



## 2017 NEC Significant Code Changes Part 3

Four (4) Continuing Education Hours  
Course Approval #EE1003

Approved Continuing Education for Professional Engineers

# Table of Contents

## 2017 NEC Significant Code Changes Part 3

---

Introduction .....	1
Chapter 5 Equipment for General Use.....	2
Article 500 Hazardous (Classified) Locations, Classes I, II, and III, Divisions 1 and 2.....	2
Article 501 Class I Locations.....	5
Article 511 Commercial Garages, Repair and Storage .....	5
Article 514 Motor Fuel Dispensing Facilities.....	8
Article 516 Spray Application, Dipping, and Coating Process.....	10
Article 517 Health Care Facilities .....	12
Article 520 Theaters, Audience Areas of Motion Picture and Television Studios, Performance Areas, and Similar Locations.....	16
Article 525 Carnivals, Circuses, Fairs, and Similar Events.....	16
Article 547 Agricultural Buildings .....	17
Article 550 Mobile Homes, Manufactured Homes, and Mobile Home Parks.....	17
Article 551 Recreational Vehicles and Recreational Vehicle Parks .....	19
Article 555 Marinas and Boatyards.....	20
Article 590 Temporary Installations.....	22
Quiz Questions.....	24

# 2017 NEC Significant Code Changes

## Part 3

### LEARNING OBJECTIVES

*Upon completion of this course the student will be able to:*

1. Become familiar with some of the significant changes including additions, deletions, and modification to the 2017 Edition of NFPA 70: National Electrical Code (NEC) from the 2014 Edition.
2. Comprehend, after reviewing the significant changes and additions to the 2017 Edition of NFPA 70: National Electrical Code (NEC) the large scope of the changes to the code, thereby seeking additional and more thorough reviews of the entire code, following completion of this course.

### INTRODUCTION

Every three years, the National Electrical Code® (NEC®) is revised and expanded. Initially the NFPA® received 4,012 public suggestions for changes, which resulted in 1,235 first revisions. There were 1,513 public comments submitted in response to these 1,235 first revisions, resulting

#### 2017 National Electric Code (NEC)

- 5,525 Public Suggestions to 2014 NEC
- 1,794 Revisions Made
- Changes Included
  - Editorial Clarification,
  - Expanded Requirements,
  - New Requirements,
  - Deleted Requirements,
  - Relocation of Requirements
- Five New Articles Added

in 559 second revisions. Changes included editorial clarification, expanded requirements, new requirements, deleted requirements, and the relocation of other requirements. Nine new articles were proposed, and five new articles were added to the 2017 NEC. With the fast pace of technology, it's more important than ever for

anyone participating in the electrical industry to get up to speed with all the changes.

### What to Expect

In this course the student will be presented an overview of the most significant changes found in the 2017 NEC.

This is part 3 of a series of courses covering the changes and will progress through each chapter and its articles presenting the many important changes.

The changes will be highlighted for easy recognition and a short synopsis of the reason for the change is presented as well.

#### DISCLAIMER:

Although every effort has been made to the accuracy of the material presented, by no means shall the student use or substitute this material for the official 2017 NEC. Additionally, Ezekiel Enterprises, LLC shall not be liable for any special, incidental, consequential or exemplary damages resulting, in whole or in part, from the reader's uses of or reliance upon this material.

## 2017 NEC Major Additions

- Large-Scale Photovoltaic (PV) Electric Power Production Facility (New Article 691) covers systems that produce at least 5 megawatts (MW) of power, or enough to power 800+ U.S. homes.
- Energy Storage Systems (New Article 706) governs ESS installation, disconnection, shutdown, and safety labeling.
- Stand-Alone Systems (New Article 710) covers power production sources that are not connected to the grid, including PV and wind-powered systems.
- Direct Current Microgrids (New Article 712) concerns independent energy distribution networks that allow the utilization of power from dc sources to direct-current loads. Microgrids are on the rise worldwide

## CHAPTER 5 EQUIPMENT FOR GENERAL USE

### ARTICLE 500

Hazardous (Classified) Locations,  
Classes I, II, And III, Divisions 1 And 2

#### ~~500.2~~ Article 100 — Definitions

The following definitions have been relocated to article 100.

**Combustible Dust** [as applied to Hazardous (Classified) Locations]. Dust particles that are 500 microns or smaller (i.e., material passing a U.S. No. 35 Standard Sieve as defined in ASTM E11-2015, Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves), and present a fire or explosion hazard when dispersed and ignited in air.

**Combustible Gas Detection System** [as applied to Hazardous (Classified) Locations]. A protection technique utilizing stationary gas detectors in industrial establishments.

**Control Drawing** [as applied to Hazardous (Classified) Locations]. A drawing or other document provided by the manufacturer of the intrinsically safe or associated apparatus, or of the Non-incendive field wiring apparatus or associated Non-incendive field wiring apparatus, that details the allowed interconnections between the intrinsically safe and associated apparatus or between the Non-

incendive field wiring apparatus or associated Non-incendive field wiring apparatus.

**Dust-Ignitionproof** [as applied to Hazardous (Classified) Locations]. Equipment enclosed in a manner that excludes dusts and does not permit arcs, sparks, or heat otherwise generated or liberated inside of the enclosure to cause ignition of exterior accumulations or atmospheric suspensions of a specified dust on or in the vicinity of the enclosure.

**Dusttight** [as applied to Hazardous (Classified) Locations]. Enclosures constructed so that dust will not enter under specified test conditions.

**Informational Note No. 1:** Enclosure Types 3, 3S, 3SX, 4, 4X, 5, 6, 6P, 12, 12K, and 13, per ANSI/NEMA 250-2014, Enclosures for Electrical Equipment, are considered dusttight and suitable for use in unclassified locations and in Class II, Division 2; Class III; and Zone 22 hazardous (classified) locations.

**Informational Note No. 2:** For further information, see ANSI/ISA-12.12.01-2013, Non-incendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations.

**Hermetically Sealed** [as applied to Hazardous (Classified) Locations]. Equipment sealed against the entrance of an external atmosphere where the seal is made by fusion, for example, soldering, brazing, welding, or the fusion of glass to metal.

**Nonincendive Circuit** [as applied to Hazardous (Classified) Locations]. A circuit, other than field wiring, in which any arc or thermal effect produced under intended operating conditions of the equipment, is not capable, under specified test conditions, of igniting the flammable gas-air, vapor-air, or dust-air mixture.

**Nonincendive Component** [as applied to Hazardous (Classified) Locations]. A component having contacts for making or breaking an incendive circuit and the contacting mechanism is constructed so that the component is incapable of igniting the specified flammable gas-air or vapor-air mixture. The housing of a nonincendive component is not intended to exclude the flammable atmosphere or contain an explosion.

**Nonincendive Equipment** [as applied to Hazardous (Classified) Locations]. Equipment having electrical/electronic circuitry that is incapable, under normal operating conditions, of causing ignition of a specified flammable gas-air, vapor-air, or dust-air mixture due to arcing or thermal means.

**Nonincendive Field Wiring** [as applied to Hazardous (Classified) Locations]. Wiring that enters or leaves an equipment enclosure and, under normal operating conditions of the equipment, is not capable, due to arcing or thermal effects, of igniting the flammable gas-air, vapor-air, or dust-air mixture. Normal operation includes opening, shorting, or grounding the field wiring.

**Nonincendive Field Wiring Apparatus** [as applied to Hazardous (Classified) Locations]. Apparatus intended to be connected to nonincendive field wiring.

**Oil Immersion** [as applied to Hazardous (Classified) Locations]. Electrical equipment immersed in a protective liquid in such a way that an explosive atmosphere that may be above the liquid or outside the enclosure cannot be ignited.

**Purged and Pressurized** [as applied to Hazardous (Classified) Locations]. The process of (1) purging, supplying an enclosure with a

protective gas at a sufficient flow and positive pressure to reduce the concentration of any flammable gas or vapor initially present to an acceptable level; and (2) pressurization, supplying an enclosure with a protective gas with or without continuous flow at sufficient pressure to prevent the entrance of a flammable gas or vapor, a combustible dust, or an ignitable fiber.

**Unclassified Locations** [as applied to Hazardous (Classified) Locations]. Locations determined to be neither Class I, Division 1; Class I, Division 2; Class I, Zone 0; Class I, Zone 1; Class I, Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2; Zone 20; Zone 21; Zone 22; nor any combination thereof.

#### ■ Reason for the Change

The fourteen definitions that resided at 500.2 in previous editions of the *Code* have been relocated to Article 100 of the *NEC*.

### 500.5(A) Classifications of Locations

#### 500.5 Classifications of Locations.

##### (A) ~~Classifications of~~

**Locations General.** Locations shall be classified depending on the properties of the flammable gas, flammable liquid-produced vapor, combustible liquid-produced vapors, combustible dusts, or fibers/flyings that ~~may~~ could be present, and the likelihood that a flammable or combustible concentration or quantity is present. Each room, section, or area shall be considered individually in determining its classification. Where pyrophoric materials are the only materials used or handled, these locations are outside the scope of this article.

**Informational Note No. 1:** Through the exercise of ingenuity in the layout of electrical installations for hazardous (classified) locations, it is frequently possible to locate much of the equipment in a reduced level of classification or an unclassified location and, thus, to reduce the amount of special equipment required.

Refrigerant machinery rooms ~~and areas containing~~ that contain ammonia refrigeration

systems that and are equipped with adequate mechanical ventilation that operates continuously or is initiated by a detection system at a concentration not exceeding 150 ppm shall be permitted to ~~may~~ be classified as “unclassified” locations.

**Informational Note No. 2:** For further information regarding classification and ventilation of areas involving closed-circuit ammonia refrigeration systems, see ANSI/ASHRAE 15-1994 2013, *Safety Code for Mechanical Refrigeration Standard for Refrigeration Systems*, and ANSI/CGA G2.1-1989 IAR 2-2014, *Safety Requirements for the Storage and Handling of Anhydrous Ammonia Standard for Safe Design of Closed-Circuit Ammonia Refrigeration Systems*.

#### Reason for the Change

The title of 500.5(A) was changed from “Classifications of Locations” to “General” as 500.5(A) applies to all of 500.5, including 500.5(B), (C), and (D). Revisions to the text of 500.5(A) clarify that “refrigerant machinery rooms” containing ammonia refrigeration may be classified as “unclassified” locations based on the use of gas detection and adequate ventilation with this “adequate ventilation” being defined as “continuous or initiated by a detection system at a concentration not exceeding 150 ppm (parts per million).”

### Table 500.8(D)(2) Equipment

**(2) Class II Temperature.** The temperature marking specified in 500.8(C) shall be less than the ignition temperature of the specific dust to be encountered. For organic dusts that may dehydrate or carbonize, the temperature marking shall not exceed the lower of either the ignition temperature or 165°C (329°F).

**Informational Note:** See NFPA 499-2013, *Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas*, for minimum ignition temperatures of specific dusts.

~~The ignition temperature for which equipment was approved prior to this requirement shall be assumed to be as shown in Table 500.8(D)(2).~~

### Table 500.8(D)(2) Class II Temperatures *[Table 500.8(D)(2) has been deleted]*

#### Reason for the Change

Previous Table 500.8(D)(2) has been deleted as the table is no longer applicable because the fixed ignition temperature limits referenced in the table are no longer used to evaluate Class II temperature limitations on equipment.

### 501.10(B)(1) Wiring Methods. (Class I Locations)

**(1) General.** In Class I, Division 2 locations, all wiring methods permitted in 501.10(A) and the following wiring methods shall be permitted:

- (1) ~~All wiring methods permitted in 501.10(A)~~ Rigid metal conduit (RMC) and intermediate metal conduit (IMC) with listed threadless fittings.
- (2) Enclosed gasketed busways and enclosed gasketed wireways.
- (3) Type PLTC and Type PLTC-ER cable
- (4) Type ITC and Type ITC-ER cable
- (5) Type MC, MV, TC, or TC-ER cable
- (6) Listed reinforced thermosetting resin conduit (RTRC) and Schedule 80 PVC conduit (in industrial establishments with restricted public access with specific conditions).
- (7) Optical fiber cable
- (8) Cablebus

Where seals are required for boundary conditions as defined in 501.15(A) (4), the Division 1 wiring method shall extend into the Division 2 area to the seal, which shall be located on the Division 2 side of the Division 1–Division 2 boundary. [This sentence was located under List Item (6)]

#### Reason for the Change

Besides the wiring methods permitted in the previous *Code*, the wiring methods permitted

for Class I, Division 2 locations have been expanded to include rigid metal conduit (RMC) and intermediate metal conduit (IMC) with listed threadless fittings, as well as cablebus.

## ARTICLE 501 Class I Locations

### 501.15(D)(1) Sealing and Drainage. (Class I Locations)

**(1) At Terminations.** Cables shall be sealed with sealing fittings that comply with 501.15(C) at all terminations. Type MC-HL cables with a gas/vaportight continuous corrugated metallic sheath and an overall jacket of suitable polymeric material shall be sealed with a listed fitting after the jacket and any other covering have been removed so that the sealing compound can surround each individual insulated conductor in such a manner as to minimize the passage of gases and vapors.

Seals for cables entering enclosures shall be installed within 450 mm (18 in.) of the enclosure or as required by the enclosure marking. Only explosion-proof unions, couplings, reducers, elbows, and capped elbows that are not larger than the trade size of the enclosure entry shall be permitted between the sealing fitting and the enclosure.

**Exception:** Shielded cables and twisted pair cables shall not require the removal of the shielding material or separation of the twisted pairs, provided the termination is sealed by an approved means to minimize the entrance of gasses or vapors and prevent propagation of flame into the cable core.

#### ■ Reason for the Change

A new sentence was added to 501.15(D)(1) identifying that only explosion-proof unions, couplings, reducers, elbows, and capped elbows that are not larger than the trade size of the enclosure entry are permitted between the cable sealing fitting and the enclosure in a Class I, Division 1 location.

## ARTICLE 511 Commercial Garages, Repair and Storage

### Table 511.3(C) and Table 511.3(D) Area Classification, General. (Commercial Garages, Repair, and Storage)

**(C) Major Repair Garages, Major and Minor.** ~~Where flammable liquids having a flash point below 38°C (100°F) such as gasoline, or gaseous fuels such as natural gas, hydrogen, or LPG, will not be dispensed, but repair activities that involve the transfer of such fluids or gases are performed, the classification rules in (1), (2), and (3) shall apply.~~ Where vehicles using Class I liquids or heavier-than-air gaseous fuels (such as LPG) are repaired, hazardous area classification guidance is found in Table 511.3(C).

**Informational Note:** For additional information, see NFPA 30A-2015, *Code for Motor Fuel Dispensing Facilities and Repair Garages*, Table 8.3.2.

~~(1) Floor Areas.~~

~~(a) Ventilation Provided.~~

~~(b) Ventilation Not Provided.~~

~~(2) Ceiling Areas.~~

~~(a) Ventilation Provided.~~

~~(b) Ventilation Not Provided.~~

~~(3) Pit Areas in Lubrication or Service Room.~~

~~(a) Ventilation Provided.~~

~~(b) Ventilation Not Provided.~~

### Table 511.3(C) Extent of Classified Locations for Major and Minor Repair Garages with Heavier-Than-Air Fuel

Note: Reference Page 5 to view Table 511.3 (C)

**(D) Minor Repair Garages,**

**Major.** Where flammable liquids having a flash point below 38°C (100°F) such as gasoline, or gaseous fuels such as natural gas or hydrogen, will not be dispensed or transferred, the classification rules in (D)(1), (D)(2), and (D)(3) shall apply to the lubrication and service rooms. Where vehicles using lighter-than-air gaseous fuels (such as hydrogen and natural gas) are repaired or stored, hazardous area classification guidance is found in Table 511.3(D).

**Informational Note:** For additional information see NFPA 30A-2015, Code for Motor Fuel Dispensing Facilities and Repair Garages, Table 8.3.2.

(1) Floor Areas.

(a) Ventilation Provided.

(b) Ventilation Not Provided.

(2) Ceiling Areas.

(3) Pit Areas in Lubrication or Service Room.

(a) Ventilation Provided.

(b) Ventilation Not Provided.

### Table 511.3(D) Extent of Classified Locations for Major Repair Garages with Lighter-than-Air Fuel

Note: Reference Page 6 to view Table 511.3 (D)

#### Reason for the Change

The text provisions of 511.3(C) and (D) were revised into a table format and moved to two new tables in 511.3. The previous requirements of 511.3(C) and (D) were replaced with a new Table 511.3(C) covering both major and minor repair garages where heavier than air gaseous Class I liquids are transferred or dispensed. New Table 511.3(D) covers major repair garages where vehicles using lighter than air gaseous fuels are repaired or stored.

### 511.8 Underground Wiring. (Commercial Garages, Repair and Storage)

#### 511.8 Underground Wiring. (Commercial Garages, Repair and Storage)

Underground wiring shall be installed in threaded rigid metal conduit or intermediate metal conduit.

**Exception:** Type PVC conduit, Type RTRC conduit, and Type HDPE conduit shall be permitted where buried under not less than 600 mm (2 ft) of cover. Where Type PVC conduit, Type RTRC conduit, or Type HDPE conduit is used, threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 600 mm (2 ft) of the underground run to emergence or to the point of connection to the aboveground raceway, and an equipment grounding conductor shall be included to provide electrical continuity of the raceway system and for grounding of non-current-carrying metal parts.

#### Reason for the Change

A new section (511.8) was added to Article 511 requiring the underground wiring method for a commercial repair garage to be installed in threaded rigid metal conduit (RMC) or threaded steel intermediate metal conduit (IMC). A new exception at 511.8 permits PVC conduit, RTRC conduit, and high-density polyethylene (HDPE) conduit to be used where buried under not less than 600 mm (2 ft) of cover.



**Table 511.3(C) Extent of Classified Locations for Major and Minor Repair Garages with Heavier-Than-Air Fuel**

Location	Class I		Extent of Classified Locations
	Division (Group D)	Zone (Group IIA)	
<b>Repair garage, major</b> (where Class I liquids or gaseous fuels are transferred or dispensed*)	1	1	Entire space within any pit, below-grade work area, or subfloor work area that is not ventilated
	2	2	Entire space within any pit, below-grade work area, or subfloor work area that is provided with ventilation of at least 0.3 m <sup>3</sup> /min/m <sup>2</sup> (1 ft <sup>3</sup> /min/ft <sup>2</sup> ) of floor area, with suction taken from a point within 300 mm (12 in.) of floor level
	2	2	Up to 450 mm (18 in.) above floor level of the room, except as noted below, for entire floor area
	Unclassified	Unclassified	Up to 450 mm (18 in.) above floor level of the room where room is provided with ventilation of at least 0.3 m <sup>3</sup> /min/m <sup>2</sup> (1 ft <sup>3</sup> /min/ft <sup>2</sup> ) of floor area, with suction taken from a point within 300 mm (12 in.) of floor level
	2	2	Within 0.9 m (3 ft) of any fill or dispensing point, extending in all directions
Specific areas adjacent to classified locations	Unclassified	Unclassified	Areas adjacent to classified locations where flammable vapors are not likely to be released, such as stock rooms, switchboard rooms, and other similar locations, where mechanically ventilated at a rate of four or more air changes per hour or designed with positive air pressure or where effectively cut off by walls or partitions
<b>Repair garage, minor</b> (where Class I liquids or gaseous fuels are transferred or dispensed*)	2	2	Entire space within any pit, below-grade work area, or subfloor work area that is not ventilated
	2	2	Up to 450 mm (18 in.) above floor level, extending 0.9 m (3 ft) horizontally in all directions from opening to any pit, below-grade work area, or subfloor work area that is not ventilated
	Unclassified	Unclassified	Entire space within any pit, below-grade work area, or subfloor work area that is provided with ventilation of at least 0.3 m <sup>3</sup> /min/m <sup>2</sup> (1 ft <sup>3</sup> /min/ft <sup>2</sup> ) of floor area, with suction taken from a point within 300 mm (12 in.) of floor level
	Unclassified	Unclassified	Areas adjacent to classified locations where flammable vapors are not likely to be released, such as stock rooms, switchboard rooms, and other similar locations, where mechanically ventilated at a rate of four or more air changes per hour or designed with positive air pressure or where effectively cut off by walls or partitions
	Specific areas adjacent to classified locations	Unclassified	Unclassified

\* Includes draining of Class I liquids from vehicles.

**Table 511.3(D) Extent of Classified Locations for Major Repair Garages with Lighter-Than-Air Fuel**

Location	Class I		Extent of Classified Locations
	Division <sup>2</sup>	Zone <sup>3</sup>	
Repair garage, major (where lighter-than-air gaseous fueled <sup>1</sup> vehicles are repaired or stored)	2	2	Within 450 mm (18 in.) of ceiling, except as noted below.
	Unclassified	Unclassified	Within 450 mm (18 in.) of ceiling where ventilation of at least 0.3 m <sup>3</sup> /min/m <sup>2</sup> (1 ft <sup>3</sup> /min/ft <sup>2</sup> ) of floor area, with suction taken from a point within 450 mm (18 in.) of the highest point in the ceiling
Specific areas adjacent to classified locations	Unclassified	Unclassified	Areas adjacent to classified locations where flammable vapors are not likely to be released, such as stock rooms, switchboard rooms, and other similar locations, where mechanically ventilated at a rate of four or more air changes per hour or designed with positive air pressure or where effectively cut off by walls or partitions

<sup>1</sup>Includes fuels such as hydrogen and natural gas, but not LPG.

<sup>2</sup>For hydrogen (lighter than air) Group B, or natural gas Group D.

<sup>3</sup>For hydrogen (lighter than air) Group IIC or IIB+H<sub>2</sub>, or natural gas Group IIA.

## ARTICLE 514

### Motor Fuel Dispensing Facilities

#### 514.3(B)(3) Classification of Location

##### (3) Fuel Storage.

(a) Aboveground tanks storing CNG or LNG shall be separated from any adjacent property line that is or can be built upon, any public way, and the nearest important building on the same property.

**Informational Note:** The relevant distances are given in Section 8.4 of NFPA 52-2013, Vehicular Gaseous Fuel Systems Code.

(b) Aboveground tanks storing hydrogen shall be separated from any adjacent property line that is or can be built upon, any public way, and the nearest important building on the same property.

**Informational Note:** The relevant distances given in NFPA 2-2011, Hydrogen Technologies Code.

(c) Aboveground tanks storing LP-Gas shall be separated from any adjacent property line that is or can be built upon, any public way, and the nearest important building on the same property.

**Informational Note:** The relevant distances are given in Section 6.3 of NFPA 58-2014, Liquefied Petroleum Gas Code.

(d) Aboveground tanks storing CNG, LNG, or LP-Gas shall be separated from each other by at least 6 m (20 ft) and from dispensing devices that dispense liquid or gaseous motor vehicle fuels by at least 6 m (20 ft).

**Exception No. 1:** The required separation shall not apply to tanks or dispensers storing or handling fuels of the same chemical composition.

**Exception No. 2:** The required separation shall not apply when both the gaseous fuel storage and dispensing equipment are at least 15 m (50 ft) from any other

aboveground motor fuel storage or dispensing equipment.

**Informational Note:** For further information, see NFPA 52-2013, Vehicular Gaseous Fuel Systems Code, or NFPA 58-2014, Liquefied Petroleum Gas Code, as applicable.

**(e)Dispenser Installations Beneath Canopies.** Where CNG or LNG dispensers are installed beneath a canopy or enclosure, either the canopy or enclosure shall be designed to prevent accumulation or entrapment of ignitable vapors or all electrical equipment installed beneath the canopy or enclosure shall be suitable for Class I, Division 2 hazardous (classified) locations.

**(f)Specific Requirements for LP-Gas Dispensing Devices.** Dispensing devices for LP-Gas shall be located as follows:

(1)At least 3 m (10 ft) from any dispensing device for Class I liquids

(2)At least 1.5 m (5 ft) from any dispensing device for Class I liquids where the following conditions exist:

a.The LP-Gas deliver nozzle and filler valve release no more than 4 cm<sup>3</sup> (0.1 oz) of liquid upon disconnection.

b.The fixed maximum liquid level gauge remains closed during the entire refueling process.

Table 514.3(B)(2) shall be used to delineate and classify areas for the purpose of installation of electrical wiring and electrical utilization equipment.

#### ■ Reason for the Change

Specific requirements for fuel storage of compressed natural gas, liquefied natural gas, and liquefied petroleum gas were put in place, along with references to other NFPA documents that offer further detail were added to the 2017 NEC.

**514.8 Ex. No. 2 Underground Wiring.**  
(Motor Fuel Dispensing Facilities)

**514.8 Underground Wiring.** (Motor Fuel Dispensing Facilities)

Underground wiring shall be installed in threaded rigid metal conduit or threaded steel intermediate metal conduit. Any portion of electrical wiring that is below the surface of a Class I, Division 1, or a Class I, Division 2, location [as classified in Table 514.3(B)(1) and Table 514.3(B)(2)] shall be sealed within 3.05 m (10 ft) of the point of emergence above grade. Except for listed explosionproof reducers at the conduit seal, there shall be no union, coupling, box, or fitting between the conduit seal and the point of emergence above grade. Refer to Table 300.5.

**Exception No. 1:** Type MI cable shall be permitted where it is installed in accordance with Article 332.

**Exception No. 2:** Type PVC conduit, ~~and~~ Type RTRC conduit, and Type HDPE conduit shall be permitted where buried under not less than 600 mm (2 ft) of cover. Where Type PVC conduit, ~~or~~ Type RTRC conduit, or Type HDPE conduit is used, threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used for the last 600 mm (2 ft) of the underground run to emergence or the point of connection to the aboveground raceway, and an equipment grounding conductor shall be included to provide electrical continuity of the raceway system and for grounding of non-current-carrying metal parts.

#### ■ Reason for the Change

In addition to the permitted wiring methods allowed in the 2014 NEC, high density polyethylene (HDPE) conduit was added to 514.8, Ex. No. 2 as an acceptable wiring method for underground installations for motor fuel dispensing facilities where buried under not less than 600 mm (2 ft) of cover.

**514.11(A), (B), and (C) Circuit Disconnects.** (Motor Fuel Dispensing Facilities)

**514.11 Circuit Disconnects.** (Motor Fuel Dispensing Facilities)

**(A)General.** ~~Each circuit leading to or through dispensing equipment, including all~~

associated power, communications, data, and video circuits, and equipment for remote pumping systems, shall be provided with a clearly identified and readily accessible switch or other approved means, located remote from the dispensing devices, to disconnect simultaneously from the source of supply, all conductors of the circuits, including the grounded conductor, if any. Fuel dispensing systems shall be provided with one or more clearly identified emergency shutoff devices or electrical disconnects. Such devices or disconnects shall be installed in approved locations but not less than 6 m (20 ft) or more than 30 m (100 ft) from the fuel dispensing devices that they serve. Emergency shutoff devices or electrical disconnects shall disconnect power to all dispensing devices; to all remote pumps serving the dispensing devices; to all associated power, control, and signal circuits; and to all other electrical equipment in the hazardous (classified) locations surrounding the fuel dispensing devices. When more than one emergency shutoff device or electrical disconnect is provided, all devices shall be interconnected. Resetting from an emergency shutoff condition shall require manual intervention and the manner of resetting shall be approved by the authority having jurisdiction.

Single pole breakers utilizing handle ties shall not be permitted.

**Exception:** Intrinsically safe electrical equipment need not meet this requirement.

### (B) Attended Self-Service Motor Fuel Dispensing Facilities.

Emergency controls as specified in 514.11(A) shall be installed at a location acceptable to the authority having jurisdiction, but controls shall not be more than 30 m (100 ft) from dispensers. At attended motor fuel dispensing facilities, the devices or disconnects shall be readily accessible to the attendant.

**(C) Unattended Self-Service Motor Fuel Dispensing Facilities.** Emergency controls as specified in 514.11(A) shall be installed at a location acceptable to the authority having jurisdiction, but the control shall be more than 6 m (20 ft) but less than 30 m

(100 ft) from the dispensers. Additional emergency controls shall be installed on each group of dispensers or the outdoor equipment used to control the dispensers. Emergency controls shall shut off all power to all dispensing equipment at the station. Controls shall be manually reset only in a manner approved by the authority having jurisdiction. At unattended motor fuel dispensing facilities, the devices or disconnects shall be readily accessible to patrons and at least one additional device or disconnect shall be readily accessible to each group of dispensing devices on an individual island.

**Informational Note:** For additional information, see 6.7.1 and 6.7.2 of NFPA 30A-2012, Code for Motor Fuel Dispensing Facilities and Repair Garages.

### ■ Reason for the Change

The same basic requirements for the emergency shutoff devices still exist for the 2017 NEC. Fuel dispensing systems are required to be provided with one or more clearly identified emergency shutoff devices or electrical disconnects. Such devices or disconnects shall be installed in approved locations but not less than 6 m (20 ft) or more than 30 m (100 ft) from the fuel dispensing devices that they serve. Language was revised at 514.11 to clearly indicate that these minimum and maximum distances hold true at both attended and unattended motor fuel dispensing facilities.

## ARTICLE 516

### Spray Application, Dipping, and Coating Process

#### Article 516 Spray Application, Dipping, Coating, and Printing Processes Using Flammable or Combustible Materials

### Article 516 Spray Application, Dipping, Coating, and Printing

## Processes Using Flammable or Combustible Materials

### Part I. General

**516.1 Scope.** This article covers the regular or frequent application of flammable liquids, combustible liquids, and combustible powders by spray operations and the application of flammable liquids, or combustible liquids at temperatures above their flashpoint, by spraying, dipping, coating, printing, or other means.

### 516.2 Definitions.

**Limited Finishing Workstation.** A apparatus that is capable of confining the vapors, mists, residues, dusts, or deposits that are generated by a spray application process but does not meet the requirements of a spray booth or spray room, as herein defined.

**Informational Note.** See Section 14.3 of NFPA 33, Standard for Spray Application Using Flammable or Combustible Materials, for limited finishing workstations.

**Spray Area.** Any fully enclosed, or unenclosed area in which dangerous quantities of flammable or combustible vapors, mists, residues, dusts, or deposits are present due to the operation of spray processes, including (1) any area in the direct path of a spray application process; (2) the interior of a spray booth, spray room, or limited finishing workstation, as herein defined; (3) the interior of any exhaust plenum, eliminator sections, or scrubber section; (4) the interior of any exhaust duct or exhaust stack leading from a spray application process; (5) the interior of any recirculation path up to and including recirculation particulate filters; (6) any solvent concentrator (pollution abatement) unit of solvent recovery (distillation) unit; and (7) the inside of a membrane enclosure. The following are not part of the spray area: (1) fresh air make-up units; (2) air supply ducts and air supply plenums; (3) recirculation air supply ducts downstream of recirculation particulate filters; and (4) exhaust ducts from solvent concentrator (pollution abatement) units.

**Informational Note.** Unenclosed spray areas are locations outside of buildings or are localized operations within a larger room or space. Such are normally provided with some local vapor extraction/ventilation system. In automated operations, the area limits are the maximum area in the direct path of spray operations. In manual operations, the area limits are the maximum area of spray when aimed at 90 degrees to the application surface.

**Spray Booth:** A power-ventilated enclosure for a spray application operation or process that confines and limits the escape of material being sprayed, including vapors, mists, dusts, and residues that are produced by the spraying operation and conducts or directs these materials to an exhaust system.

**Informational Note.** A spray booth is an enclosure or insert within a larger room used for spray/coating/dipping applications. A spray booth can be fully enclosed or have open front or face and can include separate conveyor entrance and exit. The spray booth is provided with a dedicated ventilation exhaust with supply air from the larger room or from a dedicated air supply.

The following are the updated section numbers and titles in the 2017 NEC.

### Part II. Open Containers

#### ~~516.3 Classification of Locations.~~

#### ~~516.4 Wiring and Equipment in Class I Locations~~ Area Classification.

### Part III. Spray Application Processes

#### 516.5 Area Classification.

#### 516.6 Wiring and Equipment in Class I Locations.

### Part IV. Spray Application Operations in Membrane Enclosures

#### 516.18 Area Classification for Temporary Membrane Enclosures.

### 516.23 Electrical and Other Sources of Ignition.

## Part V. Printing, Dipping, and Coating Processes

### 516.29 Classification of Locations.

### 516.35 Areas Adjacent to Enclosed Dipping and Coating Processes.

### 516.36 Equipment and Containers in Ventilated Areas.

### 516.37 Luminaires.

### 516.38 Wiring and Equipment Not Within Classified Locations.

### 516.40 Static Electric Discharges.

#### ■ Reason for the Change

Article 516 was re-arranged and revised to give the article a clearer outline. Four individual parts were added to the article. The requirements now align with the requirements of NFPA 33 and NFPA 34.

## ARTICLE 517

### Health Care Facilities

#### 517.2 Definitions. (Health Care Facilities)

#### 517.2 Definitions. (Health Care Facilities)

**Governing Body.** The person or persons who have the overall legal responsibility for the operation of a health care facility.

#### ■ Reason for the Change

The term “governing body” appears at seven different locations in Article 517 for the 2017 NEC and a new definition has been added at 517.2.

#### 517.2 Definitions. (Health Care Facilities)

#### 517.2 Definitions. (Health Care Facilities)

#### Health Care

**Facilities.** Buildings, or portions of buildings,

or mobile enclosures in which human medical, dental, psychiatric, nursing, obstetrical, or surgical care are provided.

**Informational Note:** Examples of health care facilities include, but are not limited to, hospitals, nursing homes, limited care facilities, clinics, medical and dental offices, and ambulatory care centers, whether permanent or movable.

#### ■ Reason for the Change

The definition of a *Health Care Facility* was revised for the 2017 NEC and now includes the term “mobile enclosures.” The examples of a health care facility that were included in the definition in the previous edition of the *Code* are now found in an informational note below the revised definition.

#### 517.2 Definitions. (Health Care Facilities)

#### 517.2 Definitions. (Health Care Facilities)

**Medical Office (Dental Office).** A building or part thereof in which the following occur: (1) examinations and minor treatments or procedures are performed under the continuous supervision of a medical or dental professional; (2) only sedation or local anesthesia is involved and treatment or procedures do not render the patient incapable of self-preservation under emergency conditions; and (3) overnight stays for patients or 24-hour operation are not provided.

#### ■ Reason for the Change

To define a well-used term in Article 517, a new definition for *Medical Office (Dental Office)* was added at 517.2 for the 2017 NEC.

#### 517.2 Definitions. (Health Care Facilities)

#### 517.2 Definitions. (Health Care Facilities) Patient Care

**Space.** Any space of ~~within~~ a health care facility wherein patients are intended to be examined or treated.

**Informational Note No. 1:** The governing body of the facility designates patient care space in accordance with the type of patient care anticipated and with the definitions of the area classification.

**Informational Note No. 2:** Business offices, corridors, lounges, day rooms, dining rooms, or similar areas typically are not classified as patient care space.

**Basic Care (Category 3) Space.** Space in which failure of equipment or a system is not likely to cause injury to the patients, staff, or visitors caregivers but can may cause patient discomfort.

**Informational Note No. 2:** [Category 3] spaces, formerly known as basic care rooms [(spaces)] isare typically a location where basic medical or dental care, treatment, or examinations are performed. Examples include, but are not limited to, examination or treatment rooms in clinics, medical and dental offices, nursing homes, and limited care facilities.

**General Care (Category 2) Space.** Space in which failure of equipment or a system is likely to cause minor injury to patients, staff, or visitors caregivers.

**Informational Note No. 3:** [Category 2] spaces were formerly known as general care rooms [(spaces)]. Examples include, includes but are not limited to areas such as patient inpatient bedrooms, examining dialysis rooms, & treatment in vitro fertilization rooms, clinics procedural rooms, and similar rooms areas where the patient may come into contact with electromedical devices or ordinary appliances such as a nurse call system, electric beds, examining lamps, telephones, and entertainment devices.

**Critical Care (Category 1) Space.** Space in which failure of equipment or a system is likely to cause major injury or death to patients, staff, or visitors caregivers.

**Informational Note No. 4:** [Category 1] spaces, formerly known as critical care rooms [(spaces)], are typically where patients are

intended to be subjected to invasive procedures and connected to line-operated, patient care-related appliances. Examples includes include, but are not limited to, special care units patient rooms used for critical care, intensive care units, and special care treatment rooms such as coronary care units, angiography laboratories, cardiac catheterization laboratories, delivery rooms, operating rooms, post-anesthesia care units, trauma rooms, and other similar rooms areas in which are patients are intended to be subjected to invasive procedures and are connected to line-operated, electromedical devices.

**Support (Category 4) Space.** Space in which failure of equipment or a system is not likely to have a physical impact on patient care patients or caregivers.

**Informational Note No. 5:** [Category 4] spaces were formerly known as support rooms [(spaces)], where a procedure is performed that subjects patients or staff to wet conditions are considered as wet procedure areas. Wet conditions include standing fluids on the floor or drenching of the work area. Routine housekeeping procedures and incidental spillage of liquids do not define wet procedure areas. It is the responsibility of the governing body of the health care facility to designate the wet procedure areas. Examples of support spaces include, but are not limited to, anesthesia work rooms, sterile supply, laboratories, morgues, waiting rooms, utility rooms, and lounges.

#### ■ Reason for the Change

The four types of patient care spaces were revised to include NFPA 99 numbered categories assigned to each of these types of patient care spaces. Bracketed NFPA 99s were added after each description and informational note. Informational notes were relocated after each definition, and these informational notes contain examples of each of the different categories

### 517.16 Use of Isolated Ground Receptacles. (Health Care Facilities)

## 517.16 Use of Isolated Ground Receptacles. (Health Care Facilities)

### (A) Inside of a Patient Care

**Vicinity.** An isolated ground receptacle shall not be installed within a patient care vicinity.

### (B) Outside of a Patient Care

**Vicinity.** Isolated ground receptacle(s) installed in patient care spaces outside of a patient care vicinity(s) shall comply with 517.16(B)(1) and (2).

(1) The grounding terminals of isolated ground receptacles installed in branch circuits for patient care spaces shall be connected to an insulated equipment grounding conductor in accordance with 250.146(D) in addition to the equipment grounding conductor path required in 517.13(A).

The equipment grounding conductor connected to the grounding terminals of isolated ground receptacles in patient care spaces shall be clearly identified along the equipment grounding conductor's entire length by green insulation with one or more yellow stripes.

(2) The insulated equipment grounding conductor required in 517.13(B)(1) shall be clearly identified along its entire length by green insulation, with no yellow stripes, and shall not be connected to the grounding terminals of isolated ground receptacles but shall be connected to the box or enclosure indicated in 517.13(B)(1)(2) and to non-current-carrying conductive surfaces of fixed electrical equipment indicated in 517.13(B)(1)(3).

**Informational Note No. 1:** This type of installation is typically used where a reduction of electrical noise (electromagnetic interference) is necessary, and parallel grounding paths are to be avoided.

**Informational Note No. 2:** Care should be taken in specifying a system containing isolated ground receptacles, because the grounding impedance is controlled only by the grounding wires and does not benefit from any conduit or building structure in parallel with the grounding path.

## Reason for the Change

New provisions were added to 517.16 pertaining to the proper installation of isolated ground receptacles located outside of a patient care vicinity. The prohibition of isolated ground receptacle inside a patient care vicinity are addressed at 517.16(A) and isolated ground receptacles installed outside a patient care vicinity are addressed at 517.16(B).

## 517.30 Sources of Power. (Health Care Facilities)

### ~~517.35~~ 517.30 Sources of Power. (Health Care Facilities)

#### (A) Two Independent Sources of

**Power.** Essential electrical systems shall have a minimum of the following two independent sources of power: a normal source generally supplying the entire electrical system and one or more alternate source(s) for use when the normal source is interrupted.

~~(B) Alternate Source Types of Power Sources.~~ The alternate source of power shall be one of the following:

(1) **Generating Units.** Generator(s) driven by some form of prime mover(s) and located on the premises. Where the normal source consists of generating units on the premises, the alternate source shall be either another generating set or an external utility service.

~~(2) Another generating unit(s) where the normal source consists of a generating unit(s) located on the premises~~

~~(3) An external utility service when the normal source consists of a generating unit(s) located on the premises~~

~~(4) A battery system located on the premises~~

(2) **Fuel Cell Systems.** Fuel cell systems shall be permitted to serve as the alternate source for all or part of an essential electrical system, provided the following conditions apply:

(1) Installation of fuel cells shall comply with the requirements in Parts I through VII of



Article 692 for 1000 volts or less and Part VIII for over 1000 volts.

**Informational Note:** For information on installation of stationary fuel cells, see NFPA 853-2015, Standard for Installation of Stationary Fuel Cell Power Systems.

(2) N + 1 units shall be provided where N units have sufficient capacity to supply the demand loads of the portion of the system served.

(3) System shall be able to assume loads within 10 seconds of loss of normal power source.

(4) System shall have a continuing source of fuel supply, together with sufficient on-site fuel storage for the essential system type.

(5) A connection shall be provided for a portable diesel generator to supply life safety and critical portions of the distribution system.

(6) Fuel cell systems shall be listed for emergency system use.

### (C) Location of Essential Electrical System Components.

Careful consideration shall be given to the location of the spaces housing the components of the Essential electrical system components shall be located to minimize interruptions caused by natural forces common to the area (e.g., storms, floods, earthquakes, or hazards created by adjoining structures or activities). Consideration shall also be given to the Installations of electrical services shall be located to reduce possible interruption of normal electrical services resulting from similar causes as well as possible disruption of normal electrical service due to internal wiring and equipment failures. Consideration shall be given to the Feeders shall be located to provide physical separation of the main feeders of the alternate source from the main feeders of the normal electrical source to prevent possible simultaneous interruption.

**Informational Note:** Facilities in which the normal source of power is supplied by two or more separate central station-fed services experience greater than normal electrical service reliability than those with only a single feed. Such a dual source of normal power consists of two or more electrical services fed from separate

generator sets or a utility distribution network that has multiple power input sources and is arranged to provide mechanical and electrical separation so that a fault between the facility and the generating sources is not likely to cause an interruption of more than one of the facility service feeders.

### ■ Reason for the Change

The same basic provisions that were located at 517.35 were relocated to 517.30. Fuel cell systems will now be permitted to serve as the alternate source for all or part of an essential electrical system as any reference to a battery system has been deleted.

### 517.34(B) Critical Branch. (Essential Electrical System-Health Care Facilities)

### ~~517.33~~ 517.34 Critical Branch. (Essential Electrical System-Health Care Facilities)

(A) **Task Illumination and Selected Receptacles.** The critical branch of the essential electrical system shall supply power for task illumination, fixed equipment, selected receptacles, and special power circuits serving the following areas and functions related to patient care:

(B) **Switching.** It shall be permitted to control task illumination on the critical branch.

~~(B)~~ (C) **Subdivision of the Critical Branch.** It shall be permitted to subdivide the critical branch into two or more branches.

**Informational Note:** It is important to analyze the consequences of supplying an area with only critical care branch power when failure occurs between the area and the transfer switch. Some proportion of normal and critical power or critical power from separate transfer switches may be appropriate.

### ■ Reason for the Change

Positive language was added at 517.34(B) to specifically permit the control of task illumination on the critical branch of the essential electrical system.

**ARTICLE 520****Theaters, Audience Areas of Motion Picture and Television Studios, Performance Areas, and Similar Locations****520.2 Definitions. (Theaters, Audience Areas of Motion Picture and Television Studios, Performance Areas, and Similar Locations):  
Adapter****520.2 Definitions. (Theaters, Audience Areas of Motion Picture and Television Studios, Performance Areas, and Similar Locations)**

**Adapter.** A device used to adapt a circuit from one configuration of an attachment plug or receptacle to another configuration with the same current rating.

**Reason for the Change**

A new definition of *Adapter* was added at 520.2 to address misapplication of this term in Article 520.

**520.2 Definitions. (Theaters, Audience Areas of Motion Picture and Television Studios, Performance Areas, and Similar Locations)****520.2 Definitions. (Theaters, Audience Areas of Motion Picture and Television Studios, Performance Areas, and Similar Locations)**

**Stage Switchboard.** A permanently installed switchboard, panelboard, or rack containing dimmers or relays with associated overcurrent protective devices, or overcurrent protective devices alone, used primarily to feed stage equipment.

**Stage Switchboard, Portable.** A portable rack or pack containing dimmers or relays with associated overcurrent protective devices, or

overcurrent protective devices alone that are used to feed stage equipment.

**Reason for the Change**

A new definition for “Stage Switchboard, Portable” was added to Article 520 and the phrase “permanently installed” was added to the existing definition of “Stage Switchboard.”

**ARTICLE 525****Carnivals, Circuses, Fairs, and Similar Events****525.23(D) Ground-Fault Circuit-Interrupter (GFCI) Protection. (Carnivals, Circuses, Fairs, and Similar Events)****525.23 Ground-Fault Circuit-Interrupter (GFCI) Protection. (Carnivals, Circuses, Fairs, and Similar Events)****(A) Where GFCI Protection Is**

**Required.** GFCI protection for personnel shall be provided for the following:

- (1) All 125-volt, single-phase, 15- and 20-ampere non-locking-type receptacles used for disassembly and reassembly or readily accessible to the general public
- (2) Equipment that is readily accessible to the general public and supplied from a 125-volt, single-phase, 15- or 20-ampere branch circuit

The ~~ground fault circuit interrupter~~ GFCI shall be permitted to be an integral part of the attachment plug or located in the power-supply cord within 300 mm (12 in.) of the attachment plug. Listed cord sets incorporating ~~ground-fault circuit interrupter~~ GFCI for personnel shall be permitted.

**(B) Where GFCI Protection Is Not**

**Required.** Receptacles that are not accessible from grade level and that only facilitate quick disconnecting and reconnecting of electrical equipment shall not be required to be provided

with GFCI protection. These receptacles shall be of the locking type.

**(C) Where GFCI Protection Is Not Permitted.** Egress lighting shall not be protected by a GFCI.

**(D) Receptacles Supplied by Portable Cords.** Where GFCI protection is provided through the use of GFCI receptacles, and the branch circuits supplying receptacles utilize flexible cord, the GFCI protection shall be listed, labeled, and identified for portable use.

■ **Reason for the Change**

New requirements were imposed at 525.23(D) requiring GFCI protection to be listed, labeled, and identified for portable use when said GFCI protection is provided through the use of GFCI receptacles, and the branch circuits supplying these receptacles utilize a flexible cord.

## ARTICLE 547

### Agricultural Buildings

#### 547.5(F) Wiring Methods. (Agricultural Buildings)

**547.5 Wiring Methods. (Agricultural Buildings)**

**(F) Separate Equipment Grounding Conductor.** Where an equipment grounding conductor is installed underground within a location falling under the scope of Article 547, it shall be insulated or covered.

**Informational Note:** For further information on aluminum and copper-clad aluminum conductors, see 250.120(B).

■ **Reason for the Change**

A revision at 547.5(F) eliminated the permission to use a “covered” equipment grounding conductor for an underground installation at agricultural buildings.

## ARTICLE 550

### Mobile Homes, Manufactured Homes, and Mobile Home Parks

#### 550.2 Definitions. (Mobile Homes, Manufactured Homes, and Mobile Home Parks)

**550.2 Definitions. (Mobile Homes, Manufactured Homes, and Mobile Home Parks)**

**Manufactured Home.** A structure, transportable in one or more sections, ~~that, which~~ in the traveling mode is 2.4 m (8 ~~body~~-ft) or more in width or 12.2 m (40-ft) or more in length, or when erected on site, is 29.77 m<sup>2</sup> (320 ft<sup>2</sup>) or more ~~and that~~ is built on a permanent chassis and designed to be used as a dwelling with or without a permanent foundation, whether or not connected to the utilities, and includes plumbing, heating, air conditioning, and electrical systems ~~contained when connected~~ therein. The term manufactured home includes any structure that meets all the ~~provisions~~ requirements of this paragraph except the size requirements and with respect to which the manufacturer voluntarily files a certification required by the regulatory agency, ~~and except that such term does not include any self-propelled recreational vehicle.~~ Calculations used to determine the number of square meters (square feet) in a structure are based on the structure’s exterior dimensions, ~~measured at the largest horizontal projections when erected on site.~~ These ~~dimensions~~ and include all expandable rooms, cabinets, and other projections containing interior space, but do not include bay windows.

For the purpose of this *Code* and unless otherwise indicated, the term *mobile home* includes manufactured homes and excludes park trailers defined in 552.4.

**Informational Note No. 1:** See the applicable building code for definition of the term permanent foundation.

**Informational Note No. 2:** See 24 CFR Part 3280, Manufactured Home Construction and Safety Standards, of the Federal Department of Housing and Urban Development, for additional information on the definition.

## ■ Reason for the Change

The existing definition for a “manufactured home” was revised for consistency with the definition of a “manufactured home” found in NFPA 501 (*Standard on Manufactured Housing*). The last sentence of the definition was revised to exclude park trailers.

### 550.13(B) Receptacle Outlets. (Mobile Homes, Manufactured Homes, and Mobile Home Parks)

#### 550.13 Receptacle Outlets. (Mobile Homes, Manufactured Homes, and Mobile Home Parks)

(B) Ground-Fault Circuit Interrupters (GFCI). All 125-volt, single-phase, 15- and 20-ampere receptacle outlets installed outdoors, in compartments accessible from outside the unit, or in bathrooms, including receptacles in luminaires, in the locations specified in 550.13(B)(1) through (5) shall have GFCI protection for personnel. ~~GFCI protection shall be provided for receptacle outlets serving countertops in kitchens and receptacle outlets located within 1.8 m (6 ft) of a wet bar sink. The exceptions in 210.8(A) shall be permitted.~~

(1) Outdoors, including in compartments accessible from outside the unit

(2) Bathrooms, including receptacles in luminaires

(3) Kitchens, where receptacles are installed to serve countertop surfaces

(4) Sinks, where receptacles are installed within 1.8 m (6 ft) of the outer edge of the ~~a wet bar sink~~

(5) Dishwashers

~~Feeders supplying branch circuits shall be permitted to be protected by a ground-fault circuit interrupter in lieu of the provision for such interrupters specified herein.~~

**Informational Note:** For information on protection of dishwashers, see 422.5.

(Note to Reader: The GFCI requirements for dwelling unit dishwashers remained at 210.8(D)

and not at 422.5 as indicated in the added informational note above.)

## ■ Reason for the Change

The GFCI provisions for mobile and manufactured homes were revised into a list format. Along with the previous GFCI requirements, GFCI requirements for all sinks (not just wet bar sinks), dishwashers and other locations similarly found at 210.8(A) were incorporated into 550.13(B). Clarification was added to the GFCI provisions for outdoor receptacle outlets to include all outdoor receptacle outlets including (but not limited to) outdoor receptacle outlets located in compartments accessible from outside the unit. The option of delivering the required GFCI protection through a feeder that supplied the branch circuits associated with the receptacle outlets requiring GFCI protection was removed.

### 550.25(B) Arc-Fault Circuit-Interrupter Protection. (Mobile Homes, Manufactured Homes, and Mobile Home Parks)

#### 550.25 Arc-Fault Circuit-Interrupter Protection. (Mobile Homes, Manufactured Homes, and Mobile Home Parks)

(A) **Definition.** Arc-fault circuit interrupters are defined in Article 100.

(B) **Mobile Homes and Manufactured Homes.** All 120-volt branch circuits that supply 15- and 20-ampere outlets installed in family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, or similar rooms or areas of mobile homes and manufactured homes shall comply with 210.12.

## ■ Reason for the Change

AFCI protection at mobile and manufactured homes was revised by eliminating the specific list of rooms and areas requiring AFCI protection at mobile and manufactured

homes and simply requiring compliance with 210.12.

## ARTICLE 551

### Recreational Vehicles and Recreational Vehicle Parks

#### 551.2 Definitions. (Recreational Vehicles and Recreational Vehicle Parks)

#### 551.2 Definitions. (Recreational Vehicles and Recreational Vehicle Parks)

**Recreational Vehicle Park.** ~~A plot of land upon which~~ Any parcel or tract of land under the control of any person, organization, or governmental entity wherein two or more recreational vehicle sites are located, established, or maintained for occupancy by recreational vehicles of the general public as temporary living quarters for recreation or vacation purposes, recreational park trailer, and/or other camping sites are offered for use by the public or members of an organization for overnight stays.

#### ■ Reason for the Change

The definition of “Recreational Vehicle Park” was revised to correlate with the same definition in NFPA 1194 (*Standard for Recreational Vehicle Parks and Campgrounds*).

#### 551.71 Type Receptacles Provided. (Recreational Vehicle Parks)

#### 551.71 Type Receptacles Provided. (Recreational Vehicle Parks)

**(A) 20-Ampere.** Every recreational vehicle site with electrical supply shall be equipped with recreational vehicle site supply equipment with at least one 20-ampere, 125-volt receptacle.

**(B) 30-Ampere.** A minimum of 70 percent of all recreational vehicle sites with electrical supply shall each be equipped with a 30-ampere, 125-volt receptacle conforming to Figure 551.46(C)(1). This supply shall be permitted to

include additional receptacle configurations conforming to 551.81. The remainder of all recreational vehicle sites with electrical supply shall be equipped with one or more of the receptacle configurations conforming to 551.81.

**(C) 50-Ampere.** A minimum of 20 percent of existing and 40 percent of all new recreational vehicle sites, with electrical supply, shall each be equipped with a 50-ampere, 125/250-volt receptacle conforming to the configuration as identified in Figure 551.46(C)(1). Every recreational vehicle site equipped with a 50-ampere receptacle shall also be equipped with a 30-ampere, 125-volt receptacle conforming to Figure 551.46(C)(1). These electrical supplies shall be permitted to include additional receptacles that have configurations in accordance with 551.81.

**(D) Tent Sites.** Dedicated tent sites with a 15- or 20-ampere electrical supply shall be permitted to be excluded when determining the percentage of recreational vehicle sites with 30- or 50-ampere receptacles.

**(E) Additional Receptacles.** Additional receptacles shall be permitted for the connection of electrical equipment outside the recreational vehicle within the recreational vehicle park.

**(F) GFCI Protection.** All 125-volt, single-phase, 15- and 20-ampere receptacles shall have listed ground-fault circuit-interrupter protection for personnel. The GFCI devices used in RV site electrical equipment shall not be required to be weather or tamper resistant in accordance with 406.9 and 406.12.

**Informational Note:** The percentage of 50 ampere sites required by 551.71 may be inadequate for seasonal recreational vehicle sites serving a higher percentage of recreational vehicles with 50 ampere electrical systems. In that type of recreational vehicle park, the percentage of 50 ampere sites could approach 100 percent.

#### ■ Reason for the Change

The section has been broken into six separate first level subdivisions with titles. The number of RV sites required to be equipped

with 50-ampere, 125/250-volt receptacles has increased from 20 percent to 40 percent for all new recreational vehicle sites. GFCI devices used in RV site electrical equipment are not required to be weather- or tamper-resistant in accordance with 406.9 and 406.12.

### **551.73(A) Calculated Load. (Recreational Vehicle Parks)**

#### **551.73 Calculated Load. (Recreational Vehicle Parks)**

**(A) Basis of Calculations.** Electrical services and feeders shall be calculated on the basis of not less than ~~9600~~ 12,000 volt-amperes per site equipped with 50-ampere, 208Y/120 or 120/240-volt supply facilities; 3600 volt-amperes per site equipped with both 20-ampere and 30-ampere supply facilities; 2400 volt-amperes per site equipped with only 20-ampere supply facilities; and 600 volt-amperes per site equipped with only 20-ampere supply facilities that are dedicated to tent sites. The demand factors set forth in Table 551.73(A) shall be the minimum allowable demand factors that shall be permitted in calculating load for service and feeders. Where the electrical supply for a recreational vehicle site has more than one receptacle, the calculated load shall be calculated only for the highest rated receptacle.

Where the electrical supply is in a location that serves two recreational vehicles, the equipment for both sites shall comply with 551.77, and the calculated load shall only be calculated for the two receptacles with the highest rating.

#### ■ Reason for the Change

The minimum calculated load for RV parks sites equipped with 50-ampere, 208Y/120 or 120/240-volt supply facilities has increased from 9600 volt-amperes to 12,000 volt-amperes per site. The calculated loads for 20-ampere and 30-ampere supply facilities remained the same.

### **551.75(B) Grounding. (RV Parks)**

#### **551.75 Grounding. (RV Parks)**

**(A) General.** All electrical equipment and installations in recreational vehicle parks shall be grounded as required by Article 250.

**Informational Note:** See 250.32(A), Exception, for single branch circuits.

**(B) Grounding Electrode.** Power outlets or recreational vehicle site supply equipment, other than those used as service equipment, shall not be required to have a grounding electrode. An auxiliary grounding electrode(s) in accordance with 250.54 shall be permitted to be installed.

#### ■ Reason for the Change

A new 551.75(B) was added indicating that power outlets or RV site supply equipment (other than those used as service equipment) are not required to have a grounding electrode established at RV site electrical equipment.

## **ARTICLE 555 Marinas and Boatyards**

### **Article 555 Marinas, Boatyards, and Commercial and Noncommercial Docking Facilities**

#### **Article 555 Marinas, Boatyards, and Commercial and Noncommercial Docking Facilities**

**555.1 Scope.** This article covers the installation of wiring and equipment in the areas comprising fixed or floating piers, wharves, docks, and other areas in marinas, boatyards, boat basins, boathouses, yacht clubs, boat condominiums, docking facilities associated with one-family dwellings, two-family dwellings, multifamily dwellings, and residential condominiums, any multiple docking facility, or similar occupancies, and facilities that are used, or intended for use, for the purpose of repair, berthing, launching, storage, or fueling of small craft and the moorage of floating buildings.

~~Private, noncommercial docking facilities constructed or occupied for the use of the owner or residents of the associated single-family dwelling are not covered by this article.~~

**Informational Note:** See NFPA 303-2011, *Fire Protection Standard for Marinas and Boatyards*, for additional information.

#### ■ Reason for the Change

The title of Article 555 was changed from “Marinas and Boatyards” to “Marinas, Boatyards, and Commercial and Noncommercial Docking Facilities.” Revisions to 555.1 make Article 555 relevant to dwelling unit docking facilities as well as commercial docking facilities.

### 555.3 Ground-Fault Protection. (Marinas, Boatyards and Commercial and Noncommercial Docking Facilities)

#### 555.3 Ground-Fault Protection. (Marinas, Boatyards and Commercial and Noncommercial Docking Facilities)

The ~~main~~ overcurrent protective devices that ~~feeds~~ supply the marina, boatyards, and commercial and noncommercial docking facilities shall have ground fault protection not exceeding ~~100 mA~~ 30 mA. ~~Ground-fault protection of each individual branch or feeder circuit shall be permitted as a suitable alternative.~~

#### ■ Reason for the Change

The ground-fault protection required for overcurrent protective devices for marinas, and now boatyards, and commercial and noncommercial docking facilities as well was reduced to a maximum of 30 mA rather than 100 mA. This GFP protection is required in all supply overcurrent protective devices, not necessarily in the main OCPD. The allowance of GFCI protection in each individual branch or feeder was deleted as this 30 mA GFP protection is required in all supply OCPDs. GFCI protection is still required for 15- and

20-ampere, single-phase, 125-volt receptacles by the requirements of 555.19(B)(1).

### 555.19(B)(1) Receptacles. (Marinas, Boatyards, and Commercial and Noncommercial Docking Facilities)

**555.19 Receptacles. (Marinas, Boatyards, and Commercial and Noncommercial Docking Facilities)** Receptacles shall be mounted not less than 305 mm (12 in.) above the deck surface of the pier and not below the electrical datum plane on a fixed pier.

#### (B) Other Than Shore Power.

##### (1) Ground-Fault Circuit-Interrupter (GFCI) Protection for

**Personnel.** ~~Fifteen- and 20-ampere, single-phase, 125-volt receptacles installed outdoors, in boathouses, in buildings or structures used for storage, maintenance, or repair where portable electrical hand tools, electrical diagnostic equipment, or portable lighting equipment are to be used shall be provided with GFCI protection for personnel. Receptacles in other locations shall be protected in accordance with 210.8(B).~~

#### ■ Reason for the Change

The statement, “where portable electrical hand tools, electrical diagnostic equipment, or portable lighting equipment are to be used” was deleted. GFCI protection for personnel will now be required for all 125-volt, single-phase, 15- and 20-ampere receptacles installed outdoors, in boathouses, and in buildings or structures used for storage, maintenance, or repair regardless of the intended use of these receptacles.

### 555.24 Signage. (Marinas, Boatyards and Commercial and Noncommercial Docking Facilities)

### 555.24 Signage. (Marinas, Boatyards and Commercial and Noncommercial Docking Facilities)

Permanent safety signs shall be installed to give notice of electrical shock hazard risks to persons using or swimming near a boat dock or marina and shall comply with all of the following:

- (1) The signage shall comply with 110.21(B)(1) and be of sufficient durability to withstand the environment.
- (2) The signs shall be clearly visible from all approaches to a marina or boatyard facility.
- (3) The signs shall state “WARNING — POTENTIAL SHOCK HAZARD — ELECTRICAL CURRENTS MAY BE PRESENT IN THE WATER.”

#### ■ Reason for the Change

New requirements were added for permanent safety signs to be installed to give notice of electrical shock hazard risks to persons using or swimming near a boat dock or marina. The signage must comply with 110.21(B) (1) and be clearly visible from all approaches to a marina or boatyard facility. The signs shall state “WARNING — POTENTIAL SHOCK HAZARD — ELECTRICAL CURRENTS MAY BE PRESENT IN THE WATER.”

## ARTICLE 590

### Temporary Installations

#### 590.4 General. (Temporary Installations)

#### 590.4 General. (Temporary Installations)

**(B) Feeders.** Overcurrent protection shall be provided in accordance with 240.4, 240.5, 240.100, and 240.101. Conductors shall be permitted within cable assemblies or within multiconductor cords or cables of a type identified in Table 400.4 for hard usage or extra-hard usage. For the purpose of this section, the following wiring methods shall be permitted:

(1) Type NM, ~~and~~ Type NMC, and Type SE cables shall be permitted to be used in any dwelling, building, or structure without any height limitation or limitation by building construction type and without concealment within walls, floors, or ceilings.

(2) Type SE cable shall be permitted to be installed in a raceway in an underground installation.

**Exception:** Single insulated conductors shall be permitted where installed for the purpose(s) specified in 590.3(C), where accessible only to qualified persons.

#### ■ Reason for the Change

Along with Type NM and Type NMC cables, Type SE cable has been added to the acceptable cable assembly wiring methods for temporary installations. Type SE cable is now permitted to be installed in a raceway in a temporary underground installation as well.

#### 590.6(A)(1) Ground-Fault Protection for Personnel. (Temporary Installations)

#### 590.6 Ground-Fault Protection for Personnel. (Temporary Installations)

Ground-fault protection for personnel for all temporary wiring installations shall be provided to comply with 590.6(A) and (B). This section shall apply only to temporary wiring installations used to supply temporary power to equipment used by personnel during construction, remodeling, maintenance, repair, or demolition of buildings, structures, equipment, or similar activities. This section shall apply to power derived from an electric utility company or from an on-site-generated power source.

**(A) Receptacle Outlets.** Temporary receptacle installations used to supply temporary power to equipment used by personnel during construction, remodeling, maintenance, repair, or demolition of buildings, structures, equipment, or similar activities shall comply with the requirements of 590.6(A)(1) through (A)(3), as applicable.



**Exception:** In industrial establishments only, where conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program as specified in 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power were interrupted or having a design that is not compatible with GFCI protection.

**(1) Receptacle Outlets Not Part of Permanent Wiring.** All 125-volt, single-phase, 15-, 20-, and 30-ampere receptacle outlets that are not a part of the permanent wiring of the building or structure and that are in use by personnel shall have ground-fault circuit-interrupter protection for personnel. In addition to this required ground-fault circuit-interrupter protection for personnel, listed cord sets or devices incorporating listed ground-fault circuit-interrupter protection for personnel identified for portable use shall be permitted.

#### ■ Reason for the Change

The phrase “In addition to this required ground-fault circuit-interrupter protection for personnel,” was added in front of “listed cord sets or devices incorporating listed ground-fault circuit-interrupter protection for personnel identified for portable use shall be permitted.” This added language was to clarify that these portable GFCI cord sets or devices are permitted *in addition to* the GFCI protection required for all 125-volt, single-phase, 15-, 20-, and 30-ampere receptacle outlets that are not a part of the permanent wiring of the building or structure.

## ACCESS THE CODE

The complete 2017 NEC can be accessed online for free at the following link. Be sure to select “Free access to the 2017 edition of NFPA 70”

<http://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards?mode=code&code=70>

Additional, the code can be purchased in both a book and pdf from the same link.

# Quiz Questions

---

The following twenty (20) question quiz will test the student's comprehension of the course. The student must pass this online quiz with a score greater than 70%.

1. **Combustible dust are dust particles that are \_\_\_\_\_ and smaller.**

- 500 microns
- 200 microns
- 0.50 centimeters
- 1 millimeters

2. **What is the purpose of oil immersion of electrical equipment in an enclosure?**

- To prevent contamination of equipment with air-borne contaminants
- An outdated method of protection no longer used commercially
- So an increase in conductivity can be achieved
- So an explosive atmosphere that may be above the liquid or outside the enclosure cannot be ignited

3. **Why was table 500.8(D)(2) deleted?**

- Table was inapplicable as temperatures above 329°F are not encountered
- NFPA 499-2013 now contains that data
- The fixed ignition temperature limits referenced in the table are no longer used to evaluate Class II temperature limitations on equipment
- Classified

4. **Seals for cables entering enclosures shall be installed within \_\_\_\_\_ of the enclosure or as required by the enclosure marking.**

- 12 in.
- 16 in.
- 20 in.
- 18 in.

5. **What is the meaning of IMC?**

- Internal Machinery Conduit
- Inert Material Compatibility
- Intrinsic Mechanical Component
- Intermediate Metal Conduit

6. True or False? A minor repair garage with heavier-than-air fuel will be either unclassified or Division II.

- True
- False

7. **LP-Gas dispensing devices should be located at least \_\_\_\_\_ from any dispensing device for Class I liquids.**

- 10 feet
- 20 feet
- 30 feet
- 50 feet

8. **In reference to article 514.8, what type of conduit was added in the 2017 NEC for acceptable underground installation.**

- RTRC
- HDPE
- PVC
- CNG

9. True or False? Fuel dispensing systems shall be provided with one or more clearly identified emergency shutoff devices or electrical disconnects.

- True
- False

10. For fuel dispensing facilities which are unattended, what are the requirements for emergency disconnects available to patrons?

- Unattended fuel dispensing facilities are not allowed by code
- At least one additional device or disconnect shall be readily accessible to each group of dispensing devices on an individual island
- Not less than two per vehicle
- None of the above

11. What is a Limited Finishing Workstation?

- A spray area
- An apparatus that is capable of confining the vapors, mists, residues, dusts, or deposits that are generated by a spray application process but does not meet the requirements of a spray booth or spray room
- A spray booth
- A box fan

12. What is the main difference between a spray area and a spray booth?

- A spray booth does not have ventilation
- A spray area requires ventilation
- A spray booth is commercially manufactured to meet or exceed OSHA regulations
- A spray area can be unenclosed

13. What was newly added to the definition of Health Care Facilities?

- Patient care space
- Buildings
- Patient wait area
- Mobile enclosures

14. What medical space is defined as, causes minor discomfort to patients if subjected to equipment failures?

- Critical Care
- General Care
- Support
- Basic Care

15. Why are grounding conductor requirements of article 517.16 (2) required?

- To ensure parallel grounding paths are installed
- To maintain alignment with building codes for medical facilities
- To mitigate hazardous combustion of certain medically used liquids
- To reduce electrical noise (electromagnetic interference)

16. True or False? Fuel cell systems are now acceptable as alternate power sources for health care facilities.

- True
- False

17. What is the purpose of an adapter as defined in article 520?

- A device used to adapt a circuit from one configuration of an attachment plug or receptacle to MULTIPLE configurations with the same current rating
- A device used to adapt a circuit from one configuration of an attachment plug or receptacle to another configuration with THE SAME current rating
- A device used to adapt a circuit from one configuration of an attachment plug or receptacle to another configuration with DIFFERENT current rating
- A permanently installed switchboard, panelboard, or rack containing dimmers or relays with associated overcurrent protective devices

18. Every recreational vehicle site with electrical supply shall be equipped with recreational vehicle site supply equipment with at least one \_\_\_\_\_?

- 30-ampere, 125-volt receptacle
- 50-ampere, 125-volt receptacle
- 10-ampere, 125-volt receptacle
- 20-ampere, 125-volt receptacle

19. The ground-fault protection required for overcurrent protective devices for marinas is now \_\_\_\_\_ mA rather than \_\_\_\_\_ mA.

- 30, 100
- 100, 30
- 30, 10
- 20, 30

20. True or False? Type SE cable is not permitted to be installed in a raceway in a temporary underground installation.

- True
- False