



Mike Holt's Illustrated Guide to

# Article 760

## FIRE ALARM SYSTEMS

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## ABOUT THE AUTHOR

**Mike Holt** is an author, businessman, educator, speaker, publisher and *NEC*® expert. He has written hundreds of electrical training books and articles, founded three successful businesses, and has taught thousands of electrical *Code* seminars across the United States and internationally.



Mike's approach to electrical training is based on his own experience as an electrician, contractor, inspector and teacher. He's always felt a responsibility to his students and to the electrical industry to provide education beyond the scope of just passing an exam. This commitment, coupled with the lessons he learned at the University of Miami's MBA program, have helped him build one of the largest electrical training and publishing companies in the United States.

Mike's one-of-a-kind presentation style and his ability to simplify and clarify technical concepts explain his unique position as one of the premier educators and *Code* experts in the country. His passion for the electrical field drives his goal to increase electrical safety and improve lives.

Mike's commitment to pushing boundaries and setting high standards extends into his personal life. He's an eight-time Overall National Barefoot Waterski Champion with more than 20 gold medals, many national records, and he has competed in three World Barefoot Tournaments. In 2015, at the tender age of 64, he started a new adventure—competitive mountain bike racing. Every day he continues to find ways to motivate himself, both mentally and physically.

Mike and his wife, Linda, reside in New Mexico and Florida, and are the parents of seven children and six grandchildren. As his life has changed over the years, a few things have remained constant: his commitment to God, his love for his family, and doing what he can to change the lives of others through his products and seminars.

*I dedicate this book to the  
Lord Jesus Christ,  
my mentor and teacher.  
Proverbs 16:3*



# ARTICLE 760

## FIRE ALARM SYSTEMS

### Introduction to Article 760—Fire Alarm Systems

This article covers the installation of wiring and equipment for fire alarm systems. It includes fire detection and alarm notification, voice, guard's tour, sprinkler waterflow, and sprinkler supervisory systems. Many of these rules are outside of the scope of this material, however, some of the topics we cover include the following:

- ▶ Scope
- ▶ Access to Electrical Equipment Behind Panels Designed to Allow Access
- ▶ Abandoned Cables
- ▶ Circuit Identification
- ▶ Supply-Side Overvoltage Protection
- ▶ Fire Alarm Circuit Requirements
- ▶ Wiring Methods
- ▶ Separation from Power Conductors

### Part I. General

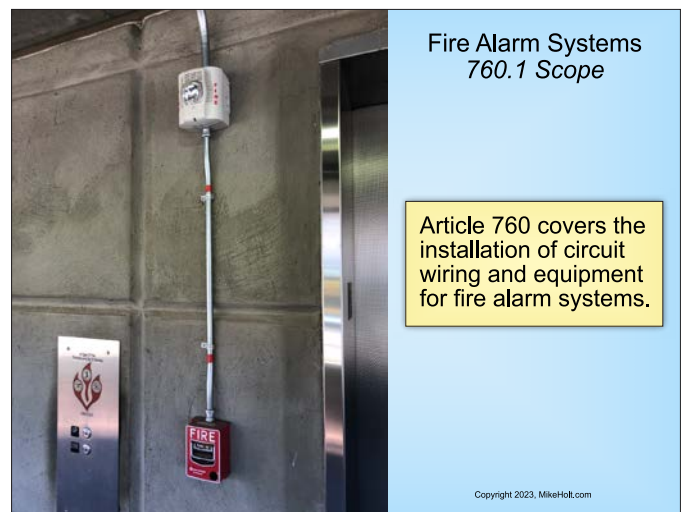
#### 760.1 Scope

Article 760 covers the installation of circuit wiring and equipment for fire alarm systems. ▶[Figure 760-1](#)

**According to Article 100**, a "Fire Alarm Circuit" is the wiring connected to equipment powered and controlled by the fire alarm system. ▶[Figure 760-2](#)

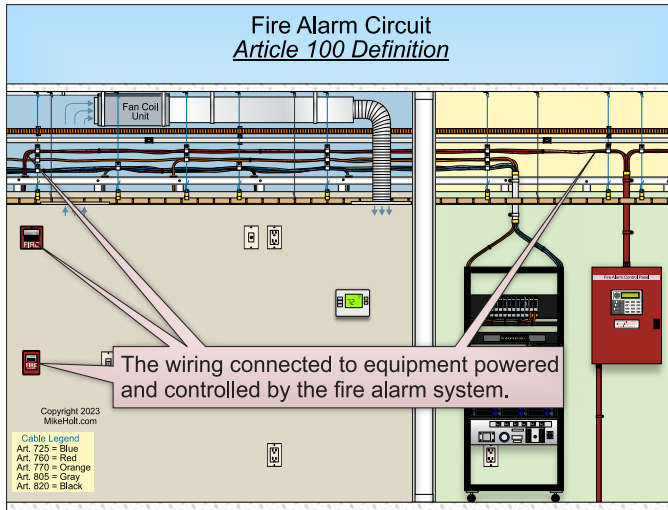
#### Author's Comment:

- ▶ Residential smoke alarm systems, including interconnecting wiring, are not covered by Article 760 because they are not powered by a fire alarm system as defined in NFPA 72, *National Fire Alarm and Signaling Code*.



▶[Figure 760-1](#)

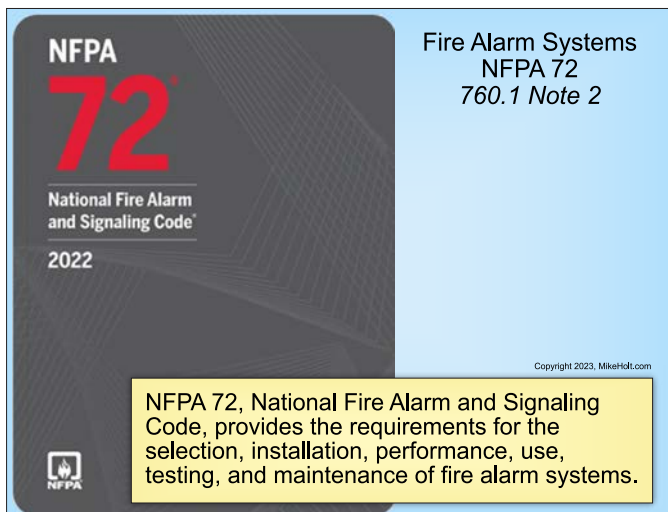




► Figure 760-2

**Note 1:** Fire alarm systems include fire detection and alarm notification, guard's tour, sprinkler waterflow, and sprinkler supervisory systems. Other circuits that might be controlled or powered by the fire alarm system include building safety functions, elevator capture, elevator shutdown, door release, smoke doors and damper control, fire doors and damper control, and fan shutdown.

**Note 2:** NFPA 72, *National Fire Alarm and Signaling Code*, provides the requirements for the selection, installation, performance, use, testing, and maintenance of fire alarm systems. ► Figure 760-3



► Figure 760-3

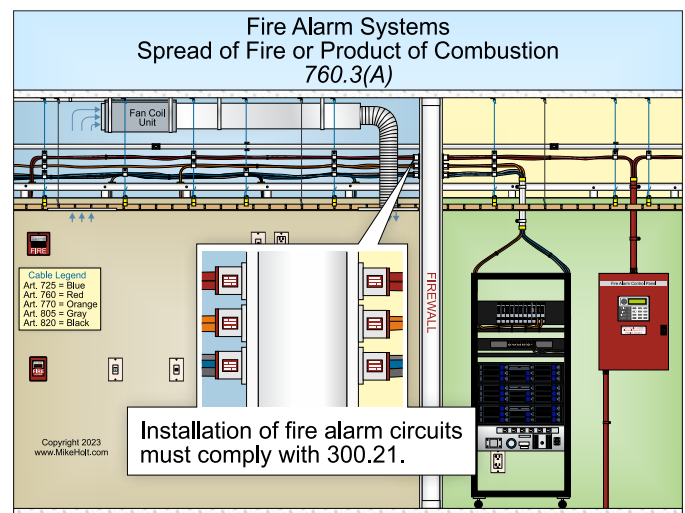
**Author's Comment:**

- Building control circuits associated with the fire alarm system, such as elevator capture and fan shutdown, must comply with Article 725 [760.3(D)]. Article 760 applies if these components are powered and directly controlled by the fire alarm system.
- NFPA 101, *Life Safety Code*, or the local building code specifies when and where a fire alarm system is required.

**760.3 Other Articles**

Fire alarm circuits and equipment must comply with 760.3(A) through (O). Only those sections contained in Article 300 specifically referenced below apply to fire alarm systems.

**(A) Spread of Fire or Products of Combustion.** Installation of fire alarm circuits must comply with 300.21. ► Figure 760-4

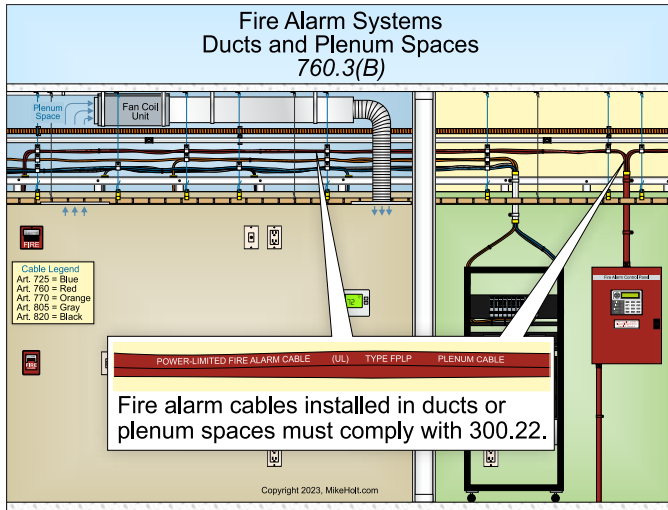


► Figure 760-4

**(B) Ducts and Plenum Spaces.** Fire alarm cables installed in ducts or plenum spaces must comply with 300.22. ► Figure 760-5

*Ex 1:* Power-limited fire alarm cables selected in accordance with Table 760.154 and installed in accordance with 760.135(B) and 300.22(B) can be installed in ducts specifically fabricated for environmental air.

*Ex 2:* Power-limited fire alarm cables selected in accordance with Table 760.154 and installed in accordance with 760.135(C) can be installed in plenum spaces.



▶ Figure 760-5

**(C) Corrosive, Damp, or Wet Locations.** Fire alarm circuits installed in corrosive, damp, or wet locations must be identified for use in the operating environment [110.11], must be of materials suitable for the environment in which they are to be installed, and must be of a type suitable for the application [300.5(B), 300.6, 300.9, and 310.10(F)].

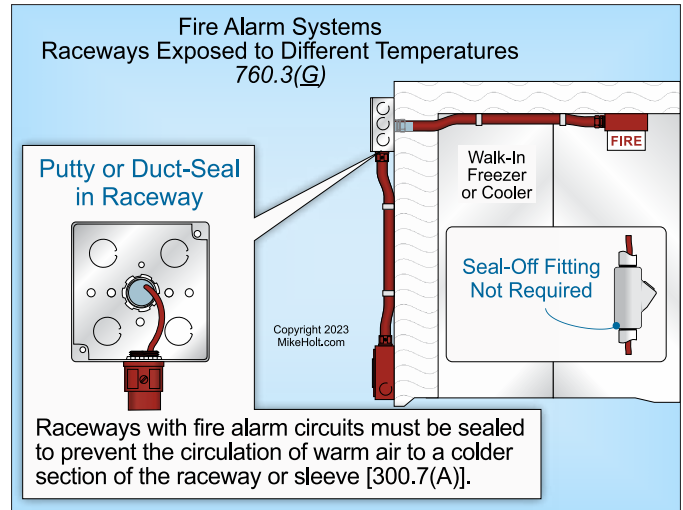
**(D) Building Control Circuits.** Building control systems with Class 2 circuits (elevator capture, fan shutdown, and so on) associated with the fire alarm system, but not controlled and powered by the fire alarm system, must be installed in accordance with Article 725.

**(G) Raceways or Sleeves Exposed to Different Temperatures.** If a raceway or sleeve is subjected to different temperatures, and where condensation is known to be a problem, the raceway or sleeve must be filled with a material approved by the authority having jurisdiction that will prevent the circulation of warm air to a colder section of the sleeve or raceway in accordance with 300.7(A). ▶ Figure 760-6

**(I) Installation Cables in a Raceway.** Raceways must be large enough to permit the installation and removal of cables without damaging conductor insulation [300.17]. ▶ Figure 760-7

#### Author's Comment:

- ▶ When all conductors within a raceway are the same size and insulation, the number of conductors permitted can be found in Annex C for the raceway type.
- ▶ For conductors not included in Chapter 9 (such as multiconductor cable), the actual dimensions must be used. If one multiconductor cable is used inside a raceway the single-conductor percentage fill area must be used [Chapter 9, Notes to Tables, Note 5 and 9].



▶ Figure 760-6

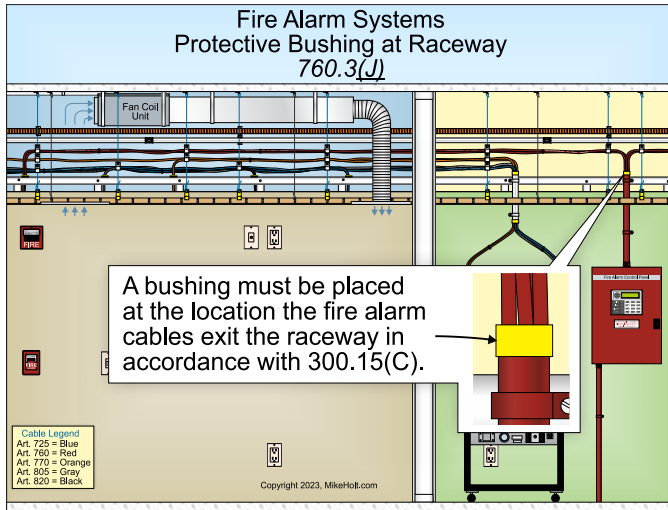


▶ Figure 760-7

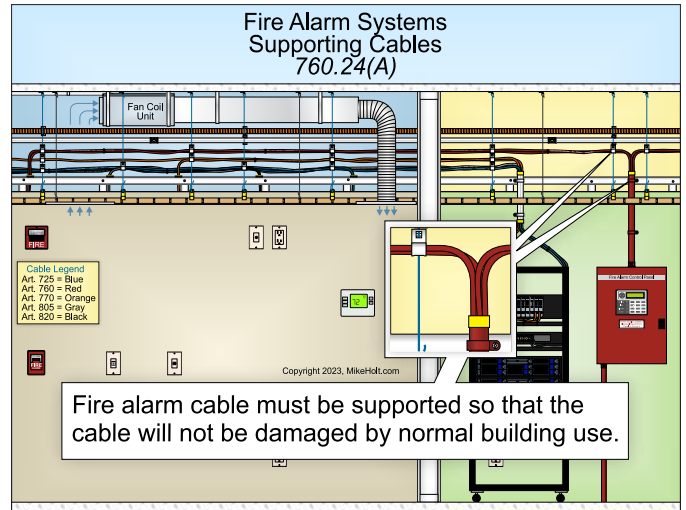
**(J) Protective Bushing at Raceway.** When a raceway is used for the support or protection of cables, a bushing is required to reduce the potential for abrasion and must be placed at the location the cables exit the raceway in accordance with 300.15(C). ▶ Figure 760-8

**(O) Cables for Power-Limited Fire Alarm (PLFA) Circuits.** The listing and installation of cables for power-limited fire alarm circuits must comply with Part III of this article and Parts I and II of Article 722.

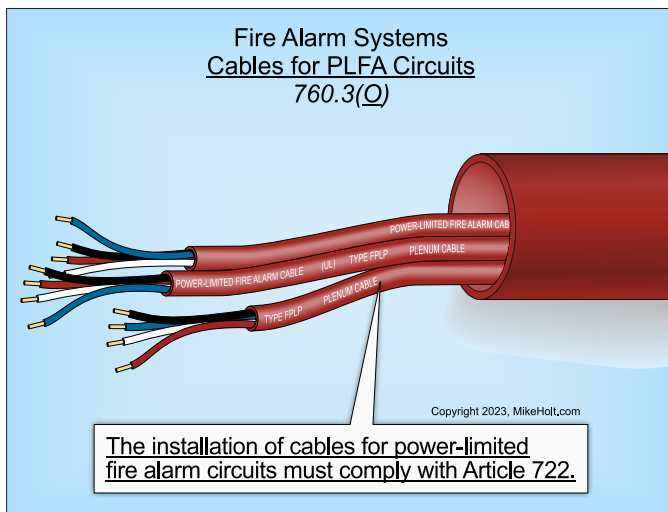
▶ Figure 760-9



▶ Figure 760-8



▶ Figure 760-10



▶ Figure 760-9

## 760.21 Access to Electrical Equipment Behind Panels Designed to Allow Access

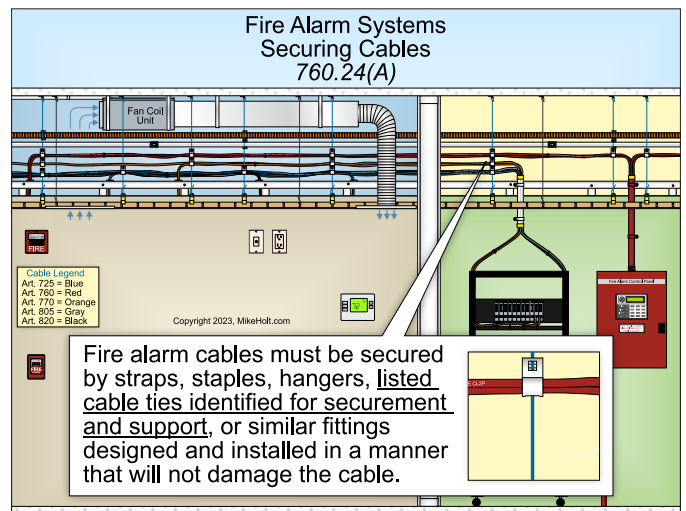
Access to equipment cannot be prohibited by an accumulation of cables that prevents the removal of suspended-ceiling panels.

## 760.24 Mechanical Execution of Work

**(A) General.** Fire alarm circuits must be installed in a neat and workmanlike manner.

**Cable Support.** Exposed fire alarm cables must be supported by the structural components of the building so the cable(s) will not be damaged by normal building use. ▶ Figure 760-10

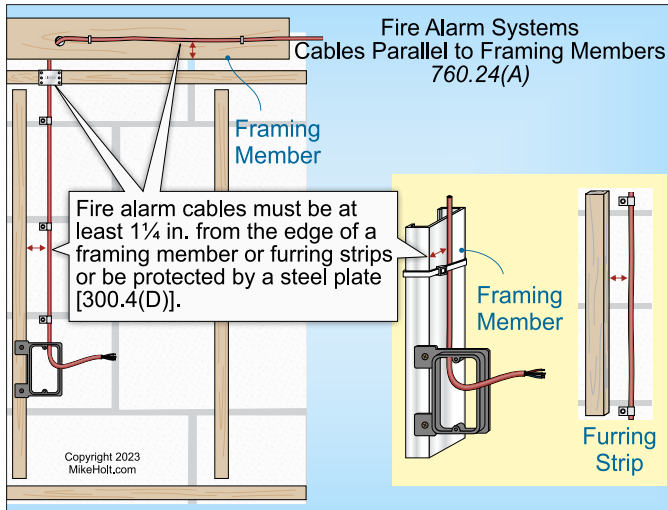
**Cable Securement.** Fire alarm cables must be secured by hardware including straps, staples, hangers, listed cable ties identified for securement and support, or similar fittings designed and installed in a manner that will not damage the cable. ▶ Figure 760-11



▶ Figure 760-11

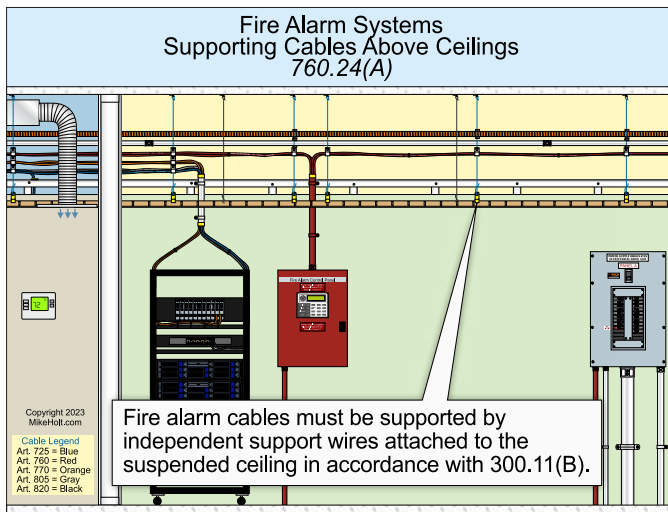
**Protection From Physical Damage [300.4].** Fire alarm cables installed through or parallel to framing members or furring strips must be protected where they are likely to be penetrated by nails or screws by installing the wiring method so it is not less than 1 ¼ in. from the nearest edge of the framing member or furring strips, or by protecting it with a 1/16 in. thick steel plate or equivalent [300.4(A) and (D)].

▶ Figure 760-12



▶ Figure 760-12

**Securing and Supporting [300.11].** Ceiling-support wires or the ceiling grid is not permitted to support raceways or cables. Independent support wires secured at both ends can be used to support raceways or cables. Raceways and cables can be supported by independent support wires attached to the suspended ceiling in accordance with 300.11(B) [760.130(B)]. ▶ **Figure 760-13**

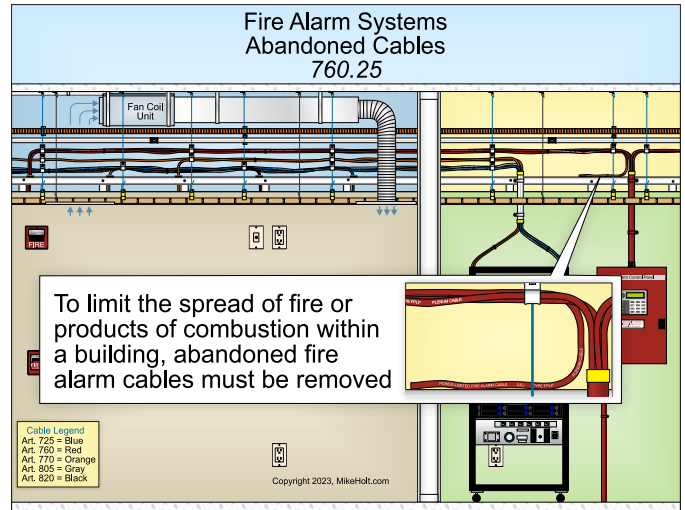


▶ Figure 760-13

**Note:** Paint, plaster, cleaners, abrasives, corrosive residues, or other contaminants might result in an undetermined alteration of PLFA and NPLFA cable properties.

## 760.25 Abandoned Cables

To limit the spread of fire or products of combustion within a building, abandoned fire alarm cables must be removed. ▶ **Figure 760-14**



▶ Figure 760-14

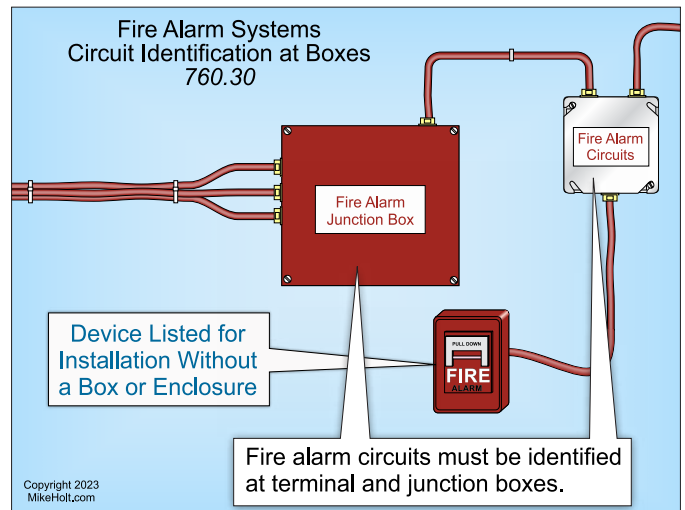
**According to Article 100,** “Abandoned Cable” is defined as a cable that is not terminated at equipment other than a termination fitting or a connector and is not identified for future use with a tag.

Where cables are identified for future use with a tag, the tag must be able to withstand the environment involved.

## 760.30 Fire Alarm Circuit Identification

Fire alarm circuits must be identified at terminal and junction boxes.

▶ Figure 760-15



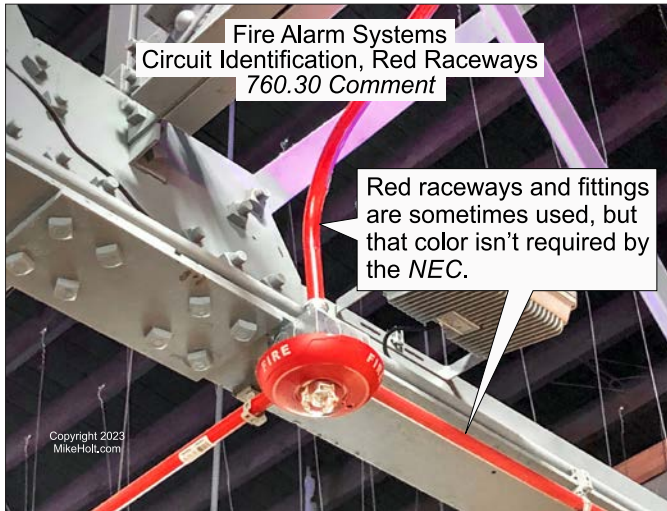
▶ Figure 760-15

The identification must be in such a manner that will help to prevent unintentional signals on the fire alarm system circuits during testing and servicing of other systems.



**Author's Comment:**

- ▶ Red raceways and fittings are sometimes used, but that color is not required by the NEC. ▶ **Figure 760-16**

▶ **Figure 760-16****760.33 Supply-Side Overvoltage Protection**

A listed surge-protective device must be installed on the supply side of a fire alarm control panel in accordance with Part II of Article 242.

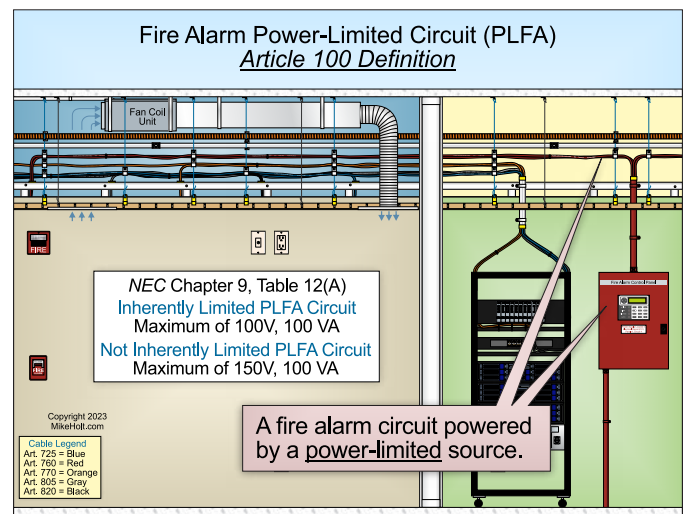
▶ **Figure 760-17**

▶ **Figure 760-17****760.35 Fire Alarm Circuit Requirements**

**(B) Power-Limited Fire Alarm Circuits.** Power-limited fire alarm (PLFA) circuits must comply with Parts I and III of this article.

**Part III. Power-Limited Fire Alarm (PLFA) Circuits**

**According to Article 100,** a “Power-Limited Fire Alarm” circuit is powered by a power-limited source. ▶ **Figure 760-18**

▶ **Figure 760-18****760.121 Power Sources for Power-Limited Fire Alarm Equipment**

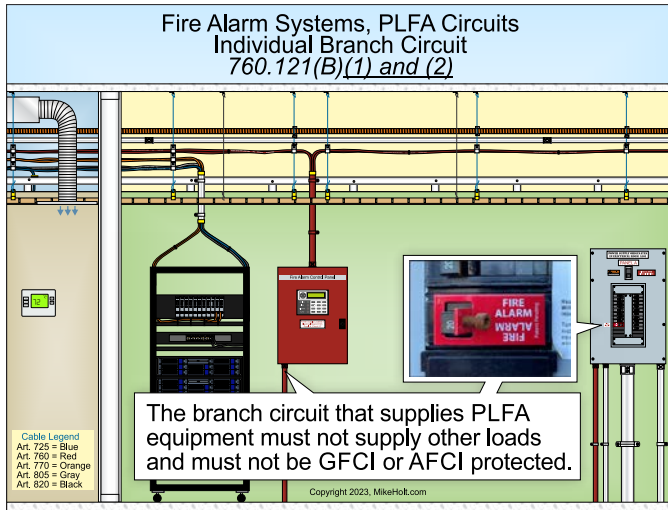
**(A) Power Sources.** The power source for power-limited fire alarm equipment must be one of the following:

- (1) A listed PLFA transformer
- (2) A listed PLFA power supply
- (3) Listed equipment marked to identify the PLFA power source

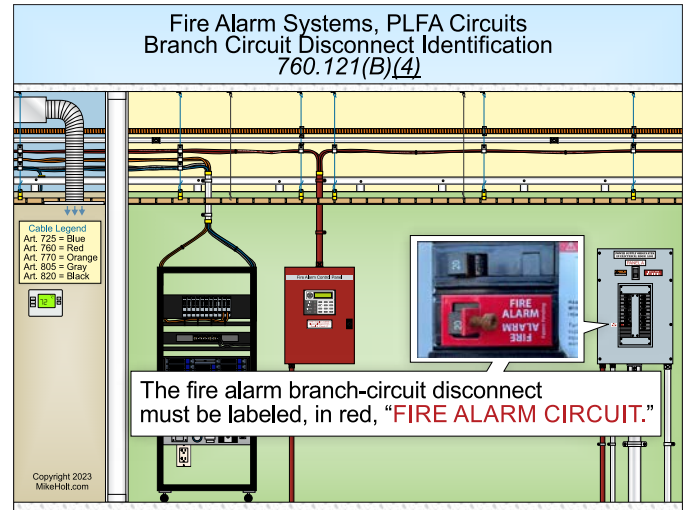
**(B) Branch Circuit.** Power-limited fire alarm equipment must comply with the following: ▶ **Figure 760-19**

- (1) The branch circuit supplies no other loads.
- (2) The branch circuit is not GFCI or AFCI protected.





▶ Figure 760-19



▶ Figure 760-21

- (3) The location of the branch-circuit overcurrent protective device for the power-limited fire alarm equipment must be identified at the fire alarm control unit. ▶ Figure 760-20



▶ Figure 760-20

- (4) The branch-circuit disconnect must be identified in red, be accessible only to qualified personnel, and be identified as the “FIRE ALARM CIRCUIT.” The red identification must not damage the overcurrent protective device or obscure any manufacturer’s markings. ▶ Figure 760-21
- (5) The fire alarm branch-circuit disconnect is permitted to be secured in the closed (on) position. ▶ Figure 760-22

**Note:** GFCI protection is not required for receptacles in dwelling-unit unfinished basements that supply power for fire alarm systems. See 210.8(A)(5) Ex.



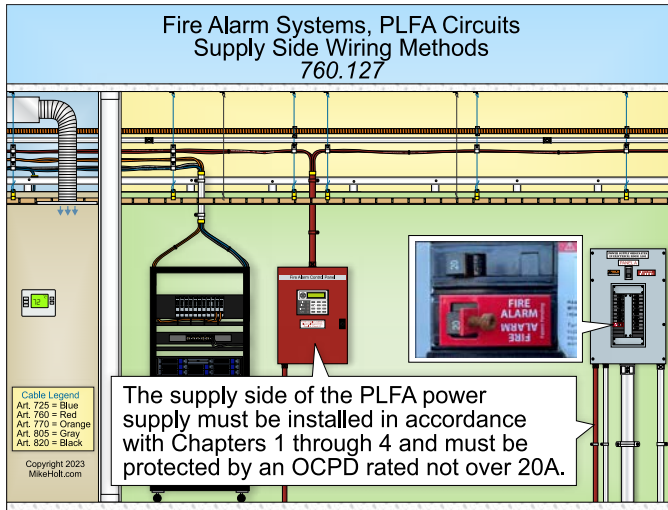
▶ Figure 760-22

## 760.124 Marking

Fire alarm equipment supplying power-limited fire alarm cable circuits must be durably marked to indicate each circuit that is a power-limited fire alarm circuit.

## 760.127 Wiring Methods on Supply Side of the Power-Limited Fire Alarm Source

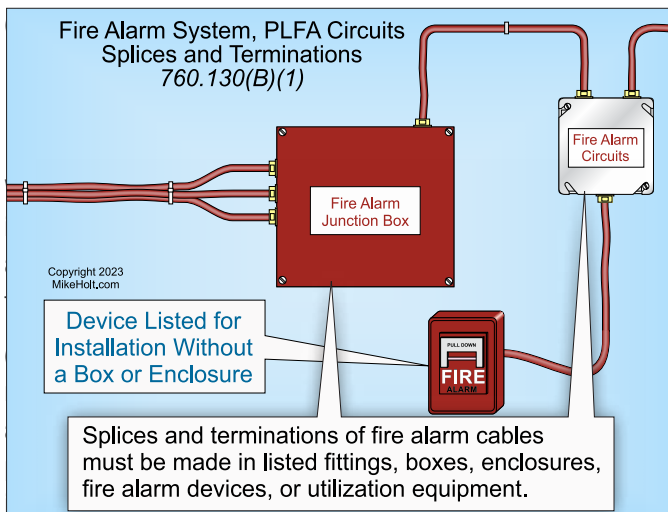
Conductors and equipment on the supply side of the power-limited fire alarm power supply must be installed in accordance with Chapters 1 through 4. Transformers or other devices supplied from power-supply conductors must be protected by an overcurrent device rated not over 20A. ▶ Figure 760-23



► Figure 760-23

### 760.130 Load Side of the Power-Limited Fire Alarm Power Source

#### (B) PLFA Wiring Methods and Materials.



► Figure 760-24

### 760.136 Separation from Power Conductors

**(A) General.** Power-limited fire alarm cables are not permitted to be placed in any enclosure, raceway, or cable with power conductors.

**(B) Separated by Barriers.** If separated by a barrier, power-limited fire alarm circuits are permitted with power conductors.

#### Author's Comment:

- Separation is required to prevent a fire or shock hazard that can occur from a short between the fire alarm circuit and the higher-voltage circuits.

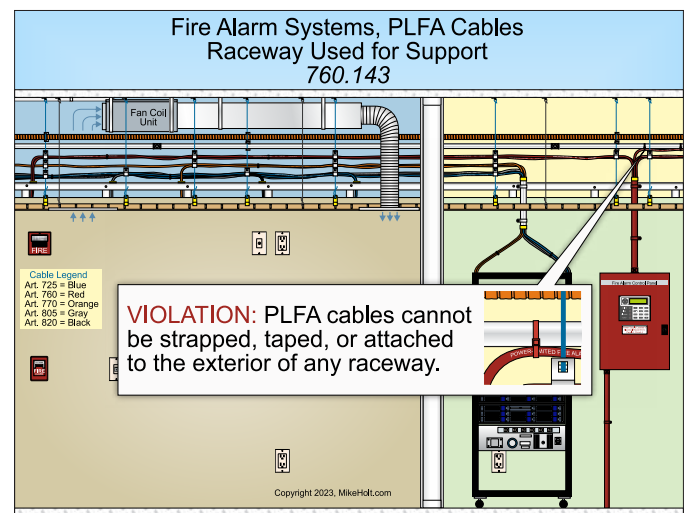
**(D) Associated Systems.** Power-limited fire alarm conductors can be installed with power conductors where introduced solely to connect to equipment associated with power circuit conductors, and:

- (1) A minimum of ¼ in. separation is maintained from the power-limited fire alarm conductors from the power conductors.

### 760.143 Support of PLFA Cables

Power-limited fire alarm cables are not permitted to be strapped, taped, or attached to the exterior of any raceway as a means of support.

► Figure 760-25



► Figure 760-25

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