



# One- and Two-Family Dwelling Electrical Systems - Part II

## 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 II covers Chapters 9 through 17.

### **Course Objectives**

1. Students will gain an understanding of one- and two-family dwelling wiring systems
2. Students will be exposed to outlet device requirements and luminaires for the home
3. Students will be competent in heating and A/C equipment and appliances
4. Students will be able to understand special requirements for swimming pools and low voltage installations

### **Learning Outcomes**

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

- Describe outlet device requirements and luminaires for the home
- Discuss requirements for A/C equipment and baseboard heating units
- Identify specifications for appliances
- Understand provisions for swimming pools
- Explain requirements for supply to separate buildings and existing electrical wiring
- Locate low voltage wiring specifications

## **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)

Introduction (so seat time allocated)

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

Chapter 9 - Outlet Devices

(25 minutes)

- Outlet, Device, Pull, and Junction Boxes; Conduit Bodies; Fittings; & Handholes
- Box Volume Calculations
- 314.16(B) Box Fill Calculations
- 314.16(B)(1) Exception: Fixture Wires
- 314.16(B) Box Fill Calculations
- 334.30, 314.17(C) Securing Cables at Boxes
- 314.27(A)(1) Boxes for Luminaires
- 314.27(D) Support of Utilization Equipment
- 314.27(B) Listed Floor Boxes to be Used
- 314.27(C) Boxes at Ceiling-Suspended (Paddle) Fan Outlets
- 314.27(C) and 422.18 Boxes Supporting Paddle Fans
- 314.27(C) Boxes at Ceiling Fan Locations
- 300.22(C) Exception: Through Wiring Permitted
- Chapter 9 Quiz

Chapter 10 - Luminaires for the Home

(15 minutes)

- 410.10(A) Suitable for Wet or Damp Locations
- 410.10(D) Bathtub and Shower Areas
- 410.16(C) Incandescent or LED Luminaires
- 410.16(C) Fluorescent Luminaires
- 410.16(B) Luminaires Not Permitted in Closets
- 410.116(A)(1), 410.116(B) Installation in Insulation
- 410.52 Temperature Rating of Conductors
- 406.12(A) Tamper-Resistant Receptacles
- 406.12(A) Exception: Tamper-Resistant Receptacles
- 406.9 Receptacles in Damp or Wet Locations
- 406.9(C) Receptacles Not in Shower or Tub Spaces
- Chapter 10 Quiz

## Chapter 11 - Requirements for Appliances

(10 minutes)

- Article 100: Definitions
- Branch Circuit for Appliances
- 422.12 Individual Branch Circuit Required
- 422.16(A) Use of Flexible Cords Limited
- 422.16(B) Appliances Connected with Flexible Cords
- 422.16(B) Flexible Cords Permitted
- 422.13 Wiring of Electric Water Heaters
- 422.11 OCPD for Electric Water Heaters
- 422.31 Disconnecting Means Required
- Chapter 11 Quiz

## Chapter 12 - Baseboard Heating Unit

(10 minutes)

- Article 424- Fixed Electric Space-Heating (FESH) Equipment
- 210.52 - Informational Note: Receptacle Locations
- 424.3 Branch Circuits for FESH Equipment
- 424.3 Branch Circuit Requirements
- Answers to Questions 1 and 2 (previous slide)
- 424.19 Disconnecting Means Required
- 424.22 Overcurrent Protection for FESH
- Chapter 12 Quiz

## Chapter 13 - A/C Equipment

(15 minutes)

- Air-Conditioning Equipment Installations
- AC Unit Nameplate Information
- 440.4(B) Nameplate Required
- 440.4(B) Minimum Circuit Ampacity
- 440.22(A) Branch-Circuit Short-Circuit and Ground-Fault Protection
- 440.14 Disconnecting Means Location
- 110.26 Adequate Working Space Required
- 210.63 Service Receptacle Required
- Chapter 13 Quiz

## Chapter 14 Swimming Pools I

(35 minutes)

- Article 680
- NEC Article 680
- Article 680 Organization
- Application of Other Articles
- Article 680: Definitions

- Ground-Fault Circuit-Interrupter Types
- Class A GFCI Device
- GFCI Requirements for Swimming Pools
- Grounding Requirements
- Cord- and Plug-Connected Equipment
- Overhead Conductor Clearances for Pools, etc.
- Underground Wiring Depths and Locations
- Electric Pool Water Heaters
- Equipment Rooms and Pits
- Maintenance Disconnecting Means
- Receptacle Locations for Permanently Installed Swimming Pools
- Luminaires, Lighting Outlets and Ceiling Fans
- GFCI Protection in Adjacent Areas for Luminaires
- Low-Voltage Luminaires
- Switching Devices
- Underwater Luminaires- Supplied by a Transformer or Power Supply
- Underwater Luminaires- Supplied by a Branch Circuit
- Underwater Luminaire Installation Requirements
- Wet-Niche Luminaires
- Chapter 14 Swimming Pools I Quiz

#### Chapter 14 - Swimming Pools II

(40 minutes)

- Wet-Niche Luminaires
- Dry-Niche and No-Niche Luminaires
- Equipment Grounding for Underwater Luminaires
- Equipotential Bonding Requirements
- The Equipotential Bonding Grid
- Underwater Audio Equipment Installation(s)
- Wiring Methods for Permanently Installed Pool-Associated Motors
- Feeders Supplying Pool Equipment
- Electrically Operated Pool Covers for Permanently Installed Pools
- Storable Pools, Storable Spas, and Storable Hot Tubs
- Storable Pools, Storable Spas, and Storable Hot Tubs- Luminaires
- Storable Pools, Storable Spas, and Storable Hot Tubs- Receptacles
- Spas, Hot Tubs and Equipment Assemblies
- Spa or Hot Tub Installed Outdoors
- Spa or Hot Tub Installed Indoors
- Luminaires, Lighting Outlets, and Ceiling Fans Near Indoor Spas or Hot Tubs
- Wall Switches in the Vicinity of Indoor Spas or Hot Tubs
- Grounding of Indoor Spas and Hot Tubs
- Electric Water Heaters for Indoor Spas or Hot Tubs
- Ground-Fault Circuit-Interrupter Protection of Spas and Hot Tubs
- Hydromassage Bathtubs in Dwellings
- Hydromassage Bathtubs in Dwellings- GFCI Protection

- Hydromassage Bathtubs in Dwellings- Access
- Hydromassage Bathtubs in Dwellings- Bonding
- Chapter 14 Swimming Pools II Quiz

#### Chapter 15 - Supply Separate Buildings

(25 minutes)

- Branch Circuits & Feeders Run to Accessory Buildings
- Outside Branch Circuits and Feeders
- Load Calculations and Overcurrent Protection
- Minimum Size of Conductors
- Conductor Covering and Wiring Methods on Buildings and Outbuildings
- Overhead Circuits Leaving or Entering a Building
- Clearance for Overhead Conductors
- Underground Outside Branch Circuits and Feeders
- Disconnecting Means Required at Each Separate Building and Structure
- Grounding Requirements in Separate Buildings or Structures
- Feeder and Branch Circuit Equipment-Grounding Means
- Grounding Electrode System for a Separate Building or Structure (Outbuilding)
- Sizing Grounding Electrode Conductor(s) (Outbuilding)
- Grounding Electrodes at Separate Buildings or Structures (Outbuildings)
- Bonding Grounding Electrodes Together (Outbuildings)
- Chapter 15 Quiz

#### Chapter 16 - Existing Electrical Wiring

(30 minutes)

- Existing Electrical Installations & Wiring
- Modifying Circuits and Equipment in Existing Dwellings
- Extension of Existing Branch Circuits
- AFCI Protection for Branch Circuit Extensions or Modifications
- Knob-and-Tube Wiring
- Uses Permitted for Knob-and-Tube Wiring
- Uses Not Permitted for Knob-and-Tube Wiring
- Changing from Existing Knob-and-Tube Wiring
- Replacing Existing Luminaires
- Replacing Non-Grounding Type Receptacles
- Where a Grounding Means Exists in the Box
- Where a Grounding Means Does Not Exist in the Box
- Grounding of Branch-Circuit Extensions
- Replacement Where GFCI Protection Is Required
- Replacement Where Tamper or Weather Resistant Receptacles Are Required
- Switches Where No Grounding Means Exists in the Box
- Grounding Cooking Appliances and Clothes Dryers on Existing Branch Circuits
- Edison-Based Type Plug Fuses

- Chapter 16 Quiz

## Chapter 17 - Low Voltage Systems

(35 minutes)

- Low Voltage & Limited Energy Systems
- Class 1, Class 2, & Class 3, Remote-Control, Signaling, & Power-Limited Circuits
- NEC Definitions
- Remote-Control, Signaling, and Power-Limited Circuits
- Wiring Methods for Class 2 Circuits
- Electric Light or Power Circuits and Class 2 Circuits
- Class 2 Conductors and Cables within Buildings
- Fire Alarm Systems
- Branch Circuit for Fire Alarm Circuits
- Communications Circuits
- Communications Circuits- Mechanical Execution of Work
- Communications Circuits- In Raceways, Boxes, and Cables
- Required Communications Outlet at Dwelling Units
- Intersystem Bonding Termination
- Radio and Television Equipment
- Grounding for Receiving Stations
- Bonding Grounding Electrodes Together
- Local Community Antenna Television Systems (CATV)
- Network-Powered Broadband Communications (NPBC) Systems
- NPBC Installation Requirements
- Premises-Powered Broadband Communications Systems
- Wiring in Air-Handling Spaces
- Chapter 17 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 II*

Course Approval Number: xxxxx

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

*Online course provided by:*

**The Media Factory, Inc. (d/b/a PacePDH.com)**

Tampa, FL 33609

(813) 830-6523

Instructor Name: Jody Wages



[www.pacepdh.com](http://www.pacepdh.com)

A handwritten signature in black ink, appearing to read "Ron May". The signature is fluid and cursive, written over a white background.

*Ron May, Vice President*



# Course Syllabus

## **Sponsor / Facilitator Information**

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## **Instructor / Code Change Content Expert**

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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](mailto: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.