



One- and Two-Family Dwelling Electrical Systems - Part I

Supporting Information

Course Description

This 4-hour course is based on IAEI's One- and Two-Family Dwelling Electrical Systems book. Electrical systems, equipment or components that are not specifically covered in Chapters 34 through 43 of the IRC are required to comply with the applicable provisions of the National Electrical Code, NFPA 70 (see IRC E3401.2).

This program focuses on the requirements for electrical installations based on the electrical code and includes information relative to making proper electrical installations and inspections of residential wiring systems. Part I covers Chapters 1 through 8.

Course Objectives

1. Students will gain an understanding of one- and two family dwelling wiring systems
2. Students will be exposed to definitions and general requirements
3. Students will be competent in services installations as well as grounding and bonding requirements
4. Students will be able to locate requirements for feeders, personnel protection and power and lighting distribution

Learning Outcomes

Upon successful completion of this course participants will be able to:

- Describe general requirements including ampacity and derating
- Explain definitions and compute electrical calculations including ampacity, load, circuits and grounded (neutral) service conductors.
- Understand installations of services including definitions, clearances, service disconnects and permitted uses.
- Discuss grounding and bonding requirements as well as cabinets and enclosures
- Identify requirements for feeders and personnel protection
- Locate power and lighting distribution requirements

Timed Course Outline – (4 online CE hours)

(to ensure students do not get the same exam, test questions are selected at random from a question pool)

1. Introduction (no time allotted for seat time calculation)

- Welcome
- Introduction
- The primary purpose of the NEC
- The NEC and IRC unique definitions
- Important PACE Instructions

Chapter 1 - General Requirements

(15 minutes)

- Article 100: Definitions
- General Requirements
- 90.1 The Purpose of the Code
- Appliance and Utilization Terminals
- Ampacity
- Table 310.15(B)(2)(a) Correction Factors (in part)
- Derating for Ambient Temperature
- Derating for Number of Conductors
- 310.15(A)(2) Exception - Ampacity Selection
- Derating for Temperature and Quality
- Chapter 1 Quiz

Chapter 2 - Electrical Calculations

(25 minutes)

- Introduction
- Planning and Design Practices
- Code Definitions Important to This Chapter
- Article 100: Definitions
- Calculating Service-Entrance Conductor Sizes
- Ampacity 1
- Ampacity 2
- Load Calculation Methods
- Fractions of an Ampere
- Unit Load for Branch Circuits and General Lighting
- General-Use Receptacle Outlets
- Minimum Number of General-Purpose Lighting Circuits

- Small Appliance Branch Circuits
- Laundry Branch Circuit
- Single-Family Dwelling Calculation Example
- Application of Demand Factor
- Other Loads
- Fixed Electric Space-Heating Loads
- Four or More Appliances in the Calculation
- Electric Clothes Dryer Loads
- Electric Ranges
- Minimum Size of Grounded (Neutral) Service Conductor
- Noncoincident Loads
- Heat Pump Loads
- Chapter 2 Quiz

Chapter 3 - Installations of Services

(35 minutes)

- Installation of Services
- General Requirements for Services
- Article 100: Definitions
- 230.9 Clearance on Buildings
- 230.24(A) Clearances Above Roofs
- 230.24(A) Ex. No. 3 - Clearances Above Roofs
- 230.24(B) Vertical Clearances from Ground
- 230.70(A)(1) Service Disconnect Location
- 230.70(A)(2) Not Permitted in Bathrooms
- 230.70(B) Service Disconnect Suitable for the Use
- 110.26(A) Working Space Required
- 230.71(A) Maximum Number of Disconnects
- 230.71(A) & 230.72(A) Service Disconnects Grouped
- Minimum Size of Service-Entrance Conductors
- Section 310.15(B)(7) Permitted to be Used
- 230.40 Ex. No. 1 - Number of SE Conductor Sets
- Number of Service-Entrance Conductor Sets
- Chapter 3 Quiz

Chapter 4 - Grounding and Bonding

(45 minutes)

- Grounding and Bonding
- Article 100 Definitions
- Purpose of Grounding
- 250.24(C) Grounded Conductor to Service
- 250.28 Main Bonding Jumper
- The "Grounding Target" at the Service
- 250.92 and 250.142 Bonding at Services

- SSBJ Size on Supply Side of Service
- SSBJ Size on Supply Side of Service 2
- 250.92(B) Methods of Bonding at Services
- 250.94 Bonding for Other Systems
- The Intersystem Bonding Termination
- 250.52(A) Grounding Electrodes
- 250.50 Grounding Electrode System
- 250.53(D)(2) Supplemental Electrode Required
- 250.52(A)(3) Concrete-Encased Electrodes
- 250.53(A)(2) Supplemental Electrode Required
- 250.68(C)(1) Connections Within First 1.5 m (5 ft)
- 250.58 Common Grounding Electrode
- 250.70 Grounding Electrode Conductor Connections
- Bonding of Metal Water Piping Systems
- Table 250.66 Grounding Electrode Conductors
- Bonding of Metal Water Piping Systems
- 250.104(A) and (B) Bonding of Piping Systems
- Bonding of Other Piping Systems
- Table 250.122 (in part) Sizing EGCs
- Chapter 4 Quiz

Chapter 5 - Cabinets and Enclosures

(15 minutes)

- 312.2 Damp and Wet Locations
- 312.5(C) Cable Entries to Cabinets
- 312.6(C) Protect Conductors from Abrasion
- 240.24 Accessibility and Location of Overcurrent Devices
- 408.4(A) Circuit Directory or Circuit Identification
- 408.3(C) Panelboard as Service Equipment
- 408.36 Overcurrent Protection for Panelboards
- 408.36 Ex. No. 1 Overcurrent Protection
- 408.36(D) Back-Fed Devices
- 408.40 Grounding of Panelboards
- Grounded conductors in panelboards limited to one conductor per terminal
- Chapter 5 Quiz

Chapter 6 - Requirements for Feeders

(15 minutes)

- Requirements for Feeders
- Article 100: Definition of a Feeder
- Equipment Grounding Conductors
- 250.119 Identification of EGCs
- Table 250.122 (in part) Sizing EGCs
- 250.24(A)(5) Separate Neutrals and Grounds

- 338.10 Type SE and USE - Uses Permitted
- 338.10(B) Type SE Cable Permitted as Feeders
- Chapter 6 Quiz

Chapter 7 - Personnel Protection

(30 minutes)

- Chapter 7 - Personnel Protection
- Article 100 Definitions
- 210.8 GFCIs in Readily Accessible Locations
- GFCI Protection Required in Dwellings
- GFCI Principles of Operation
- 210.8(A) GFCI for Dwelling Units
- 210.8(A)(1) GFCI Protection for Bathrooms
- 210.8(A)(2) GFCI Protection in Garages
- 210.8(A)(3) GFCI Protection Outdoor Receptacles
- 210.8(A)(4) Crawl Spaces
- 210.8(A) GFCI for Dwelling Units
- 210.8(A)(6) GFCI Kitchen Countertop Receptacles
- 210.8(A)(7) GFCI Required at Dwelling Unit Sinks
- 210.8(A)(5) GFCI Protection Unfinished Basements
- 210.8(A) GFCI for Dwelling Units
- 210.8(A)(9) GFCI Bathtub or Shower Stalls
- 210.8(A)(10) GFCI Dwelling Laundry Areas
- 210.8(C) GFCI for Boat Hoists
- 210.8(D) Dwelling Unit Kitchen - Dishwasher Branch Circuit
- Table 300.5 GFCI Residential Burial Depth
- 680.71 GFCI for Hydromassage Bathtub
- Chapter 7 Quiz

Chapter 8 - Power & Lighting Distribution I

(30 minutes)

- Power and Lighting Distribution
- Methods of Grounding Receptacles
- 250.146, 250.148 Grounding of Receptacles
- 404.9(B) Grounding of Switches
- 210.21(B) Receptacle Rating and Type
- Rating of Outlet Devices
- 210.21(B) & (B)(3) Receptacle Ratings
- 210.52(A) Dwelling Unit Receptacle Outlets
- 210.52(A) Receptacle Locations and Spacing
- 210.52(A)(3) Floor Receptacles
- 210.52(A)(2) Receptacle Location and Spacing
- 210.52 Dwelling Unit Receptacle Outlets
- 210.52(B) Small Appliance Receptacles
- 210.52(B)(2) Ex. No. 1 & 2 No Other Outlets

- 210.52(C) Kitchen Countertop Receptacles
- 210.52(C) Kitchen Receptacles at Counter Spaces
- 210.52(C)(5) Kitchen Countertop Receptacles
- 210.52(C)(5) Receptacle Outlet Locations
- 210.52(C)(4) Separate Spaces
- 210.52(D) Bathroom Receptacle Outlet
- 210.11(C)(3) Bathroom Branch Circuit
- Chapter 8 - Power & Lighting Distribution I Quiz

Chapter 8 - Power & Lighting Distribution II

(30 minutes)

- 210.52(E)(1) Outdoor Receptacle Outlet(s)
- 210.52(E)(3) Balconies, Decks, and Porches
- Laundry Circuit and Outlet(s)
- 210.52(F), 210.50(C) Laundry Receptacle Outlet(s)
- 210.52(G) Basements, Garages, and Accessory Buildings (with Power)
- 210.52(G)(1) Dwelling Unit Garages
- 210.52(I) Foyers
- 210.70(A)(1) Lighting Outlets Required
- 210.70(A)(2)(c) Switches at Stairways and Landings
- 210.70(A)(3) Storage or Equipment Spaces
- Wiring Methods
- Ampacity of Type NM Cables
- 300.4(A) Cable Protection Requirements
- 300.4(A)(1) Ex. No. 2: Cable Protection
- 300.4(A) Cable Protection Requirements
- 334.80 Ampacity of Type NM Cable
- Table 310.15(B)(3)(a) Adjustment Factors for More Than Three Current-Carrying Conductors
- Article 338 Service-Entrance Cable
- Underground Feeder and Branch-Circuit Cable
- Table 300.5 Underground Wiring Installations
- 300.5(C) and (D) Underground Cables Under Buildings
- Chapter 8 - Power & Lighting Distribution II Quiz

Total Seat Time: 240 minutes

Utah Electrician (DOPL)
Continuing Education Course Completion Certificate

David Arnold

License Number: 123456

*This certifies that the individual named has successfully
completed the course requirements for:*

One- and Two-Family Dwelling Electrical Systems - Part I

Course Approval Number: xxxxx

*which was completed on 4/21/2022
and has earned 4.00 continuing education hours.*

Online course provided by:

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Instructor Name: Jody Wages



www.pacepdh.com

A handwritten signature in black ink, appearing to read "Ron May".

Ron May, Vice President



Course Syllabus

Sponsor / Facilitator Information

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Assignments and Homework:

This is an online course. All course work is contained within the course itself. There are no additional assignments or homework outside the course itself.

Broadcast Schedules:

All portions of this course may be taken at any time 24/7, at the student's discretion.

Student Material Requirements:

This course requires an Internet connection. While the course will play using a slower connection, a higher speed connection (e.g. DSL or cable modem) is recommended because of the extensive use of audio in the course. The course also can be played on a tablet or smart phone.

Testing and Grading Information:

The course includes quizzes throughout the course, typically about every half hour. The

passing score for the quizzes is 70%. The *NEC*® 2020 code book may be used as a reference during testing.

Library and Resource Information:

Strikethrough code language, showing previous 2017 code language that has been changed or deleted in the 2020 *NEC*, is available in the Summary of Change tab at the end of each code change slide.

Deadlines:

There are no deadlines imposed by PacePDH.com and our courses do not expire. However, to receive credit, the course should be completed before the Board/jurisdiction course approval date expires. The system will not allow you to launch a course that is expired. Obviously, you should try to complete the course before your individual license renewal period ends.

Registration Period:

You may register for this course at any time.

Fees and Refunds:

PacePDH.com typically receives course tuition payments in advance via student credit or debit card payments through its secure online Web portal. Checks are also accepted; in which case courses are assigned once the check is received. For company or group purchases, payment terms may be given.

PacePDH.com's refund policy is simple, a full cash refund is offered for up to 90 days or until the course has been completed, whichever comes first. After the 90 day period courses that have not been completed can be converted into course credits for other Pace offerings. For example, if a student has completed one hour of a four-hour online course and then decides they do not want to complete the course, a full refund is still offered if it is within 90 days of the purchase date, otherwise a course credit is offered. Once the online course has been completed, as determined by our LMS (learning management system), a refund is no longer offered.

ADA Information:

This course is not compliant with Section 508 of the U.S. Rehabilitation Act.

Technology Support Services:

Tech support for students is available Monday through Friday 8AM to 6PM eastern time. Afterhours and weekend support is offered at times. Support is available by phone at

(800) 576-4341, via Web form at <http://www.pacepdh.com/index.cfm?fuseaction=custom.contact> or via e-mail at PaceSupport@PacePDH.com .

Completion and Assignment Time Lines:

See “Deadlines” above.

Prior Learning Assessments / Prerequisites:

There are no prerequisites for this course. Course interface/navigation instructions, “Ask the Instructor” and directions on how to take personal course notes are provided at the beginning of the course.