed

they are not the answer.

In Los Angeles, the First Interstate Bank Tower fire spread so quickly that fire officials cited that the flashover effect may cause the 62-story building to collapse (AP, 1988). In February of 1991, three firefighters were killed battling the One Meridian Plaza fire in Philadelphia. About eleven hours into the blaze a structural engineer warned that the top twenty floors of the building could collapse (AP, 1991). Fortunately both of these examples withstood the disaster, yet these cases make it evident that something besides refuge areas must be done.

The purpose of this paper is not to diminish the importance of refuge areas but to offer adjunct alternatives in the way of building evacuation by elevators, Designated Firefighter Elevators, and External Emergency Scaling Platforms. However, the paper will begin with a strong recommendation directed toward building owners, rescue personnel and firefighters about elevator education.

EDUCATION

Proper and thorough elevator safety training is essential for rescue personnel and firefighters who may be involved with elevator structures. Having been actively involved with instructing firefighters for the past ten years I can personally testify to the limited awareness found concerning real life elevators which should not be confused with what one sees on Hollywood's silver screen.

Untrained rescue personnel can actually compound an emergency with disastrous results. In one documented incident, firefighters responded to a power outage elevator entrapment at a senior citizen building. For almost two hours the

firefighter's efforts had not gained them entrance to the elevator and when the power was restored the three trapped passengers remained stuck due to the damage caused by the well-meaning rescuers. Eventually, the occupants were removed through the side access door of the neighboring elevator car with the aid of the building management (Waterbury-American). This is a dangerous procedure that could have been avoided with the proper training.

The misadventure continued for two additional days while the elevator awaited a new hoistway door to be fabricated, delivered, and installed. One elevator for eighteen floors of senior citizens constitutes a tremendous hardship.

More cases of botched rescue attempts can be cited with each elevator person having their favorite. Although some instances have had fatal results, the valuable elevator training aimed at firefighters and rescue squads is rarely ever seen.

Proper education should consist of basic elevator safety including fundamentals of hoistway door closing mechanisms and locking devices; car door opening restrictive devices; hoistway enclosures; and basic machine room layouts. Also a working knowledge of both Phase I and Phase II operation should be taught.

Even the best made devices and systems would fail without training and with that in mind education should be expanded beyond emergency personnel to building occupants. Floor marshals and alternatives should be appointed and informed about building evacuation and elevators.

When the training is completed, drills should be run. In this way all components can be tested and proved. An evacuation drill of the 20 story Century Tower in New Haven, Connecticut illustrates my point. Despite encountering some difficulty from a few reluctant office workers, the drill marshals managed to evacuate the building fairly efficiently. However, the evacuated building occupants mustered in the surrounding streets blocking traffic which in turn hindered the arrival of emergency vehicles (Ashton). Even though the firefighters were delayed the drill should be considered a success for surfacing the unexpected problem so it could be addressed.

BUILDING EVACUATION BY ELEVATORS: THE 'E'-PROGRAM

In a high-rise building emergency, arriving firefighters would love to find the building evacuated or undergoing evacuation. The savings in manpower from evacuation procedures, searching for missing occupants, and fighting the mass of exiting people could be extended to the handling of the actual emergency.

Since the first symposium, where I informally presented my design for an E-Program ('E' standing for evacuation), there has been more voices raised in favor of using elevators for rapid building evacuation. The reason is that during the preliminary stages of a fire the best means of egress is by elevator. For this to happen early detection by building sensors, however remote, would be relayed to the elevator system to activate the E-Program.

The E-Program is a pre-phase I program that can best be described as a down trap to force elevator passengers to the best means of egress. This is accomplished by all up hall call buttons and car buttons becoming inoperative. Yet the elevators would continue to run normally responding only for down hall calls. Inside each car a rather discreet visual and audible indicator would alert passengers of the E-Program. When the elevators reached the building's designated or alternate level the passengers would exit while the car doors stayed open and the car lights were extinguished.

After a pre-determined time a loud alarm would sound inside the car driving out any would be passengers. Of course this would be complimented by a visual indicator for the hearing impaired. The elevator doors would then close, the alarm would cease and the elevator would deadhead for the top terminal landing of the building where it again would respond only to down hall calls.

The cycle would continue until reset or Phase I or Phase II went into effect whereupon the elevators would operate accordingly. However, rescue command could have the option to continue the E-Program if the situation allowed. The addition of a green pilot in-use light at each hall station would indicate to building occupants that the elevators are still working. This idea can be applied to the existing emergency service requirements.

To augment the E-Program and also Phase II, mobility impaired people could be issued a secured button code. This simple Morse code would be entered through the existing hall button fixture on each floor. Its purpose would be to signal the elevator system of their location whereupon the E-Program would prioritize the signal by dispatching an express elevator immediately to their level. On Phase II firefighters would also be afforded the luxury of knowing where the disabled are located by the issuance of the same button code.

The E-Program could be incorporated into existing equipment without great expense. Furthermore, the E-Program would not compromise the minimum requirements of emergency operation as cited by the present code. However, it should be understood that the E-Program must be specifically fine tuned for each building's elevator system and building population.

DESIGNATED FIREFIGHTERS ELEVATORS

Despite the aforementioned education and E-Program contentions, there is still the problem of providing a lifting platform for firefighters and evacuating the mobility impaired in the event of a rapid or instantaneous high rise emergency such as the World Trade Center explosion. For these incidents I offer a two prong approach with the first being Designated Firefighters Elevators.

The inherent similitude between chimneys and elevator hoistways lend the latter to be prone with filling with extremely high temperature gases and smoke. During the 1981 MGM Grande Hotel fire in Las Vegas, elevator hoist ropes annealed and broke (ASME). For this to happen temperatures at the top of the hoistway exceeded 1200 degrees. In other cases, elevators and hoistways filled with smoke due to the low pressure found in most elevator hoistways.

What to do? One idea would be to design new buildings with at least a few outside elevators. In the future, plan to see outside elevators with dedicated power rises feeding their machine rooms. Two additional pluses for this concept would be better security while offering the architect the opportunity to incorporate the medium of movement into the structure's aesthetic design.

Designated Firefighters Elevators located within the building must be equipped with several design enhancements as follows:

1. The Designated Firefighter's Elevator should be at least a 4,000# capacity servicing all floors. Speed and the number of DFEs provided should be dictated by building size. Each DFE should be housed in a separate hoistway.
 2. Dedicated power rises should be run within the isolated Firefighter's Elevator's hoistway to the separated machine room. Means for applying an emergency power supply could be positioned at ground level.
 3. All wiring should be of the high temperature insulation type with weatherproof/ water resistant devices throughout.
 4. Elevator entrances should be sloped and drained accordingly to help ward off water.
 5. Provisions for fresh air to the Firefighter's Elevator would be added and also use to prevent smoke from entering the DFE. The argument for entire hoistway pressurization should be dismissed as impractical because:
 - a. the problem of closing of hoistway doors. Any elevator field technician can attest to the number of call-backs attributed to abnormal wind resistance. Therefore for hoistway pressurization to work the system would have to be run constantly which would cause an expensive maintenance cost to building owners.
 - b. The enormity of the pressurization devices for higher rise buildings.
 - c. The expense and difficulty of gasketing of hoistway doors.
- A more practical application is that of pressurizing only the elevator cab as advocated by Alvin S. Vener in his fine paper entitled ELEVATORS: FROM LIABILITY TO ASSETS IN BUILDING FIRES (Vener). Vener's plan calls for fresh air to be introduced into the elevator car by means of a supply duct mounted in the hoistway and a transfer plate mounted on the car. A more cost effective and maintenance free device may be to provide the positive air flow to the elevator car by means of a traveling air hose.
6. Pressurization of the machine room. This could be done by same source that provides fresh air to the Firefighter's

Elevator car.

7. Car door opening restrictive devices should be either eliminated or engineered to only remove the possibility of falling while exiting a disabled elevator. The latter should be considered for all elevators.
8. Means for opening and exiting the car top escape hatch should be provided for rescue personnel in the advent of a disabled car.
9. Monitor each elevator lobby and the machine room with heat sensors that would provide a visual signal to the Firefighter's Elevator car. Flashing indicator lights may suffice.
10. Provide a means for the mobility impaired to signal their location. The simple secured Morse code signal previously described could indicate their location through an enunciator in the DFE car. Although the hall button lights would not latch the green in-use light would continue to glow as long as the DFE functioned.

insure an efficient and effective evacuation. All components is meant to include even the most erratic and unpredictable but yet most important: the human factor. In our schools fire drills are held to insure a safe and reliable evacuation, should not the same be done for our high-rise community?

EXTERNAL EMERGENCY SCALING PLATFORM

New buildings could be designed, and existing buildings could be retrofitted, for an External Emergency Scaling Platform engineered to climb fixed rails mounted on exterior walls. The plan would be for the self-propelled platform to be trucked to the emergency site by a rescue truck manned by rescue squads especially trained in the platform's operation. At the site the crew would attach the device to the fixed rails for the purpose of carrying firefighters, rescue squads, Emergency Medical Technicians, and other needed personnel and equipment to the upper levels of the building. As the platform descended it would remove the non-ambulatory through windows that could only be opened from the outside. Power for the mechanism would be by either batteries or diesel (Holt, Whalley, DeGrand).

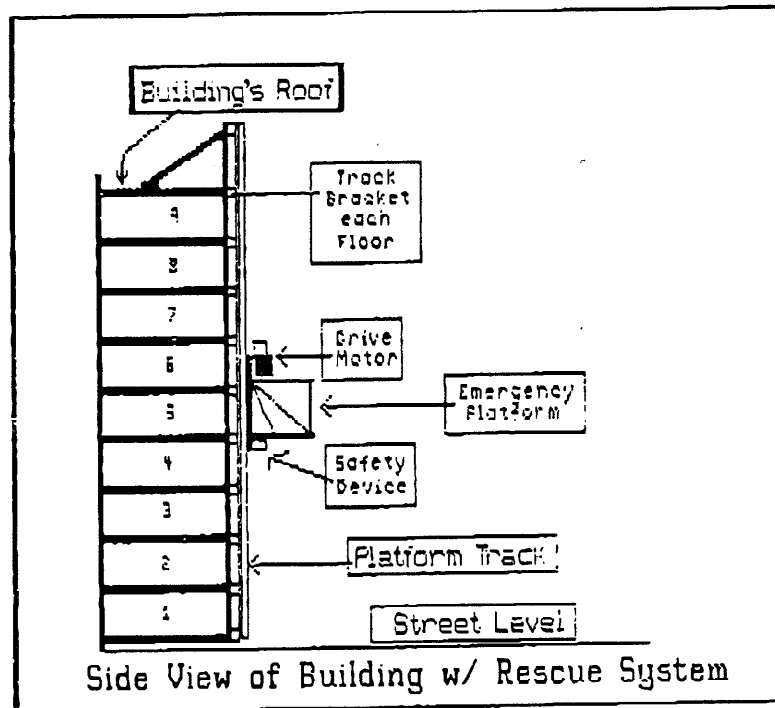
CONCLUSION

One must keep in mind that all the above proposed ingredients would not insure the best of plans without proper drilling. There cannot be too much emphasizing that all components involved in high rise building emergencies should be rehearsed to

Emergency Building Scaling System

Independently Powered Platform and Structure Tracks

Figure 1 of 4



Side View of Building w/ Rescue System