



## USING ELEVATORS FOR OCCUPANT EVACUATION

*By Ron Coté, P.E., Principal Life Safety Engineer*

It has been taught and reinforced throughout most of our lives not to use elevators in fire and similar emergencies. The placard shown in Exhibit 1 demonstrates the time-honored message to which we've been exposed. Yet, newer elevator and building technology and recent fire/life safety code changes permit specialized elevators to be used by building occupants for evacuation. The messages associated with the new technology of safe use of evacuation elevators conflict with our training. This article is intended to put the subject into perspective so that building occupants can be made aware of conditions under which it is safe to use an elevator for occupant evacuation.



**Exhibit 1.** Placard advising not to use elevators in time of fire emergency.

NFPA 101®- *Life Safety Code*®, NFPA 5000® - *Building Construction and Safety Code*®,

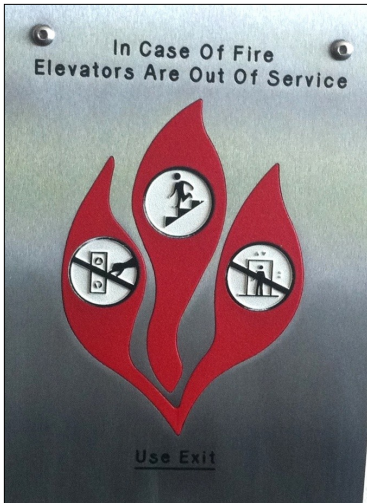
and the IBC - *International Building Code*®, all reference and mandate the use of the expert, consensus code on elevators - ASME A17.1/CSA B44, *Safety Code for Elevators and Escalators*, hereafter referred to as the elevator code. Since 1973, the elevator code has required elevators to be equipped with fire fighters' emergency operation (FEO) which consists of two phases. Phase I is emergency recall operation and Phase II is emergency in-car operation. Phase I calls elevators out of service where conditions for safe elevator operation cannot be assured. Phase II permits emergency responders, like fire fighters, to place elevators back into

service so trained personnel can manually control the operation of elevator cars to assist in fire fighting and rescue operations.

Elevators might not be safe to operate when effects of fire reach components of the elevator system. For example, if the elevator car and hoistway doors open at a fire floor, the doors might fail to close due to smoke blocking the light beam that is installed to sense the presence of an occupant standing in the door opening. Occupants of the elevator car will then be trapped on the fire floor.

The elevator code limits the capture and recall of elevators to conditions where smoke is detected in the elevator machine/control room/space, in the elevator hoistway, or at the elevator landings on each floor served by the elevator system. The concept is one of calling the elevators out of service only when smoke is present in proximity to the elevator equipment or when emergency responders manually initiate the recall feature. Elevators should not be recalled just because the building fire alarm system has been initiated. The recall of elevators upon alarm system initiation leads to inconvenience to building occupants where the alarm is unintended as experienced with nuisance alarms. Repeated episodes of occupant inconvenience lead to the unauthorized disablement of the elevator emergency recall operation features.

The new code provisions for occupant evacuation elevators capitalize on the fact that elevators might be made safe for occupant evacuation in a building fire for the time period during which the fire effects are remote from the elevator equipment. Exhibit 2 shows the elevator placard required by the elevator code. The message is conservative and technically inaccurate as the elevators will not be called out of service under all building fire conditions, only when smoke is sensed in the vicinity of the elevator equipment.



**Exhibit 2.** Placard required by ASME A17.1/CSA B44.

NFPA 101 Section 7.14, NFPA 5000 Section 11.14, and IBC 3008 permit elevators for occupant evacuation where numerous building construction and elevator features comply with a host of specialized requirements. The requirements are aimed at keeping smoke away from the elevators for as long as practical. As soon as smoke is sensed in the vicinity of the elevators, the occupant evacuation elevator system is no longer available. The requirements address the following:

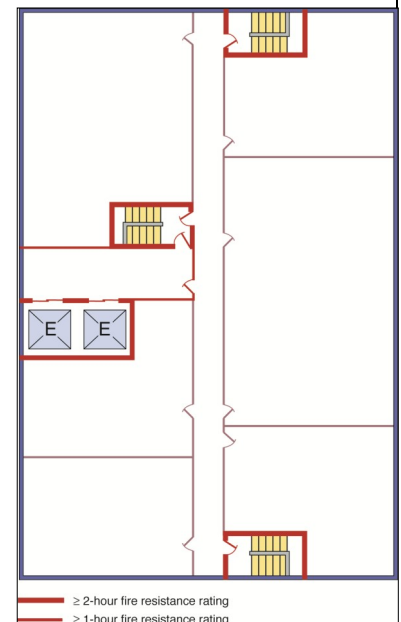
- Occupant information features including signage indicating the elevators are suitable for use by building occupants for evacuation during fires, and real-time messaging to occupants in the elevator lobbies advising of the operating status of the elevators
  - Display at the fire command center of conditions related to safe continued operation such as location/status of each elevator car, alarm system activations, status of normal and standby power
  - Fire detection, alarm and communications systems including two-way communication capability between elevator landings and fire command center
  - Full building sprinklering except in the elevator machine/control room/space so as to avoid installing shunt breakers that would abruptly disable the elevators upon heat sensing so as to trap occupants (a change in NFPA 13-2013 will recognize such omission of sprinklers in machine/control rooms/spaces)
  - Separation of elevator machine rooms and hoistways from other building spaces by minimum 2-hour fire resistance-rated construction
  - Protection of electrical power and control wiring
- Provision of what the code calls the *occupant evacuation shaft system* as addressed below

The occupant evacuation shaft system provides the building construction features that support the occupant evacuation elevator system. The concepts on which the requirements for the occupant evacuation shaft system are based include the following:

1. The elevator hoistway must be served at each floor by an elevator lobby where building occupants can wait in safety for elevators.
2. An enclosed exit stair needs to be located immediately adjacent to, and directly accessible from, each elevator lobby to provide a means for occupant evacuation once elevators are called out of service.
3. The elevator hoistway, elevator lobby, and associated enclosed exit stair (i.e., the areas that comprise the occupant evacuation shaft system) need to be protected from fire originating outside the occupant evacuation shaft system.
4. Smoke from fire outside the occupant evacuation shaft system must not enter the occupant evacuation shaft system in sufficient quantity to initiate elevator recall via the smoke detectors in the elevator lobbies and hoistway.
5. Fire must not breach the occupant evacuation shaft system for the period of time that the elevators can be used effectively for occupant evacuation.
6. Each elevator lobby must be sized to accommodate the number of persons expected to need, or benefit from, the occupant elevator evacuation system.
7. Water from discharging sprinklers and fire fighter hose needs to be kept out of the hoistway to permit elevator equipment to continue operating safely.

**Exhibit 3.** Occupant evacuation shaft system separated from remainder of floor.

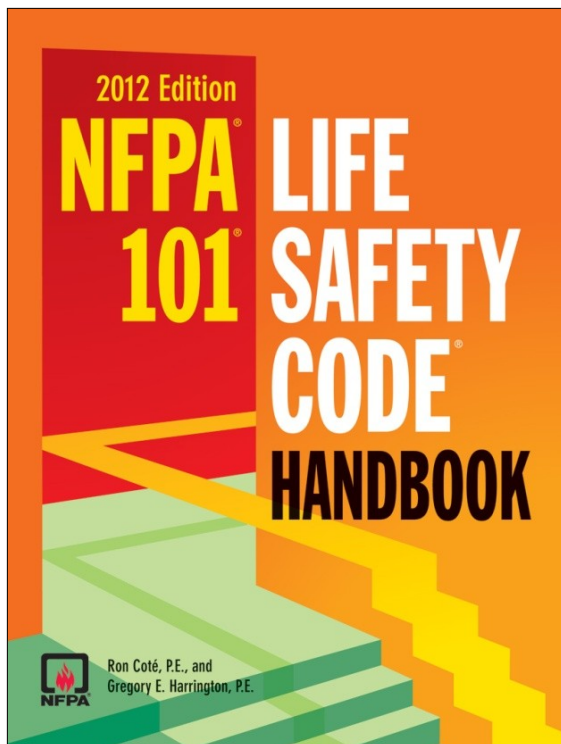
Exhibit 3 illustrates the occupant evacuation shaft system. The shaft



system is the combined area of the hoistway, elevator lobby, and associated enclosed exit stair. Note that occupants of the elevator lobby have direct access to an enclosed exit stair without having to enter the corridor.

For verbatim code text and detailed related commentary on occupant evacuation elevators, see the *Life Safety Code® Handbook - 2012*, as depicted in Exhibit 4, available from NFPA at:

<http://www.nfpa.org/catalog/product.asp?title=2012-NFPA-101-Life-Safety-Code-Handbook-Set&pid=101ST12&target%5Fpid=101ST12&src%5Fpid=10112&link%5Ftype=cross%5Fsell&order%5Fsrc=C331>

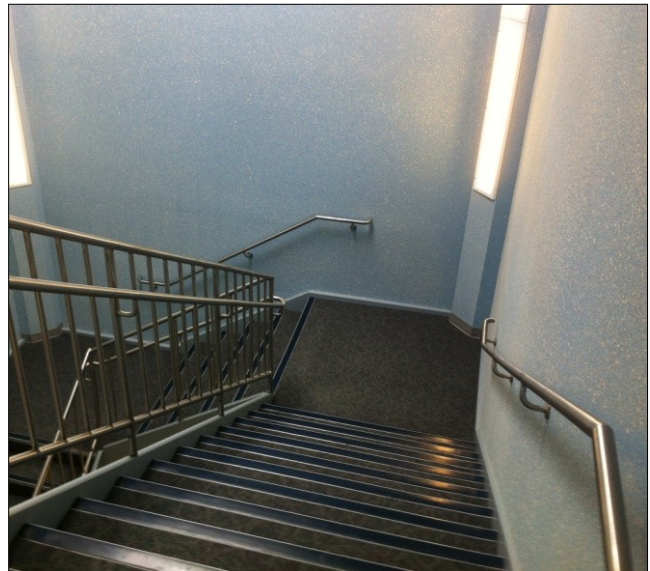


**Exhibit 4.** *Life Safety Code® Handbook*

Based on the detailed criteria required for occupant evacuation elevators, you might have correctly concluded that the vast majority of existing elevators are not the specialized elevators suitable for occupant evacuation under fire conditions. Where elevator lobbies do not have placards advising that elevators are suitable for use by building occupants for evacuation during fire, continue to train occupants that elevators

should not be used for evacuations. Rely on exit stairs. Exhibit 5 depicts an exit stair, installed for compliance with the requirements for means of egress. Note the handrail and guard system and the prominently marked leading edge of each tread.

In the future, it might become common for dormitories, classroom buildings and other campus occupancies to have occupant evacuation elevators. Until then, make sure you are familiar with the egress, evacuation and relocation procedures for every building on your site.



**Exhibit 5.** *Means of egress-compliant exit stair enclosure.*

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