Elevator control switch

Why do buildings require Eaton elevator disconnects?

The Eaton elevator disconnect is a simple, all-in-one solution that takes the mystery out of meeting the many codes associated with fire protection and safety in elevator shafts. The model national building codes that prescribe the requirements for sprinklers, elevators, and electrical equipment, and how the various systems shall interact, are:

- NFPA® 70 (National Electrical Code®)
- NFPA 72 (National Fire Alarm Code)
- ANSI/ASME A17.1 (Safety Code for Elevators and Escalators)
- NFPA 13 (Installation of Sprinkler Systems)

In addition to these national codes, state and local jurisdictions or other agencies of the government (such as the U.S. Department of Veterans Affairs) may edit or amend the codes, as they deem necessary for public safety.

This paper will illustrate how the Eaton elevator disconnect enables consultants, contractors, and building owners to install a single device that meets the requirements of the various codes.

Why is there a need for the Eaton elevator disconnect?

According to 2002 NFPA 13, 8.14.5, fire sprinkler protection is required (with some exceptions) at the top and bottom of elevator shafts (**Figure 1, Note 1**). Additionally, NFPA 13 requires the installation of sprinklers in the elevator machine room. When sprinkler heads are installed in elevator shafts, or in elevator machine rooms, then they must also be installed according to the state-adopted elevator code (in many cases ANSI/ASME A17.1).

The ASME A17.1 Safety Code for Elevators and Escalators, Rule 102.2(c)(3), requires the shutdown of power to the elevator prior to the application of water in the elevator machine room or hoistway (**Figure 1, Note 2**).

Shutdown of power is usually accomplished with the use of a shunt trip device in the elevator circuit, and is done for two valid safety concerns.

The first of these is to minimize the potential for electric shock due to the release of water onto energized electrical equipment. The second, and less obvious, is to reduce the possibility of elevator car slippage after the car has gone to the recall floor and the doors have opened. Slippage is possible when the hoisting equipment (cables, sheave, braking system, etc.) become wet from discharged water.

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The Eaton elevator disconnect is a fusible switch that is equipped with a shunt trip mechanism. The shunt trip is operated by a control relay (called a fire safety interface relay) in the unit that is wired to a normally open contact in the remote fire alarm control panel (FACP).

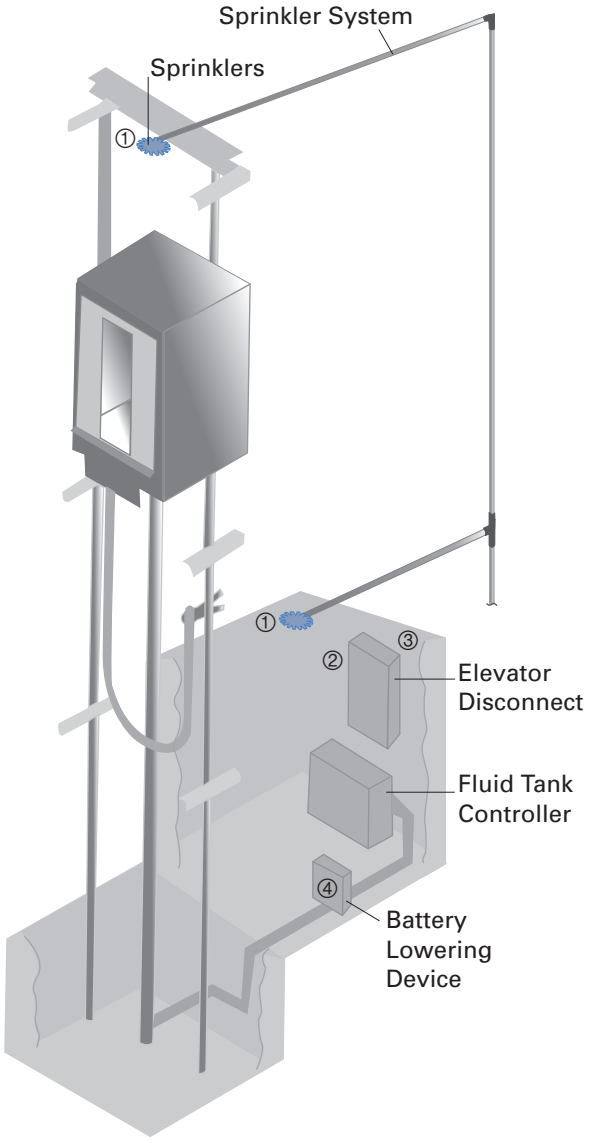
When the FACP receives a signal from the fire alarm system that there is going to be a sprinkler release in an elevator shaft, a normally open contact in the FACP closes, energizing the fire safety interface relay and completing a circuit to initiate a trip.

The fire safety interface relay is available with a 120 Vac or a 24 Vdc coil. The 120V coil should be selected when powered by the elevator disconnect control circuit, and the 24V relay should be selected when the power is supplied from the fire alarm system.

In addition to turning off power, the model codes require other functions that are satisfied by the Eaton elevator disconnect (**Figure 1, Note 3**). One of these requirements is that the shunt trip control circuit requires monitoring. The 2002 NFPA 72 (fire alarm code) in Section 6.15.4.4 requires:

Control circuits to shut down elevator power shall be monitored for the 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 annunciation.

Thus, there is a requirement to monitor and annunciate the presence of shunt trip control power. This is accomplished in the Eaton elevator disconnect by the fire alarm voltage monitoring relay option. This relay is either an SPDT or a 3PDT relay. When control power is present, the closed relay contacts complete a circuit to the FACP that indicates the presence of control voltage. If control voltage is lost, the contact opens, signaling an alarm at the FACP and/or monitoring and annunciating a single elevator; all that is required is the single-pole relay. When wiring multiple switches (for multiple elevators), the three-pole relay option should be chosen. However, if there is a doubt, selecting the three-pole relay will provide all the functionality that is needed.



① NFPA 13 requires sprinklers in elevator shaft (with exceptions) and in control room.

② ASME A17.1 (Safety Code for Elevators and Escalators) requires shutdown of power to the elevator prior to the release of water.

③ NFPA 72 (Fire Alarm Code) requires control circuit for elevator shutdown to be monitored for the loss of voltage.

④ NEC® requires standby power systems such as a battery lowering device to be disconnected by an auxiliary contact in the elevator disconnect.

Figure 1. Typical Hydraulic Elevator Components and Requirements

Additional requirements and concerns

Many elevators are equipped with backup power supplies to allow the elevator to be lowered if power is lost. For example, many hydraulic elevators are equipped with a battery system that opens a solenoid to lower the elevator, and then provides power to open the elevator doors.

This battery-lowering device is viewed by the NEC as an "emergency or standby power system," and is governed by Article 620.91 (**Figure 1, Note 4**). Paragraph (C) requires that the main disconnect be provided with an auxiliary contact that disconnects the additional power source from the load when the disconnecting means is in the open position. The purpose of this auxiliary contact is to disconnect the backup power system when the elevator switch is opened to prevent the elevator from automatically lowering while being maintained—which would endanger maintenance personnel.

The Eaton elevator disconnect is supplied with a standard set of 1NO and 1NC auxiliary contacts that are wired to the terminal blocks for this feature. Other manufacturers offer this as an option.

An additional concern that is not code related is accidental signaling of a loss of voltage if a switch is turned off for maintenance or testing. For example, if an Eaton elevator disconnect is turned off to perform routine maintenance, the control voltage will be disconnected and will send a signal to the FACP—which may alert the local fire department and initiate a fire call.

To solve this problem, an optional micro switch mounted on the main switch can be supplied and field-wired in parallel with the alarm contact on the voltage monitoring relay. Wiring in this fashion would prevent an alarm signal from being sent when the Eaton elevator disconnect is turned off for routine maintenance.

An additional standard feature on the Eaton elevator disconnect is a key-to-test switch to perform a functional test of the operation of the shunt trip. A pilot light signaling that the switch is ON and a neutral lug are the only other available options.

The available enclosures include NEMA® 1, 3R, 12, and 4 (painted), allowing the Eaton elevator disconnect to be mounted in virtually any standard operating environment.

In summary, the Eaton elevator disconnect is an all-in-one solution for meeting the various codes associated with elevator shutdown and monitoring. It is clearly the best choice for engineers and contractors who need to provide code-compliant solutions—for whichever code needs to be met.

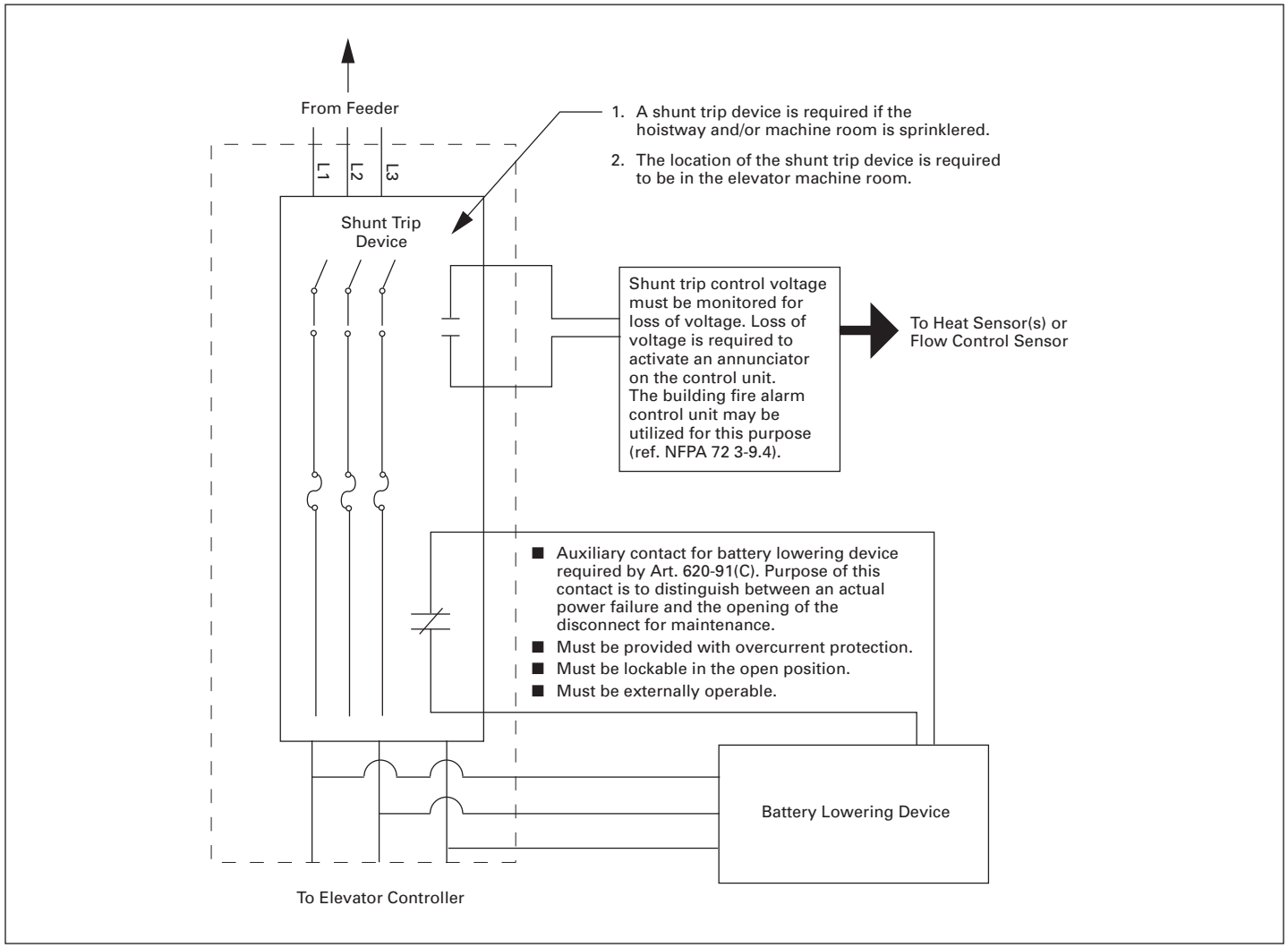


Figure 2. Shunt Trip Device Wiring Diagram

Elevator control switch features

Standard

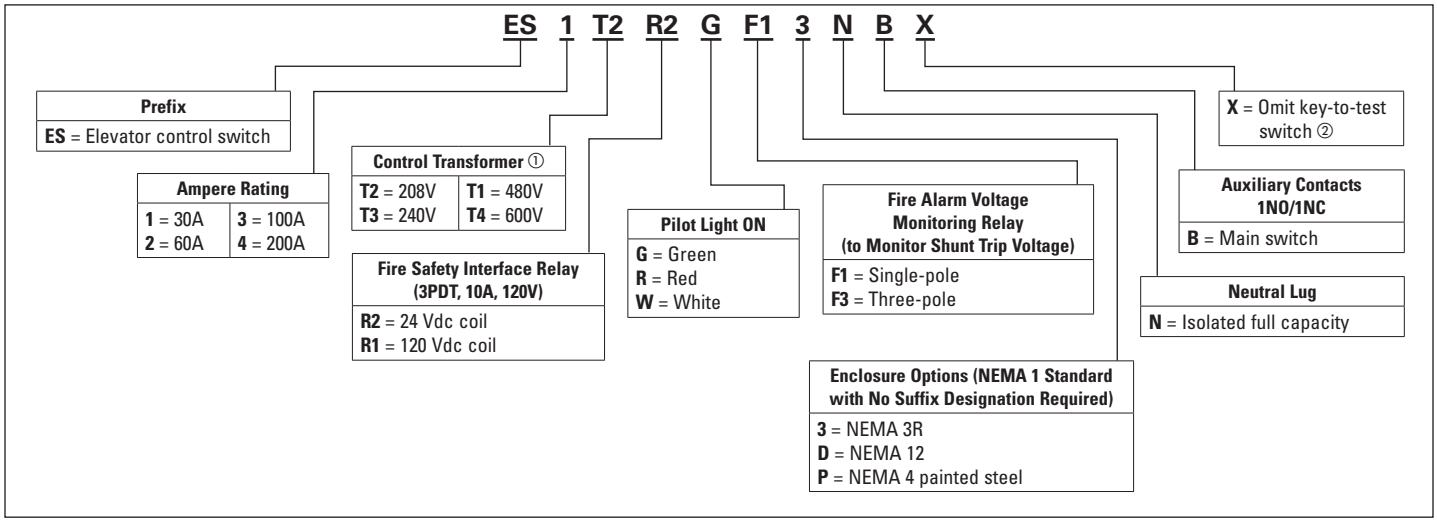
- 30–400A, 600 Vac, three-phase fused power switch
- 200,000A rms short-circuit current rating
- Shunt trip 120V
- Control power terminal block
- Ground lug per NEC
- Class J fuse mounting only (Class J fuses not included)
- Key-to-test switch 120V

Mechanically interlocked auxiliary contact for hydraulic elevators with automatic recall (5A, 120 Vac rated) 1NO, 1NC.

Optional

- Control power transformer with fuses and blocks
- Fire safety interface relay
- Pilot light—ON
- Isolated neutral lug (oversized 200% rated neutral option available where required by excessive nonlinear loads)
- Fire alarm voltage monitoring relay (to monitor shunt trip voltage)
- NEMA 1, 3R, 4, and 12 enclosures available through 400A
- Phase failure and undervoltage relay available; consult factory
- For added protection, use Eaton fuse covers to improve maintenance personnel protection, through 200A (OSHA 1910.333, Paragraph C)
- OSHPD Special Seismic Certification Preapproval (OSP)

Table 1. Elevator Control Switch Catalog Numbering System



① 100 VA with primary and secondary fusing (120V secondary).

② Required by some local codes in Arizona.

For information/instructions regarding remote shunt trip modification method to meet conflicting local codes in some areas, please see instruction leaflet IL008003EN.

For information regarding the use of fine-stranded wire within the elevator control switch, please see instruction leaflet IL008004EN.

For more information regarding elevator control switches and other Eaton switching device solutions, please go to www.eaton.com/switches.

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