

Elevator Fire Safety: Elevator Recall and Elevator Power Shutdown

Background

Elevators are an extremely safe mode of transportation. If code compliant, elevators and the hoistways and associated machine rooms do not add any significant fire load. The only significant fire risk that they add is the possible transport of smoke and the possible entrapment of users. For this reason codes specify fire safety features to reduce the likelihood of smoke migration and to control elevators when they are threatened with fire or smoke.

The codes recognize that there is almost no risk of fire in a code compliant elevator or hoistway that would be mitigated by protection being required in those spaces. Therefore, building codes, fire codes, elevator safety codes and sprinkler and fire alarm standards have been coordinated to not require any special protection in properly constructed hoistways. The exception (see NFPA 13 below) is if a hydraulic elevator uses a combustible fluid.

Several years ago I participated in a joint effort sponsored by ASME to address elevator fire safety and to coordinate ASME A17.1, building codes, NFPA 101 *Life Safety Code*, NFPA 13 *Standard for the Installation of Sprinkler Systems* and NFPA 72 *National Fire Alarm Code*. The task group included elevator safety experts, fire protection engineers, fire alarm and sprinkler experts, fire fighters, code experts and others. This work resulted in requirements that are now in place.

Summary

There is no need and no code requirement to sprinkle an elevator hoistway unless the hoistway or the elevator car fail to meet the non-combustibility requirements that they are required to meet. The exception (see NFPA 13 below) is if a hydraulic elevator uses a combustible fluid.

There is no need and no code requirement to put a smoke detector in an elevator hoistway unless it has sprinklers. If a hoistway has sprinklers at the top, a smoke detector is needed, and required by code, to recall and safely park the elevator. If a hoistway has sprinklers at the top, a heat detector or flow switch without any time delay mechanism is needed, and required by code, to shunt power before or at the instant water is discharged.

Where sprinklers are provided or required in a building by another code, elevator lobbies and elevator machine rooms are required to have them for complete coverage. If a machine rooms has sprinklers, smoke detection is needed, and required by code, to recall and safely park the elevator. If a machine rooms has sprinklers, heat detection or a flow switch without any time delay mechanism is needed, and required by code, to shunt power before or at the instant water is discharged.

There is no need and no code requirement to recall or control elevators unless the shaft or machine room are threatened. Thus, the codes work together to require elevator recall only when smoke detectors in the following areas are activated: 1) elevator lobbies, 2) elevator machine rooms, or 3) if provided per the above, elevator hoistways.

Disclaimer: The following code excerpts are current as of this writing. Local codes or amendments may change these requirements. The opinions stated above are those of R.P. Schifiliti Associates, Inc. and are generalizations that may not apply to your specific situation.

Excerpts from: ASME/ANSI A17.1, *Safety Code for Elevators and Escalators*, 1993

211.3b Smoke Detectors. System-type smoke detectors conforming to the requirements of UL 268 shall be installed in each elevator lobby and associated machine room in accordance with NFPA 72, Chapter 3. Smoke detectors are not required in elevator lobbies at unenclosed landings. System-type smoke detectors shall be permitted to be installed in any hoistway and shall be installed in hoistways which are sprinklered (see Rule 102.2).

(1) The activation of a smoke detector in any elevator lobby, other than at the designated level, shall cause all cars that serve that lobby to return nonstop to the designated level. The activation of a smoke detector in any elevator hoistway shall cause all elevators having any equipment located in the hoistway, and any associated elevators of a group automatic operation, to return nonstop to the designated level, except that smoke detectors in hoistways installed at or below the lowest landing of recall, when activated, shall cause the car to be sent to the upper level of recall. The operation shall conform to the requirements of Rule 211.3a.

(2) When the smoke detector at the designated level is activated, the operation shall conform to the requirements of Rule 211.3a, except that the cars shall return to an alternate level approved by the enforcing authority, unless the designated-level three-position Phase I switch (Rule 211.3a) is in the "ON" position.

(3) The activation of a smoke detector in any elevator machine room, except a machine room at the designated level, shall cause all elevators having any equipment located in that machine room, and any associated elevators of a group automatic operation, to return nonstop to the designated level. The activations of a smoke detector in any elevator machine room at the designated level shall cause all elevators having any equipment located in that machine room, and any associated elevators of a group automatic operation, to return nonstop to the alternate level, or the appointed level when approved by the authority having jurisdiction.

(4) Elevators shall only react to the first smoke detector zone which is activated for that group.

(5) Phase I operation, when initiated by a smoke detector, shall be maintained until canceled by moving the Phase I switch to the "BYPASS" position [see also Rule 211.3a(10)]. Smoke detectors and/or smoke detector systems shall not be self-resetting.

NOTE (Rule 211.3b): In buildings with fire alarm systems, see NFPA 72A for additional information.

Excerpts from: NFPA 13, Standard for the Installation of Sprinkler Systems, 1999

5-13.6 Elevator Hoistways and Machine Rooms.

5-13.6.1*

Sidewall spray sprinklers shall be installed at the bottom of each elevator hoistway not more than 2 ft (0.61 m) above the floor of the pit.

Exception: For enclosed, noncombustible elevator shafts that do not contain combustible hydraulic fluids, the sprinklers at the bottom of the shaft are not required.

5-13.6.2*

Automatic sprinklers in elevator machine rooms or at the tops of hoistways shall be of ordinary- or intermediate-temperature rating.

5-13.6.3*

Upright or pendent spray sprinklers shall be installed at the top of elevator hoistways.

Exception: Sprinklers are not required at the tops of noncombustible hoistways of passenger elevators with car enclosure materials that meet the requirements of ASME A17.1, Safety Code for Elevators and Escalators.

A-5-13.6.1

The sprinklers in the pit are intended to protect against fires caused by debris, which can accumulate over time. Ideally, the sprinklers should be located near the side of the pit below the elevator doors, where most debris accumulates. However, care should be taken that the sprinkler location does not interfere with the elevator toe guard, which extends below the face of the door opening.

ASME A17.1, Safety Code for Elevators and Escalators, allows the sprinklers within 2 ft (0.65 m) of the bottom of the pit to be exempted from the special arrangements of inhibiting waterflow until elevator recall has occurred.

A-5-13.6.2

ASME A17.1, Safety Code for Elevators and Escalators, requires the shutdown of power to the elevator upon or prior to the application of water in elevator machine rooms or hoistways. This shutdown can be accomplished by a detection system with sufficient sensitivity that operates prior to the activation of the sprinklers (see also NFPA 72, National Fire Alarm Code®). As an alternative, the system can be arranged using devices or sprinklers capable of effecting power shutdown immediately upon sprinkler activation, such as a waterflow switch without a time delay. This alternative arrangement is intended to interrupt power before significant sprinkler discharge.

A-5-13.6.3

Passenger elevator cars that have been constructed in accordance with ASME A17.1, Safety Code for Elevators and Escalators, Rule 204.2a (under A17.1a-1985 and later editions of the code) have limited combustibility. Materials exposed to the interior of the car and the hoistway, in their end-use composition, are limited to a flame spread rating of 0 to 75 and a smoke development rating of 0 to 450.

Excerpts from: NFPA 72, National Fire Alarm Code, 1999

3-9.3 Elevator Recall for Fire Fighters' Service.

3-9.3.1*

System-type smoke detectors located in elevator lobbies, elevator hoistways, and elevator machine rooms used to initiate fire fighters' service recall shall be connected to the building fire alarm system. In facilities without a building fire alarm system, these smoke detectors shall be connected to a dedicated fire alarm system control unit that shall be designated as "elevator recall control and supervisory panel," permanently identified on the control unit and on the record drawings. Unless otherwise required by the authority having jurisdiction, only the elevator lobby, elevator hoistway, and the elevator machine room smoke detectors shall be used to recall elevators for fire fighters' service.

3-9.3.2

Each elevator lobby, elevator hoistway, and elevator machine room smoke detector shall be capable of initiating elevator recall when all other devices on the same initiating device circuit have been manually or automatically placed in the alarm condition.

3-9.3.3

A lobby smoke detector shall be located on the ceiling within 21 ft (6.4 m) of the centerline of each elevator door within the elevator bank under control of the detector.

Exception: For lobby ceiling configurations exceeding 15 ft (4.6 m) in height or that are other than flat and smooth, detector locations shall be determined in accordance with Chapter 2.

3-9.3.4

Smoke detectors shall not be installed in elevator hoistways.

Exception No. 1: Where the top of the elevator hoistway is protected by automatic sprinklers.

Exception No. 2: Where a smoke detector is installed to activate the elevator hoistway smoke relief equipment.

3-9.3.5

If ambient conditions prohibit installation of automatic smoke detection, other automatic fire detection shall be permitted.

3-9.3.6

When actuated, each elevator lobby, elevator hoistway, and elevator machine room smoke detector shall initiate an alarm condition on the building fire alarm system and shall visibly indicate, at the control unit and required remote annunciators, the alarm initiation circuit or zone from which the alarm originated. Actuation from elevator hoistway and elevator machine room smoke detectors shall cause separate and distinct visible annunciation at the control unit and required annunciators to alert fire fighters and other emergency personnel that the elevators are no longer safe to use.

Actuation of these detectors shall not be required to actuate the system notification appliances where the alarm signal is indicated at a constantly attended location.

Exception: If approved by the authority having jurisdiction, the elevator hoistway and machine room smoke detectors shall be permitted to initiate a supervisory signal.

3-9.3.7*

For each group of elevators within a building, three separate elevator control circuits shall be terminated at the designated elevator controller within the group's elevator machine room(s). The operation of the elevators shall be in accordance with Rules 211.3 through 211.8 of ANSI/ASME

A17.1, Safety Code for Elevators and Escalators. The smoke detectors shall actuate the three elevator control circuits as follows:

- (a) The smoke detector located in the designated elevator recall lobby shall actuate the first elevator control circuit. In addition, if the elevator is equipped with front and rear doors, the smoke detectors in both lobbies at the designated level shall actuate the first elevator control circuit.
- (b) The smoke detectors in the remaining elevator lobbies shall actuate the second elevator control circuit.
- (c) The smoke detectors in elevator hoistways and the elevator machine room(s) shall actuate the third elevator control circuit. In addition, if the elevator machine room is located at the designated level, its smoke detector shall also actuate the first elevator control circuit.

3-9.4 Elevator Shutdown.

3-9.4.1*

Where heat detectors are used to shut down elevator power prior to sprinkler operation, the detector shall have both a lower temperature rating and a higher sensitivity as compared to the sprinkler.

3-9.4.2

If heat detectors are used to shut down elevator power prior to sprinkler operation, they shall be placed within 2 ft (610 mm) of each sprinkler head and be installed in accordance with the requirements of Chapter 2. Alternatively, engineering methods, such as specified in Appendix B, shall be permitted to be used to select and place heat detectors to ensure response prior to any sprinkler head operation under a variety of fire growth rate scenarios.

3-9.4.3*

If pressure or waterflow switches are used to shut down elevator power immediately upon or prior to the discharge of water from sprinklers, the use of devices with time delay switches or time delay capability shall not be permitted.

3-9.4.4*

Control circuits to shut down elevator power shall be monitored for presence of operating voltage. Loss of voltage to the control circuit for the disconnecting means shall cause a supervisory signal to be indicated at the control unit and required remote annunciators.

A-3-9.3.1

In facilities without a building alarm system, dedicated fire alarm system control units are required by 3-9.3.1 for elevator recall in order that the elevator recall systems be monitored for integrity and have primary and secondary power meeting the requirements of this code.

The control unit used for this purpose should be located in an area that is normally occupied and should have audible and visible indicators to annunciate supervisory (elevator recall) and trouble conditions; however, no form of general occupant notification or evacuation signal is required or intended by 3-9.3.1.

A-3-9.4.1

A lower response time index is intended to provide detector response prior to the sprinkler response, because a lower temperature rating alone might not provide earlier response. The listed spacing rating of the heat detector should be 25 ft (7.6 m) or greater.

A-3-9.4.3

Care should be taken to ensure that elevator power cannot be interrupted due to water pressure surges in the sprinkler system. The intent of the code is to ensure that the switch and the system as a whole do not have the capability of introducing a time delay into the sequence. The use of a switch with a time delay mechanism set to zero does not meet the intent of the code, because it is possible

to introduce a time delay after the system has been accepted. This might occur in response to unwanted alarms caused by surges or water movement, rather than addressing the underlying cause of the surges or water movement (often due to air in the piping). Permanently disabling the delay in accordance with the manufacturer's printed instructions should be considered acceptable. Systems that have software that can introduce a delay in the sequence should be programmed to require a security password to make such a change.

OLD - See 2010 Revision - OLD