

BFAAM Apprenticeship Program

Period 4

Related Training Instruction (RTI)

Module 2 – NEC / NFPA 70 –

Reading material associated with this
module: Chapter 7, Article 760 and related
Chapter 2 (Grounding) Items of NFPA 70,
National Electrical Code (NEC), 2014 edition

National Electric Code

Chapter 2 Grounding

- **250.86 Other Conductor Enclosures & Raceways.** Except as permitted by 250.112(I), metal enclosures and raceways for other than service conductors shall be connected to the equipment grounding conductor.

National Electric Code

Chapter 2 Grounding

- **250.112(I) Remote-Control, Signaling, and Fire Alarm Circuits.** Equipment supplied by Class 1 circuits shall be grounded unless operating at less than 50 volts. Equipment supplied by Class 1 power-limited circuits, Class 2 and Class 3 remote-control and by fire alarm circuits shall be grounded where system grounding is required by Part II or Part VIII of this article.

National Electric Code

Chapter 2 Grounding

- **Part II covers Alternating Current.**
- **Part VIII covers Direct Current.**
- The actual requirement for grounding a fire alarm system are first based on voltage and then on other conditions. The actual requirement for grounding a system depends on the voltage of the initiating and notifying circuits of the fire alarm system.

National Electric Code

Chapter 2 Grounding

- **250.118 Types of Equipment Grounding Conductors.** The equipment grounding conductor run with or enclosing the circuit conductors shall be one or more or a combination of the following:
 - (1) A Copper conductor.
 - (4) Electrical Metal Tubing (EMT)
 - (7) Flexible metallic tubing where the tubing is terminated in listed fittings and meeting the following conditions:

National Electric Code

Chapter 2 Grounding

- a. The circuit conductors contained in the tubing are protected by overcurrent devices rated at 20 amperes or less.
- b. The combined length of flexible metal conduit and flexible metal tubing and liquidtight flexible metal conduit in the same ground return path does not exceed 1.8 m (6 ft.).
- c. Please note FMT is not allowed as a grounding conductor in the State of Michigan.

National Electric Code

Chapter 2 Grounding

- **250.119 Identification of Equipment Grounding Conductors.** Unless required elsewhere in this code, equipment grounding conductors shall be permitted to be bare or insulated. Individually insulated equipment grounding conductors shall be green or green with one or more yellow stripes. No other use allowed except for equipment grounding.

National Electric Code

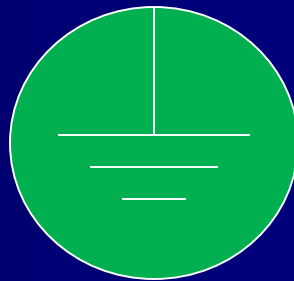
Chapter 2 Grounding

- **Exception:** Power-limited, Class 2 or Class 3 circuit cables containing only circuits operating at less than 50 volts shall be permitted to use a conductor with green insulation for other than equipment grounding purposes.

National Electric Code

Chapter 2 Grounding

- Common symbol used to indicate the grounding termination point for an equipment grounding conductor.



National Electric Code

Chapter 2 Grounding

VIII. Direct-Current Systems

- **250.160 General.** Direct-current systems shall comply with part VIII and other sections of article 250 not specifically intended for ac systems.
- **250.162 Direct-Current Circuits and Systems to Be Grounded.** Direct-current circuits and systems shall be grounded as provided for in 250.162(A) & (B).

National Electric Code

Chapter 2 Grounding

- **(A) Two-Wire, Direct-Current Systems.** A 2-wire, dc system supplying premises wiring and operating at greater than 60 volts but not greater than 300 volts shall be grounded.

Exception No. 3: Direct-current fire alarm circuits having a maximum current of 0.030 ampere as specified in Article 760, Part III, shall not be required to be grounded.

National Electric Code

Chapter 2 Grounding

Most new fire alarm systems are direct-current (DC) systems that operate @ 24 VOLTS or less. For the most part the fire alarm panels have PLFA (power-limited fire alarm) power supplies for the initiating device & notification appliance circuits. As we can see in section 250.162, systems that operate at less than 60 volts DC are not required to be grounded. Since the system is not required to be grounded, the raceways, boxes and other enclosures are not required to be grounded.

National Electric Code

Chapter 2 Grounding

Please Note, however, that the fire alarm control panel is likely to be supplied by a 120 volt AC circuit, which section 250.20(B) does require the circuit and the fire alarm panel to be grounded.

National Electric Code

Chapter 2 Grounding

- **760.32 Fire Alarm Circuits Extending Beyond One Building.** NPFLA & PLFA circuits that extend beyond one building and run outdoors shall meet the installation requirements of Parts II, III, and IV of Article 800 and Part I of Article 300.

National Electric Code

Article 760

- **Fire Alarm System Requirements are found in Chapter 7, Article 760.**
- **Article 760 includes Part I – General, Part II – NPLFA, and Part III - PLFA**
- Article 300 requirements do not apply, unless specifically referenced by Article 760

National Electric Code

Article 760

I. General

- **760.1 Scope.** Article 760 regulates installation of wiring and equipment, including all circuits controlled and powered by the fire alarm system.

Please note the FPN No.1 (fine print note)

National Electric Code

Article 760

- **Information Note No.1**, explains what is inclusive of fire alarm systems.
- You will notice at the end of the note it states that: For further information on the installation and monitoring for integrity requirements for fire alarm systems, refer to NFPA 72-2013 National Fire Alarm and Signaling Code.

National Electric Code

Article 760

- **760.2 Definitions.**
- **Abandoned Fire Alarm Cable.**
Installed fire alarm cable that is not terminated at equipment other than a connector and not identified for future use with a tag.

National Electric Code

Article 760

- **Fire Alarm Circuit.** The portion of the wiring system between the load side of the overcurrent device or the power-limited supply and the connected equipment of all circuits powered & controlled by the fire alarm system. Fire Alarm circuits are classified as either non-power limited (NPLFA) or power limited (PLFA).

National Electric Code Article 760

- **Fire Alarm Circuit Integrity Cable.**

Cable used in fire alarm systems to ensure continued operation of critical circuits during a specified time under fire condition.

National Electric Code

Article 760

- **Non-Power-Limited Fire Alarm Circuit (NPLFA).** A fire alarm circuit powered by a source that complies with 760.41 & 760.43.

National Electric Code

Article 760

- **760.41 NPLFA Circuit Power Source Requirements.**

(A) Power Source. The power source of NPLFA circuits shall comply with Chapters 1 through 4, and the output voltage shall not exceed 600 volts, nominal.

National Electric Code

Article 760

(B) Branch Circuit. A dedicated branch circuit shall be required for the supply of the power source. The circuit shall be identified at the FACP. The circuit disconnecting means shall have red identification and be identified as "Fire Alarm Circuit". This branch circuit shall not be supplied by either ground-fault or arc-fault circuit interrupters.

National Electric Code

Article 760

- **760.43 NPLFA Circuit Overcurrent Protection.** Overcurrent protection shall not exceed 7 amperes for 18 AWG conductors & 10 amperes for 16 AWG conductors. 14 AWG conductors and larger shall be in accordance with the conductor ampacity without applying the derating factors of 310.15 to the ampacity calculation.

National Electric Code

Article 760

- **Power-Limited Fire Alarm Circuit (PLFA).** A fire alarm circuit powered by a source that complies with 760.121.

National Electric Code

Article 760

- **760.121 Power-Sources for PLFA Circuits.**

(A) Power Source. The power source for a power-limited fire alarm circuit shall be as specified in 760.121(A)(1), (2), or (3)

National Electric Code

Article 760

- (1) A listed PLFA or Class 3 Transformer.
- (2) A listed PLFA or Class 3 Power Supply.
- (3) Listed equipment marked to identify the PLFA power source

National Electric Code

Article 760

(B) Branch Circuit. A dedicated branch circuit shall be required for the supply of the power source. The circuit shall be identified at the FACP. The circuit disconnecting means shall have red identification and be identified as "Fire Alarm Circuit". This branch circuit shall not be supplied by either ground-fault or arc-fault circuit interrupters.

National Electric Code

Article 760

- 760.3 Other Articles. Circuits and equipment shall comply with 760.3 (A) Through (K). Only those sections of Article 300 referenced in this article shall apply to fire alarm systems.

National Electric Code

Article 760

- **(A) Spread of Fire or Products of Combustion.** Section 300.21. The accessible portion of abandoned fire alarm cables shall be removed.

National Electric Code

Article 760

- **(B) Ducts, Plenums, and Other Air-Handling Spaces.** Section 300.22, where installed in ducts, plenums or other spaces used for environmental air.

Exception: As permitted in 760.53
(B)(1) & (2) and Table 760.154

National Electric Code

Article 760

- **(C) Hazardous (Classified) Locations.** Articles 500 through 516 and 517 part IV, where installed in hazardous locations.

National Electric Code

Article 760

- **(D) Corrosive, Damp or wet Locations.** Comply with Sections 110.11, 300.6, & 300.9
- **(E) Building Control Circuits.** Comply with Article 725 when building control circuits are associated with the fire alarm system.

National Electric Code

Article 760

- **(F) Optical Fiber Cables.** Comply with Article 770 when OFC are used for fire alarm circuits.
- **(G) Installation of Conductors with Other Systems.** Installations shall comply with 300.8

National Electric Code

Article 760

- **760.21 Access to Electrical Equipment Behind Panels Designed to Allow Access.** Access to electrical equipment shall not be denied by an accumulation of conductors and cables that prevents removal of panels, including suspended ceiling panels.

National Electric Code

Article 760

- **760.24 Mechanical Execution of Work.** Fire alarm circuits shall be installed in a neat workmanlike manner. Cables to be installed shall be supported by the building structure in a manner as not to be damaged by normal building use.

National Electric Code

Article 760

- **760.25 Abandoned Cables.** The accessible portion of abandoned fire alarm cables shall be removed. If tagged for future use, tag must withstand the environment involved.

National Electric Code

Article 760

- **760.30 Fire Alarm Circuit Identification.** Fire alarm circuits shall be identified at terminal & junction locations to help prevent unintentional signals on fire alarm circuits during testing & servicing of other systems.

BFAAM Apprenticeship Program

Period 4

Reading Assignment for
Module 23 – NFPA 70 / NEC –

Reading material associated with this
module: Chapter 7, Article 760 (begin @
760.35) and Related Chapter 3 Requirements
of NFPA 70, *National Electrical Code*,
2014 edition