At Your Pace Online LLC 1383 2nd Ave., Gold Hill, OR 97525 877-724-6150 www.TradesmanCE.com

16 HOUR 2020 NEC PACKAGE Instructor: Chuck Price

The class begins with a broad introduction to the changes made to the 2020 National Electrical Code[®] (NEC-2020). It includes a brisk discussion of the code review process, a detailed explanation of how the NEC is organized, and coverage of code-wide changes, new Articles for 2020, and the changes to Article 100 (Definitions) and Article 110 (Requirements for Electrical Installations). It then presents every significant change made to Chapters 2, 3 & 4 of NEC-2020. These are the three "core" Chapters in the NEC, addressing the provisions that govern almost every electrical installation, barring any specialized circumstances. The class finishes up by presenting every significant change made to Chapters 5 & 6, Chapter 5 is generally considered the most difficult to master. It governs situations requiring special electrical precautions due to hazardous substances, critical services being provided, or higher risks to the public and other users. Since Chapter 6 addresses specialized equipment, it often sees the greatest innovation and most rapid changes of any in the electrical field, and contains the greatest number of significant changes covered in this class.

Each change in Chapters 1-6 is presented first with a "thumbnail" to help orient the student and provide a ready means for reviewing the material. The 2020 NEC language for the affected code is then provided, with any deletions and revisions from the 2017 NEC clearly shown. Most importantly, each change is accompanied by a thorough-going discussion of what the change means and the reason it was installed in the Code. The discussion includes, where possible, the reasons provided by the relevant code-making panel that oversaw the change and any vital contributions to the discussion from working electricians, manufacturers, and industry analysts. The goal is to express every change in clear language, to focus on how the changes should be applied by a working electrician, and to provide the resources to explore the change more fully for those who wish to do so.

Learning Objectives:

By the end of this class, students will be able to:

- Navigate the 2020 NEC far more effectively;
- Participate to the degree the student desires in the code review process;
- Locate and act on the broad changes to the NEC;
- Utilize the new definitions and requirements in their work and in their future use of the NEC;
- Keep up with the latest changes to GFCI and AFCI requirements;
- Become more familiar with some of the newest wiring materials and methods;
- Apply new approaches on branch circuits;
- Adhere to the latest codes on receptacles, including those on kitchen islands in meeting rooms, and on decks or porches;
- Calculate lighting loads based on new research; the first major change to these calculations since 1971;
- Provide for the most effective and reliable grounding and bonding, including where alternative sources of power are involved.

- Adopt the most up-to-date rules on Exit Enclosures (Stair Towers);
- Apply the new protocols for enclosures for ceiling (paddle) fans, NM Cable, and Power Monitoring/Energy Management Systems;
- Work with medium voltage cable more easily and incorporate Type P cable for specialized uses;
- Ensure that installations in Cablebus and Cable Trays are done correctly;
- Comply with new Surge Protection and Emergency Disconnect rules.
- Adopt the most up-to-date methods on switch connections, on service and industrial control panels, and on the latest innovations in lighting control switches;
- Familiarize themselves with some of the newer panelboard and hanging lamp and low-voltage lighting options;
- Apply the latest approaches to electronic protection for motors and transformers;
- Familiarize themselves with new wiring methods and protection techniques for electrical installations within hazardous locations;
- Apply the most current rules on wiring methods and protection for repair garages; gas stations, and healthcare facilities;
- Abide by safer standards for electrical installations for agricultural buildings, mobile homes, RVs, and temporary installations such as construction sites;
- Navigate the heavily revised approach for the NEC toward electrical connections at Marinas, Boatyards, and Commercial and Noncommercial Docking Facilities;
- Use the latest upgrades for electric signs and electric power supply to office cubicles;
- Apply the most current rules on cranes, hoists, and elevators;
- Stay up-to-date on the many changes to EV charging systems;
- Safely install electrical systems around pools and bodies of water;
- Comply with new marking requirements for Fuel Cell Systems, PV Systems, elevators, electric signs, and fire pumps; and
- Navigate the rapidly changing and growing field of PV systems, including larger PV power generation systems.

Assessment:

The following learning objectives are assessed via the following questions.

- Navigate the 2020 NEC far more effectively;
 - o Assessed by questions 1-4
- Participate to the degree the student desires in the code review process;
 - o Assessed by question 2-4, 15&16
- Locate and act on the broad changes to the NEC;
 - o Assessed by questions 5-14 & 17
- Utilize the new definitions and requirements in their work and in their future use of the NEC;
 - o Assessed by questions 18-42 & 50
- Keep up with the latest changes to GFCI and AFCI requirements;
 - o Assessed by questions 55-68
- Become more familiar with some of the newest wiring materials and methods;
 - o Assessed by questions 43-49, 51-54, 75-79, 96-102 & 230-240
- Apply new approaches on branch circuits;
 - o Assessed by questions 80-93
- Adhere to the latest codes on receptacles, including those on kitchen islands in meeting rooms, and on decks or porches;
 - o Assessed by questions 69-74

- Calculate lighting loads based on new research; the first major change to these calculations since 1971;
 - o Assessed by questions 80-90
- Provide for the most effective and reliable grounding and bonding, including where alternative sources of power are involved.
 - o Assessed by questions 103-108 & 111-120
- Adopt the most up-to-date rules on Exit Enclosures (Stair Towers);
 - o Assessed by questions 125&126
- Apply the new protocols for enclosures for ceiling (paddle) fans, NM Cable, and Power Monitoring/Energy Management Systems;
 - o Assessed by questions 138-147
- Work with medium voltage cable more easily and incorporate Type P cable for specialized uses;
 - o Assessed by questions 136, 137 & 148-150
- Ensure that installations in Cablebus and Cable Trays are done correctly;
 - o Assessed by questions 157, 158 & 161-170
- Comply with new Surge Protection and Emergency Disconnect rules.
 - o Assessed by questions 94&95, 109&110
- Adopt the most up-to-date methods on switch connections, on service and industrial control panels, and on the latest innovations in lighting control switches;
 - o Assessed by questions 175-182 & 185-187
- Familiarize themselves with some of the newer panelboard and hanging lamp and low-voltage lighting options;
 - o Assessed by questions 198-207 & 210-218
- Apply the latest approaches to electronic protection for motors and transformers;
 - o Assessed by questions 223-229
- Familiarize themselves with new wiring methods and protection techniques for electrical installations within hazardous locations;
 - o Assessed by questions 241-259
- Apply the most current rules on wiring methods and protection for repair garages; gas stations, and healthcare facilities;
 - o Assessed by questions 261-274
- Abide by safer standards for electrical installations for agricultural buildings, mobile homes, RVs, and temporary installations such as construction sites;
 - o Assessed by questions 275-297
- Navigate the heavily revised approach for the NEC toward electrical connections at Marinas, Boatyards, and Commercial and Noncommercial Docking Facilities;
 - o Assessed by questions 299-310
- Use the latest upgrades for electric signs and electric power supply to office cubicles;
 - o Assessed by questions 312-320
- Apply the most current rules on cranes, hoists, and elevators;
 - o Assessed by questions 321-325
- Stay up-to-date on the many changes to EV charging systems;
 - o Assessed by questions 326-334
- Safely install electrical systems around pools and bodies of water;
 - o Assessed by questions 337-368
- Comply with new marking requirements for Fuel Cell Systems, PV Systems, elevators, electric signs, and fire pumps; and
 - o Assessed by questions 384, 393, 316, 323, 399 & 400
- Navigate the rapidly changing and growing field of PV systems, including larger PV power

generation systems.

o Assessed by questions 369-398

Syllabus:

Module 1 Introduction to the Course

The class begins with an overview of the changes to NEC-2020, followed by a survey of five significant code-wide changes, and a look at the four new Articles added for 2020. The module ends with a discussion of the revision to the defined Scope of the NEC from Article 90.

Module 2 Changes to Chapter 1

Chapter 1 is comprised of two Articles: Article 100 that covers Definitions and Article 110 that provides the general requirements for electrical installations. These are two core Articles that affect every phase of electrical work.

Thirteen new or revised definitions are covered, including "Equipotential Plane", "Free Air". "Grounded Conductor". "Island Mode", and "Reconditioned".

The significant changes to four general requirements complete the class, including changes to 110.12 Mechanical Execution of Work, 110.14 Terminal Connection Torque, 110.22 Identification of Disconnecting Means, and Spaces About Electrical Equipment.

Module 3 Changes to Chapter 2

Covers 45 changes to the 2020 NEC, including GFCI for Basements & Indoor Damp/Wet Locations, for Specific Appliances & Equipment, and for Outdoor Outlets, Branch Circuit Requirements for Dwelling Unit Bathrooms & Garages, AFCI in Nursing Homes and After Modifications, and Receptacles for Peninsular Countertops, Meeting Rooms, and Balconies, Decks & Porches. There are 12 changes in Articles 215 through 230, including GFCI Protection for Feeders and for Temporary Feeders, Changes to Lighting Loads Calculations, Surge Protection Devices in Dwelling Units, Maximum Disconnects in a Single Enclosure, and Emergency Disconnects at a Readily Accessible Location. This module concludes with some of the most misunderstood and most often violated codes in the NEC: those regarding grounding and bonding. There are 15 changes, including Overcurrent Protection, a new Article on Overvoltage Protection, Grounding Systems Permitted to Be Connected on the Supply Side of the Disconnect, GEC Connections to Rebar, Metal Enclosures to Connect Bonding Jumpers or EGCs, Restricted Use of Metal Frames as EGCs, and an Exception to Resizing ECGs.

Module 4 Changes to Chapter 3

This module 29 significant changes including Protection Against Physical Damage with Alternative Metal Fittings; Boxes, Conduit Bodies or Fittings Required; Stair Towers; Reorganization of Article 310; Ampacity Tables; and a new Article 311 on Medium Voltage Cable. The second half of the module covers changes to Power Monitoring or Energy Management Equipment in Enclosures; Volume Allowance for EGCs and Equipment Bonding Jumpers; Outlet Boxes for Ceiling Fans; Type MC Cable in Hazardous Locations; Measuring Type NM Cable from the Enclosure; a new Article on Type P Cable; Conductor Size and Termination in Cablebus; and Limitations of Single Conductor Applications in Cable Tray Systems.

Module 5 Changes to Chapter 4

This module opens with 12 changes to Articles 400-406, including a New Type of Fixture Wire -FFHH-2, Rating and Use of General-Use Snap Switches Dimmers and Control Switches, Electronic Control Switches, Installation Requirements of Controlled Receptacles, Tamper-Resistant Receptacles, and Single-Pole Separable Connectors. There are 11 changes to Articles 408 & 410, including new Panelboard Circuit Directory Locations, Methods of Grounding Luminaires; and Identification of Control Conductor Insulation for Luminaire. The module finishes with 14 changes to

1h 48m 2s

2h 48m 38s

1h 5m 16s

3h 18m 49s

42m 16s

Articles 422-490, including GFCI for Appliances; Electronically Protected Motor Circuits and Controllers; Emergency Shutdown in One- and Two-Family Dwelling Units; Transformers and Transformer Vaults; Identification of Power Sources for Storage Batteries; and Retrofit Trip Units for Equipment Over 1000 Volts Nominal.

Module 6 Changes to Chapter 5

The module opens with 5 changes to the Articles 500-505 on Hazardous (Classified) Locations, including Combustible Gas Detection Systems; New Protection Techniques for Equipment, Type TC-ER-HL and Type P Cable; and Table 505.9(C)(2)(4) for Zone 0, 1, and 2 Locations, There are 8 changes to Articles 511 through 517 such as GFCI in Commercial Garages; Circuit Disconnects in Motor Fuel Dispensing Facilities; and Isolated Ground Receptacles, GFP, Battery Systems, and the Life Safety and Critical Branches of Healthcare Facilities. The module continues with 10 changes to Articles 518-551, including Hard Usage Cords in Theaters, a new Part II in Article 545 on "Relocatable Structures"; GFCI Protection and Service Distribution Points for Agricultural Buildings; Receptacles for Manufactured Home; and Reverse Polarity Devices for RVs. The module finishes with 7 changes to Articles 555 and 590, including Bonding of Non-Current-Carrying Metal Parts, GFCI, and GFPE for Docks and Houseboats; a new Part III to Article 555 on Floating Buildings; and OCPD and a new Exception for Splices in Temporary Installations.

Module 7 Changes to Chapter 6

3h 58m 6s

This final module begins with five changes to Article 600 [Electric Signs and Outline Lighting]; two changes to Article 620 [Elevators, Dumbwaiters, Escalators, Moving Walks, Platform Lifts and Stairway Chairlifts]; and a change to Cables Under a Raised Floor of IT Equipment Rooms in Article 645, along with a thoroughgoing restructuring of Article 625 on EVs, including new provisions for bidirectional power transfer systems. It then covers 18 changes to Articles 680 and 682 that cover Swimming Pools, Fountains, and Natural and Artificially Made Bodies of Water, including new inspection protocols, a return of rules on underground wiring that had been eliminated, new provisions on Low-Voltage equipment and lighting, revised codes on electrically-powered pool lifts, and revised guidance on bonding and equipotential planes. There are 19 changes to PV System codes covered such as those for circuit sizing, OCPD, rapid shutdowns, means of isolating equipment, identification and grouping, new Mating Connectors, new minimums before GFP rules apply to PV Systems, and a vital new informational graphic on large-scale PV systems. The final changes presented revise labeling for Fuel Cell Systems and add new selective coordination guidance for fire pumps.

Testing:

Student's fulfillment of the learning objectives is evaluated through both in-text questions and a 160question final exam drawn at random from a question bank of 480 questions. Students must answer at least 70% of the final exam questions correctly in order to successfully complete the class.

Course Details:

Requirements:

Our system is offered online and so there are a few requirements in order to complete our course. Our course can be taken with a minimal system that meets all of the requirements, but the learning experience will be best if the system meets the recommendations.

Required: Internet capable device. Our course is compatible with smartphones, tablets, and traditional computers. It is not necessary that students own this device, merely that they have access to such a device.

Required: Internet connection.

Recommended: High-speed internet connection. Our course uses a number of videos and therefore the experience will be better with a high-speed connection.

2h 33m 8s

Required: Up-to-date browser.

Recommended: Up-to-date version of Google Chrome.

Course Setup:

Course completion is tracked through questions between the sections. In order to mark the course as complete students will need to answer all of the questions attached to the course.

Upon enrolling in our course students will have access for 365 days. After this 365-day period they may contact us to have their enrollment renewed. Any questions, concerns, or issues that arise while taking the class can be addressed by calling the contact number, writing to the contact e-mail, or sending a message through the "Suggestion Box" included in the course. Any message will receive a response within one business day, and usually within one hour.

After finishing all course content, the student will need to fill out the "Completion Questionnaire" so that their completion can be reported to the state.

Continuing Education Credit Criteria:

Each portion of this course is only accessible once the student has satisfactorily completed the course content of the previous portion, including the review questions. Upon successful completion of the course content and any and all review questions, the student completes a "Mandatory Questionnaire" which provides us with the information we need to report completion to the state. The student will then have access to the certificate of completion, which is solely for the student's own records.

Refunds:

All tuition and fees paid by the applicant shall be refunded if the applicant is rejected by the school before enrolment. All tuition and fees paid by the applicant shall be refunded if requested within three business days after the terms and conditions have been accepted (on the enrollment page). All refunds will be returned within thirty business days. After the initial three business days have elapsed, AYPO will happily refund 100% of the purchase price for any course which the student has not yet begun.

Refunds of all or some portion of the purchase price may be available in situations where the student has already started taking the course, but not yet completed it. In general, for individuals who have already completed an entire course, refunds will not be available. Our office staff may be reached at (877) 724-6150 for more information about refund requests.

Attendance and Dismissal:

Students who enroll in this class are required to complete 100% of the course to receive credit. Since this class is presented online, enrolled students are not dismissed.

Course Content:

At Your Pace Online is responsible for the content of this course.