

ELEVATOR USAGE DURING A BUILDING FIRE

by John "Gus" Degenkolb

As indicated in the announcement for the symposium on Elevators and Fire, there are three model building codes used in the United States as well as certain requirements pertaining to elevators in the National Fire Protection Association's Life Safety Code. With a few exceptions, one or another of the editions of the three model building codes are the basis for building construction throughout the United States. Broadly speaking, even those jurisdictions which do not use a model building code, have quite similar requirements. Where elevators are concerned, some edition or another of A17.1 is the foundation for their elevator requirements. In this area, A17.1 is somewhat similar to the National Electrical Code. The principle difference, as I see it, is that the National Electrical Code accepts and really considers input from a wide spectrum of interests while the A17.1 code is much more in-bred considering input almost exclusively from those intimately involved with elevators.

As an example, the elevator industry has been represented on the NFPA 80 Committee concerning Fire Doors and Windows for many, many years — well before 1955 to my knowledge. Nevertheless, there were no tested and labeled fire doors for use with passenger elevators until sometime around 1970. There were such doors for freight elevators, but not for passenger cars. About that time, a building official, architect and an owner came to agreement that a new high rise building would have to have labeled fire doors for openings in the hoistway to the elevator cars. One company had to test and label, and soon the rest of the industry followed.

Another example has been the elevator industry resistance, with a few exceptions, to the gasketing or otherwise modifying elevator doors to make them resistive to the passage of smoke. Each of these items came from outside the industry and were resisted. It has only been in recent years, with the active participation of Ed Donoghue and Elmer Sumka that there has been real cooperation from the elevator industry.

So, how do the three model building codes deal with elevators? Two of the three building codes make specific reference to A17.1 at the very start of the Chapter concerning elevators. The third only references A17.1 in the Appendix Chapter. An Appendix Chapter is generally understood to be that part of a code which must be specifically adopted. It is not part of the adoption process of the main body of the code.

All three limit the number of cars permitted within a hoistway to four, and when four or more serve the same portion of a building and there are no others, two hoistways must be provided.

The elevator car must be 68 inches in one code, 51 x 80 in another, and the third is silent. The clear opening to the car is required to be 42-inches in one code and 36-inches in another. Where the code is silent, it is assumed that A17.1 prevails.

Two codes require an enclosed elevator lobby separating that lobby from the remainder of the building. While the third code has no specific requirement, there is a provision that smoke is to be so controlled that it will not enter the hoistway. With the advent of requirements for mobility impaired persons becoming mandatory, the elevator lobby separation requirement may be universal and not just for high rise buildings as is now the case.

The three codes are consistent in specifying the area of the hoistway vent. The vent shall be not less than 3½% of the area of the hoistway provided a minimum of 3 square feet is provided for each car. But here the similarity stops. Two specifically require that the vent be in the side of the hoistway enclosure with one of them also saying that it must be directly below the floor at the top of the hoistway.

Two permit mechanical *ventilation* if it provides equivalent venting. This is not acceptable in a residential occupancy. The third permits hoistway pressurization. There is a considerable difference as to the degree to which the vent is to be open. Automatic venting by actuation of the

elevator lobby smoke detector, with a manual override, is a requirement of one of the codes. A second requires that not less than 1/3 of the required vent area be permanently open unless all vents activate upon detection of smoke by a lobby smoke detector. The closed portion of the required vent area may be of 1/8 inch thick plain glass. Nothing is said as to how that glass is to be broken out to provide the required vent area. The third code also permits the closed portion of the required vent area to consist of windows, skylights or duct openings glazed with plain glass not more than 1/8 inch thick but there are no provisions for breaking it out or opening it up.

Only one of the codes prohibits the interconnection of hoistway vents, that is, combining two hoistways into one vent as was the situation found in the Las Vegas MGM hotel fire.

Then, two of the codes will permit the complete elimination of vents in a building equipped throughout with an approved sprinkler system if the building is not one having overnight sleeping facilities such as a hotel, apartment house, or hospital. This is particularly hard for me to understand after having seen smoke development in great quantities in sprinklered buildings such as occurred in Operation School Burning, the San Francisco fire tests of 1983.

A couple of years ago the elevator industry proposed limiting the size of the opening in the floor of the elevator machine room into the hoistway. One of the codes bought this proposal. With that exception, it is true that the codes do not limit the size of the floor opening and require sleeves which are to extend 12 inches beneath the machine room floor in an effort to limit the amount of smoke which may enter the elevator machine room. But the measurements proposed by the elevator industry would permit great amounts of smoke into the machine room. But more about that later.

The code differences given are not all of those to be found but are more or less typical. Several years ago, it was my understanding that the building codes would only cover specifics involving information or requirements which are not provided in A17.1. At the same time, A17.1 would delete requirements which are found in the building codes. For example, earlier editions of A17.1 specified the type of construction and its level of fire-resistance. After all, all building codes are not identical in that regard. For example, two will permit 1 hour shaft walls in buildings of Type I construction four or less stories in height. One requires that the shaft be of 2 hour construction. Each of the codes has different designations for the

type of construction, one having 4 classes, one has 5 and the other has 6. So, rather than have A17.1 make requirements which may conflict with the local code, it was decided to leave it up to the locally used building code.

In my opinion there is a solution to this mess, the Council of American Building Officials is one of the sponsors of this symposium. It has its "code arm", the Board for the Coordination of Model Codes (BCMC). With the active participation of the elevator industry, it is my opinion that the BCMC could develop a single position. That does not mean that it will fly with all three model building codes but it could much closer than what we have now.

Before discussing specific problems concerning the use of elevators under fire conditions, I would like to mention one somewhat aggravating condition which comes up sporadically. It concerns elevator lobbies with locked doors so that there is no escape from the lobby except by elevator. If the elevator cars have been recalled and no longer respond to floor calls, anyone in the lobby is trapped. That should not be and is an absolute violation of the codes whether called an exit access or exit. Means of egress doors shall be readily openable from the side from which egress is to be made without the use of a key or special knowledge or effort. Terminology may vary with the different codes but the intent is clear — you shall not lock anyone within an elevator lobby. Now to specific problems concerning the use of elevators under fire conditions.

In May 1988 there was a fire in the First Interstate Bank Building in Los Angeles. It was a 62 story building. The fire originated on the 12th floor at about 10:30 p.m. It took a total of 64 fire companies and 383 fire fighters more than 3½ hours to control the fire according to the NFPA Fire Investigation Report by Thomas J. Klem. There were, in my opinion, significant elevator problems.

The Los Angeles Fire Department did not use elevators to carry equipment up to the 10th floor with the fire on the 12th. It required approximately 100 men to carry equipment to that level. Suppose the fire had been on the 50th floor of that 62 story building. I have no information on the fire in the New York Empire State Building in July 1990. It was reported to have been on the 51st floor. It is most likely that elevators were used to carry equipment at least the major part of the height to the fire. Doesn't the use of elevators become almost mandatory to carry equipment at least part of the way up? So, because of the nature of the elevator operation, it is exceedingly

important that the elevator machine room be kept clear of smoke, heat and humidity.

With the sensitive electronic equipment used to operate the cars, with light emitting diodes used in the controls, etc., smoke in the machine room could knock out any use of elevators completely. So, pressurization of the machine room or enclosure of the cables and hoisting mechanism at the point of entry into the machine room becomes essential. I am informed by the elevator industry that the sleeves protecting the floor openings against the passage of smoke are not being installed even though they are a requirement of the model codes. The industry contends that they will not work anyway. So something needs to be done. In response to some of my comments some time ago, Ed Donoghue wrote to me saying: "Your concern regarding smoke in the machine room is well founded. That concern should also include controlling the heat and humidity in the machine room. Excessive temperature and humidity will be just as deadly in knocking out elevator service".

In the September/October 1990 Fire Journal is an article by Elliot Gittleman. He discussed the subject of elevators and sprinklers. He said that the "A17.1 Committee was concerned about the effect of water on the elevator controllers." Mr. Gittleman proposed that such a possible danger could be corrected if you placed the elevator control equipment in raintight enclosures even though the A17.1 Committee felt it was impractical. I think it is a sound solution. This might be an alternate or adjunct to pressurization of the machine room. An insulated enclosure would be capable of maintaining low temperature; protect against smoke particles interfering with the operations; and could probably protect against unacceptable levels of humidity. Based on personal observations, elevator machine rooms are not maintained free of combustibles. Sprinkler protection in the room is justified.

Back in 1988 a question was raised by the fire services in Oregon concerning automatic sprinkler heads in elevator shafts. It was stated that the Uniformed Building Code requires a sprinkler head to be installed at the bottom of the shaft and at every other floor within the shaft. It was stated that the state elevator code conflicted with that suggesting that one head be located at the bottom of the shaft and in the equipment room and "if heads are located above that, at every other floor, that they be open heads activated by a smoke detector in the elevator shaft or equipment room". The representative of the Oregon Fire Services thought "it would be inappropriate to activate automatic sprinkler heads in an elevator shaft

strictly by smoke and would question the benefit of that type of installation". I agree and so would, I think, Mr. Gittleman based on what he wrote in his article. He said: "The real problem is whether sprinkler protection is needed in the elevator shaft". After some discussion pro and con in his article, he concluded that "The solution to the problem is to remove the requirement for a sprinkler at the top of a noncombustible elevator shaft. Protection of the shaft pit by sprinklers would still be required and would be effective against a fire in the pit area."

In my opinion, the elevator machine room should be sprinklered; the elevator control mechanisms should be protected against water damage; the elevator pits should be sprinkler protected; and hoistway pressurization should be required so that relatively smoke free elevator lobbies will be provided as areas of refuge for the mobility impaired. That also means that elevator lobbies are to be separated from the remainder of the building.

The First Interstate Bank fire disclosed another problem involving the elevators. According to the NFPA report, the building contained 31 passenger elevators in 4 banks, 2 for sublevels, and 2 service elevators which served all levels and with a lobby at each floor. According to the report, all of the elevators were designed to be recalled to the ground floor lobby on smoke detector activation. But those used by cleaning and maintenance crews were on "independent service" and could not be recalled. Other cars were not accounted for because their doors did not open when they returned to the ground floor. One elevator stopped on the 22nd floor and one on the 33rd. This was, should be, cause for concern. Something needs to be corrected. When a smoke detector is actuated in an elevator lobby, all elevator cars in that bank are to return to the ground floor or other designated floor. Because the hoistway openings to the cars are fire doors, they must go to the closed position if smoke is detected in that lobby, all elevator cars in that bank are to return to the ground floor or other designated floor. Because the hoistway openings to the cars are fire doors, they must go to the closed position if smoke is detected in that lobby. Otherwise they are to stand with open doors so that they can be checked to see if anyone is inside. Insofar as I am concerned, the failure to have cars returned to the basic floor is improper and unacceptable. The Fire Department has enough to do without having to try to locate "lost" cars.

In my opinion, the building codes are not clear on this point. The November/December 1989 Fire

Journal, in its Letters Column, contained a letter from Ed Donoghue. He said: "Since 1984, ASME/ANSI A17.1 has required that automatic elevators on independent service automatically respond to Phase I recall after a period of 15 to 60 seconds. Since 1985, the same code has also required that all elevators with firefighters service be subject to monthly Phase I and II operation, with a record of this operation maintained at the building". This is of sufficient importance that such requirements should be in the building code or fire code or both since it was obviously overlooked in Los Angeles.

While mentioning the elevator lobby separation requirement, why aren't we installing a standpipe outlet in the elevator lobby? It seems to me that would be a "natural" addition at very little cost. It has been opposed by the fire service when it has been proposed as a code change.

For some reason or another, advancements made by the industry are not being made known adequately to the enforcement official. Possibly, when a fire safety measure is developed, it should be proposed for introduction into the building or fire code. I recognize that there is a sort of agreement that the requirements of building codes will not be written into the elevator code and vice versa. But there must be some cross over. For example, in one Colorado area, a single person is the elevator inspector for a number of jurisdictions. Everything pertaining to elevators is his responsibility. The building official himself doesn't become involved. It is a "hands off" situation for anyone except the one person assigned. In some states all elevator inspections are the responsibility of a state inspector. The local man has next to nothing to do with elevators nor does the fire inspector. That one inspector may not be sufficiently knowledgeable in other areas of the building and fire code which have to do with fire safety and so certain things may be overlooked. When fire departments are developing fire fighting strategies for specific buildings, they are apparently not aware of new requirements of A17.1 and it certainly isn't a particularly available document nor one which is easily read and understood.

Years of effort have been expended to inform the public that they are not to use elevators at the time of fire. Now there is major activity, new Federal Legislation — the Americans with Disabilities Act — to require access to buildings for the mobility impaired. In a multi-story building that means, most frequently, access by elevators. So now we have made the upper stories accessible. But how do we get those people out in a fire

emergency once they are inside? By elevator, naturally. But that is somewhat contrary to what we have been preaching all these years. How are we going to reverse this position? The Life Safety Code and the Board for the Coordination of Model Codes have proposed making elevators accessible for egress for the mobility impaired. Various fire marshals have called questioning the wisdom of this approach. How is the possible opposition from the fire service going to be resolved? Frankly, it is my opinion, that with the new requirements for accessibility for the mobility impaired, the fire service has no choice. There is no other realistic solution for evacuation without help from others. Stair landings can be made larger to accommodate a couple of wheelchairs but the occupants of those chairs will eventually have to be carried down physically. Buildings can be divided into two or more compartments or fire areas with elevator facilities in each area but horizontal exist are not always practical nor the best solution. Based again on personal experience, I am not willing to accept the premise that just because a building is protected by an automatic sprinkler system, there is no problem. Sprinkler systems have been known to fail. The 1983 San Francisco fire tests, in an actual building, made it abundantly clear that unacceptable levels of smoke can be developed before the sprinklers operate — and they may not operate at all. So, while the NFPA and BCMC and the Federal government, the latter apparently concerned only with access and no concern for evacuation, may introduce new code provisions. There is certainly work to be done by the elevator industry to see that the new requirements will function properly and safely.

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