



Mike Holt's

SUMMARY OF THE CHANGES TO THE NATIONAL ELECTRICAL CODE®



April 10, 2020

BASED ON THE
2020 NEC®

NOTICE TO THE READER

The publisher does not warrant or guarantee any of the products described herein or perform any independent analysis in connection with any of the product information contained herein. The publisher does not assume, and expressly disclaims, any obligation to obtain and include information other than that provided to it by the manufacturer.

The reader is expressly warned to consider and adopt all safety precautions that might be indicated by the activities herein and to avoid all potential hazards. By following the instructions contained herein, the reader willingly assumes all risks in connection with such instructions.

The publisher makes no representation or warranties of any kind, including but not limited to, the warranties of fitness for particular purpose or merchantability, nor are any such representations implied with respect to the material set forth herein, and the publisher takes no responsibility with respect to such material. The publisher shall not be liable for any special, consequential, or exemplary damages resulting, in whole or part, from the reader's use of, or reliance upon, this material.

Author: Mike Holt

COPYRIGHT © 2020 Charles Michael Holt



Produced and Printed in the USA

All rights reserved. No part of this work covered by the copyright hereon may be reproduced or used in any form or by any means graphic, electronic, or mechanical, including photocopying, recording, taping, or information storage and retrieval systems without the written permission of the publisher. You can request permission to use material from this text by either calling 888.632.2633, e-mailing Info@MikeHolt.com, or visiting www.MikeHolt.com.

For more information, call 888.NEC.CODE (632.2633), or e-mail Info@MikeHolt.com.

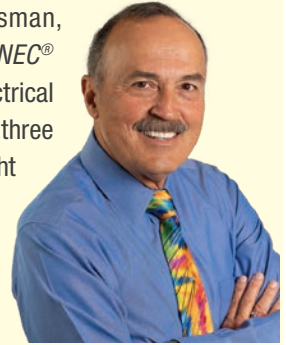
NEC®, NFPA 70®, NFPA 70E® and National Electrical Code® are registered trademarks of the National Fire Protection Association.



This logo is a registered trademark of Mike Holt Enterprises, Inc.

ABOUT THE AUTHOR

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



Mike's approach to electrical training is based on his own experience as an electrician, contractor, inspector and teacher. He's always felt a responsibility to his students and to the electrical industry to provide education beyond the scope of just passing an exam. This commitment, coupled with the lessons he learned at the University of Miami's MBA program, have helped him build one of the largest electrical training and publishing companies in the United States. His one-of-a-kind presentation style and his ability to simplify and clarify technical concepts explain his unique position as one of the premier educators and *Code* experts in the country. His passion for the electrical field drives his goal to increase electrical safety and improve lives.

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

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

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



TABLE OF CONTENTS

How to Use the *National Electrical Code*v

Summary of the Changes—2020 *National Electrical Code*[®] 1

Changes in the 2020 *National Electrical Code*[®] 2

Definitions2

Specific Terms2

Revisions, Edits and Reorganizations3

CHAPTER 1—GENERAL RULES 4

Global Changes.....4

Article 100 Definitions4

Article 110—Requirements for Electrical Installations.....4

CHAPTER 2—WIRING AND PROTECTION 6

Article 200—Use and Identification of Grounded Conductors6

Article 210—Branch Circuits6

Article 215—Feeders.....8

Article 220—Branch-Circuit, Feeder, and Service Load Calculations8

Article 225—Outside Branch Circuits and Feeders.....8

Article 230—Services.....9

Article 240—Overcurrent Protection 10

Article 242—Overvoltage Protection 11

Article 250—Grounding and Bonding..... 11

CHAPTER 3—WIRING METHODS AND MATERIALS 14

Article 300—General Requirements for Wiring Methods and Materials 14

Article 310—Conductors for General Wiring..... 14

Article 312—Cabinets..... 15

Article 314—Outlet, Device, Pull, Junction Boxes; Conduit Bodies; and Handhole Enclosures 15

Article 320—Armored Cable (Type AC) 15

Article 330—Metal-Clad Cable (Type MC)..... 16

Article 334—Nonmetallic Sheathed Cable (Type NM) 16

Article 336—Power and Control Tray Cable (Type TC)..... 16

Article 338—Service- Entrance Cable (Types SE and USE)..... 16

Article 340—Underground Feeder and Branch-Circuit Cable (Type UF)..... 16

Article 342—Intermediate Metal Conduit (Type IMC) 16

Article 344—Rigid Metal Conduit (Type RMC)..... 16

Article 350—Liquidtight Flexible Metal Conduit (Type LFMC) 17

Article 356—Liquidtight Flexible Nonmetallic Conduit (Type LFNC)..... 17

Article 358—Electrical Metallic Tubing (Type EMT) 17

Article 380—Multioutlet Assemblies 17

Article 392—Cable Trays..... 17

CHAPTER 4—EQUIPMENT FOR GENERAL USE..... 18

Article 400—Flexible Cords and Flexible Cables 18
 Article 402—Fixture Wires 18
 Article 404—Switches..... 18
 Article 406—Receptacles and Attachment Plugs (Caps)..... 18
 Article 408—Switchboards and Panelboards 19
 Article 410—Luminaires, lampholders, and Lamps..... 19
 Article 411—Low-Voltage Lighting 20
 Article 422—Appliances..... 20
 Article 424—Fixed Electric Space-Heating Equipment..... 20
 Article 430—Motors, Motor Circuits, and Controllers..... 20
 Article 440—Air-Conditioning and Refrigeration Equipment..... 21
 Article 445—Generators 21
 Article 450—Transformers..... 21
 Article 480—Storage Batteries 21

CHAPTER 5—SPECIAL OCCUPANCIES 22

Article 500—Hazardous (Classified) Locations 22
 Article 501—Class I Hazardous (Classified) Locations..... 22
 Article 502—Class II Hazardous (Classified) Locations..... 22
 Article 503—Class III Hazardous (Classified) Locations..... 22
 Article 511—Commercial Garages, Repair and Storage 22
 Article 514—Motor Fuel Dispensing facilities..... 23
 Article 517—Health Care Facilities 23
 Article 518—Assembly Occupancies..... 23
 Article 525—Carnivals, Circuses, Fairs, and Similar Events..... 23
 Article 547—Agricultural Buildings..... 23
 Article 550—Mobile Homes, Manufactured Homes, and
 Mobile Home Parks..... 24
 Article 555—Marinas, Boatyards, Commercial and
 Noncommercial Docking Facilities..... 24
 Article 590—Temporary Installations 24

CHAPTER 6—SPECIAL EQUIPMENT 25

Article 600—Electric Signs and Outline Lighting..... 25
 Article 620—Elevators, Escalators, and Moving Walks,
 Platform Lifts, and Stairway Chair Lifts..... 25
 Article 625—Electric Vehicle Power Transfer System 25
 Article 645—Information Technology Equipment..... 26
 Article 680—Swimming Pools, Spas, Hot Tubs, Fountains,
 and Similar Installations 26
 Article 690—Solar Photovoltaic (PV) Systems..... 27
 Article 691—Large-Scale Photovoltaic (PV) Electric Supply
 Stations..... 28
 Article 694—Wind Electric Systems 28
 Article 695—Fire Pumps 28

CHAPTER 7—SPECIAL CONDITIONS 29

Article 700—Emergency Systems 29
 Article 701—Legally Required Standby Systems..... 29
 Article 702—Optional Standby Systems 29
 Article 705—Interconnected Electric Power Production Sources.. 30
 Article 706—Energy Storage Systems 30
 Article 710—Stand-Alone Systems..... 31
 Article 712—Direct Current Microgrids 31
 Article 725—Remote-Control, Signaling, and Power-Limited
 Circuits 31
 Article 760—Fire Alarm Systems..... 32
 Article 770—Optical Fiber Cables and Raceways 32

CHAPTER 8—COMMUNICATIONS SYSTEMS 33

Article 800—General Requirements for Communications
 Systems 33
 Article 805—General Requirements for Communications
 Circuits 34
 Article 810—Radio and Television Satellite Equipment..... 34
 Article 820—Community Antenna Television (CATV) and Radio
 Distribution Systems (Coaxial Cable) 34

HOW TO USE THE *NATIONAL ELECTRICAL CODE*

The original *NEC* document was developed in 1897 as a result of the united efforts of various insurance, electrical, architectural, and other cooperative interests. The National Fire Protection Association (NFPA) has sponsored the *National Electrical Code* since 1911.

The purpose of the *Code* is the practical safeguarding of persons and property from hazards arising from the use of electricity. It isn't intended as a design specification or an instruction manual for untrained persons. It is, in fact, a standard that contains the minimum requirements for an electrical installation that's essentially free from hazard. Learning to understand and use the *Code* is critical to you working safely; whether you're training to become an electrician, or are already an electrician, electrical contractor, inspector, engineer, designer, or instructor.

The *NEC* was written for qualified persons; those who understand electrical terms, theory, safety procedures, and electrical trade practices. Learning to use the *Code* is a lengthy process and can be frustrating if you don't approach it the right way. First, you'll need to understand electrical theory and if you don't have theory as a background when you get into the *NEC*, you're going to struggle. Take one step back if necessary and learn electrical theory. You must also understand the concepts and terms in the *Code* and know grammar and punctuation in order to understand the complex structure of the rules and their intended purpose(s). The *NEC* is written in a formal outline which many of us haven't seen or used since high school or college so it's important for you to pay particular attention to this format. Our goal for the next few pages is to give you some guidelines and suggestions on using your *Code* book to help you understand that standard, and assist you in what you're trying to accomplish and, ultimately, your personal success as an electrical professional!

Language Considerations for the *NEC*

Terms and Concepts

The *NEC* contains many technical terms, and it's crucial for *Code* users to understand their meanings and applications. If you don't understand a term used in a rule, it will be impossible to properly apply the *NEC* requirement. Article 100 defines those that are used generally in two or more articles throughout the *Code*; for example, the term "Dwelling Unit" is found in many articles. If you don't know the *NEC* definition for a "dwelling unit" you can't properly identify its *Code* requirements. Another example worth mentioning is the term "Outlet." For many people it has always meant a receptacle—not so in the *NEC*!

Many *Code* articles use terms unique to that specific article, and the definitions of those terms only apply to that given article. Definitions for them are usually found in the beginning of the article. For example, Section 250.2 contains the definitions of terms that only apply to

Article 250—Grounding and Bonding. Whether definitions are unique to a specific article, or apply throughout the *NEC*, is indicated at the beginning of the definitions (xxx.2) section of the article. For example, Article 690 contains definitions (in 690.2) that apply ONLY to that article while Article 705 introduces definitions (in 705.2) that apply throughout the entire *Code*.

Small Words, Grammar, and Punctuation

Technical words aren't the only ones that require close attention. Even simple words can make a big difference to the application of a rule. Is there a comma? Does it use "or," "and," "other than," "greater than," or "smaller than"? The word "or" can imply alternate choices for wiring methods. A word like "or" gives us choices while the word "and" can mean an additional requirement must be met.

An example of the important role small words play in the *NEC* is found in 110.26(C)(2), where it says equipment containing overcurrent, switching, “or” control devices that are 1,200A or more “and” over 6 ft wide require a means of egress at each end of the working space. In this section, the word “or” clarifies that equipment containing any of the three types of devices listed must follow this rule. The word “and” clarifies that 110.26(C)(2) only applies if the equipment is both 1,200A or more and over 6 ft wide.

Grammar and punctuation play an important role in establishing the meaning of a rule. The location of a comma can dramatically change the requirement of a rule such as in 250.28(A), where it says a main bonding jumper shall be a wire, bus, screw, or similar suitable conductor. If the comma between “bus” and “screw” was removed, only a “bus screw” could be used. That comma makes a big change in the requirements of the rule.

Slang Terms or Technical Jargon

Trade-related professionals in different areas of the country often use local “slang” terms that aren’t shared by all. This can make it difficult to communicate if it isn’t clear what the meaning of those slang terms are. Use the proper terms by finding out what their definitions and applications are before you use them. For example, the term “pigtail” is often used to describe the short piece of conductor used to connect a device to a splice, but a “pigtail” is also used for a rubberized light socket with pre-terminated conductors. Although the term is the same, the meaning is very different and could cause confusion. The words “splice” and “tap” are examples of terms often interchanged in the field but are two entirely different things! The uniformity and consistency of the terminology used in the *Code*, makes it so everyone says and means the same thing regardless of geographical location.

NEC Style and Layout

It’s important to understand the structure and writing style of the *Code* if you want to use it effectively. The *National Electrical Code* is organized using twelve major components.

1. Table of Contents
2. Chapters—Chapters 1 through 9 (major categories)
3. Articles—Chapter subdivisions that cover specific subjects
4. Parts—Divisions used to organize article subject matter
5. Sections—Divisions used to further organize article subject matter
6. Tables and Figures—Represent the mandatory requirements of a rule
7. Exceptions—Alternatives to the main *Code* rule
8. Informational Notes—Explanatory material for a specific rule (not a requirement)
9. Tables—Applicable as referenced in the *NEC*
10. Annexes—Additional explanatory information such as tables and references (not a requirement)
11. Index
12. Changes to the *Code* from the previous edition

1. Table of Contents. The Table of Contents displays the layout of the chapters, articles, and parts as well as the page numbers. It’s an excellent resource and should be referred to periodically to observe the interrelationship of the various *NEC* components. When attempting to locate the rules for a specific situation, knowledgeable *Code* users often go first to the Table of Contents to quickly find the specific *NEC* rule that applies.

2. Chapters. There are nine chapters, each of which is divided into articles. The articles fall into one of four groupings: General Requirements (Chapters 1 through 4), Specific Requirements (Chapters 5 through 7), Communications Systems (Chapter 8), and Tables (Chapter 9).

Chapter 1—General

Chapter 2—Wiring and Protection

Chapter 3—Wiring Methods and Materials

Chapter 4—Equipment for General Use

Chapter 5—Special Occupancies

Chapter 6—Special Equipment

Chapter 7—Special Conditions

Chapter 8—Communications Systems (Telephone, Data, Satellite, Cable TV, and Broadband)

Chapter 9—Tables—Conductor and Raceway Specifications

3. Articles. The *NEC* contains approximately 140 articles, each of which covers a specific subject. It begins with Article 90, the introduction to the *Code* which contains the purpose of the *NEC*, what is covered and isn’t covered, along with how the *Code* is arranged. It also gives information on enforcement, how mandatory and permissive rules are written, and how explanatory material is included. Article 90 also includes information on formal interpretations, examination of equipment for safety, wiring planning, and information about formatting units of measurement. Here are some other examples of articles you’ll find in the *NEC*:

Article 110—Requirements for Electrical Installations

Article 250—Grounding and Bonding

Article 300—General Requirements for Wiring Methods and Materials

Article 430—Motors, Motor Circuits, and Motor Controllers

Article 500—Hazardous (Classified) Locations

Article 680—Swimming Pools, Fountains, and Similar Installations
 Article 725—Remote-Control, Signaling, and Power-Limited
 Circuits
 Article 800—General Requirements for Communications
 Systems

4. Parts. Larger articles are subdivided into parts. Because the parts of a *Code* article aren't included in the section numbers, we tend to forget to what "part" an *NEC* rule is relating. For example, Table 110.34(A) contains working space clearances for electrical equipment. If we aren't careful, we might think this table applies to all electrical installations, but Table 110.34(A) is in Part III, which only contains requirements for "Over 1,000 Volts, Nominal" installations. The rules for working clearances for electrical equipment for systems 1,000V, nominal, or less are contained in Table 110.26(A)(1), which is in Part II—1,000 Volts, Nominal, or Less.

5. Sections. Each *NEC* rule is called a "*Code* Section." A *Code* section may be broken down into subdivisions; first level subdivision will be in parentheses like (A), (B),..., the next will be second level subdivisions in parentheses like (1), (2),..., and third level subdivisions in lowercase letters such as (a), (b), and so on.

For example, the rule requiring all receptacles in a dwelling unit bathroom to be GFCI protected is contained in Section 210.8(A)(1) which is in Chapter 2, Article 210, Section 8, first level subdivision (A), and second level subdivision (1).

Note: According to the *NEC Style Manual*, first and second level subdivisions are required to have titles. A title for a third level subdivision is permitted but not required.

Many in the industry incorrectly use the term "Article" when referring to a *Code* section. For example, they say "Article 210.8," when they should say "Section 210.8." Section numbers in this textbook are shown without the word "Section," unless they're at the beginning of a sentence. For example, Section 210.8(A) is shown as simply 210.8(A).

6. Tables and Figures. Many *NEC* requirements are contained within tables, which are lists of *Code* rules placed in a systematic arrangement. The titles of the tables are extremely important; you must read them carefully in order to understand the contents, applications, and limitations of each one. Notes are often provided in or below a table; be sure to read them as well since they're also part of the requirement. For example, Note 1 for Table 300.5 explains how to measure the cover when burying cables and raceways and Note 5 explains what to do if solid rock is encountered.

7. Exceptions. Exceptions are *NEC* requirements or permissions that provide an alternative method to a specific rule. There are two types of exceptions—mandatory and permissive. When a rule has several exceptions, those exceptions with mandatory requirements are listed before the permissive exceptions.

Mandatory Exceptions. A mandatory exception uses the words "shall" or "shall not." The word "shall" in an exception means that if you're using the exception, you're required to do it in a specific way. The phrase "shall not" means it isn't permitted.

Permissive Exceptions. A permissive exception uses words such as "shall be permitted," which means it's acceptable (but not mandatory) to do it in this way.

8. Informational Notes. An Informational Note contains explanatory material intended to clarify a rule or give assistance, but it isn't a *Code* requirement.

9. Tables. Chapter 9 consists of tables applicable as referenced in the *NEC*. They're used to calculate raceway sizing, conductor fill, the radius of raceway bends, and conductor voltage drop.

10. Informative Annexes. Annexes aren't a part of the *Code* requirements and are included for informational purposes only.

- Annex A. Product Safety Standards
- Annex B. Application Information for Ampacity Calculation
- Annex C. Raceway Fill Tables for Conductors and Fixture Wires of the Same Size
- Annex D. Examples
- Annex E. Types of Construction
- Annex F. Critical Operations Power Systems (COPS)
- Annex G. Supervisory Control and Data Acquisition (SCADA)
- Annex H. Administration and Enforcement
- Annex I. Recommended Tightening Torques
- Annex J. ADA Standards for Accessible Design

11. Index. The Index at the back of the *NEC* is helpful in locating a specific rule using pertinent keywords to assist in your search.

12. Changes to the *Code*. Changes in the *NEC* are indicated as follows:

- ▶ Rules that were changed since the previous edition are identified by shading the revised text.
- ▶ New rules aren't shaded like a change, instead they have a shaded "N" in the margin to the left of the section number.
- ▶ Relocated rules are treated like new rules with a shaded "N" in the left margin by the section number.

- ▶ Deleted rules are indicated by a bullet symbol “•” located in the left margin where the rule was in the previous edition. Unlike older editions the bullet symbol is only used where one or more complete paragraphs have been deleted. There’s no indication used where a word, group of words, or a sentence was deleted.
- ▶ A Δ represents text deletions and figure/table revisions.

How to Locate a Specific Requirement

How to go about finding what you’re looking for in the *Code* book depends, to some degree, on your experience with the *NEC*. Experts typically know the requirements so well that they just go to the correct rule. Very experienced people might only need the Table of Contents to locate the requirement for which they’re looking. On the other hand, average users should use all the tools at their disposal, including the Table of Contents, the Index, and the search feature on electronic versions of the *Code* book.

Let’s work through a simple example: What *NEC* rule specifies the maximum number of disconnects permitted for a service?

Using the Table of Contents. If you’re an experienced *Code* user, you might use the Table of Contents. You’ll know Article 230 applies to “Services,” and because this article is so large, it’s divided up into multiple parts (eight parts to be exact). With this knowledge, you can quickly go to the Table of Contents and see it lists the Service Equipment Disconnecting Means requirements in Part VI.

Author’s Comment:

- ▶ The number “70” precedes all page numbers in this standard because the *NEC* is NFPA Standard Number 70.

Using the Index. If you use the Index (which lists subjects in alphabetical order) to look up the term “service disconnect,” you’ll see there’s no listing. If you try “disconnecting means,” then “services,” you’ll find that the Index indicates the rule is in Article 230, Part VI. Because the *NEC* doesn’t give a page number in the Index, you’ll need to use the Table of Contents to find it, or flip through the *Code* book to Article 230, then continue to flip through pages until you find Part VI.

Many people complain that the *NEC* only confuses them by taking them in circles. Once you gain experience in using the *Code* and deepen your understanding of words, terms, principles, and practices, you’ll find it much easier to understand and use than you originally thought.

With enough exposure in the use of the *NEC*, you’ll discover that some words and terms are often specific to certain articles. The word “solar” for example will immediately send experienced *Code* book users to Article 690—Solar Photovoltaic (PV) Systems. The word “marina” suggests what you seek might be in Article 555. There are times when a main article will send you to a specific requirement in another one in which compliance is required in which case it will say (for example), “in accordance with 230.xx.” Don’t think of these situations as a “circle,” but rather a map directing you to exactly where you need to be.

Customizing Your *Code* Book

One way to increase your comfort level with your *Code* book is to customize it to meet your needs. You can do this by highlighting and underlining important *NEC* requirements. Preprinted adhesive tabs are also an excellent aid to quickly find important articles and sections that are regularly referenced. However, understand that if you’re using your *Code* book to prepare to take an exam, some exam centers don’t allow markings of any type. For more information about tabs for your *Code* book, visit www.MikeHolt.com/tabs.

Highlighting. As you read through or find answers to your questions, be sure you highlight those requirements in the *NEC* that are the most important or relevant to you. Use one color, like yellow, for general interest and a different one for important requirements you want to find quickly. Be sure to highlight terms in the Index and the Table of Contents as you use them.

Underlining. Underline or circle key words and phrases in the *Code* with a red or blue pen (not a lead pencil) using a short ruler or other straightedge to keep lines straight and neat. This is a very handy way to make important requirements stand out. A short ruler or other straight-edge also comes in handy for locating the correct information in a table.

Interpretations

Industry professionals often enjoy the challenge of discussing, and at times debating, the *Code* requirements. These types of discussions are important to the process of better understanding the *NEC* requirements and applications. However, if you decide you’re going to participate in one of these discussions, don’t spout out what you think without having the actual *Code* book in your hand. The professional way of discussing a requirement is by referring to a specific section rather than talking in vague generalities. This will help everyone involved clearly understand

the point and become better educated. In fact, you may become so well educated about the *NEC* that you might even decide to participate in the change process and help to make it even better!

Become Involved in the *NEC* Process

The actual process of changing the *Code* takes about two years and involves hundreds of individuals trying to make the *NEC* as current and accurate as possible. As you advance in your studies and understanding of the *Code*, you might begin to find it very interesting, enjoy it more, and realize that you can also be a part of the process. Rather than sitting back and allowing others to take the lead, you can participate by making proposals and being a part of its development. For the 2020 cycle, there were 3,730 Public Inputs and 1,930 comments. Hundreds of updates and five new articles were added to keep the *NEC* up to date with new technologies and pave the way to a safer and more efficient electrical future.

Here's how the process works:

STEP 1—Public Input Stage

Public Input. The revision cycle begins with the acceptance of Public Input (PI) which is the public notice asking for anyone interested to submit input on an existing standard or a committee-approved new draft standard. Following the closing date, the committee conducts a First Draft Meeting to respond to all Public Inputs.

First Draft Meeting. At the First Draft (FD) Meeting, the Technical Committee considers and provides a response to all Public Input. The Technical Committee may use the input to develop First Revisions to the standard. The First Draft documents consist of the initial meeting consensus of the committee by simple majority. However, the final position of the Technical Committee must be established by a ballot which follows.

Committee Ballot on First Draft. The First Draft developed at the First Draft Meeting is balloted. In order to appear in the First Draft, a revision must be approved by at least two-thirds of the Technical Committee.

First Draft Report Posted. First revisions which pass ballot are ultimately compiled and published as the First Draft Report on the document's NFPA web page. This report serves as documentation for the Input Stage and is published for review and comment. The public may review the First Draft Report to determine whether to submit Public Comments on the First Draft.

STEP 2—Public Comment Stage

Public Comment. Once the First Draft Report becomes available, there's a Public Comment period during which anyone can submit a Public Comment on the First Draft. After the Public Comment closing date, the Technical Committee conducts/holds their Second Draft Meeting.

Second Draft Meeting. After the Public Comment closing date, if Public Comments are received or the committee has additional proposed revisions, a Second Draft Meeting is held. At the Second Draft Meeting, the Technical Committee reviews the First Draft and may make additional revisions to the draft Standard. All Public Comments are considered, and the Technical Committee provides an action and response to each Public Comment. These actions result in the Second Draft.

Committee Ballot on Second Draft. The Second Revisions developed at the Second Draft Meeting are balloted. To appear in the Second Draft, a revision must be approved by at least two-thirds of the Technical Committee.

Second Draft Report Posted. Second Revisions which pass ballot are ultimately compiled and published as the Second Draft Report on the document's NFPA website. This report serves as documentation of the Comment Stage and is published for public review.

Once published, the public can review the Second Draft Report to decide whether to submit a Notice of Intent to Make a Motion (NITMAM) for further consideration.

STEP 3—NFPA Technical Meeting (Tech Session)

Following completion of the Public Input and Public Comment stages, there's further opportunity for debate and discussion of issues through the NFPA Technical Meeting that takes place at the NFPA Conference & Expo®. These motions are attempts to change the resulting final Standard from the committee's recommendations published as the Second Draft.

STEP 4—Council Appeals and Issuance of Standard

Issuance of Standards. When the Standards Council convenes to issue an NFPA standard, it also hears any related appeals. Appeals are an important part of assuring that all NFPA rules have been followed and that due process and fairness have continued throughout the standards development process. The Standards Council considers appeals based on the written record and by conducting live hearings during which all interested parties can participate. Appeals are decided on the entire record of the process, as well as all submissions and statements presented.

After deciding all appeals related to a standard, the Standards Council, if appropriate, proceeds to issue the Standard as an official NFPA Standard. The decision of the Standards Council is final subject only to limited review by the NFPA Board of Directors. The new NFPA standard becomes effective twenty days following the Standards Council's action of issuance.

Temporary Interim Amendment—(TIA)

Sometimes, a change to the *NEC* is of an emergency nature. Perhaps an editing mistake was made that can affect an electrical installation to the extent it may create a hazard. Maybe an occurrence in the field created a condition that needs to be addressed immediately and can't wait for the normal *Code* cycle and next edition of the standard. When these circumstances warrant it, a TIA or "Temporary Interim Amendment" can be submitted for consideration.

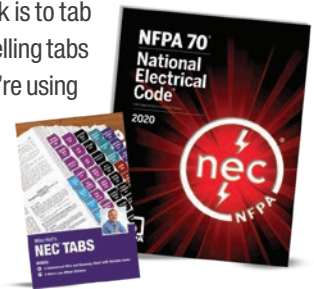
The NFPA defines a TIA as, "tentative because it has not been processed through the entire standards-making procedures. It is interim because it is effective only between editions of the standard. A TIA automatically becomes a Public Input of the proponent for the next edition of the standard; as such, it then is subject to all of the procedures of the standards-making process."

Author's Comment:

- ▶ Proposals, comments, and TIAs can be submitted for consideration online at the NFPA website, www.nfpa.org. From the homepage, look for "Codes & Standards," then find "Standards Development," and click on "How the Process Works." If you'd like to see something changed in the *Code*, you're encouraged to participate in the process.

2020 *Code* Book and Tabs

The ideal way to use your *Code* book is to tab it for quick reference—Mike's best-selling tabs make organizing the *NEC* easy. If you're using your *Code* book for an exam, you'll need to confirm with your testing authority that a tabbed *Code* book is allowed into the exam room.





SUMMARY OF THE CHANGES—2020 *NATIONAL ELECTRICAL CODE*®

Every three years, the *National Electrical Code*® (*NEC*®) is revised and expanded. Initially the NFPA® received 3,730 public suggestions for changes, which resulted in 1,400 first revisions. There were 1,930 public comments submitted in response to these 1,400 first revisions, resulting in 634 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 2020 *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. Make sure that you get a copy of the 2020 *NEC*; then get a copy of *Mike Holt's Illustrated Guide to Changes to the National Electrical Code 2020* textbook that will help you understand the changes. With your Code book and Mike's textbook, watch and listen to the Videos—Mike and his outstanding team of *Code* experts provide feedback and insight on the topics being discussed, bringing to life the rules, their application, and what impact they will have on your work.

CHANGES IN THE 2020 *NATIONAL ELECTRICAL CODE*[®]

Introduction to Global Changes in the 2020 *National Electrical Code*

If you have been in the electrical profession long enough, you know that learning and training (and sometimes re-training) are never-ending processes that follow you through your entire career. Perhaps the most common of these processes is navigating the changes and revisions made to the *National Electrical Code* every three years. Over the years there have been many changes, clarifications and additions introduced and applied to the *Code*. Some may seem to have had little substantiation but are in keeping with the intention and mission of the NFPA which is to minimize the risks and hazards involved with the use of electricity.

Definitions

With that mission in mind, many substantial changes were made for the 2020 *NEC* with one of the most significant being the global reorganization of the “Definitions” used throughout the *Code*.

To globally analyze how the definitions in Article 100 and the “xxx.2” sections of each Article apply to the associated rules, a task group was created to review definitions globally. They compared the current location of each definition with the *NEC Style Manual* requirements and relocated many terms that appeared in two or more articles to Article 100. The *NEC Style Manual* does not prohibit a definition located in an “xxx.2” section from applying elsewhere in the *Code*, however, it states that “in general, Article 100 shall contain definitions of terms that appear in two or more articles of the *NEC*.”

During this process the task group identified that there are some cases in the (xxx.2) of an Article, where definitions apply only in that Article and others where they apply throughout the *Code*.

The task group report stated that, where the definitions in an “xxx.2” section only apply within that article the following parent text should be added:

“The definitions in this section shall only apply within this article.”

The task group report also acknowledged that some “xxx.2” definitions apply outside the article in which they appear. In those cases, the following parent text should be added:

“The definitions in this section shall apply within this article and throughout the *Code*.”

By adding this new text and creating new “xxx.2” subsections where they were needed, the application and usability of the definitions was greatly increased, and the text now better complies with the *NEC Style Manual*.

Specific Terms

“Global Changes” as such, are generalized changes that apply throughout the *Code*. Sometimes the change might be an *NEC Style Manual* change, and other times, as is the case here, the change might just apply to a specific term or terms used throughout the *Code*.

Revisions, Edits and Reorganizations

With every *Code* cycle revision, it seems there is at least one article that receives extensive editing and/or reorganization. The 2020 *NEC* is no exception! A few articles were extensively revised, and others were deleted altogether!

A few Articles where significant changes occurred were:

- **Chapter 2.** A new article (Article 242) was added containing relocated text from Articles 280 and 285.
- **Chapter 3.** Article 310 was significantly revised.
- **Chapter 6.** Articles 690 and 691 were almost completely revised and reorganized.
- **Chapter 7.** Extensive changes were made in Articles 705 and 710.
- **Chapter 8.** Was reorganized and a new Article 805 was added.

CHAPTER

1

GENERAL RULES

Global Changes

Global Changes—The word “allowable” as applied to ampacity was removed from the *Code* and the phrases “provisions of” and “the provisions of this” were also removed as they were deemed to be redundant.

Article 100 Definitions

100 Definitions—Not a *Code* cycle goes by without changes and/or additions to Article 100 and this one is no exception! Wherein definitions are concerned, this cycle’s revisions may just be some of the most complex. Many of the definitions that appeared in individual articles were moved to Article 100. This is mainly due to certain terminology being used in more than one article making the term(s) more common. Some of the definition sections in individual articles were deleted altogether because their terms were relocated to Article 100 (250.2 for example). In fact, only a few definitions remain in all of Chapter 8! The definitions in Article 100 are now divided into Parts I, II, and III.

The overall scope of the changes to definitions also includes guidance for those that remain in individual articles and clearly states whether the definition is specific to only that article, or applicable throughout the *NEC*. There are a few new definitions and some clarification was added to some of the existing ones.

100 Part III—Definitions, Hazardous (Classified) Locations—Article 100 was given a Part III for the 2020 edition; previous editions only had two. In the 2020 *NEC*, many of the definitions used in the hazardous (classified) location articles were relocated from those articles to Part I of Article 100 and placed in alphabetical order. This, according to some *Code* users, made accessing those definitions more difficult; therefore, they were placed in a new Part III, Hazardous (Classified) Locations with no technical changes for 2020. In addition, all the definitions that remained in the “xxx.2” sections of Articles 500, 501, 502, 503, 504, 505, 506, 511, 513, 514, 515, and 516 were moved to this new Part III of Article 100.

Article 110—Requirements for Electrical Installations

110.3 Examination, Identification, Installation, Use, and Product Listing (Certification) of Equipment—The revision clarifies that equipment that is listed, labeled, or both be installed in accordance with the instructions included in the listing or labeling. How the product might be used or installed is still ultimately at the discretion of the authority having jurisdiction (AHJ).

110.5 Conductor Material—Copper-clad aluminum conductors seem to have been neglected for a very long time and for no reason other than perhaps limited availability due to lack of demand. If most electrical current travels on the outside of the conductor (skin effect) you would think that copper-clad aluminum is just as reliable as copper by itself. This section was revised to delete the Informational Note regarding a copper-clad aluminum conductor and place it into the rule text.

110.12 Mechanical Execution of Work—This is perhaps one of the most contentious and practically unenforceable rules in the entire *NEC* because it is entirely subjective since there is no solid definition of “installed in a neat and workmanlike manner.” This rule, that appeared in the “xxx.24” sections of some Chapter 7 and 8 articles, was relocated to Article 110 where it applies generally throughout the *Code*.

110.14 Conductor Termination and Splicing—The importance of properly tightened electrical terminations cannot be stressed enough. Loose connections are the cause of far too many service calls, equipment damage, and (worse yet) electrical fires. This rule addressing the torquing of connections first appeared in the 2020 *NEC*. It was revised to require the use of an approved means (not just a calibrated torque tool) to achieve the required torque value. Three new Informational Notes provide guidance for the *Code* user.

110.21 Markings—Reconditioning, and when it is permitted, was addressed globally throughout the *Code* during this 2020 revision cycle. This section was clarified to require that, in addition to the equipment being identified as “reconditioned,” the original listing marking must be removed.

110.22 Identification of Disconnecting Means—All electrical circuits large or small require a means to turn off the power and those means are required to be clearly identified. Turning off the wrong circuit(s) can sometimes create havoc! The requirement to identify the disconnecting means in this rule was expanded to include a requirement to identify the source of the circuit that supplies the disconnecting means.

110.24 Available Fault Current—Fault current far exceeds that of rated current and as such is far more dangerous. The sheer power behind an electrical fault can vaporize metal and justifies the critical attention it receives. The word “maximum” that preceded “available fault current” was deleted because the new definition of “Fault Current, Available (Available Fault Current)” specifies that current is the largest amount that can be delivered into a short circuit at that point on the system. A new Informational Note was also added.

110.26 Spaces About Electrical Equipment—There just cannot be enough emphasis placed upon the importance of clear and accessible working space around electrical equipment. The *NEC* goes to great lengths to help ensure the safety of electrical workers. It is sad, but sometimes a change to this section is the result of an unforeseeable incident that results in injury, property damage, and even fatalities. This is not the case for all changes to the *Code*, but some changes and clarifications during the 2020 revision cycle were made to require even safer workspaces. When equipment is installed on concrete pads it affects the equipment, but the pad itself is not equipment so it could extend out past the 6 in. permitted for electrical equipment. This change clarifies this. Clarifications were also made to entrances and egresses to and from working spaces (C) as well as the illumination (D) of these areas.

110.28 Enclosure Types—Two new Informational Notes were added to the enclosure selection rule to advise the reader that dusttight-rated enclosures are suitable for use in Class II, Division 2 dust hazard areas.

CHAPTER

2

WIRING AND PROTECTION

Article 200—Use and Identification of Grounded Conductors

200.3 Connections to Grounded System—Even though there are both neutral conductors and grounded-phase conductors, this section focuses primarily on distinguishing neutral conductors from phase conductors and grounded-phase conductors. The rule ensuring that neutral conductors are properly connected was revised to make it clear it applies to all premises wiring systems—both indoor and outdoor.

200.6 Identification of Grounded Conductors—Subsection (A) was revised to clarify the fact that it is talking about the identification of insulated conductors. Exception 1 to 200.6(E), which previously only permitted the re-identification of conductors in multiconductor cables as neutral or grounded-phase conductors where the conditions of maintenance and supervision ensure that only qualified persons service the installation, was reduced and moved to the latter part of this rule.

200.9 Means of Identification—This rule requiring a substantially white color terminal for neutral conductor connections was revised to only apply to devices or equipment with polarized connections. It was also modified to recognize that neutral termination points may be identified by a silver color.

200.10 Identification of Terminals—The color used to identify the neutral conductor connection on most wiring devices (duplex receptacles for example) is silver rather than “substantially white,” so the language was revised to reflect that fact.

Article 210—Branch Circuits

210.5 Identification for Branch Circuits—We have all become accustomed to using the term “nominal” when referring to different voltages, but the *NEC* now uses the term “voltage classes.” This may take some getting used to as there are much higher “voltage classes” throughout the electrical industry. For example, we refer to 240/120 as a low nominal voltage but outside of the *NEC*, a lower-class voltage might be anything below 5,000V and a medium-class voltage can be as high as 35,000V. With that in mind, this rule was revised to clarify that where there are multiple systems of the same system “voltage class,” all systems of the same voltage class are permitted to use the same identification. So, for all intents and purposes, if you have 480/277V and 208Y/120V within the same facility, this rule requires them to be marked to distinguish the different voltage classes, and the marking style must remain consistent.

210.6 Branch-Circuit Voltage Limitations—There are voltage limitations for dwelling occupancies where circuits are terminated. The rules of where circuits having a voltage that exceeds 120V between conductors but does not exceed 277V to ground were editorially revised without technical change.

210.8 GFCI Protection—There is absolutely no doubt that ground-fault circuit-interrupter protection has done more than its fair share of protecting people from the hazards involved with the use of electricity. Each *Code* cycle increases the emphasis on GFCI protection and the locations in which such protection is required. With so much attention given to this section, it is inevitable that all circuits in dwelling units will eventually require this protection. The 2020 changes and revisions to this section are numerous and include clarifications, expansions to existing rules, and a few new additional items. Some items were relocated and placed in their appropriate articles as indicated in the Informational Notes. So much revision requires the extensive analysis that follows.

210.11 Branch Circuits Required—The rule in 210.11(C)(3) was revised to make it clear that the receptacle outlets required by 210.52(D), and any additional receptacle outlets installed to serve any countertop or similar work surface, must be supplied by one or more 20A branch circuits. Section 210.11(C)(4) was also revised and permits receptacle outlets, other than the ones required by 210.52(G)(1), to be supplied by branch circuits with a rating of other than 20A.

210.12 Arc-Fault Circuit-Interrupter Protection—The requirement to provide AFCI protection where the branch circuit is extended or modified was expanded to include guest rooms and guest suites. In addition, the exception to this branch circuit extension and modified rule was revised to say that any conductors inside an enclosure do not count as part of the 6-ft limit and to say that the addition of a splicing device does not trigger the AFCI requirement.

210.15 Reconditioned Equipment—Here is another instance of the *Code* globally addressing reconditioning of electrical equipment. A new rule was added prohibiting some protective devices required by Article 210 from being reconditioned. It is just not worth the risk of trying to recondition such sensitive lifesaving devices as GFCIs, GFPEs, and AFCIs.

210.19 Conductor Sizing—If you understand the fundamentals of current flow and how electrons move through a circuit, then you will understand that a conductor rating higher than the termination rating can act as a “funnel” with all of these electrons merging into one lane and creating a “traffic-jam” that just generates more and more heat.

This is never a good situation and the branch-circuit minimum conductor ampacity rule in 210.19(A)(1) has been clarified by adding a reference to the termination requirements of 110.14(C). A new exception was also added, which mirrors the one in 215.2(A)(1)(a) for feeders, permitting the use of 90°C conductors between terminal blocks installed outside of the source and load termination enclosures. By the way, if you are interested in learning about some of these fundamentals, be sure to check out *Mike Holt's Illustrated Guide to Electrical Fundamentals*.

210.52 Dwelling Unit Receptacle Outlet Requirements—Section 210.52 always seems to bring out some of the most contentious debates. Arguments range from what a countertop is versus a work surface, to where the measurement for the length of a peninsula should begin. The 2020 revision reorganized and clarified much of this section and even provided some guidance when measuring for peninsula receptacles. There was also some expansion to the rules regarding balconies, decks, basements, and garages. The term “wall switch” was replaced by “listed wall-mounted control device” which seems to be part of a general shift in consideration of the new electronic and wireless devices throughout the *Code*.

210.63 Equipment Requiring Servicing—This rule makes sense in that it often requires the use of an extension cord to service HVAC equipment for example. That is not to say that using an extension cord that is in good repair is a bad thing, but not having to need one because of a close enough receptacle outlet reduces unnecessary risk. The requirements of 210.63 and 210.64 requiring a receptacle outlet for servicing of equipment have been combined into 210.63 and expanded to include all serviceable equipment, not just heating and air-conditioning.

210.65 Meeting Rooms—This section was relocated from 210.71 because it is better suited to follow the receptacle rules. The meeting room receptacle outlet rule was clarified to more clearly indicate the number and location of the required receptacle outlets. Section 210.65(B)(1) clarifies that covers the required receptacles in fixed walls of meeting rooms.

210.70 Lighting Outlet Requirements—The control method of the required lighting outlets was changed from “wall switch” to “listed wall-mounted control device.” The storage and equipment space lighting outlet rule in 210.70(C) was modified to require control devices at each point of entry and to permit the use of listed wall-mounted control devices.

Article 215—Feeders

215.2 Conductor Sizing—As has been the trend, the *Code* has been modifying the “not more than 600V” limitation to “not more than 1,000V.” The feeder minimum conductor ampacity rule has been clarified and a reference to the termination requirements of 110.14(C) was added effectively “catching up” to this trend. With PV systems sometimes generating more than 600V (for example), it is good that voltage ratings across the board have been increased including manufacturer’s listing of hand tools and test equipment at the same 1,000V.

215.9 Ground-Fault Circuit-Interrupter Protection for Personnel—GFCI devices for feeders are permitted to provide the protection required by 210.8 for circuits of any ampacity. The GFCI protection requirements have been expanding to include circuits rated higher than 15A and 20A. Feeders that have GFCI protection can now protect these higher rated circuits when such protection is required.

Article 220—Branch-Circuit, Feeder, and Service Load Calculations

220.11 Floor Area—If you have ever sat in an electrical classroom or studied for an exam, one thing that might resonate is that the total floor area of a structure is based on the outside footprint of the building. The requirement for this method of measurement was moved from 220.12 into its own standalone section.

220.12 Lighting Load for Non-Dwelling Occupancies—This section now only applies to nondwelling occupancies and the lighting load table was revised to more closely conform to the maximum permitted lighting loads as specified in the energy codes.

The energy code lighting loads are much less than those found in the *NEC*, but the *Code* wants to make sure the services and feeders can still support loads that are not in compliance with the energy codes.

The scope of this section was changed to only include lighting loads for nondwelling occupancies and was reorganized from a single paragraph with exceptions into subsections with the previous Ex 1 becoming positive text in (B). The new language in (B) made Ex 2 unnecessary and it was deleted.

220.14 Other Loads—Occupancies—This section, for service and feeder calculation(s) purposes, has seen some clarification made to (J) and (K). In addition, a new subsection (M) was added to address the lighting and receptacle loads for hotel and motel occupancies.

220.16 Loads for Additions to Existing Installations—Loads added to an existing dwelling unit must be calculated for an expansion of any size.

220.42 General Lighting Demand Factors—Hospitals require a lot of light and all this light requires significant electrical power. Subject to the previous demand factors, the demand load for hospitals has been grossly underestimated and this change compensates for that. On the other hand, lighting demands in the hospitality sector have greatly decreased in the past few years and that fact has also been taken into consideration. With all that said, the demand factors for hospital lighting loads were eliminated and those for hotels and motels have decreased.

220.53 Appliance Load, Dwelling—The demand factor of 75 percent for four or more appliances fastened in place when calculating a service or feeder is now limited to appliances rated ¼ hp or greater, or 500W or greater.

220.60 Noncoincident Loads—When determining demand loads that are not likely to all place a burden on the service at the same time, the lesser of these loads can be disregarded for the purposes of sizing a service. This rule was clarified to say that where a motor is one of the noncoincident loads 125 percent of the motor load must be used in the calculation.

220.87 Determining Existing Loads—A new exception was added prohibiting the use of demand load data from being used where the system is also supplied by a renewable energy system. There is just no way to easily determine the contribution from a renewable energy source such as a PV system, or the reduction from the peak shaving when the PV system is under load, making this method virtually unreliable.

Article 225—Outside Branch Circuits and Feeders

225.4 Conductor Covering—Conductors run on the exterior of buildings and structures are obviously going to be exposed to direct sunlight, a warmer environment, and subsequently more heat overall. “Thermoplastic” (rubber) coverings do not hold up to heat as well as “Thermoset,” so “Rubber Covered” was replaced with “Thermoset” as that term includes rubber-covered conductors.

225.10 Wiring on Buildings (or Other Structures)—The list item for multiconductor cable was deleted and new list items for SE and TC-ER cables were added as the term “Multiconductor” was too broad.

225.15 Supports over Buildings—The requirement for outside branch circuits or feeders that pass over a building in accordance with 230.29 was replaced with one requiring them to be securely supported. This corrects the mistakenly referenced 230.29 (which required the bonding of metal structures that support service conductors) since bonding metal support structures is only appropriate ahead of the service disconnect.

225.19 Clearances from Buildings—This section was revised to clarify that it only applies to overhead spans of open conductors and open multiconductor cables, not to cable assemblies with an outer jacket such as Type SE cable.

225.30 Number of Supplies—A new list item (A) was added to permit docking facilities and piers to be supplied by multiple feeders or branch circuits. Much like services, the general rule is to permit only one supply source per building. Revised language in (B) permits up to six feeders to a second building or structure under limited circumstances.

Article 230—Services

230.31 Underground Service Conductor Size and Ampacity—The last word of this section title was editorially changed from “Rating” to “Ampacity.” The same revisions were made throughout to correlate with this global effort since “ampacity” is the more correct term. There are no technical changes to this rule about underground service conductors.

230.42 Minimum Size and Ampacity—This section, regarding the minimum sizing of service-entrance conductors, has the same editorial title change (from “Rating” to “Ampacity”) as 230.31. The same revisions were made throughout to correlate with the global effort to use the more correct terminology. A new Informational Note concerning busways was also added.

230.43 Wiring Methods—An additional wiring method, Type TC-ER cable, was added to the permitted wiring methods for service-entrance conductors.

230.44 Cable Trays—There are a variety of wiring methods suitable to be used for service entrances. Type TC-ER cable was added to the five other types of service-entrance cables that are permitted to be installed in cable tray.

230.46 Spliced Conductors—Using power distribution blocks with higher termination temperature limitations allowing for the use of smaller conductors has become a cost-effective way of installing larger services. When used ahead of the service disconnect, these power distribution blocks must be marked suitable for this purpose; however, the *NEC* has extended enforcement of this rule until the next *Code* cycle giving manufacturer’s ample time to comply with this new requirement. This section was expanded to include requirements for the devices used to splice or tap service conductors.

230.62 Service Equipment—Enclosed or Guarded—No matter how many times we are told to de-energize and never work on “hot” electrical equipment, there are times where shutting down is not an option. This new rule requires uninsulated service-phase busbars or terminals to be protected from inadvertent contact by barriers. This, along with the proper personal protective equipment (PPE), will help protect service technicians.

230.66 Marking for Service Disconnect—Service equipment must be listed or field evaluated. It has pretty much always been required to be listed; but, on occasions when service equipment is assembled or constructed in the field listing is not possible. The components may be listed for the purpose but once assembled it becomes a single unlisted item. This is where the FEB or “Field Evaluation Body” comes in. A field evaluation can be conducted and that documented field evaluation result will suffice.

230.67 Surge Protection—This new section requiring the installation of a surge-protective device (SPD) for all dwelling unit services has been a long time coming. Up until now, dwelling unit surge protection has been optional and usually an “extra” for the electrician.

230.70 Service Disconnect Requirements—This rule was revised to clarify that only the phase conductors need to be disconnected from the service conductors, thereby prohibiting the neutral conductor from being part of this disconnection.

230.71 Number of Service Disconnects—A service is permitted to have only one disconnecting means; however, the number of service disconnects can vary based on the number of disconnects, the grouping, and special circumstances which permit more than one service disconnect.

230.82 Connected on Supply Side of the Service Disconnect—Emergency disconnect switches, as required by 230.85, and meter-mounted transfer switches were added to the list of equipment that can be connected on the supply side of the service disconnect. When this is done ahead of metering equipment it is called “cold sequencing.”

Many utility companies are not particularly fond of this practice because it allows the consumer to de-energize the electrical service before the metering equipment. This obviously creates security concerns because, while these disconnects are designed to be used in case of emergency, not everyone's intent may be so noble.

230.85 Emergency Disconnects—One- and two-family dwelling units are now required to have an “emergency disconnect” installed in a readily accessible exterior location in accordance with 230.85. Finally! Firefighters can respond to a fully engulfed residence and turn the electric supply to the building off without potentially standing in a pool of electrified water!

Article 240—Overcurrent Protection

240.2 Definitions—As a part of the global reorganization of the definitions this *Code* cycle, new parent text was added to say that the definitions in this section apply only within Article 240. Also, in order to ensure clarity and consistent enforcement, the term “Reconditioned” is defined here as well as in Article 100.

240.5 Protection of Flexible Cords, Flexible Cables, and Fixture Wires—The conductors in most fixtures are usually smaller than those of ordinary branch circuits which are protected by 15A and 20A overcurrent devices. The language highlighted that 16AWG and 18 AWG fixture wire can be protected with a 15A overcurrent protective device (OCPD) in addition to the previously permitted 20A OCPD. This makes sense but as we all know, if it is not permitted by the *Code* it cannot be done!

240.6 Standard Ampere Ratings—Adjustable circuit breakers require a high level of expertise when determining their settings. In order to keep unqualified personnel from making inaccurate and possibly dangerous adjustments, preventative measures need to be in place. A fourth method of restricting access (password protection) was added for these adjustable trip circuit breakers.

240.21 Location in Circuit—Feeder circuits are permitted to be protected at a much higher rated current than the individual loads they might serve, but the loads and the smaller conductors feeding them still need to be protected as well. This protection is provided by a suitably rated overcurrent device for the smaller demand load. This rule was revised to clarify that these types of taps are permitted at any point on the load side of the feeder OCPD.

240.24 Location of Overcurrent Protective Devices at Premises—Whether circuit breakers or fuses are used, overcurrent protective devices must be readily accessible. The word “switches” previously used in this rule was edited to read “switches that contain fuses.”

240.33 Vertical Position—Circuit-breaker enclosures (panelboards) need to be oriented in a vertical position. They can be mounted horizontally so long as, when operating the device, on is up and off is down. This seems impractical since half of the breakers in a typical panel will be in violation of this rule. There was an editorial change here about mounting a panel vertically, that deleted a blanket exemption by saying, “unless that is impracticable.” Mounting panels vertically may orient the circuit breakers horizontally, left to right, and right to left but operation of circuit breakers in these directions is permitted. The language was revised in an attempt to prohibit circuit breaker enclosures from being installed in the face up position.

240.40 Disconnecting Means for Fuses—Most fused disconnects are designed so the blades of the knife switch are above the fuse cartridge which automatically de-energizes the fuse when the disconnect is turned to the off position. Cartridge fuses must now have a line-side disconnect even where they are only accessible to qualified persons.

240.62 Reconditioned Equipment—The global introduction of the rules for reconditioning electrical equipment are throughout the entire 2020 revision of the *NEC*. A new section was added here to prohibit low-voltage fuseholders and low-voltage nonrenewable fuses from being reconditioned.

240.67 Arc Energy Reduction—Fuses—Anytime the potential dangers surrounding arc faults or arc blasts can be reduced further protects electricians and service technicians. A new sentence was added to subsection (A) requiring that the method chosen to reduce the clearing time of a fuse must operate at a value below the available arcing current, and a new list item (4) adds another permitted method; “current limiting, electronically actuated fuses.” Subsection (C) was added and requires the arc energy reduction system to be performance tested when first installed.

240.86 Series Ratings—Series rating of electrical service and distribution equipment is a specialized skill. In fact, the *Code* requires it to be performed only by qualified persons, and on larger jobs its usually engineered and included in the drawing specifications. Editorial revisions were made to the series rating rule to replace “acceptable” with “approved,” and the motor contribution in subsection (C) was revised for clarity; but there was no actual change to the requirements.

240.87 Arc Energy Reduction—Circuit Breakers—The changes here are the same as those in 240.67 for fuses; anytime the dangers surrounding arc faults or arc blasts can be reduced further protects electricians and service technicians. The change here applies to circuit breakers and the change in (B) clarifies that temporary adjustment of the breaker’s instantaneous trip setting is not a permitted method of arc energy reduction.

240.88 Reconditioned Equipment—The global introduction of the rules for reconditioning electrical equipment are throughout the entire 2020 revision of the *NEC*. This new section was added to specify the types of equipment involved with circuit breakers that are permitted to be reconditioned.

240.91 Protection of Conductors—Subsection (B) was clarified to permit the OCPD to have a rating other than a standard rating as found in 240.6, and to provide a reference to Table 240.92(B).

Article 242—Overvoltage Protection

Article 242 Overvoltage Protection—This new article replaces Articles 280, Surge Arresters, Over 1,000V, and Article 285, Surge-Protective Devices (SPDs), 1,000V or Less.

Article 250—Grounding and Bonding

250.6 Objectionable Current—The change here clarifies that electronic equipment must be connected to an equipment grounding conductor, even if doing so results in “objectionable current” that interferes with the operation of the equipment. This is especially annoying for equipment sensitive to the alternating-current frequency (or “60 cycle”) humming or buzzing that often occurs with audio equipment.

250.12 Clean Surfaces—This rule was revised to require clean surfaces for bonding connections as well as grounding connections. This means that it is necessary to ensure metal-to-metal contact. Paint and/or other types of coatings can create a nonconductive coating and interfere with (or prevent) electrical continuity.

250.20 Systems Required to be Grounded—An Informational Note was added to the end of subsection (B), Alternating-Current Systems 50V to 1,000V, referencing high-impedance grounding as an effective tool to reduce arc flash hazards. This information was extracted from Annex “O” of NFPA 70E, *Standard for Electrical Safety in the Workplace*.

250.25 Grounding for Supply Side of the Service Disconnect—The redundant text in 250.25 was removed since not all equipment connected to the utility is considered a service. PV system power production equipment is connected in parallel with a service and may even be connected to the utility (if only for power production to the utility) with no service equipment in parallel. By referencing parts of 250.24, this rule requires that supply-side equipment is connected to a grounding electrode system, has an effective ground-fault current path, and is bonded with the more stringent requirements of 250.92 and 250.102(C).

250.26 Conductor to Be Grounded-Alternating-Current Systems—This section was revised to clarify which conductor of various grounded systems is to be grounded and is now presented in a list format containing items (1) through (5). For example, the neutral conductor of a 3-wire system is to be grounded.

250.28 Main Bonding Jumper and System Bonding Jumper—The change in this section helps to avoid any confusion as it aligns with the requirements in 250.102(C)(1) which is used to size wire type bonding jumpers and permits the use of aluminum and copper-clad aluminum for main bonding jumpers.

250.30 Separately Derived Systems—The phrase “separately derived systems” was replaced with “power sources of the same type” for clarification. Several list items were also clarified, and a new exception was added to (A)(1)(b) that describes how the system bonding jumper (SBJ) is required to be connected when multisource separately derived systems are involved. Emphasis has been placed on the fact that the neutral conductor need not be larger than the phase conductors, and clarification as to sizing the tap conductor from a common grounding electrode conductor was made by the addition of an exception to 250.30(A)(6)(b).

250.32 Buildings Supplied by a Feeder—The text was clarified to require a grounding electrode system and a grounding electrode conductor to be installed at a building supplied by feeders. This means that a grounding electrode and a grounding electrode conductor are required at a detached garage with electrical power.

250.34 Generators—Portable and Vehicle- or Trailer-Mounted—This section, for portable and vehicle-mounted generators was expanded to include trailer-mounted generators. There is really no difference between a vehicle- or trailer-mounted generator but they are different in name. This revision clears up any ambiguity and applies the same requirements to the now distinguishable “trailer-mounted” generator.

250.36 High-Impedance Grounded Systems—An Informational Note was added to the end of the section.

250.53 Grounding Electrode Installation Requirements—A new last sentence was added to this section to prohibit using rebar as a conductor to interconnect the electrodes of a grounding electrode system. Steel reinforcing rod, better known as “rebar,” has been used as a “Ufer” ground for many years and has proven its reliability as an effective ground-fault current path. Even so, rebar cannot be used as a bonding jumper to interconnect grounding electrodes, but it can be used to extend a grounding electrode itself as defined in 250.68.

250.64 Grounding Electrode Conductor Installation—This section was revised into a list format of (A) through (F) as indicated in the parent text for greater usability with technical changes only in subsection (A) and clarifications throughout. The only technical change as mentioned is that bare, covered, or insulated aluminum or copper-clad aluminum grounding electrode conductors, where the installation complies with one of the three list items, is permitted. That means that bare conductors cannot be exposed to corrosive environments so terminations to outdoor enclosures must be approved for the environment. Last, but certainly not least, anything aluminum cannot be terminated within 18 in. of the earth.

250.68 Grounding Electrode Conductor and Bonding Jumper Connection to Grounding Electrodes—The requirements for using rebar to extend a grounding electrode were clarified in list items (C) (3)(a), (b), and (c).

250.98 Bonding Loosely Jointed Metal Raceways—This section was expanded to cover “expansion-deflection, or deflection” fittings as well as the previously covered expansion fittings. This is almost self-explanatory in that whenever metal-to-metal connections are required to be able to move or slide, a bonding jumper must be installed to compensate for this movement and maintain electrical continuity.

250.104 Bonding of Piping Systems and Exposed Structural Metal—This rule was revised to clarify that the bonding jumper to a metal water piping system is never required to be larger than 3/0 copper or 250 kcmil aluminum. The sizing requirements for bonding jumpers to a metal water pipe in a building or structure supplied by a feeder were moved from 250.102(C)(1) to 250.102(D).

250.109 Metal Enclosures—This new section specifically permits metal enclosures to be used to connect bonding jumpers or equipment grounding conductors as a part of the effective ground-fault current path. This has been a long-standing practice; like an unwritten rule. The rule is now written, and the practice is officially permitted!

250.112 Specific Equipment Fastened in Place (Fixed) or Connected by Permanent Wiring Methods—Skid-mounted systems are prominent in industrial processes because they are extremely efficient for storage and distribution of any machinery or equipment used in the process. They include electrical wiring and control systems as well and are a cost-effective means of providing electrical distribution throughout the system. This revision clarifies that for permanently skid-mounted equipment, only EGCs of the wire type are sized by the rules in 250.122.

250.114 Equipment Connected by Cord and Plug—Portable luminaires? Handlamps? There are just too many slang terms for these items for many to know exactly what this type of equipment is based on in the *Code* language. Suffice it to say, whatever you are calling your construction lights today, they are required to be connected to an equipment grounding conductor (a three-prong plug). Non-technical edits were made in the parent text regarding the aforementioned, and list items (3)e and (4)e were revised to include the term “portable luminaires” to ensure that the grounding needs for these products is included and applies to both residential and non-residential occupancies.

250.119 Identification of Equipment Grounding Conductors—The revision to this section permits an insulated conductor of a multiconductor cable to be re-identified as an EGC, no matter what the occupancy or conditions of maintenance and supervision are.

250.120 Equipment Grounding Conductor Installation—The permitted uses of aluminum and copper-clad aluminum EGCs has been expanded. The only technical change in this section is that bare, covered, or insulated aluminum or copper-clad aluminum grounding electrode conductors (where the installation complies with one of the three list items) are permitted. Bare conductors cannot be exposed to corrosive environments and terminations to outdoor enclosures must be approved for the environment. Last but certainly not least, anything aluminum cannot be terminated within 18 in. of the earth.

250.121 Restricted Use of Equipment Grounding Conductors—Where the metal structure of a building is permitted to be used as a grounding electrode conductor (GEC), and in fact is required to be part of the grounding system, such is not the case when it comes to equipment grounding conductors (EGCs). A new subsection was added to prohibit using the structural metal frame of a building or structure as an EGC. That rule was moved from 250.136(A) to this section.

250.122 Sizing Equipment Grounding Conductors—The language here was revised to clarify that the increase in the size of the phase conductors as a result of required ampacity adjustment and/or correction do not require an increase in the size of the EGC and an exception was added. Hopefully this will put to rest the long-standing debates about this proportional increase of the EGC.

250.132 Short Sections of Raceway—This rule was revised to clarify that if short sections of raceways or cable armor are required to be “grounded” they must be connected to an EGC. Short sections of metal raceways used to sleeve and protect a wiring method and effectively connected to a metal box which is connected to the equipment grounding conductor, comply with this provision. A similar sleeve that is mid-span and not connected at either end is not compliant and electrical continuity to ground must be established by another means.

250.136 Equipment Secured to Grounded Metal Supports—This rule was relocated here from 250.121 and clarifies that equipment is considered connected to the equipment grounding conductor where a metal rack or structure is connected to an equipment grounding conductor and in electrical contact with the equipment. The reappearance of this rule in this location makes it apparent it applies throughout the *NEC*.

250.138 Cord-and-Plug-Connected Equipment—The incorrect term of “grounded” was removed from this section to avoid confusion. Grounded means exactly that, connected to the ground or the Earth and even though an equipment grounding conductor does eventually make its way to the Earth when terminated at the main disconnecting means, it serves a different purpose and must make its way back to the source of the electrical power to maintain an effective ground-fault current path.

250.146 Connecting Receptacle Grounding Terminal to an Equipment Grounding Conductor—The section’s title and its parent text were revised to clarify that a receptacle must be connected to an EGC. In keeping with the intent, the language in (A), (C), and (D) was also revised to clarify that a receptacle grounding terminal must be connected to an equipment grounding conductor.

250.148 Continuity of Equipment Grounding Conductors in Boxes—Another attempt is being made to write a rule that reflects the Code-Making Panel’s intent as to the connection of EGCs at metal boxes. There is one universal rule when it comes to metal electrical equipment, it must be bonded! Be sure it has a connection to an effective ground-fault current path via the equipment grounding conductor (EGC) when that is the requirement, or to the grounding electrode conductor (GEC) at the first means of disconnect. While the rules here in 250.148 do not change any of this, there has been much misunderstanding of just what needs to be bonded in metal boxes and when special provisions for them are needed. Hopefully the revisions, though minor, may be enough to provide proper clarification.

CHAPTER

3

WIRING METHODS AND MATERIALS

Article 300—General Requirements for Wiring Methods and Materials

300.3 Conductors—Additional language was added in section (B)(1) to ensure that when connections, taps, or extensions are made from paralleled conductors, each connection involves all the paralleled conductors of each phase and/or neutral.

300.4 Protection Against Physical Damage—Subsection (G) was expanded and reorganized into a list format (1) through (4) encompassing the use of listed metal fittings with smoothly rounded edges as well as insulated fittings and threaded hubs.

300.7 Raceways Exposed to Different Temperatures—The rule in the subsection (A) was revised to require the use of an “identified” sealant that is safe for the conductors and the raceway itself, and to correlate with the language in 225.27.

300.22 Wiring in Ducts and Plenum Spaces—A conflict with the *NEC* style manual created the need for this revision in subsection (D) with no technical change. The conflict was that any reference to an article as a whole is prohibited; this was corrected by identifying the *Code* references by section.

300.25 Exit Enclosures (Stair Towers)—This rule requires electrical wiring or equipment serving areas other than the emergency exit enclosure to be installed outside of the exit structure.

Article 310—Conductors for General Wiring

310.1 Scope—Article 310 was completely reorganized, and its scope changed to limit its application to conductors with a voltage rating up to and including 2,000V. When compared to the voltage classes for power distribution (which can exceed 35,000V) 2,000V is relatively low. A new Article 311 was created for conductors with a voltage rating over 2,000V so the two voltage classes are now separated.

310.3 Conductors—Information pertaining to the minimum size of conductors for specific voltage ranges up to and including 2,000V that was in section and Table 310.106(A) of the 2020 *Code* was relocated to 310.3 with revisions in the subsections.

310.4 Conductor Construction and Applications—The information about the construction requirements for conductors suitable for carrying up to (and including) 2,000V, was relocated from 310.104 in the 2020 *Code* and the information for those suitable for carrying over 2,000V was moved to the new Article 311.

310.6 Conductor Identification—Section 310.110(C), that was in the 2020 *NEC*, was relocated here and states that phase conductors must be clearly distinguishable from neutral and equipment grounding conductors. The term “grounding” was revised to read “equipment grounding” for clarity.

310.10 Uses Permitted—The only technical changes were that all the items applying to conductors suitable for carrying over 2,000V were moved to the new Article 311.

310.12 Single-Phase Dwelling Services and Feeders—The Table now included in this rule has been literally “bouncing” around the *Code* book (and at one time, even removed) much to the displeasure of all those who had become accustomed to its location in 310.15(B)7. It has now found its way “home” to its own, hopefully permanent, parent section of 310.12 and reformatted with individual subsections. In addition, the table that has been in Annex D since the 2014 *NEC* has been restored as Table 310.12.

310.14 Ampacities for Conductors Rated 0V Through 2,000V—The charging text and requirements from 310.15(A) and (C) in the 2020 *NEC* containing adjustments and corrections to the ampacities of conductors 2,000V and below is now in this section.

310.15 Ampacity Tables—This section contains most of the information that was in 310.15(B), except for the dwelling unit service and feeder conductor size rules that are now found in 310.12. Section 310.15 contains the rules that apply to the conductor ampacity tables for conductors rated 0V through 2,000V which were originally part of the table headings. The tables themselves are in 310.16 through 310.21. This move restores the table numbers that were used in the 2008 and earlier *NEC* editions. The parent text in this section provides that the ampacities from the tables are modified by the rules in 310.15(A) through (F) and 310.12.

310.16 Ampacities of Insulated Conductors in Raceways, Cables, or Buried—The information that was in the headings of Tables 310.15(B)(16) through 310.15(B)(21) that provided guidance as to the conditions under which the listed ampacities for conductors applied was relocated to this section.

Article 312—Cabinets

312.5 Enclosures—A new exception was added for cable tray installations in subsection (C) to permit commonly used installation methods for conductors entering enclosures.

312.6 Deflection of Conductors—The rule regarding the deflection of conductors or space necessary for conductors to be bent without damage was revised to clarify that the rule also applies to conductors in meter socket enclosures.

312.8 Overcurrent Device Enclosures—Subsection (B) was expanded to permit both power monitoring and control equipment to be installed in switch or overcurrent device enclosures.

Article 314—Outlet, Device, Pull, Junction Boxes; Conduit Bodies; and Handhole Enclosures

314.16 Number of Conductors—A new sentence was added requiring that, in addition to the volume required for conductors and devices in a box, the box must also comply with the depth requirements of 314.24. More than four equipment grounding conductors can no longer be grouped together as “one of the largest conductors” as evidenced by the new language in subsection (B)(5).

314.17 Conductors That Enter Boxes or Conduit Bodies—The language in subsection (A) was revised to require openings through which conductors enter to be closed in a manner “identified for the application” in place of the 2020 *Code* rule that required the closing device to be approved. In addition, subsections (B) and (C) were merged and reorganized.

314.27 Outlet Box Requirements—The revised rule in subsection (C) requires ceiling outlet boxes installed in habitable rooms of dwelling units in a location where a ceiling fan may be installed to be ceiling fan rated. An option not to install the fan rated box was added where there is access to structural framing that will support a ceiling fan in the future.

314.29 Boxes, Conduit Bodies, and Handhole Enclosures to Be Accessible—The revision to this section expanded the original text into two new subsections without technical change.

Article 320—Armored Cable (Type AC)

320.23 In Accessible Attics or Roof Spaces—The intention of the change in subsection (A) was to clarify that this rule does not apply where “pull down” stairs are used, and the cable might be installed exposed.

320.80 Conductor Ampacity—Language was added to subsection (A) that requires ampacity adjustment to be made in accordance with 310.15(C)(1) where more than two Type AC cables containing two or more current-carrying conductors in each cable are installed in contact with thermal installation, caulk, or sealing foam without maintaining spacing between conductors.

Article 330—Metal-Clad Cable (Type MC)

330.80 Conductor Ampacities—The language that was added for Armored Cable was also added here to subsection (C) and requires ampacity adjustment where Type MC cable is used in thermal insulation to be in accordance with 310.15(C)(1).

Article 334—Nonmetallic Sheathed Cable (Type NM)

334.30 Securing and Supporting—The method of measurement from, and length of excess cable between, the last means of cable support and the enclosure is now specified for Type NM cable.

Article 336—Power and Control Tray Cable (Type TC)

336.2 Definition—The definition of Type TC cable was revised to specify that it contains an equipment grounding conductor.

336.10 Uses Permitted—Because Type TC cable provides limited physical protection for the conductors inside the cable assembly, it was assumed that its use was restricted just because “TC” was in its letter designation. The new language has somewhat alleviated this self-imposed restriction. The rule regarding the use of TC-ER-JP was clarified to permit its use for branch circuits and feeders as well as exterior wiring.

Article 338—Service-Entrance Cable (Types SE and USE)

338.2 Definitions—The definition of “Service-Entrance Cable” was revised to make it clear that a service-entrance cable has an overall covering. A new definition, “Service-Entrance Conductor Assembly” was also added.

338.10 Uses Permitted—The installation methods for interior installations in subsection (B) were reorganized into a new list format with a new “in contact with thermal insulation” ampacity rule added to both new list items to assist in explaining the requirements of using Types SE and USE cable as feeders or branch circuits.

Article 340—Underground Feeder and Branch-Circuit Cable (Type UF)

340.10 Uses Permitted—There were revisions to the list items regarding the permitted uses of Type UF cable.

340.12 Uses Not permitted—A new Informational Note following 340.12(9) advises that sunlight-resistant marking on the cable jacket does not apply to the individual conductors contained within the jacket unless they are identified as such.

Article 342—Intermediate Metal Conduit (Type IMC)

342.10 Uses Permitted—New wording in subsection (E) clarifies that IMC is suitable for use where subject to severe physical damage.

342.14 Dissimilar Metals—This section was clarified as to what types of fittings are acceptable for use with stainless and galvanized steel IMC.

Article 344—Rigid Metal Conduit (Type RMC)

344.10 Uses Permitted—Specific language in subsection (E) was added to permit RMC to be installed in areas subject to severe physical damage.

344.14 Dissimilar Metals—This section was clarified as to what types of fittings are acceptable for use with stainless steel RMC.

Article 350—Liquidtight Flexible Metal Conduit (Type LFMC)

350.10 Uses Permitted—The permitted uses for LFMC were expanded to include areas subject to machine oils in list item (1), and a new list item (4) regarding the temperature rating of conductors was added.

350.12 Uses Not Permitted—The parent text was revised into a single sentence prohibiting the use of LFMC where it is subject to physical damage and the list items were removed.

350.30 Securing and Supporting—The permission to use the LFMC fittings as a means of support has been limited to installations permitted by the exceptions after subsection (A).

Article 356—Liquidtight Flexible Nonmetallic Conduit (Type LFNC)

356.10 Uses Permitted—The permitted uses for LFNC were expanded to include areas subject to machine oils in list item (2), and a new list item (8) was added regarding the temperature rating of conductors used in LFNC.

Article 358—Electrical Metallic Tubing (Type EMT)

358.10 Uses Permitted—A new subsection (E) was added to permit steel and stainless steel EMT to be installed were subject to physical damage.

Article 380—Multioutlet Assemblies

380.12 Uses Not Permitted—A new list item (7) was added.

Article 392—Cable Trays

392.10 Uses Permitted—The language was revised to clarify the use of single insulated conductors in cable tray.

392.18 Cable Tray Installations—The change to the rule in subsection (H) clarifies that the “over 600V” applies to the operating voltage of the system and not to the voltage rating of the conductors.

392.30 Securing and Supporting—A new list item was added to subsection (B) that requires cable ties used for securing and supporting cables and conductors in cable tray to be listed for the purpose.

392.44 Expansion Splice Plates—This change requires expansion splice plates be used where necessary to compensate for expansion and contraction.

392.46 Bushed Conduit and Tubing—This section was expanded to provide guidance for the protection of cables and conductors where they transition from the cable tray to raceways or into enclosures.

CHAPTER

4

EQUIPMENT FOR GENERAL USE

Article 400—Flexible Cords and Flexible Cables

400.12 Uses Not Permitted—This section was revised to clarify what types of cords and cables to which the “uses not permitted” applies. The exception to (5) was expanded to include power-supply cords (extension cords) as well as flexible cords and flexible cables.

400.17 Protection from Damage—This rule was revised to replace “reduced” with “adjusted,” as that is the correct *NEC* term. Cords are subject to the same ampacity adjustments as other wiring methods.

Article 402—Fixture Wires

402.3 (Fixture Wire) Types—A new type of fixture wire has been recognized by the product standards and was added to this table.

Article 404—Switches

404.2 Switch Connections—This rule was revised to better clarify the locations where light switches are required to have a neutral conductor run to the switch box.

404.4 Damp or Wet Locations—This section was edited to prohibit switches from being installed in tub spaces; the previous language only prohibited them from being installed within the tub itself.

404.7 Indicating—Changes to this rule clarify that the on/off indication for a switch or circuit breaker must be visible when accessing the external operating means.

404.9 General-Use Snap Switches, Dimmers, and Control Switches—This section was expanded to include dimmers and control switches, and (A) and (B) were expanded and clarified along with two of the three exceptions following (B).

404.10 Mounting of General-Use Snap Switches, Dimmers, and Control Switches—Switches must now be mounted flush to the box or finished surface and their cover plates must completely cover the wall opening.

404.12 Grounding of Enclosures—The final sentence of this rule was changed to add a direct reference to the exceptions in 314.3.

404.14 Rating and Use of Switches—Switches must now be listed devices as indicated in the parent text. In addition, (A) was edited and (E) was expanded.

Article 406—Receptacles and Attachment Plugs (Caps)

406.2 Definitions—New parent text is a part of the global reorganization of definitions throughout the *Code*.

406.3 Receptacle Rating and Type—Language was added to prohibit the use of reconditioned receptacles, the text in (D) was clarified, and (D)(2) now says there must be a provision to connect a metal faceplate to the equipment grounding conductor.

406.4 General Installation Requirements—Section 406.4(A) was revised to correlate with the rules in Article 210 and a new list item was added in (D).

406.5 Receptacle Mounting—Section 406.5(G) was revised into a two-item list format and new language in list item (2) was added.

406.7 Attachment Plugs, Cord Connectors and Flanged Surface Devices—Additional language was added to say that reconditioned attachment plugs, cord connectors, and flanged surface devices are not permitted.

406.9 Receptacles in Damp or Wet Locations—The prohibited locations for receptacles in bathrooms were expanded and a new exception was added.

406.10 Grounding-Type Receptacles, Adapters, Cord Connectors, and Attachment Plugs—Three subsection titles were revised.

406.12 Tamper-Resistant Receptacles—Four list items were modified, and one list item was added.

Article 408—Switchboards and Panelboards

408.3 Arrangement of Busbars and Conductors—The revisions to this section were minor and included no technical changes.

408.4 Field Identification—A change in subsection (A) now permits the required circuit directory to be located adjacent to the panel.

408.6 Short-Circuit Current Rating—This new rule requires switchboards, switchgear, and panelboards to have a short-current rating not less than the available fault current, and the available fault current must be field marked on the enclosure at the point of supply.

408.8 Reconditioning of Equipment—This new section addresses the reconditioning of panelboards, switchboards, and switchgear.

408.18 Clearances—A new subsection was added, along with two new list items that address side and rear access requirements to switchgear and panelboards.

408.23 Power Monitoring and Energy Management Equipment—This new section references the requirements of 312.8(B).

408.36 Overcurrent Protection—The exception to this rule that permitted panelboards not to have individual protection where used as service equipment with multiple service disconnects was deleted.

408.43 Panelboard Orientation—This new section prohibits a panelboard from being installed in a face-up position.

Article 410—Luminaires, lampholders, and Lamps

410.2 Definitions—The name of this definition was changed from “closet storage space” to “clothes closet storage space.”

410.7 Reconditioned Equipment—This new rule prohibits the use of reconditioned luminaires, lampholders, and retrofit kits.

410.10 Luminaires in Specific Locations—Subsection (D) was revised into a list format with parent text. No technical changes were made, but the requirements for luminaires in the shower area were clarified.

410.16 Luminaires in Clothes Closets—The word “closet” was changed to “clothes closet” throughout this section.

410.22 Outlet Boxes to Be Covered—Additional wording clarifies that the entire opening around a lighting outlet box must be covered.

410.36 Means of Support—The title of this section was revised, the rule was reorganized into a list format, and a reference to 314.27(E) was added.

410.40 General—Revisions were made to require lighting and lighting equipment to be grounded by being connected to an equipment grounding conductor.

410.44 Methods of Grounding, Exceptions—An exception was deleted and the remaining two were revised.

410.116 Clearance and Installation—A new subsection (C) was added to cover the installation and clearances of luminaires in fire-resistant construction.

410.118 Access to Other Boxes—This new section prohibits the use of luminaires recessed in ceilings, floors, or walls as the access point for outlet, pull, or junction boxes or conduit bodies, unless the box is an integral part of the listed luminaire.

Part XVI Special Provisions for Horticultural Lighting Equipment—A new “Part XVI” was added to specifically address the unique requirements for horticultural lighting equipment.

Article 411—Low-Voltage Lighting

411.4 Listing Required—The parent text was expanded to prohibit the reconditioning of listed low-voltage lighting systems, or a low-voltage lighting system assembled from listed parts. In addition, the language in (B) was revised.

Article 422—Appliances

422.5 GFCI Protection—GFCI protection for appliances were relocated to this section, editorial revisions were made, and two new list items were added as was a new Informational Note.

422.6 Listing Required—The listing requirement was clarified so it applies to appliances supplied at 50V or higher.

422.10 Branch Circuits—The title and the scope of this section was revised and (A) was clarified.

422.13 Storage-Type Water-Heaters—The language in this section was revised to clarify that the branch-circuit conductors and branch-circuit overcurrent protective device that supplies storage type water heaters with a capacity of 120 gallons or less must be rated at not less than 125 percent of the load.

422.16 Flexible Cords—Subsection (A) was split into two list items and the list items in (B) were reorganized.

422.19 Space for Conductors—This rule was clarified to say that the volume of the canopy and the outlet box must be combined when determining the amount of wiring space.

422.22 Utilizing Separable Attachment Fittings—This new section specifically permits the use of separable attachment fittings to support appliances.

422.31 Permanently Connected Appliance Disconnects—Sections 422.31(A) and (B) were revised to be consistent with other lockable disconnect rules in the *NEC*.

Article 424—Fixed Electric Space-Heating Equipment

424.1 Scope—The scope statement was changed to reference “central heating systems” rather than “central systems” and was editorially revised for compliance with the *NEC style manual*.

424.4 Branch Circuits, Branch-Circuit Requirements—This section was revised to clarify reference is being made to individual branch circuits that serve “fixed” heating equipment.

424.19 Disconnecting Means—The language was editorially revised to be consistent with 110.25 and other lockable disconnect rules in the *Code*.

424.44 Electric Heating Cables in Concrete or Masonry Floors—The language in (E) was revised to clarify that the GFCI protection required in this rule is in addition to any requirements in 210.8.

Article 430—Motors, Motor Circuits, and Controllers

430.2 Definitions—A new definition of “Electronically Protected (as applied to motors)” was added.

430.32 Continuous-Duty Motors—The requirements of 430.32(A)(2) and (B)(2) were expanded to include electronically protected motors as well as thermally protected motors.

430.99 Available Fault Current—Documentation of the available short-circuit current calculations must now be made readily available to those who install and maintain motor control center equipment as well as those who inspect the equipment.

430.122 Conductor Sizing—A new Informational Note was added to (A), and new subsections (B) and (D) were added as well.

430.130 Branch-Circuit Short-Circuit and Ground-Fault Protection—A new exception and Informational Note were added to 430.130(A)(1).

Article 440—Air-Conditioning and Refrigeration Equipment

440.9 Grounding and Bonding—This section was revised for clarity.

440.10 Short-Circuit Current Rating—Subsections (A) and (B) were revised. The available fault current calculation was expanded and now applies to industrial control panels as well as motor controllers used with air-conditioning and refrigerating equipment.

440.32 Single Motor-Compressor—This section was editorially revised to clarify the requirement for conductor sizing.

Article 445—Generators

445.6 Listing—A new subsection was added requiring stationary generators operating at 600V or less to comply with this section.

445.18 Disconnecting Means and Emergency Shutdown—The title change clarifies that this section applies to both the disconnection of the emergency generator and the emergency shutdown of the generator; (A), (C), and (D) were also revised to clarify the intent of this section.

Article 450—Transformers

450.9 Ventilation—This section was expanded to include a requirement for top horizontal surfaces of transformers to be marked to prohibit storage.

450.14 Disconnecting Means—The revision to this rule clarifies that a remote disconnecting means must be lockable in the open position.

Article 480—Storage Batteries

480.2 Definitions—The definition of “Storage Battery” was revised.

480.4 Battery and Cell Terminations—A new subsection (D) was relocated from 706.33 and added here without change.

480.7 DC Disconnect Methods—Subsection 480.7(B) was added. Information in subsection (C) was relocated from 706.30(B) and editorial changes were made. Section 480.7(F)(3) was expanded and subsection (G) with two list items was added.

480.10 Battery Locations—This rule was clarified to permit the use of listed fire exit hardware.

480.12 Battery Interconnections—The rules for the interconnecting of storage batteries were moved from 706.32 to this location.

480.13 Ground-Fault Detection—This section was revised and relocated from 706.30(D), and the title was changed.

CHAPTER

5

SPECIAL OCCUPANCIES

Article 500—Hazardous (Classified) Locations

500.1 Scope—Articles 500 Through 503 Informational Notes—The Informational Note that preceded this section was relocated without change to follow 500.1 as Information Note No. 4.

500.4 Documentation—The title of this section was change from “General” to “Documentation” and a new Informational Note was added.

500.5 Classifications of Hazardous Locations—Wording was added in 500.5(C)(1) to clarify the class and division of Group E combustible dusts.

500.7 Protection Techniques—An editorial change in the parent text clarifies the various protection methods permitted for the different hazardous location classes where electrical and electronic equipment might be installed.

500.8 Equipment Involving Optical Radiation—A new subsection (G) addressing the risk of ignition from sources of optical radiation (such as laser or LED sources) was added.

Article 501—Class I Hazardous (Classified) Locations

501.10 Wiring Methods—The language throughout 501.10(B)(1) was changed to clarify that both threaded and threadless fittings can used with IMC and RMC in Class I, Division 2 locations. Others were revised and a new list item (9) was added.

501.15 Raceway and Cable Seals—The language in this section was revised to clarify that standard conduit couplings are permitted between an enclosure that requires a seal and the sealing fitting.

501.105 Meters, Instruments, and Relays—A new exception was added to permit the use of cord-and-plug connections that are not listed for Class I, Division 2 locations in industrial establishments.

Article 502—Class II Hazardous (Classified) Locations

502.10 Wiring Methods—Language was added to clarify 502.10(B) and a new subsection was added.

502.150 Signaling, Alarm, Remote-Control, and Communications Systems; Meters, Instruments, and Relays—Subsection 502.150(B)(5) was added which allows the use of cord-and-plug-connections under certain conditions in Class II, Division 2 locations.

Article 503—Class III Hazardous (Classified) Locations

503.10 Wiring Methods—While there were both editorial and technical changes made to this section, the primary revision here was to require cable tray systems to contain an equipment grounding conductor.

Article 511—Commercial Garages, Repair and Storage

511.1 Scope—The Informational Note referencing NFPA 30A, *Code for Motor Fuel Dispensing Facilities and Repair Garages* was relocated to follow the scope statement.

511.3 Area Classification, General—Additional language and a new Informational Note were added to this section.

511.8 Underground Wiring Below Class I Locations—The title was revised to clarify that the use of IMC and RMC threaded fittings applies to wiring installed below a Class I location only.

511.12 Ground-Fault Circuit-Interrupter Protection for Personal—This rule was expanded by referencing the requirements of 210.8(B).

Article 514—Motor Fuel Dispensing facilities

514.1 Scope—The Informational Note referencing NFPA 30A, *Code for Motor Fuel Dispensing Facilities and Repair Garages* was relocated to follow the scope statement.

514.3 Classification of Locations—Additional language and a new Informational Note were added to this section.

514.11 Emergency Electrical Disconnects—The requirement for the emergency disconnect to open the neutral as well as the phase conductors was restored.

Article 517—Health Care Facilities

Article 517 Health Care Facilities—The Informational Note referencing NFPA 99, *Health Care Facilities Code* was relocated to follow the scope statement.

517.2 Definitions—New parent text was added to say that the definitions in Article 517 apply only within that article, and additions and changes were made to some of the definitions.

517.10 Applicability—A new list item (3) was added to (B) to include additional areas not covered by the rules in Part II.

517.13 Equipment Grounding Conductor for Receptacles and Fixed Electrical Equipment in Patient Care Spaces—The title of this section was revised and a new list item, 517.13(B)(1)(4) specific to metal faceplates was created.

517.16 Use of Isolated Ground Receptacles—New parent text from NFPA 99, *Health Care Facilities Code* was added and (B)(1) and (2) were revised to improve clarity.

Article 518—Assembly Occupancies

518.6 Illumination—This new section address illumination for working spaces about fixed service equipment, switchboards, switchgear, panelboards, or motor control centers installed outdoors where this equipment serves assembly occupancies.

Article 525—Carnivals, Circuses, Fairs, and Similar Events

525.20 Wiring Methods—Subsection 525.20(G) was revised to require protective matting to be secured to the walkway surface.

525.23 GFCI-Protection—Wording was added to 525.23(A) to reference the 210.8(B) requirements.

Article 547—Agricultural Buildings

547.2 Definitions—The new parent text is part of the *NEC style manual global* change for 2020 regarding definitions. Also, the definition of “Equipotential Plane” was revised to clarify it is very specific to agricultural buildings and applies only within this article.

547.5 Wiring Methods—Section 547.5(F) was clarified, and new language was added to (G).

547.9 Electrical Supply to Buildings or Structures from a Distribution Point—This rule was revised to improve clarity and to indicate there can be more than one electrical power distribution point.

Article 550—Mobile Homes, Manufactured Homes, and Mobile Home Parks

550.13 Receptacle Outlets—New language was added in 550.13(B) addressing the GFCI protection required in 210.8(A); additional language limits those requirements.

550.15 Wiring Methods and Materials—The previous prohibition on the use of aluminum conductors for mobile home branch-circuit wiring was deleted and 550.15(D) was revised.

Article 555—Marinas, Boatyards, Commercial and Noncommercial Docking Facilities

Article 555—Marinas, Boatyards, Floating Buildings, and Commercial and Noncommercial Docking Facilities—This article was reorganized, includes several technical changes, and was expanded to incorporate the rules for floating buildings that were in Article 553.

555.1 Scope—Informational Notes following the scope text were added and renumbered.

555.2 Definitions—New definitions were added, and some were relocated to Article 100.

555.3 Electrical Datum Plane Distances—This new section provides electrical datum plane distance rules for floating piers, areas subject to tidal fluctuations, and areas not subject to tidal fluctuations.

555.4 Location of Service Equipment—This requirement was relocated from 555.7 and was revised to include an additional reference to floating buildings.

555.5 Maximum Voltage—This rule was relocated from 555.4 and the maximum voltage for dock or marina service equipment was reduced.

555.7 Transformers—This section was formerly 555.5; it was expanded, separated into two subsections, and editorially revised.

555.9 Boat Hoists—This new rule replaces the GFCI protection requirement for boat hoists that was previously found in 210.8(C).

555.13. Bonding of Noncurrent-Carrying Metal Parts—This rule was relocated here from 553.11 and requires all metal parts likely to become energized that are in contact with the water to be connected to the ground bus of the panelboard.

Part II. Marinas, Boatyards, and Docking Facilities—This new Part II of Article 555 covers specific electrical installation rules for marinas, boatyards, and docking facilities.

555.30 Electrical Connections—This section was divided into subsections and the new 555.30(C) was added.

555.33 Receptacles—A new subsection (C) is about replacing receptacles subject to the equipotential plane rules.

555.34 Wiring Methods and Installation—Section 555.34(B)(2) was modified to require compliance with only Part I of Article 225.

555.35 Ground-Fault Protection of Equipment (GFPE) and Ground-Fault Circuit-Interrupter (GFCI) Protection—This section was relocated from 550.3 and divided into two subsections. New Informational Notes were added to both.

555.37 Equipment Grounding Conductor—This was relocated from 555.15. The title and 555.37(A) were both revised to improve clarity.

Part III Floating Buildings—This new Part III primarily consists of rules that were relocated from the now deleted Article 553 although a new one was added.

Article 590—Temporary Installations

590.4 General—The language in 590.4(F) was revised to improve clarity and two new exceptions were added to (G).

590.6 GFCI Protection for Personnel—The title of 590.6(B) was revised for clarity.

590.8 Overcurrent Protective Devices—This section was added to provide guidance for AHJs in the reuse of equipment for temporary applications.

CHAPTER

6

SPECIAL EQUIPMENT

Article 600—Electric Signs and Outline Lighting

600.2 Definitions—New definitions for “Host Sign,” “Retrofit Kit, General Use,” “Retrofit Kit, Sign Specific,” and “Subassembly” were added to this section.

600.3 Listing—The parent text in this section was revised to require both listing and labeling.

600.4 Markings—The rule in (D) was modified to permit the markings required by 600.4(A) to be installed in a location not visible to the public.

600.5 Branch Circuits—Section 600.5(A) was clarified and subsection (B) requiring the disconnecting means to be marked to identify the equipment it disconnects was added.

600.6 Disconnecting Means—This rule was revised to say that conductors passing through a sign, and not disconnected by the sign disconnect, must be inaccessible to service personnel. Subsection (A) (4) requires that there be first responder access to sign disconnects located remotely from the sign.

600.35 Retrofit Kits—This new section provides the installation requirements for retrofit kits.

Article 620—Elevators, Escalators, and Moving Walks, Platform Lifts, and Stairway Chair Lifts

620.6 GFCI Protection for Personnel—This rule was moved from 620.85 to this location.

620.22 Branch Circuits for Elevator Car(s)—Section 620.22(A) was revised to clarify which types of equipment can be supplied by the lighting circuit, and to specify the location of the overcurrent protective device if there is no machine room or machine space.

620.51 Disconnecting Means—A revision in (A) now requires disconnects to be lockable only in the open position.

Article 625—Electric Vehicle Power Transfer System

625.1 Scope—The scope was changed to include systems which permit bidirectional current flow.

625.2 Definitions—A definition for “Electric Vehicle Power Export Equipment (EVPE)” was added and the one for “Electric Vehicle Supply Equipment (EVSE)” was clarified.

625.5 Listed—Equipment covered by the scope of this article must now be listed.

625.41 Overcurrent Protection—This section was expanded to include bidirectional electric vehicle supply equipment (EVSE) and wireless power transfer equipment (WPTE).

625.42 Rating—This section was expanded to address equipment designs with adjustable input settings.

625.48 Interactive Systems—The term “electric vehicle supply equipment” was removed and replaced with the acronym EVSE.

625.54 GFCI Protection for Personnel—The GFCI requirement was expanded to apply to all receptacles installed for the connection of electric vehicle charging equipment.

625.60 AC Receptacle Outlets Used for EVPE—This new section covers alternating-current receptacles installed in electric vehicles intended to allow for the connection of off-board utilization equipment.

Article 645—Information Technology Equipment

645.5 Supply Circuits and Interconnecting Cables—Revisions were made in this section to eliminate conflicts between the *NEC* and NFPA 75, *Standard for the Fire Protection of Information Technology Equipment*.

Article 680—Swimming Pools, Spas, Hot Tubs, Fountains, and Similar Installations

680.2 Definitions—The definition of “Fountain” was revised and the term “Immersion Pool” was added.

680.3 Approval of Equipment—Revisions to this section clarify that all electrical equipment and products covered by Article 680 must be listed and installed in compliance with this article.

680.4 Inspections After Installation—The authority having jurisdiction can now require periodic inspection and testing of the pool system after installation.

680.5 Ground-Fault Circuit Interrupters—Additional wording clarifies that the GFCI requirements in Article 680 (unless otherwise noted) are in addition to those found in 210.8.

680.6 Bonding and Equipment Grounding—Revisions to this rule clarify that this section covers the requirements for bonding in addition to grounding electrical equipment.

680.7 Bonding and Equipment Grounding Terminals—Revisions to the section title and text clarified the intent of this rule.

680.11 Underground Wiring—This section was editorially revised to improve clarity and readability with only a minor technical change.

680.14 Wiring Methods in Corrosive Environment—The definition of a corrosive environment was removed from this so only the requirements for the wiring methods permitted in a corrosive location remain.

680.21 Motors (for permanently installed pools)—The GFCI protection of motors was expanded and a new subsection requires GFCI protection to be provided for existing pump receptacles when replacing a pool pump motor.

680.22 Lighting, Receptacles, and Equipment—Revisions were made to clarify this rule and new subsections were added.

680.23 Underwater Pool Luminaires—This section was editorially revised to clarify existing *Code* requirements regarding underwater wet-niche luminaires.

680.25 Feeders—A change in (A) now permits the use of LFNC as a wiring method for feeders installed in a corrosive environment.

680.26 Equipotential Bonding—Two revisions in the perimeter bonding requirements were made.

Part III Storable Pools, Storable Spas, Storable Hot Tubs, and Storable Immersion Pools—“Storable Immersion Pools” was added to the title.

680.31 Pumps—Section 680.31 was revised to clarify that the required grounding conductor is intended to be the equipment grounding conductor.

680.35 Storable and Portable Immersion Pools—This new section covers the electrical installation requirements for storable and portable immersion pools.

680.45 Permanently Installed Immersion Pools—The electrical installation requirements for permanently installed immersion pools are covered by this new section.

680.50 General—This general requirement was expanded to include “fountains intended for recreational use by pedestrians, including splash pads.”

680.54 Grounding and Bonding—The titles and sections for bonding and grounding fountains were combined, expanded, clarified, and relocated to include bonding as well as grounding.

680.59 GFCI Protection for Permanently Installed Nonsubmersible Pumps—GFCI protection is now required for outlets that supply permanently installed nonsubmersible fountain pump motors.

680.80 General—This section was revised to require electrically powered pool lifts to comply with only Part VIII of this article, except where requirements in other parts are specifically referenced.

680.84 Switching Devices and Receptacles—This section was expanded to require receptacles for electrically powered pool lifts that operate above the low-voltage contact limit to comply with the requirements of 680.22(A)(3) and (A)(4).

Article 690—Solar Photovoltaic (PV) Systems

690.2 Definitions—Some definitions were moved to Article 100 and references to “PV” were removed, and others were deleted altogether.

690.4 General Requirements—Section 690.4(B) was expanded to add three items to the list of equipment required to be listed or evaluated for the application, and new language in (F) addresses electronic power converters mounted in not readily accessible locations.

690.6 Alternating-Current Modules and Systems—This section was expanded to include ac systems as well as ac modules, and to clarify that the wiring for these modules and systems are internal components and not subject to the requirements of Article 690.

690.7 Maximum Voltage—This revisions in this section were editorial in nature.

690.8 Circuit Sizing and Current—Section 690.8(A)(2) specifying calculation of the maximum permitted input circuit currents to electronic power converters was added, and editorial changes were made in (B).

690.9 Overcurrent Protection—The parent text in (B) was expanded to include electronic devices that are listed to prevent backfeed, and the Informational Note following (B)(2) was revised.

690.11 Arc-Fault Circuit Protection (Direct Current)—Changes were made to the exception to allow additional wiring methods to exempt PV output circuits from arc-fault circuit protection.

690.12 Rapid Shutdown of PV Systems on Buildings—Subsection (A) was revised to clarify that where an ac inverter output circuit originates within the array, it must be shut down by the rapid shutdown system. Subsections (B) and (C) were clarified.

690.13 Photovoltaic System Disconnecting Means—This section was expanded and clarified, and (C) was moved to Article 705.

690.15 Disconnecting Means for Isolating Photovoltaic Equipment—The title and parent text were revised to improve clarify, and new language regarding isolating disconnects operating at over 30V was added.

Part IV Wiring Methods and Materials—The title of this part was expanded to include both wiring methods and materials.

690.31 Wiring Methods—There were several changes in this section including clarifications, editorial restructuring and relocation, and modified guidance for the adjustments of conductor ampacities.

690.33 Connectors—This rule was expanded to include mating connectors as an additional method of circuit interruption, and a new Informational Note follows new list item (3).

690.41 System Grounding—Ground-fault protection for systems that operate at 30V or less, or 8A or less is no longer required, and (B)(3) was added to require visible indication of ground faults.

690.43 Equipment Grounding and Bonding—The term “grounded” was replaced with language that requires the equipment to be connected to an equipment grounding conductor, and a new subsection (D) addresses the bonding methods for PV systems over 250V to ground.

690.45 Size of Equipment Grounding Conductors—Equipment grounding conductors for PV system circuits are no longer required to be increased in size due to voltage-drop considerations.

690.47 Grounding Electrode System—The word “Auxiliary” was deleted from the title of subsection (B).

690.51 Modules and Alternating-Current Modules—Sections 690.51 and 690.52 were combined and simplified to remove marking requirements that are found in the listing standard.

690.53 DC PV Circuits—This section was editorially simplified and retitled to reflect the current *NEC* term of “PV” instead of “Photovoltaic,” and was also revised to say that the required voltage label be both permanent and readily visible.

690.56 Identification of Power Sources—The rules for the identification of power sources for stand-alone systems were revised to reference the identification requirements found in Chapter 7 of the *Code*.

Article 691—Large-Scale Photovoltaic (PV) Electric Supply Stations

691.1 Scope—This article now applies to the installation of large-scale PV electric supply stations with an inverter generating capacity of no less than 5,000 kW and not under an electric utility's control.

691.9 Disconnecting Means for Isolating Photovoltaic Equipment—The language in this section and its title were revised to clarify that the purpose of the PV disconnecting equipment is isolation.

691.11 Fence Bonding and Grounding—This title change recognizes that any metal fencing in proximity to the large-scale energy system may require bonding and not grounding.

Article 694—Wind Electric Systems

694.22 Additional Provisions—New language (C) to specifies that the wind electric system disconnect, or manual shutdown button be located at a readily accessible exterior location for one- and two-family dwellings.

694.54 Identification of Power Sources—This section was editorially revised to reference the identification requirements found in other articles instead of duplicating the information here.

Article 695—Fire Pumps

695.3 Power Source(s) for Electric Motor-Driven Fire Pumps—The exception to (B)(1) and (2) was revised to permit a redundant electric fire pump with an independent source of power in lieu of redundant power sources and an automatic transfer switch. Changes to (C)(3) provide more specific requirements for the selective coordination of fire pump power supplies among other things.

695.4 Continuity of Power—Section 695.4(B) now requires the use of the pressure maintenance (jockey) pump's full-load current instead of its locked-rotor current when selecting the proper overcurrent protective device(s).

695.6 Power Wiring—A new exception and Informational Note were added, and (J) was revised to recognize that both cables and raceways are used for fire pump system connections.

695.10 Listed Equipment—This section was revised to prohibit the reconditioning of fire pump controllers and transfer switches.

CHAPTER

7

SPECIAL CONDITIONS

Article 700—Emergency Systems

700.2 Definitions—The word “Emergency” was added to this term to clarify the luminaires to which this definition applies, and the definition was revised.

700.4 Capacity and Rating—The title of this section was changed to clarify it covers both the capacity and the rating of the emergency system, and subsections were revised or added.

700.5 Transfer Equipment—Subsection (A) was modified to remove redundant language and to prohibit the use of meter-mounted transfer switches, and (C) was also revised.

700.6 Signals—Revisions were made to require indication that the emergency source, not just a battery, is carrying load; and the system bonding jumper for multiple paralleled emergency sources is now permitted to be installed at an alternate location.

700.12 General Requirements—The multi-paragraph parent text for this section was shortened by moving portions of the information to two new subsections.

700.16 Emergency Illumination—Each paragraph of this rule was assigned a subsection letter and a title to make it easier to understand.

700.32 Selective Coordination, Informational Note and Informational Note Figure—A new Informational Note and related Figure were added to provide clarity on how emergency system overcurrent protective devices selectively coordinate with all supply-side OCPDs.

Article 701—Legally Required Standby Systems

701.4 Capacity and Rating—This section was reorganized into three subsections.

701.5 Transfer Equipment—Transfer equipment must now be listed, the use of meter-mounted transfer switches is now prohibited, and a requirement regarding reconditioned equipment was added.

701.12 General Requirements—The parent text in this section was divided into ten subsections.

Part IV Overcurrent Protection—Three sections in Part IV were renumbered to match the numbering sequence in Article 700, and a new Informational Note and related Figure were added to what is now 701.32.

Article 702—Optional Standby Systems

702.2 Definition—The definition for “Optional Standby Systems” was revised to include stored power as well as on-site generated power.

702.4 Capacity and Rating—The title of subsection (A) was changed and (B) was revised to clarify that load calculations are an approved method of determining if an optional standby system can supply the load.

702.5 Transfer Equipment—This section was broken down into four subsections, one of which is a new rule added to permit the use of meter-mounted transfer switches.

702.7 Signs—Subsection (A) was revised to coordinate with the new dwelling unit emergency disconnect required by 230.85.

Article 705—Interconnected Electric Power Production Sources

705.2 Definitions—This definition was added to clarify that the conductors between power production equipment or a power source, and the service equipment or distribution equipment are not feeder conductors.

705.6 Equipment Approval—This was revised to clarify that where a field label is provided, it must be evaluated for interactive function.

705.10 Identification of Power Sources—The title of this section was changed to more directly inform the reader of the section content, and now requires a plaque or directory that is not installed at the service equipment to be at an approved readily visible location.

705.11 Supply-Side Source Connections—This new section addresses the requirements pertaining to the connection of electric power production sources to the supply side of the service disconnecting means as permitted by 230.82(6).

705.12 Load-Side Source Connections—The title and rules of 705.12 were revised to address only load-side connection requirements and reorganized for ease of use.

705.13 Power Control Systems—This new section addresses “multiple energy source situations” that can consist of utility, solar, generator, wind turbine, battery storage, and so forth.

705.20 Disconnecting Means, Source—The title was changed from “Disconnecting Means, Sources” to “Disconnecting Means, Source,” and in the parent text the term “ungrounded conductors” was replaced with “conductors that are not solidly grounded.”

705.25 Wiring Methods—This new section specifies the permitted wiring methods for interconnected electric power production sources.

705.28 Circuit Sizing and Current—The information in this new section was previously found in 705.60 and 705.95. The rules were relocated so they will apply throughout Article 705.

705.30 Overcurrent Protection—This section was revised to incorporate requirements that were in 705.65.

705.32 Ground Fault Protection—This now applies to GFPE devices installed in accordance with only 230.95.

705.40 Loss of Primary Source—The rules from 705.42 were combined with this section so a single rule applies to the loss of the primary supply regardless of its type.

705.45 Unbalanced Interconnections—This rule was relocated from 705.100 and is specific to single-phase and three-phase installations.

Parts II and III—Parts II and III were deleted as part of the restructuring of Article 705.

705.50 System Operation—This section was clarified by replacing the phrase “operate as a separate microgrid system” with “as an isolated microgrid operating in island mode.”

705.60 Primary Power Source Connection—New language was added to clarify that the power source conductors connected to a microgrid are considered power source output conductors.

705.70 Microgrid Interconnect Devices (MID)—This was relocated from 705.170 and a list item was revised.

Article 706—Energy Storage Systems

706.1 Scope—The scope was expanded to include temporary as well as permanent energy storage systems, and the size of the system to which the article applies was clarified.

706.2 Definitions—Definitions in this section were relocated and a new one added.

706.3 Qualified Personnel—References to other articles were deleted and new language requiring an ESS to be installed and maintained by qualified persons was added.

706.4 System Requirements—This section was changed from “System Classification” to “System Requirements” and was expanded to specify marking requirements.

706.5 Listing—The title was changed from “Equipment” to “Listing” to better reflect the requirements in this section.

706.7 Maintenance—The requirements for disconnects that were in this section were moved to 706.15; this rule now specifies the maintenance requirements for energy storage systems.

706.9 Maximum Voltage—This new section is intended to address the maximum voltage of an energy storage system.

Part II. Disconnecting Means—The name of this Part was changed.

706.16 Connection to Energy Sources—The rules in this section were relocated from 706.8 and clarified.

Part III Installation Requirements—Part III was renamed and is intended to better group the installation requirements of this article.

706.21 Directory (Identification of Power Sources)—Directory and identification of power sources labeling and marking requirements for energy storage and stand-alone systems were relocated, retitled, and modified.

Part IV. Circuit Requirements—This Part was renamed, and related sections were relocated.

706.30 Circuit Sizing and Current—Rules in this section were revised to clarify what the nameplate-rated circuit current is and that the inverter utilization output current is the continuous alternating-current output current rating.

706.31 Overcurrent Protection—A new exception was added to this section covering 100 percent rated overcurrent devices and the requirements were revised for overcurrent protection of ESS circuit conductors.

Article 710—Stand-Alone Systems

710.1 Scope—The scope was revised to clarify that this article covers electric power production systems that operate in island mode and installations not connected to an electric power production and distribution network.

710.6 Equipment Approval—The field labeling requirement was clarified to include both evaluation and labeling.

710.10 Identification of Power Sources—This new section requires a permanent plaque or directory to be installed at a building supplied by a stand-alone system.

710.12 Stand-Alone Inverter Input Circuit Current—This rule specifies maximum current and was relocated from 690.8(A)(4).

710.15 General—The permitted capacity of premises wiring systems supplied by stand-alone or isolated microgrid power sources was clarified and a new subsection (D) was added.

Article 712—Direct Current Microgrids

712.2 Definitions—Parent text was added to say that these definitions apply only within this article and the word “Functionally” was added to the definition of “Grounded.”

712.10 Directory—A source directory and a building directory listing the location and/or source of all power sources and disconnecting means are now both required.

712.25 Identification of Circuit Conductors—Phase conductors 6 AWG or smaller can no longer be identified by marking tape, tagging, or other approved means.

712.34 DC Source Disconnecting Means—This rule was revised to reference 110.25.

712.65 Available DC Fault Current—The term “short-circuit current” was replaced with “fault current” and “maximum available short-circuit current” was replaced with “available fault current.”

Article 725—Remote-Control, Signaling, and Power-Limited Circuits

725.2 Definitions—New parent text says the definitions in this article apply only within the article and some were moved to Article 100.

725.3 Other Articles—This section was revised to clarify that all the rules in Article 725 apply. It can be modified by only Article 300 and only if referenced in Article 725 as applied to Class 1, 2, and 3 circuits.

725.24 Mechanical Execution of Work, Informational Note—A new Informational Note was added explaining the effects of foreign substances on cable assembly insulation.

725.48 Conductors of Different Circuits in the Same Cable, Cable Tray, Enclosure, or Raceway—Class 1 circuits can now be installed with other circuits in a common enclosure (even if not functionally associated) if a barrier is installed to provide separation.

725.121 Power Sources for Class 2 and Class 3 Circuits—List item 5 was revised to specify a listed battery source or a battery source system identified as Class 2, and (C) was expanded and clarified.

725.135 Installation of Class 2 Cables—Subsection (B) was revised to permit only cables (and not wires) to be installed in ducts specifically fabricated for environmental air, and (E) was expanded to specifically permit the installation of innerduct within a metal raceway.

725.139 Conductors of Different Circuits in Same Cable, Enclosure, Cable Tray, Raceway, or Cable Routing Assembly—This was clarified to say that conductors of Class 2 or 3 circuits can be installed in the same cable with communications circuits if the cable is a listed communications cable.

725.144 Transmission of Power and Data—Editorial changes and three new Informational Notes help clarify these installations, the title of Table 724.144 was revised, and a new exception was added.

Article 760—Fire Alarm Systems

760.3 Other Articles—Two new subsections were added.

760.24 Mechanical Execution of Work—This section was expanded to require compliance with all of 300.4.

760.121 Power Sources for Power-Limited Fire Alarm Circuits—The fire alarm branch-circuit disconnecting means is now specifically permitted to be secured in the “on” position.

Article 770—Optical Fiber Cables and Raceways

Article 770 Informational Note—The Informational Note that followed the title of the article was deleted.

770.24 Mechanical Execution of Work—This section was expanded to require compliance with all of 300.4.

CHAPTER

8

COMMUNICATIONS SYSTEMS

Introduction to the 2020 Changes in Chapter 8 Communications Systems

There was a major restructuring of Chapter 8 during the 2020 revision cycle. Article 800 is now “General Requirements for Communications Circuits.” As the new title implies, it contains the general requirements for the other Chapter 8 articles. The only exception is Article 810 which stands completely on its own unless it specifically references *Code* rules in other articles.

The rules for “Communications Circuits” were relocated to the new Article 805. The general requirements that were in articles 805, 820, 830, and 840 were moved to Article 800 to make the *NEC* easier to use. Since the requirements were nearly identical in the four articles, the *Code-Making Panel* believed it would be more “user friendly” to have them in a single “general requirements” article.

You will now have to go to two different articles for a Chapter 8 installation; Article 800 for the general rules and one of the other four the more specific ones. The rules in this chapter are still separate from the rest of the *NEC*, unless there is a specific reference to a Chapter 1 through 7 rule in a Chapter 8 article.

Article 800—General Requirements for Communications Systems

800.1 Scope—This article covers the general requirements for Chapter 8 installations.

800.2 Definitions—Definitions in Part I of Article 100 apply throughout Chapter 8 and those found in 800.2 apply only within Chapter 8.

800.3 Other Articles—Common information from the “xxx.3” sections of the other Chapter 8 articles, except Article 810, is now located here.

800.49 Metal Entrance Conduit Grounding—This rule was in 800, 820, and 840, was clarified, and relocated here.

800.53 Separation from Lighting Conductors—The language was revised to clarify that communications cables and CATV cables must be separated from lightning conductors and not from each other, and two new Informational Notes were added.

800.100 Cable and Primary Protector Bonding and Grounding—Minor editorial changes were made and this rule now applies to the bonding and grounding of all Chapter 8 installations, except those covered by Article 810.

800.110 Raceways, Cable Routing Assemblies, and Cable Trays—This section now applies throughout Chapter 8 and so need not be repeated in each of its articles.

800.113 Installation of Wires, Cables, Cable Routing Assemblies, and Communications Raceways—These provisions were relocated from the communications circuits article with only editorial revisions and no technical changes.

800.154 Applications of Listed Communications Wires, Cables, and Raceways, and Listed Cable Routing Assemblies—This section combines and relocates the permitted cable types for Articles 805, 820, 830, and 840 into a single section without technical change.

800.179 Plenum, Riser, General-Purpose, and Limited Use Cables—The redundant requirements from 805.179, 820.179, and 830.179 were moved here as general requirements.

Article 805—General Requirements for Communications Circuits

805.93 Grounding, Bonding, or Interruption of Non-Current-Carrying Metallic Sheath Members of Communications Cables—The section title and the language within the section was revised to add the words “bonding” or “bonded.”

805.133 Installation of Communications Wires, Cables, and Equipment—This revision clarifies that where Class 2 and 3 circuits are in a communications cable, they remain classified as Class 2 or 3 circuits.

805.154 Substitutions of Listed Communications Wires, Cables, and Raceways, and Listed Cable Routing Assemblies—This section now contains only the permitted substitutions of communications cables.

Article 810—Radio and Television Satellite Equipment

810.21 Bonding Conductors and Grounding Electrode Conductors—Receiving Stations—Copper-clad aluminum was added to the list of permitted conductor types for bonding and grounding applications.

Article 820—Community Antenna Television (CATV) and Radio Distribution Systems (Coaxial Cable)

820.3 Other Articles—General references made to other articles are now found in 800.3 as a part of Chapter 8’s reorganization.

820.44 Overhead (Aerial) Coaxial Cables—With the exception of 820.44(A) and (B), the requirements for overhead cables were relocated to 800.44.

820.100 Cable Bonding and Grounding—Most of the cable bonding and grounding requirements are now found in 800.100.

820.154 Substitutions of Listed CATV Cables—The application rules were relocated to 800.154, leaving just the cable substitution rules in this section.



LEARN THE 2020 CODE...

With one of Mike Holt's Best-Selling Code® products

Takes you step-by-step through the National Electrical Code®

Now is the time to master your Code book. Learn from NEC® Expert Mike Holt, & gain confidence when you're in the field. Choose from one of these great programs:

- Understanding the NEC® Complete Training Library
- Bonding and Grounding Training Program
- Changes to the 2020 NEC® Training Program
- Limited Energy and Communications Systems Training Library



Order Today & SAVE 20%

On any Mike Holt Code Product

Use Code: PDF20CC

Offer expires: 12/31/2020

www.MikeHolt.com/code

or Call to Order 888.632.2633

“You make it so easy to learn. The DVD's are a must, and of course the books just jump out at you. Keep up the good work.”

-Mark K.