Key Revisions for the 2014 National Electrical Code® (NEC®)

PDHonline Course E428 Webinar
2 PDH's
Presented by Patrick S. Ouillette, P.E.
September 15, 2015

Agenda

- Some background of the NEC®
- The purpose of the Code
- How to use the Code
- Code Arrangement
- Definitions
- Important Code revisions for the 2014 edition
- Quiz

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Learning Objectives

Completion of this webinar will

- Familiarize the student with significant NEC® revisions
- Introduce the student who is not familiar with NFPA 70® to some of the regulations for safeguarding persons and property from hazards arising from the use of electricity
- Re-acquaint students who use the Code infrequently with some of the basic safety requirements and areas of coverage of the *NEC*
- Make the student aware of the four new Code articles and the scope of information contained in these articles

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Learning Objectives

Completion of this webinar will

- Familiarize the student with the changes in the rules for AFCIs and GFCIs
- Familiarize the student with some of the changes related to alternative energy
- Familiarize the student with new requirements for branch circuits
- Enable the student to identify Code sections where additional study may be required appropriate for the student's practice

 4

The NEC® Is:

National Fire Protection Association®

- NFPA 70®, the signature standard among the hundreds of standards published by the *NFPA*;
- The most widely adopted electrical safety standard in the world; and
- Developed through a consensus standards development process by volunteers representing varied viewpoints and interests.

 5

First National Electrical Code was drawn in 1897

 6

90.1 Purpose

- **(A) Practical Safeguarding.** The purpose of this *Code* is the practical safeguarding of persons and property from hazards arising from the use of electricity. It is not a design specification or instruction manual for untrained persons.
- **(B) Adequacy.** This Code contains provisions considered necessary for safety. Compliance results in an installation essentially free from hazard but not necessarily efficient, convenient, or adequate for good service or future expansion of electrical use.

 7

90.3 Code Arrangement

- Chapters 1-4 apply generally to all electrical installations.
  - Chapter 1 – General
  - Chapter 2 – Wiring and Protection
  - Chapter 3 – Wiring Methods and Materials
  - Chapter 4 – Equipment for General Use
- Chapters 5-7 supplement or modify chapters 1-4.
  - Chapter 5 – Special Occupancies
  - Chapter 6 – Special Equipment
  - Chapter 7 – Special Conditions
- Chapter 8 – Communications Systems stands alone, except where reference is made in chapter 8 to other sections.
- Chapter 9 – Tables are applicable as referenced.
- Informative Annexes A-J are informational only, not mandatory.

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Code-Wide Changes

Voltage Threshold: Changed from "Over 600 Volts" to "Over 1000 Volts"

Some wind generating systems operate above the existing 600-V threshold (690 volts AC is common) and solar photovoltaic (PV) systems operate in a range of DC voltages up to and including 1000 V and higher. The "High Voltage Task Group" was appointed by the Technical Correlating Committee to review existing Code and submit new proposals to address the need for installation rules for circuits and systems operating at over 600 volts.

As a result of their work, several Code articles now address Over 1000 Volts in place of Over 600 Volts. Some articles retained the 600-V threshold, particularly where there were safety concerns.

 9

Article 100 – Definitions

Readily Accessible [revised definition]

"Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to actions such as to use tools, to climb over or remove obstacles, or to resort to portable ladders, and so forth."

Where a disconnecting means is required to be readily accessible, even the use of a simple screwdriver to access the disconnect renders the disconnect not readily accessible (only accessible). This can be the case in certain HVAC equipment where a built-in disconnect is located behind an access panel that requires a screwdriver to remove or open.

 10

Article 100 – Definitions

Separately Derived System [revised definition]

"An electrical source, other than a service, having no direct connection(s) to circuit conductors of any other electrical source other than those established by grounding and bonding connections."

Separately derived systems are not services. Only a utility company supplies power via a service. Grounding the neutral of a separately derived system (e.g., a transformer) in a building to metal water piping or structural steel in the vicinity of the separately derived system will nearly always form a connection to another system's grounded conductor. The electrode used (structural steel or metal water piping) to ground the separately derived system must qualify as a grounding electrode. The revised definition clarifies that a common grounding electrode conductor used to ground multiple separately derived systems, as permitted in 250.30(A)(6), does not disqualify the systems from being separately derived systems.

 11

110.16 Arc-Flash Hazard Warning

This label meets both the 2014 *NEC* and NFPA 70E-2012 requirements.

Note: Factory marking of the information required by 70E is generally not feasible due to the variety of equipment applications.

Summary: Arc flash warning labels may be field or factory applied. Field-applied marking shall meet the requirements of new 110.21(B), which contains general requirements for field marking.

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110.21(B) Field-Applied Markings

Safety alert symbol — Signal word

DANGER
HIGH VOLTAGE – KEEP OUT
Red background and exclamation point

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING
Orange background and exclamation point

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION
Yellow background and exclamation point

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. The signal word without the safety alert symbol is sometimes used when the message addresses only a hazard to property and not to persons.

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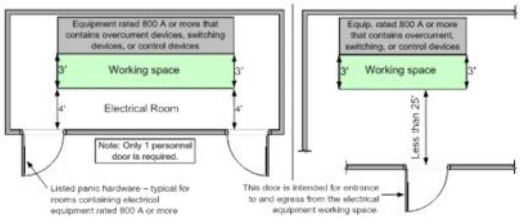
110.25 Lockable Disconnecting Means

Courtesy of Brady Worldwide, Inc.

Summary
New 110.25 contains rules that must be complied with for a disconnecting means to qualify as lockable open. An exception recognizes that where the disconnecting means is permitted to be a plug for cord-and-plug-connected equipment, the provision for locking cannot remain in place.

 14

110.26(C)(3) Spaces About Electrical Equipment



These doors must open in the direction of egress and must be equipped with listed panic hardware.

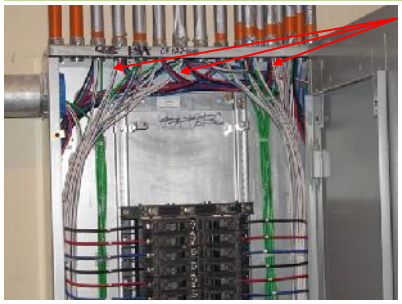
 15

110.26(E)(2) Dedicated Equipment Space, 600 V

Summary
Dedicated equipment space shall be provided for switchboards, switchgear, panelboards, and motor control centers installed in outdoor locations. The space shall be equal to the width and depth of the equipment and extend from grade to a height of 6 ft above the equipment.

 16

200.4(B) Neutral Conductors – Multiple Circuits



Multiple neutral/ grounded conductors in the same raceway

 17

210.5(C)(2) Identification of Ungrounded Branch Circuit Conductors Supplied from DC Systems

Positive Polarity, Sizes 6 AWG or Smaller

Negative Polarity, Sizes 6 AWG or Smaller

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210.8(A)(9) GFCI Protection for Personnel – Dwelling Unit Bathtubs or Shower Stalls

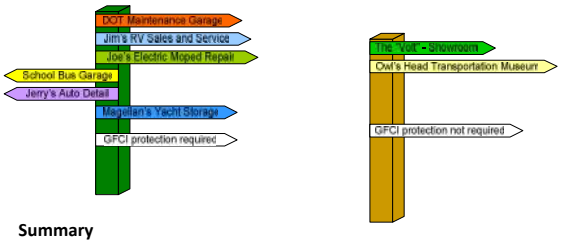
Courtesy of Interiorholic.com

210.8(A)(10) GFCI Protection for Personnel – Dwelling Unit Laundry Areas

Courtesy of decorpad.com

Summary
All 125-volt, single-phase, 15- and 20-ampere receptacle outlets installed in dwelling unit laundry rooms or areas shall be GFCI protected.

210.8(B)(8) GFCI Protection for Personnel – Other Than Dwelling Units



Summary
All 125-volt, single-phase, 15- and 20-ampere receptacles installed in nondwelling garages, service bays, and similar areas shall have GFCI protection for personnel. Vehicle showrooms and exhibition halls are exempt from the GFCI requirement.

210.8(D) GFCI Protection for Personnel – Kitchen Dishwasher Branch Circuit

Summary
Dishwashers in dwelling units shall be GFCI protected.

Application Question
Where would you locate a GFCI receptacle that serves the dishwasher in a dwelling?

Visit www.AFCISafety.org for a wealth of information on arc-fault circuit interrupters and use of AFCI and GFCI on the same circuit.

210.12(A) Arc-Fault Circuit-Interrupter (AFCI) Protection – Dwelling Units

Summary The requirement for AFCI protection for 120-volt, single phase, 15- and 20-ampere branch circuits in dwelling units has been expanded to include all such circuits in kitchens and laundry areas. The 2014 *NEC* requires all AFCI devices to be installed in a *readily accessible* location to facilitate resetting and testing.

210.12(A) Arc-Fault Circuit-Interrupter (AFCI) Protection – Dwelling Units

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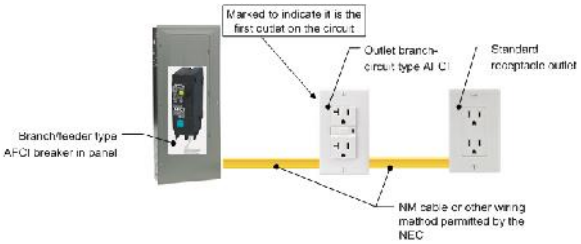
These are the options for providing AFCI protection:

(1) A listed combination type AFCI installed to provide protection for the entire branch circuit. There are no additional requirements when this method is used. The system is pictured below.

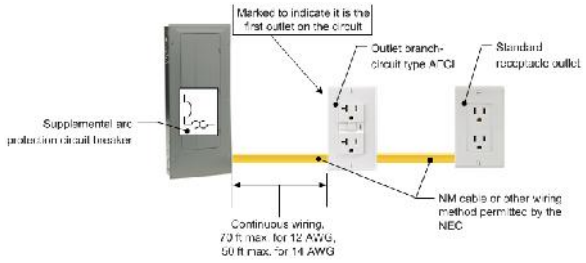
210.12(A) Arc-Fault Circuit-Interrupter (AFCI) Protection – Dwelling Units

(2) A listed branch/feeder type AFCI installed at the origin of the branch circuit in combination with a listed outlet branch circuit (OBC) type AFCI installed at the first outlet box on the circuit. The first outlet box in the circuit shall be marked to indicate that it is the first outlet of the circuit. The system is pictured below.



210.12(A) Arc-Fault Circuit-Interrupter (AFCI) Protection – Dwelling Units

(3) A listed supplemental arc protection circuit breaker installed at the origin of the branch circuit in combination with a listed outlet branch circuit (OBC) type AFCI installed at the first outlet box on the circuit, provided the following conditions are met:



210.12(A) Arc-Fault Circuit-Interrupter (AFCI) Protection – Dwelling Units

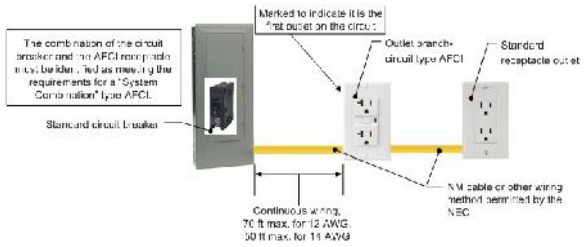
(a) the branch circuit wiring is continuous from the overcurrent device to the OBC type AFCI,

(a) the maximum length of the branch circuit wiring from the overcurrent device to the AFCI device does not exceed 50 ft for a 14 AWG conductor or 70 ft for a 12 AWG conductor, and

(c) the first outlet box in the circuit is marked to indicate that it is the first outlet of the circuit.

210.12(A) Arc-Fault Circuit-Interrupter (AFCI) Protection – Dwelling Units

(4) A listed branch circuit overcurrent protective device (e.g., a standard circuit breaker) installed at the origin of the branch circuit in combination with a listed outlet branch circuit (OBC) type AFCI installed at the first outlet box on the circuit, provided the following conditions are met:

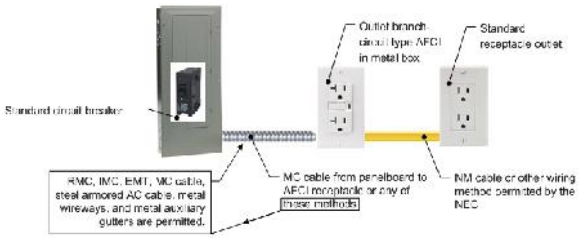


210.12(A) Arc-Fault Circuit-Interrupter (AFCI) Protection – Dwelling Units

(a) the branch circuit wiring is continuous from the overcurrent device to the OBC type AFCI,
(b) the maximum length of the branch circuit wiring from the overcurrent device to the AFCI device does not exceed 50 ft for a 14 AWG conductor or 70 ft for a 12 AWG conductor,
(c) the first outlet box in the circuit is marked to indicate that it is the first outlet of the circuit, and
(d) the combination of the branch circuit overcurrent device and the AFCI receptacle is identified as meeting the requirements for a "System Combination" type AFCI and is listed as such.

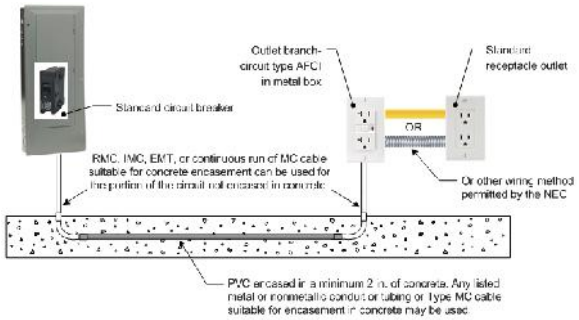
210.12(A) Arc-Fault Circuit-Interrupter (AFCI) Protection – Dwelling Units

(5) Where RMC, IMC, EMT, Type MC cable, or steel armored Type AC cables meeting the requirements of 250.118 for equipment grounding conductors, metal wireways, metal auxiliary gutters, and metal outlet and junction boxes are installed for the portion of the branch circuit between the overcurrent protective device and the first outlet,



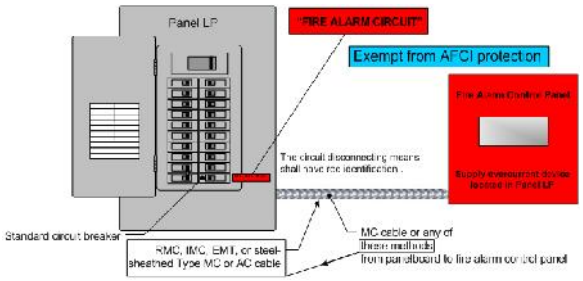
210.12(A) Arc-Fault Circuit-Interrupter (AFCI) Protection – Dwelling Units

(6) Where a listed metal or nonmetallic conduit or tubing or Type MC cable is encased in not less than 2 in. of concrete,



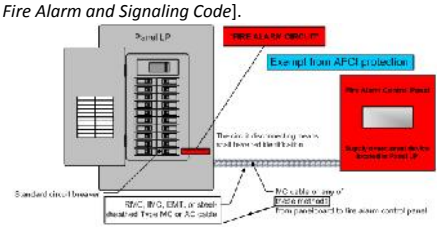
210.12(A) Arc-Fault Circuit-Interrupter (AFCI) Protection – Dwelling Units

Exception Where an individual branch circuit for a fire alarm system installed in accordance with 760.41(B) or 760.121(B) is installed in RMC, IMC, EMT, or steel-sheathed Type AC or MC cable

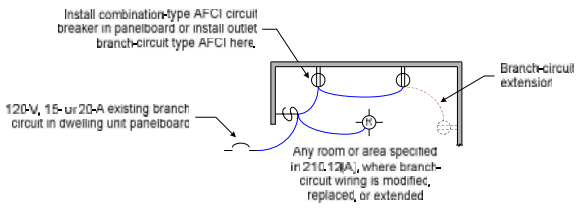


210.12(A) Arc-Fault Circuit-Interrupter (AFCI) Protection – Dwelling Units

Exception Sections 760.41(B) for non–power-limited fire alarm circuits and 760.121(B) for power-limited fire alarm circuits state that the fire alarm branch circuit shall not be supplied through AFCI or GFCI devices. Single- and multiple-station smoke alarms in dwellings powered by circuits that are protected by GFCI or AFCI devices shall have a secondary power source [see 29.6.3(5) of NFPA 72-2013, *National Fire Alarm and Signaling Code*].

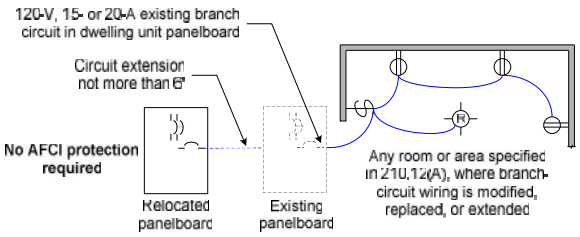


210.12(B) AFCI in Dwellings - Circuit Extensions or Modifications



Section 210.12(B), general rule, 2011 and 2014 *NEC*

210.12(B) AFCI in Dwellings - Circuit Extensions or Modifications

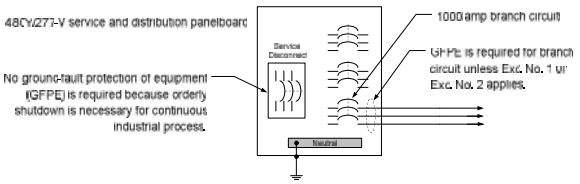


Section 210.12(B), Exception, 2014 *NEC*

210.12(C) AFCI Protection in Dormitory Units

Summary
All 120-volt, single phase, 15- and 20-ampere circuits installed to supply outlets in dormitory unit living rooms, bedrooms, hallways, closets, and similar rooms require AFCI protection using any of the methods in (1) through (6) of 210.12(A).

210.13 Ground-Fault Protection of Equipment



Summary
Each branch circuit disconnect rated 1000 A or more and installed on solidly grounded wye electrical systems operating at more than 150 volts to ground, but not exceeding 600 volts phase-to-phase, shall be provided with ground-fault protection of equipment.

210.17 (and Article 625) Electric Vehicle Branch Circuit

Summary
If an outlet(s) is installed to supply electric vehicle charging equipment, it shall be supplied by a separate circuit that has no other outlets. The load shall be 125% of the rated load or the maximum permitted by an automatic load management system.

Cord-connected electric vehicle charging station
16-A, 240-V, 3.8 kW output

Courtesy of Leviton Manufacturing Co., Inc.

210.19(A)(1) and 215.2(A)(1) Min. Amp. and Size for Conductors

Conductors shall be not smaller than the larger of the sizes calculated in accordance with subsections (a) or (b) of 210.19(A)(1) or 215.2(A)(1) as applicable.

(a) Where a branch circuit or feeder supplies continuous loads or a combination of continuous and noncontinuous loads, the minimum conductor size shall have an ampacity not less than the noncontinuous load plus 125 percent of the continuous load.
(b) The minimum branch-circuit or feeder conductor size shall have an ampacity not less than the maximum load to be served after the application of any adjustment or correction factors.

210.19(A)(1) and 215.2(A)(1) Min. Amp. and Size for Conductors

Example
A 3-phase, 4-wire feeder supplies a continuous, nonlinear lighting load of 60 amperes. The feeder circuit conductors are installed in EMT. The conductors that will be used are rated 90°C. Terminations are rated 75°C. What size aluminum conductors are required to supply the load?

Calculations based on subsection (a):

60 x 1.25 = 75 A (minimum required conductor ampacity)
From Table 310.15(B)(16): A 3 AWG aluminum conductor is permitted (75 A, 75°C column).

210.19(A)(1) and 215.2(A)(1) Min. Amp. and Size for Conductors

Example

Calculations based on subsection (b):

The second paragraph of Section 310.15(B) permits applying adjustment or correction factors to the table ampacity listed for the conductor insulation, provided the adjusted or corrected ampacity does not exceed the ampacity listed for the temperature rating of the terminations in accordance with 110.14(C).

From Table 310.15(B)(3)(a): Adjustment for four current-carrying conductors = 80% or 0.80

From Table 310.15(B)(16): The 90°C ampacity for a 3 AWG aluminum conductor is 85 A.

85 A x 0.80 = 68 A (adjusted ampacity for a 3 AWG aluminum conductor rated 90°C)

2 AWG aluminum conductors rated 90°C are required.

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210.52(E)(1) and (E)(2) Dwelling Unit Outside Receptacles

Receptacles are *readily accessible* from grade.

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210.52(E)(3) Dwelling Unit Receptacles on Balconies, Decks, and Porches

Receptacle accessible from balcony

Summary

Balconies, decks, and porches that are accessible from inside the dwelling unit shall have at least one receptacle outlet *accessible* from the balcony, deck, or porch. The receptacle outlet shall not be located more than 6½ ft above the walking surface of the balcony, deck, or porch.

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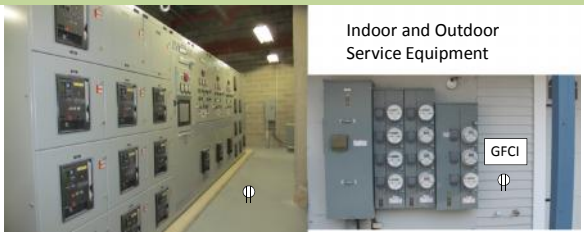
210.52(G)(1) Dwelling Unit Receptacle Outlets in Garages

This 3-car garage requires a minimum of three receptacles, in addition to any receptacles required for specific equipment.

 46

210.64 Required Outlets – Electrical Service Areas



Indoor and Outdoor Service Equipment

Summary

For other than one- and two-family dwellings, at least one 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet shall be installed within 50 ft of the electrical service equipment to accommodate electrical data acquisition and other test equipment and to facilitate maintenance.

 47

220.12, Exc. Branch-Circuit, Feeder, and Service Calculations

The *NEC* contains a new exception that permits use of the lighting load value determined in accordance with an adopted energy code provided that:

1. A power monitoring system is installed that will provide continuous information regarding the total general lighting load of the building,
2. The power monitoring system is set with alarm values to alert the building owner or manager if the lighting load exceeds the values set by the energy code, and
3. The demand factors in 220.42 are not applied to the general lighting load.

Example: Retail store lighting load calculation: 40 ft x 60 ft = 2400 ft^2 total floor area

NEC	2400 x 3 VA = 7200 VA
Energy code	2400 x 1.4 W/ft^2 = 3360 W, a 53% reduction from the *NEC* value

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220.12, Exc. Branch-Circuit, Feeder, and Service Calculations

Courtesy of Eaton Corporation and BREAKER OUTLET Circuit Breakers

"Maintenance mode"

Summary
Where the highest continuous current trip setting for which an overcurrent device installed in a breaker is rated (or can be adjusted to) is 1200 amps or higher, an approved means shall be employed to reduce clearing time.

1. Zone-selective interlocking
2. Differential relaying
3. Energy-reducing maintenance switching
4. Energy-reducing active arc flash mitigation system
5. An approved equivalent means

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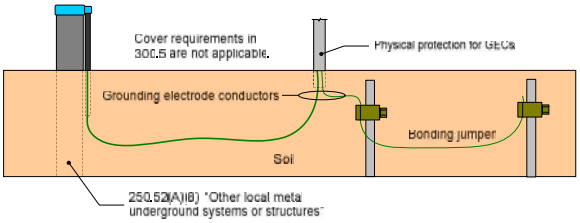
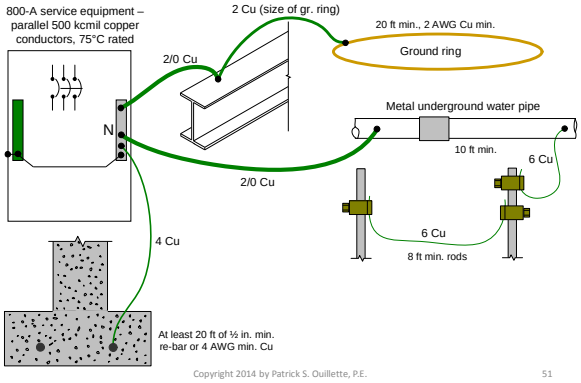
250.64(B) Securing and Protection Against Damage for GEC



Summary
Grounding electrode conductors and grounding electrode bonding jumpers are not required to comply with Section 300.5.

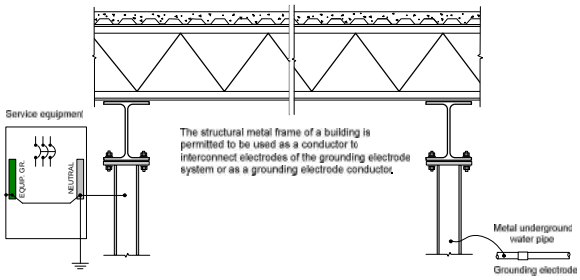
 50

250.66(A) and (B) Size of AC GEC and Connection to Electrodes



 51

250.68(C)(2) GEC and Grounding Electrode Connections



Summary The structural metal frame of a building is permitted to be used as a conductor to interconnect electrodes of the grounding electrode system or as a grounding electrode conductor, regardless of whether the metal frame itself qualifies as a grounding electrode.

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250.68(C)(3) Grounding Electrode Connections

Summary
A concrete-encased electrode of either the conductor type or reinforcing bar, extended from the location within the concrete to an accessible location above the concrete wall, is a permitted method for facilitating the grounding of the service neutral to the concrete-encased electrode.

 53

Table 250.102(C)(1) Grounded Conductor, Main Bonding Jumper, etc.

Size of Largest Ungrounded Conductor or Equivalent Area for Parallel Conductors (AWG/kcmil)		Size of Grounded Conductor or Bonding Jumper[a] (AWG/kcmil)	
Copper	**Aluminum or Copper-Clad Aluminum**	**Copper**	**Aluminum or Copper-Clad Aluminum**
2 or smaller	1/0 or smaller	8	6
1 or 1/0	2/0 or 3/0	6	4
2/0 or 3/0	4/0 or 250	4	2
Over 3/0 through 350	Over 250 through 500	2	1/0
Over 350 through 600	Over 500 through 900	1/0	3/0
Over 600 through 1100	Over 900 through 1750	2/0	4/0
Over 1100	Over 1750	See Notes	

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Table 250.167 Direct-Current Ground-Fault Detection

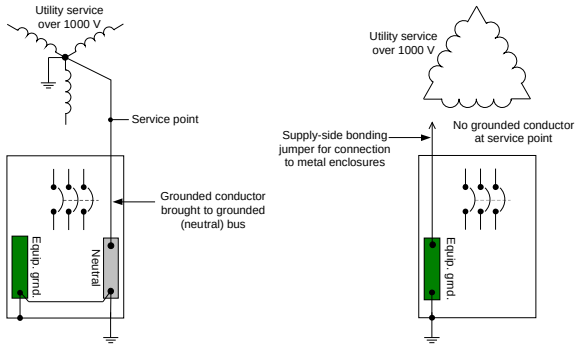
Model IRDH375 ground-fault monitor/ground detector

Courtesy of Bender Inc.

Summary
Ungrounded dc systems shall be equipped with ground-fault detection systems. Grounded dc systems are permitted to have ground-fault detection systems. Dc systems shall be marked at the source or the first disconnecting means to indicate the grounding type employed.

 55

250.186 Ground-Fault Circuit Conductor Brought to Service Equip.



 56

250.194 Over 1000 V – Grounding and Bonding of Fences, etc.

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310.15(B)(3)(c) and Table Ampacity Adjustment Factors

Table 310.15(B)(3)(c) Ambient Temperature Adjustment for Raceways or Cables Exposed to Sunlight on or Above Rooftops

Distance Above Roof to Bottom of Raceway or Cable	Temperature Adder °C	Temperature Adder °F
On roof 0 – 13 mm (0 – ½ in.)	33	60
Above roof 13 mm (½ in.)	22	40
Above roof 90 mm – 300 mm (3½ in. – 12 in.)	17	30
Above roof 300 mm – 900 mm (12 in. – 36 in.)	14	25

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310.15(B)(7) 120/240-V, Single-Phase Dwelling Services and Feeders

Summary
Table 310.15(B)(7) has been deleted. The reduced conductor size permitted for certain residential services and feeders is still permitted by applying a factor of 0.83 to the rating of the service or feeder.

Example 1
What size aluminum XHHW service-entrance conductors are required for a 200-A, 120/240-V, single-phase service for a one-family dwelling?

Service rating = 200 amps.
Multiply by 0.83: 200 A x 0.83 = 166 A.
Select an aluminum conductor from the 75°C column in Table 310.15(B)(16).
Select 4/0 Al XHHW conductors with an ampacity of 180 A, which is at least 166 A.

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310.15(B)(7) 120/240-V, Single-Phase Dwelling Services and Feeders

Example 2
What size aluminum SER cable containing XHHW conductors is required for a 200-A rated feeder that carries all of the service load for a one-family dwelling supplied by a 120/240-V, single-phase service? The feeder cable is embedded in thermal insulation.

Feeder rating = 200 amps.
Multiply by 0.83: 200 A x 0.83 = 166 A.
Section 338.10(B)(4)(a) states that where used in thermal insulation the ampacity shall be in accordance with the conductor's 60°C rating.
Select an aluminum conductor size from the 60°C column in Table 310.15(B)(16) that has an ampacity of at least 166 amps.
250 kcmil aluminum XHHW conductors with a 60°C ampacity of 170 A can be used.

 60

338.10(B)(4)(b) Types SE and USE Serv.-Ent. Cables - Uses Permitted

Courtesy of Southwire Company

Summary
Single-conductor Type USE and multi-rated USE conductors are not subject to the ampacity limitations of Part II of Article 340, i.e., the ampacity corresponding to a 60°C temperature rating for the conductor.

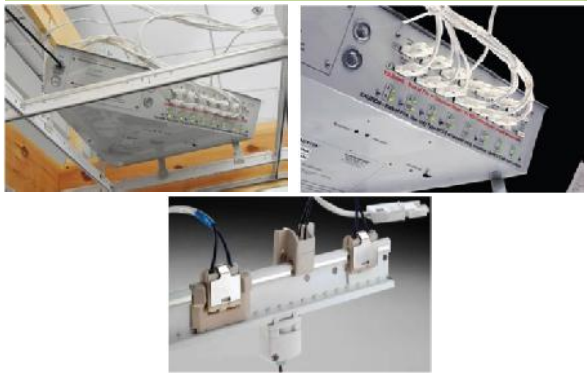
 61

376.22(B) Number of Conductors and Ampacity Adjustment in Wireways

Summary
Where the number of current-carrying conductors *at any cross section* of a metal wireway exceeds 30, the adjustment factors in 310.15(B)(3)(a) must be applied to all current-carrying conductors, not just to the number of current-carrying conductors over 30.

 62

Article 393 Low-Voltage Suspended Ceiling Power Dist. Sys.



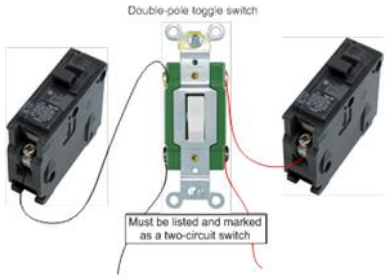
 63

404.2(C) Switches Controlling Lighting Loads

Summary
The grounded circuit conductor of a general-purpose circuit that supplies lighting shall be provided at switch locations for the future connection of electronic lighting controls such as occupancy sensors. There are seven conditions where the rule does not apply—where an occupancy sensor or other electronic lighting control would be redundant, excessive, or impossible to install.

 64

404.8(C) Multipole Snap Switches



Summary
A multipole, general-use snap switch cannot be fed from (used to control) more than a single circuit unless the switch is listed and marked as a two-circuit or three-circuit switch.

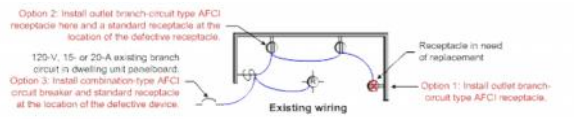
 65

406.3(E) Controlled Receptacle Marking

Summary
Nonlocking-type 125-volt, 15- and 20-amp receptacles that are controlled by an automatic control device or incorporate control features that de-energize the outlet for the purpose of energy management or building automation shall be marked by the prescribed symbol. The marking is not required for receptacles controlled by a wall switch as permitted by 210.70 to provide the required room lighting outlets.

 66

406.4(D)(4) Replacement Receptacles - AFCI



Summary
Where existing wiring supplies a receptacle from a branch circuit that requires arc-fault circuit-interrupter protection by new *NEC* rules, a replacement receptacle at this outlet shall be a listed outlet branch-circuit type AFCI receptacle, a receptacle protected by a listed outlet branch-circuit type AFCI receptacle, or a receptacle protected by a listed combination-type AFCI circuit breaker.

 67

406.9(B)(1) Receptacles of 15 and 20 Amperes in a Wet Location

Red-Dot® Code Keeper® Universal While-In-Use Cover

Thomas & Betts Corp.

Summary
Extra-duty hoods are required on all 15- and 20-ampere, 125- through 250-volt receptacles installed in wet locations.

 68

406.15 Dimmer-Controlled Receptacles

Summary
Dimmer control of receptacles used for lighting purposes is permissible, so long as the plug/receptacle combination is a nonstandard configuration type that is specifically listed and identified for each such unique combination.

 69

422.23 Tire Inflation and Automotive Vacuum Machines

GFCI protection required

Summary
The electrical supply for tire inflation and automotive vacuum machines provided for public use shall have GFCI protection for personnel.

 70

445.11 Generator Marking

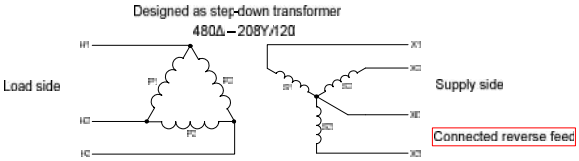
Required factory marking

Courtesy of Robin America Inc.

Output panel of a Robin Subaru portable generator

 71

450.11(B) Transformer Source Marking



Summary
A transformer is permitted to be supplied at the marked secondary voltage (reverse fed) provided the installation is in accordance with the manufacturer's instructions.

 72

Article 480 Storage Batteries

Courtesy of ACRAN Spill Containment Inc.

Summary

Doors in battery rooms shall open in the direction of egress and be equipped with listed panic hardware. Illumination shall be provided for working spaces containing battery systems, with specific rules for locating luminaires.

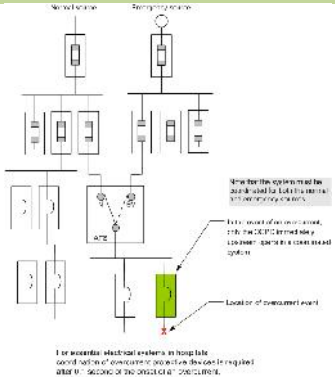
517.18 and .19 Health Care Facilities

To harmonize with NFPA 99, the term *emergency system* is no longer used in Article 517. Instead of being considered branches of the emergency system, the life safety branch and the critical branch are branches of the essential electrical system.

Essential Electrical System
- Equipment Branch
- Life safety Branch
- Critical Branch

Minimum number of required receptacles at patient bed locations
- General care area: increased from 4 to 8
- Critical care areas: increased from 8 to 14

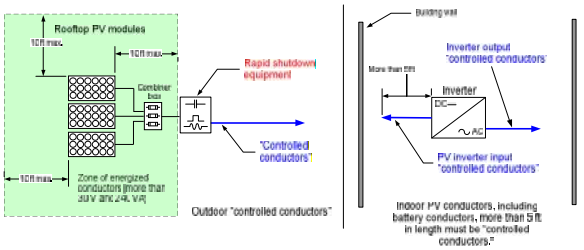
517.30(G) Essential Electrical Sys. for Hospitals - Coordination



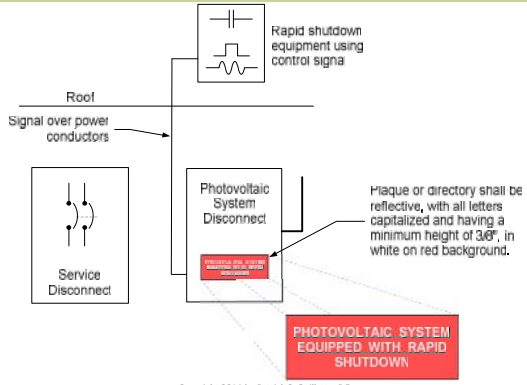
Article 646 Modular Data Centers

Courtesy of Sun Microsystems, Inc. and PRWeb

690.12 and 690.56(C) Rapid Shutdown of PV Sys. on Buildings



690.12 and 690.56(C) Rapid Shutdown of PV Sys. on Buildings

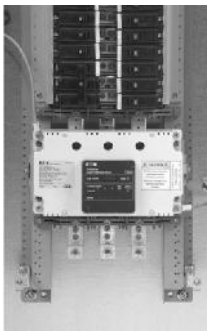


Article 694 ~~Small~~ Wind Electric Systems

3 MW wind turbine structure

Summary
Article 694 now covers all wind generators within the scope of the *NEC*—no longer limited to 100 kW or smaller. Provisions for manual shutdown are now required.

700.8 Surge Protection for Emergency Systems



Summary
A listed SPD shall be installed in or on all emergency systems switchboards and panelboards.

Article 285 – Surge-Protective Devices
- Type 1
- Type 2
- Type 3
- Type 4

SPD Series, Courtesy of Eaton Corporation
www.eaton.com/consultants

700.8 Surge Protection for Emergency Systems

Guidelines for Protection

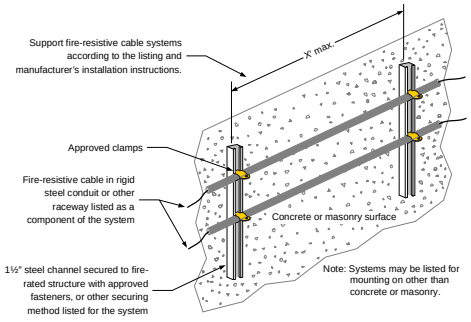
- ANSI/IEEE C62.41, IEEE Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- The consulting and specifying engineering community through the American Institute of Architects (AIA) has produced a MasterSpec document related to SPDs for low-voltage electrical power circuits. It references a protection level of 250 kA at service entrance locations.
- NFPA 780, *Standard for the Installation of Lightning Protection Systems*, Section 4.18.3.1.2, SPDs at the service entrance shall have an I_{max} rating of at least 40 kA 8/20 µs per phase or a nominal discharge current (I_n) rating of at least 20 kA 8/20 µs per phase for the protection of electrical power circuits.

700.16 Emergency Illumination

Electrical service equipment room

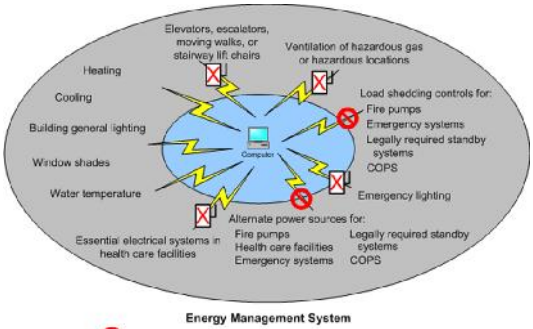
Summary Where an emergency system is installed, emergency illumination must be provided in the area of the disconnecting means required in 225.31 (a main disconnect in a separate building supplied by a feeder or branch circuit) and 230.70 (a service disconnect).

Article 728 – Fire-Resistive Cable Systems



Electrical Circuit Integrity System
(constructed with fire-resistive cable)
System No. XXXX Fire Rating – X Hr.

Article 750 – Energy Management Systems



Energy Management System
= Control of loads not permitted to be overridden by EMS
= EMS not permitted to cause disconnection of these loads

Article 750 – Energy Management Systems

(A) Load Shedding Controls. An energy management system shall not override load shedding controls that ensure the minimum electrical capacity for:
(1) Fire pumps
(2) Emergency Systems
(3) Legally required standby systems
(4) Critical operations power systems (COPS)

(B) Disconnection of Power. An energy management system shall not be permitted to cause disconnection of power to:
(1) Elevators, escalators, moving walks, or stairway lift chairs
(2) Positive mechanical ventilation for hazardous (classified) locations
(3) Ventilation used to exhaust hazardous gas or reclassify an area
(4) Circuits supplying emergency lighting
(5) Essential electrical systems in health care facilities

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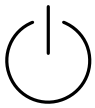
Article 750 – Energy Management Systems

(C) Capacity of Branch Circuit, Feeder, or Service. An energy management system shall not cause a branch circuit, feeder, or service to be overloaded at any time.



What does this symbol represent?

 86

Key Revisions for the 2014 National Electrical Code®

Thank you!

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