APPLICATION INSTRUCTIONS FOR CONTINUING EDUCATION PROVIDERS FOR ELECTRICIANS

2026 LICENSE RENEWAL YEAR

ALL ELECTRICAL LICENSE TYPES INCLUDING:
E-1, E-2, E-4, E-5, E-9, C-5, C-6, C-7, C-8, L-1, L-2, L-5, L-6, PV1, PV2, T-1, T-2

- All applications for Providers submitting and requesting approval of the 2026 Electrical Continued Education Program shall be submitted electronically. The following link to a You Tube video is available for anyone to review on how to complete this on line application process. The link is: CE Provider Online Submission Procedures- 20220513 130414 Meeting Recording – YouTube

- Providers should submit their completed applications as soon as possible so that review and approvals (allow 2 weeks) can be completed by September 15th PA 21-37 requires that licensees are to complete their continued education 90 days prior to renewal of their license.

- Each of the following documents shall be uploaded electronically through the application.
  - Certificates of Insurance - (Verify the effective dates)
  - School Status (Proof of private, public, trade union or trade association)
  - Experience (Proof of educational training experience in trade)
  - Certificates (Copy of certificates to be issued to attendees - must indicate **"2026 Renewal Year")** Certificates to students shall be on official school stationary showing: school name, school code, name of licensee, license number and type (verified against license or www.elicense.ct.gov), name of course, number of classroom hours, date and location of course.
  - Current Fire Marshal certificate (Indicating acceptable use of each facility)
  - Advertisements (Copy of all advertisement to be used)
  - Policies (Copy of school policies for tuition, related costs, cancellations/refunds)
  - Offerings (Dates, hours and locations of all classes)
  - Instructors (Names, addresses, Connecticut occupational license number and resumes for all instructors that will be teaching. Any changes (additions or deletions) to the instructor list must be submitted for additional approval.)
  - References (List of all reference materials to be used)
  - Teaching aids (Copy of any teaching aids such as Power Point, etc.)
  - Handout (Copy of bound handout to be distributed to each attendee or provided electronically for on-line classes, which includes laws and standards, safety, power point presentations and applicable calculations) Materials unrelated to the course content and advertisements shall not be included in course handouts or otherwise provided during the course.

- Course offerings for one licensed type and category may not be combined or taught with curriculum for other license types and categories. For example, a course may not be designated as being for E-1 and C-5, or PV-2 and L-2. Each license type and category are a separate class.

- All license holders attending classes **shall be required** to bring their copy of the **2023** National Electrical Code to class. Attendees shall also bring a functioning calculator.

  Electronic versions of the **2023** National Electrical Code are acceptable subject to individual Provider approval. **Providers shall include the following in all course advertisements:**

  - *Requirement to bring a copy of the **2023** National Electrical Code to class.*
  - *Provider policy on viewing the **2023** National Electrical Code on an electronic device during the course (cell phones will not be acceptable); and*
  - *Policy for any other materials or devices required to bring to the course.*

- Providers who desire to add any training locations or add/change any instructors that have not been previously approved to their schedules must apply for approval at least **60 days** prior to the intended date of usage.
- Providers are required to have each attendee sign a "sign in/sign out" sheet at the beginning of each class, at the end of each class, and each time an attendee leaves the room during such course. Providers must retain copies of attendance sheets for four (4) years after each course.
- Certificates of course completion shall not be distributed to any attendee until the very end of the class, at which time the person who is named on the certificate must be present and have attended all the prescribed hours of the class before the certificate is issued to such person. No certificates shall be issued to any person who is not in attendance at the end of the class. For on-line classes, and only for those people that have attended the entire class, certificates of completion shall be mailed to that attendee.
- At the completion of each course, Providers must provide PSI Examination Services ("PSI") an electronic file for each of their students. Such electronic file shall comply with all the data fields required by PSI in the template mandated by PSI. **All reports must be transmitted to PSI within 14 calendar days of each completed course.**

- After receiving course approval and prior to holding the first class, each Provider shall submit to the Department of Consumer Protection a copy of the **bound attendee handout booklet.**
- Once the application is processed and approved, the Provider will receive written confirmation that their course(s) have been fully approved. Without receipt of the written notification, a Provider shall not conduct or advertise for such courses.
- At the July 12, 2024 Electrical Work Board meeting, the board discussed and agreed that a licensed person who is teaching a Continuing Education Class is not required to take a separate class for the renewal of their personal electrical license, and that the provider shall issue a certificate of completion of the course to that individual.
- **IMPORTANT NOTICE:** Please be advised of the following Continuing Education requirements which all approved providers will need to adhere to. These changes are incorporated in HB5330, PA 22-104, Section 42. The following is a link to PA 22-104 for your reference. https://www.cga.ct.gov/2022/act/P a/pdf/2022PA-00104-R00H8-05330-PA.PDF
  - In person class size will be limited to 50 attendees
  - Online classes will be limited to 25 attendees
  - No Classes will be offered or held at a contractor's place of business
  - Providers shall retain an audio-visual recording of each class for a period of 30 days after the class and make such recording available to the department upon request.

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC SAFETY

DIVISION OF FIRE, EMERGENCY & BUILDING SERVICES
OFFICE OF STATE FIRE MARSHAL

On *(date)* _____, the *(Town/City)* _____Office of the Fire Marshal conducted an inspection of *(name of facility)* _____ *located at (address)* _____in the City/Town of _____to determine the degree of compliance with the fire safety requirements of Connecticut General Statutes Chapter 541 as authorized by Section 29-305 of the statutes. This facility was evaluated as a (new/existing) _____(occupancy classification) _____ as classified by the CONNECTICUT FIRE SAFETY CODE. As a result of this inspection, the following conditions were found:

I. At the time of inspection, no code violations were identified. **Certificate of approval recommended.**

II. At the time of inspection, conditions were discovered to be contrary to the minimum requirements of these codes. An acceptance plan of correction was submitted. *(See attached information) Certificate* **of approval recommended.**

III. At the time of inspection, conditions were discovered to be contrary to the minimum requirements of these codes. No approved plan of correction was submitted. (See *attached information) Certificate* **of approval NOT recommended.**

IV. Based on the extreme hazard to the public safety discovered at the time of this inspection, this office is currently seeking an injunction from the court through our Town/City Attorney for the purpose of closing or restricting usage of this facility by the public. *(See attached information) Certificate* **of approval NOT recommended.**

Fire Marshal Name & Signature _____Date _____

_____
City or Town

Please Note: A fire marshal inspection is valid for one year from the date of the last inspection.

STATE OF CONNECTICUT

DEPARTMENT OF CONSUMER PROTECTION
OCCUPATIONAL & PROFESSIONAL LICENSING DIVISION

EVALUATION FORM FOR ELECTRICAL CONTINUING EDUCATION COURSE

TO BE FILLED OUT BY THE STUDENT AND MAILED TO THE ADDRESS BELOW, OR
FILL OUT ON LINE AT: https://portal.ct.gov/occeval
PROVIDERS ARE NOT PERMITTED TO COLLECT, PROCESS OR DELIVER THIS INFORMATION

Date: _____ Email Address: _____Phone: _____

Student Name: _____

School Name: _____Course Name: _____

Location of Class: _____Time: _____Course Date: _____

Each instructor shall be evaluated by the students at the end of the course. Please rate your instructor and course in the following categories. Circle your choices.

INSTRUCTOR/ FACILITY	POOR	FAIR	GOOD	VERY GOOD
1. Started and ended class on time	1	2	3	4
2. Instructor's delivery of subject matter	1	2	3	4
3. Level of preparation for the class	1	2	3	4
4. Knowledge of the subject	1	2	3	4
5. Ability to answer questions	1	2	3	4
6. Rapport with the class	1	2	3	4
7. Made learning enjoyable	1	2	3	4
8. Enthusiasm	1	2	3	4
9. Depth of coverage	1	2	3	4
10. Taught the course as it was advertised	1	2	3	4
11. Gave me information that will benefit	1	2	3	4
12. Overall evaluation of the Instructor	1	2	3	4
13. Registration process	1	2	3	4
14. Staff handled in a professional manner	1	2	3	4
15. Materials (handouts)	1	2	3	4
16. Course content	1	2	3	4
17. Overall evaluation of the course	1	2	3	4
18. Accommodations of Facility	1	2	3	4

19. Was the class physically attended or virtually online ___ virtual ___ physically in person
20. If Virtual online, was the internet connection maintain for the duration of class Yes No
21. If connection not maintained, estimate percentage of class time to reestablish ___ _
22. Is your preference to take the class ___ virtually online or ___ physically in person?

Comments: _____

_____

Mail to: Department of Consumer Protection
Occupational & Professional Licensing Division
John Mesner
450 Columbus Boulevard, Suite 901
Hartford, Connecticut 06103

Updated: August 8th, 2025

2026 Continuing Education for Electricians
CURRICULUM OUTLINE

ALL ELECTRICAL LICENSE TYPES INCLUDING:
E-1, E-2, E-4, E-5, E-9, C-5, C-6, C-7, C-8,
L-1, L-2, L-5, L-6, PV1, PV2, T-1, T-2

PART I - Connecticut General Statutes

(1/2 Hour To Inform/Quick Review Attendees Material in Handout)

Connecticut General Statutes & Regulations:

Include the following Connecticut General Statutes and Regulations in all course handouts to attendees for their future reference. *(Classroom review not required.)*

- Sec 20-340 Exemptions from licensing requirements
- Sec 20-332b, Sec 20-332c Hiring ratios re apprentices, journeymen and contractors (See Exhibit A below)
- Sec 20-332-15-a Employment of apprentices
- Sec 20-332-15-a(f) How to register an apprentice
- Sec 20-332-16 Prohibited acts. Records. Lettering
- Sec 20-335 License fee. Continuing education requirements. Expiration and renewal
- Sec 20-338a Work required to be performed by licensed persons
- Sec 20-338b Building permits applications. Who may sign
- Sec 20-338c Work not to commence until permit is obtained
- Sec 20-340 Exemptions from licensing requirements
- Sec 20-341 Penalties for violations

"NEW" LEGISLATIVE CHANGES TO HIRING

SEE APPENDIX "A"

Sec. 20-332b. Hiring ratios re apprentices, journeymen and contractors. Electrical, plumbing, heating, piping and cooling, sprinkler fitter and sheet metal work.

HIRING RATIO CHART

Electrical, Plumbing, Heating, Piping and Cooling,
Sprinkler Fitter and Sheet Metal Work Trades

Apprentices	Licensees (Journeymen or Contractors)
1	1
2	2
3	3
4	6
5	9
6	12
7	15
8	18
9	21
10	24

Ratio continues at 3 Joumeypersons
To 1 Apprentice

SEE APPENDIX "A" FOR ADDITONAL LANGUAGE

(To be included in attendees handout booklet)

2026 Connecticut State Building Code

(Include in all course handouts to attendees for their future use and review with class.)

Building and Fire Code Adoption Process

State Building, Fire Safety and Fire Prevention Codes Update
The **Department of Administrative Services**, **Office of the State Building Inspector** and **Office of the State Fire Marshal**, in conjunction with the **Codes & Standards Committee** and the **Fire Prevention Code Advisory Committee**. Planned adoption of the following codes for Spring 2026.

- 2026 Connecticut State Building Code (CSBC)
- 2026 Connecticut State Fire Safety Code (CSFSC)
- 2026 Connecticut State Fire Prevention Code (CSFPC)
- 2024 International Building Code (IBC) by the ICC
- 2024 International Existing Building Code (IEBC) by the ICC
- 2024 International Energy Conservation Code (IECC) by the ICC
- 2024 International Mechanical Code (IMC) by the ICC
- 2024 International Plumbing Code (IPC) by the ICC
- 2024 International Residential Code (IRC) by the ICC
- 2024 International Swimming Pool & Spa Code (ISPSC) by the ICC
- 2023 NFPA 70 National Electrical Code (NEC) by NFPA
- 2017 ICC A117.1 Accessible and Usable Buildings and Facilities by the ICC
- 2024 International Fire Code {IFC) by the ICC
- 2024 NFPA 101 - Life Safety Code by the NFPA
- 2024 NFPA 1- Fire Code by the NFPA
- 2025 NFPA 72 - National Fire Alarm Code by the

NFPA The model codes are viewable on their publisher's web sites:

- **International Code Council {ICC) Codes**
- **National Fire Protection Association (NFPA) Codes**

https://portal.ct.gov/DAS/Office-of-State-Building-lnspector/Building-and-Fire-Code-Adoption- Process/Documents

NOTE: Always refer to the State Building Officials website indicated above for all of the most currently adopted codes and "AMENDMENTS" to the codes.

- **Discuss the CT Amendments to the 2023 NEC and other adopted codes containing amendments with reference to electrical.**

PART II – Safety

(1/2 Hour to Review with Class and Inform Attendees Material is in Handout)

All referenced handouts are provided at the end of the curriculum. Handouts should be included as part of the course materials provided to students.

HARD HATS or SAFETY HELMET ?

1) OSHA – Hard Hats to Safety Helmets for OSHA Employees

2) Hard Hats vs. Safety Helmets

WORKPLACE STRESS

1) Suicide Prevention in Construction

2) National Stand-Down

3) Workplace Mental Health

4) Long-Term Stress Harms Everyone in the Workplace

5) Workplace Stress – Overview

6) Workplace Stress – Understanding the Problem

7) Workplace Stress – Guidance and Tips for Employers

8) Workplace Stress – Training Resources

9) Workplace Stress – Real World Solutions

10) Workplace Stress – Outreach Materials

PART III - 2023 National Electrical Code

(3 Hours Instructional Time)

UNLIMITED ELECTRICAL LICENSE TYPES INCLUDING:
E-1, E-2, E-4, E-5, E-9

1. Review changes in Chapter 1,2 and 3 comparing 2020 to the 2023 National Electrical Code.
2. How to find 2023 NEC TIA's and Errata's
3. Calculations - SEE APPENDIX "B"

PART III - 2023 National Electrical Code

(3 Hours Instructional Time)

LIMITED ELECTRICAL LICENSE TYPES INCLUDING:
C-5, C-6, C-7, C-8, L-1, L-2, L-5, L-6, PV1, PV2, T-1, T-2

- For each license type listed above, review applicable changes to the license type in Chapter 1,2 and 3 comparing 2020 to the 2023 National Electrical Code
- How to find 2023 NEC TIA's and Errata's.
- Review by examples, Raceway Fill Informative Annex C
- Calculations based on bundling structured wiring - SEE APPENDIX "B"

C5, C6, L5, L6 Limited Licenses: (Emphasis on alarm systems & low voltage)

- Provider to explain difference between "C5/C6 and L5/L6" licenses relative to the
- following:
- C5/C6 - system voltage not to exceed 48 volts or 8 amperes.
- L5/L6 - system voltage not to exceed 25 volts or 5 amperes.
- Provider shall provide curriculum as it relates to changes and/or new product developments relative to the scope of work covered by these license types.

C5, C6, T1, T2 Limited Licenses: (Emphasis on telecommunications, data, grounding and bonding)

- Providers shall provide curriculum as it relates to changes and/or new product developments relative to the scope of work covered by these license types.

C7, C8 Limited Licenses:

- Providers shall provide curriculum as it relates to changes and/or new product developments relative to the scope of work covered by these license types.

L1, L2 Limited Licenses:

- Providers shall provide curriculum as it relates to changes and/or new product developments relative to the scope of work covered by these license types.

PV1, PV2 Limited Licenses:

- Providers shall provide curriculum as it relates to changes and/or new product developments relative to the scope of work covered by these license types.

END

APPENDIX "*A*"

Senate Bill No. 1465

Public Act No. 25-47

AN ACT AUTHORIZING THE COMMISSIONER OF CONSUMER PROTECTION TO ALLOW CERTAIN SKILLED TRADE LICENSEES TO DEVIATE FROM CERTAIN SKILLED TRADE HIRING RATIOS.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 1. Section 20-332b of the general statutes is repealed and the following is substituted in lieu thereof *(Effective October 1,* 2025):

(a) The [Commissioner of Consumer Protection shall amend existing regulations of Connecticut state agencies adopted pursuant to section 20-332 to specify the] following allowable hiring ratios [regarding] shall apply to apprentices, [journeymenl journeypersons and contractors for the following trades:

TRADE
Electrical, Plumbing, Heating, Piping and Cooling,
Sprinkler Fitter and Sheet Metal Work

Apprentices	Licensees (Uourneymen] Journeypersons or Contractors)
1	1
2	2
3	3
4	6

5	9
6	12
7	15
8	18
9	21
10	24

Ratio continues at 3 Journeypersons
To 1 Apprentice

(1) Notwithstanding the provisions of subsection (a) of this section, a licensed contractor may hire one or more additional apprentices even if the licensed contractor does not employ a sufficient number of licensees to satisfy the applicable allowable hiring ratio established in subsection (a) of this section, provided:

(A) The licensed contractor submits a ratio relief application to the Department of Consumer Protection, in a form and manner prescribed by the Commissioner of Consumer Protection, for such additional apprentice or apprentices, which application shall include, at a minimum:

(i) The name and contact information of the licensed contractor;

(ii) The name and contact information of the licensed and registered apprentices currently employed by the licensed contractor;

(iii) The name and contact information of each such additional apprentice, if known by the licensed contractor;

(iv) Information demonstrating that the criteria established in subparagraph (A) of subdivision (2) of this subsection or pursuant to subsection (a) of section 2 of this act have been satisfied;

(v) A statement disclosing whether the Department of Consumer Protection has taken any disciplinary action against the licensed

contractor during the three-year period immediately preceding the date of such application, and, if so, a description of such disciplinary action;

(vi) A statement disclosing whether the Labor Department has taken any enforcement action against the licensed contractor pursuant to chapter 558 during the three-year period immediately preceding the date of such application, and, if so, a description of such enforcement action;

(vii) A copy of each notice of termination of an apprenticeship agreement that the licensed contractor submitted to the Labor Department during the three-year period immediately preceding the date of such application;

(viii) If during the three-year period immediately preceding the date of such application a state agency authorized the licensed contractor to hire one or more apprentices in excess of the applicable allowable hiring ratio established in subsection (a) of this section, an attestation from the licensed contractor that (I) the state agency authorized the licensed contractor to hire such apprentice or apprentices during such three-year period, (II) the licensed contractor continues to employ such apprentice or apprentices or offered to rehire such apprentice or apprentices prior to the date of such application, and (III) the licensed contractor did not terminate the employment of such apprentice or apprentices for any reason other than that a position with the licensed contractor was unavailable; and

(ix) Any other information the Commissioner of Consumer Protection, in the commissioner's discretion, deems relevant for the purposes of this subsection; and

(B) The ratio relief application submitted to the department pursuant to subparagraph (A) of this subdivision is approved in the manner set forth in subparagraph (A) of subdivision (2) of this subsection or

subdivision (1) of subsection (b) of section 2 of this act.

(2) (A) the commissioner or the commissioner's designee determines that the licensed contractor employs a combination of not more than eight journeypersons and contractors including such licensed contractor, and the applicant attests that the Labor Department has not taken any enforcement action against the licensed contractor pursuant to chapter 558 during the three-year period immediately preceding the date of such application, the commissioner or such designee shall render a decision approving such application, provided the licensed contractor:

(i) Seeks to hire one or more additional apprentices at a ratio that does not exceed one apprentice to one journeyperson or contractor;

(ii) Attests that at least one such apprentice is enrolled in a qualified apprenticeship training program that is offered by a school in the Technical Education and Career System established under section 10-95, unless the licensed contractor made a good faith effort to seek out an apprentice enrolled in such a program and such effort was unsuccessful; and

(iii) Attests that the licensed contractor is suffering from an undue operational hardship due to the applicable allowable hiring ratio established in subsection (a) of this section.

(B) The commissioner or the commissioner's designee shall send notice of the decision rendered under subparagraph (A) of this subdivision to the licensed contractor in a form and manner prescribed by the commissioner not later than ten business days after the department received such application.

(C) Each decision rendered under subparagraph (A) of this subdivision shall be a final decision for the purposes of section 4-183.

(3) If the commissioner or the commissioner's designee determines,

after reviewing the application submitted pursuant to subparagraph (A) of subdivision (1) of this subsection, that the licensed contractor employs a combination of more than eight journeypersons and contractors including such licensed contractor, that the Labor Department has taken any enforcement action against the licensed contractor pursuant to chapter 558 during the three-year period immediately preceding the date of such application or that the licensed contractor otherwise does not satisfy the criteria set forth in subdivision
(2) of this subsection, the commissioner or such designee shall refer such application to the appropriate examining board established under section 20-331.

(4) The Commissioner of Consumer Protection may, in accordance with the provisions of chapter 54, amend any regulations adopted pursuant to section 20-332 to effectuate the provisions of this subsection.

Sec. 2. (NEW) *(Effective October 1,* 2025) (a) (1) Not later than February 1, 2026, each examining board established under section 20-331 of the general statutes shall establish a set of criteria for the purpose of determining whether good cause exists for such board to approve the ratio relief applications referred to such board pursuant to subdivision
(3) of subsection (b) of section 20-332b of the general statutes, as amended by this act. Such criteria shall include, but need not be limited to, criteria for the review of any such application submitted by a licensed contractor against whom the Labor Department has taken enforcement action pursuant to chapter 558 of the general statutes.

(2) Each examining board may amend the criteria established pursuant to subdivision (1) of this subsection not more frequently than once per calendar year.

(3) The Commissioner of Consumer Protection shall post all criteria established pursuant to subdivision (1) of this subsection, as such criteria may be amended pursuant to subdivision (2) of this subsection,

on the Department of Consumer Protection's Internet web site.

(b) (1) Not later than ninety days after the Commissioner of Consumer Protection refers a ratio relief application to the appropriate examining board pursuant to subdivision (3) of subsection (b) of section 20-332b of the general statutes, as amended by this act, such board shall (A) determine, on the basis of the criteria posted on the Department of Consumer Protection's Internet web site pursuant to subdivision (3) of subsection (a) of this section, whether good cause exists to approve such application, (B) based on such determination, render a decision approving or rejecting such application, and (C) send notice to the applicant disclosing such board's decision and the basis for such board's determination regarding the existence or nonexistence of good cause.

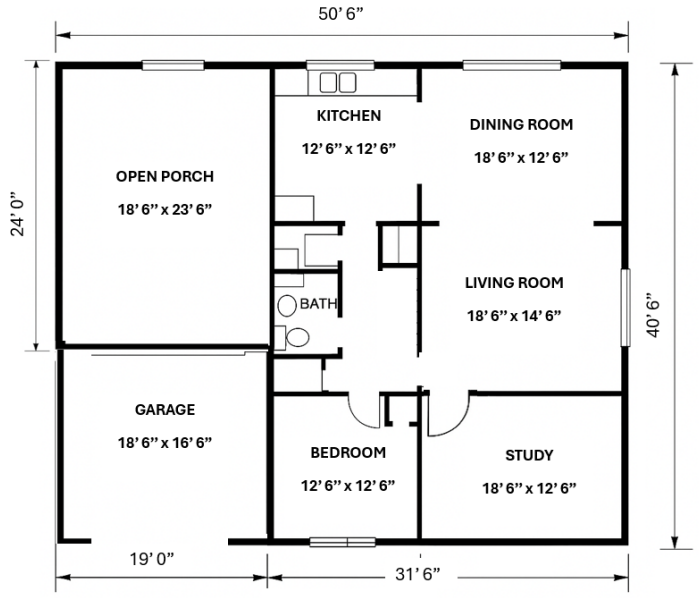
(2) Each decision rendered under subdivision (1) of this subsection shall be (A) a final decision for the purposes of section 4-183 of the general statutes, and (B) exempt from the provisions of subsection (b) of section 21a-7 of the general statutes and subsection (d) of section 21a-9 of the general statutes.

Governor's Action:
Approved June 10, 2025

APPENDIX “B”
2026 CEU Calculations Based on the 2023 NEC

- Floor area calculation 220.5(C)

Question
Calculate the floor area for the illustration below to determine the proper square footage to be used for the load calculations.



A. 2,045.25 square feet
B. 1,275 square feet
C. 1,729.85 square feet
D. 1,589.25 square feet

Solution:
Section 220.5(C)
Length: 40 feet 6 inches = 40.5 feet
Width: 50 feet 6 inches = 50.5 feet
40.5 ft × 50.5 ft = 2,045.25 square feet

Not Included is the Open Porch
Length: 24 feet 0 inches = 24.0 feet
Width: 19 feet 0 inches = 19.0 feet
24 ft × 19 ft = 456.0 square feet

Calculated floor area
Total outside dimension – not included
2,045.25 ft^2 - 456.0 ft^2
1,589.25 square feet

Answer
D. 1,589.25 square feet

- Load calculation for Electric Vehicle Supply Equipment 220.57

Question 1

A multi-unit dwelling complex has 4 electric vehicle charging stations, each rated at 6.8 kW (240V, single-phase) from the nameplate.
What is the minimum calculated load (in kilowatts) that must be considered for the feeder calculation serving the EV charging stations?

A. 27.2 kW
B. 34.0 kW
C. 36.1 kW
D. 28.8 Kw

Solution:
Section 220.57
The EVSE load shall be calculated at either 7200 watts (volt-amperes) or the nameplate rating of the equipment, whichever is higher.
7.2 kW x 4 = 28.8 kW

Answer:
D. 28.8 kW

Question 2

What is the minimum branch circuit size for a Level II EVSE with a 32-ampere current rating?

A. 32 A
B. 35 A
C. 40 A
D. 55 A

Solution:

Sections 625.42 and 210.19(A)(1) EVSE are considered a continuous load so the branch circuit must be rated at 125% of the continuous load.

32 A × 1.25 = 40 A minimum OCPD

Answer: C. 40 A

Question 3

What is the minimum size XHHW-2 copper conductor permitted to supply a Level II EVSE that has a 30-ampere current rating, assuming 75° terminations?

A. 12 AWG
B. 10 AWG
C. 8 AWG
D. 6 AWG

Solution:

Sections 625.42 and 210.19(A)(1) EVSE are considered a continuous load so the branch circuit must be rated at 125% of the continuous load.

30 A × 1.25 = 37.5 A

Table 310.16

While XHHW-2 has a temperature rating of 90° C the conductor must be rated at 75° because of the terminations.

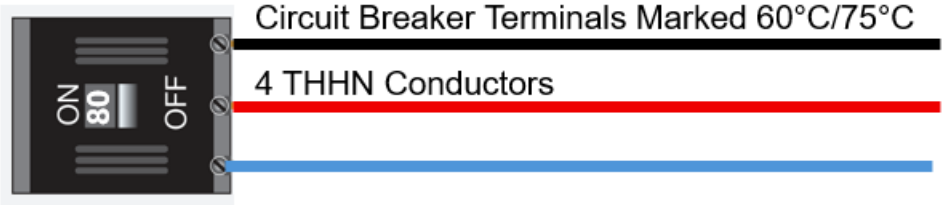
XHHW-2 = 8 AWG is rated for 50 A at 75° C.

Answer: C. 8 AWG

- Problems using a temperature correction factor to cables, conductors in raceways

Question 1

What is the ampacity of a 4 THHN conductor terminated to an 80-ampere circuit breaker that is marked for 60°C/75°C terminations?



A. 70 A
B. 85 A
C. 80 A
D. 95 A

Solution:
Table 310.16
THHN Conductors have a 90°C rating

Section 110.14(C)(1)(a)(3)
The circuit breaker terminations are marked 60°C/75°C so you use the 75°C column of Table 310.16 to determine the ampacity of the 4 THHN conductors.

Answer: B. 85 A

Question 2

What is the ampacity of the 4 THHN conductors when terminated to the 80-ampere circuit breaker when only marked for 60°C terminations?

A. 70 A
B. 85 A
C. 80 A
D. 95 A

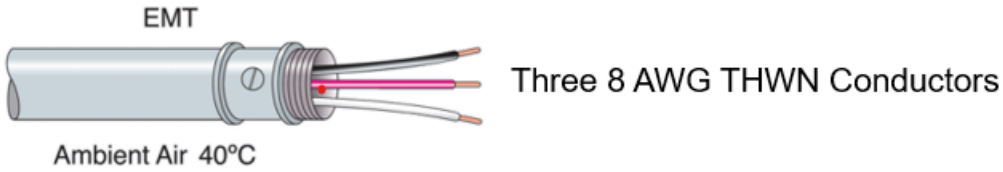
Solution:
Table 310.16
THHN Conductors have a 90°C rating

Section 110.14(C)(1)(a)(1)
The circuit breaker terminations are marked 60°C so you use the 60°C column of Table 310.16 to determine the ampacity of the 4 THHN conductors.

Answer: A. 70 A

Question 3

Determine the ampacity of three 8 AWG THWN copper conductors installed in EMT in an ambient temperature of 40°C. All the conductors are current-carrying conductors. Calculate to the nearest ampere.



A. 35 A
B. 40 A
C. 44 A
D. 50 A

Solution:

Note 1:

Table 310.15(B) shall be referenced for ampacity correction factors where the ambient temperature is other than 30°C (86°F).

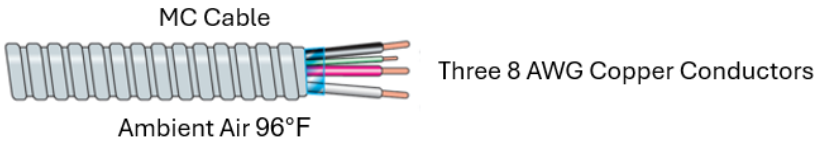
Table 310.16
8 AWG THWN = 50 A

Ambient Temperature Correction Based on 30°C (86°F)
Table 310.15(B)(1)(1), 75°C col.
THWN copper at 40°C = 0.88
50 A × 0.88 = 44 A

Answer: C. 44 A

Question 4

A 3-conductor 8 AWG copper plus an equipment grounding conductor Type MC cable is installed in an area with an ambient temperature of 96°F. The conductors within the cable assembly have THHN insulation, and all three conductors are considered current-carrying conductors. Determine the ampacity of the current-carrying conductors in this application. Calculate to the nearest ampere.



A. 35 A
B. 40 A
C. 45 A
D. 50 A

Solution:

Table 310.16
8 AWG THHN = 55 A

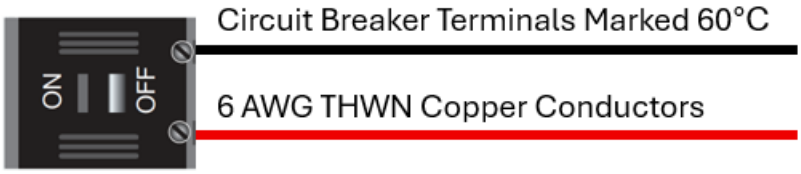
Table 310.15(B)(1)(1), 90°C col.
THHN copper at 96°F = 0.91
55 A × 0.91 = 50.05 A

Answer: 50 A

- Temperature Limitations of Equipment

Question 1

A 6 AWG THWN copper conductor is connected to a circuit breaker with termination temperature limitation marked (not to exceed) 60°C. What is the ampacity of the 6 AWG THWN copper conductor now that it is connected to this circuit breaker?



A. 50 A
B. 55 A
C. 65 A
D. 75 A

Solution:

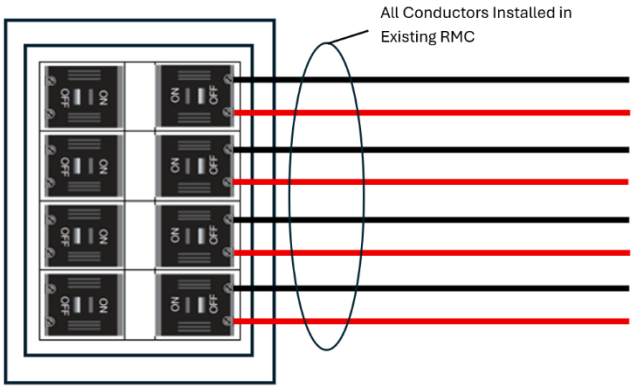
Table 310.14(1)
Table 310.16
6 AWG THWN = 65 A

Section 110.14(C)(1)(a)(2) Limited by circuit breaker to 60°C
110.14(C)(1)(a)(2) applies
Circuit breaker terminations = 60°C
Table 310.16 Ampacity
THWN ampacity at 75°C is not permitted
Use ampacity of 6 AWG copper at 60°C
6 AWG THWN copper limited to 60°C ampacity = 55 A

Answer: 55 A

Question 2

Eight 6 AWG THWN copper current-carrying conductors are installed to replace existing wiring within an existing single rigid metal conduit. The area of installation has an ambient temperature of 30°C. The new eight 6 AWG THWN conductors are connected to existing 50-ampere 2-pole circuit breakers with a marked terminal temperature rating of 60°C. What is the ampacity of the conductors, and is this an acceptable installation?



A. 45.5 A
B. 52.5 A
C. 55 A
D. 75 A

Solution:

Section 110.14(C)(1)
Table 310.14(1)
Table 310.16 Ampacity
6 AWG THWN at 75°C = 65 A

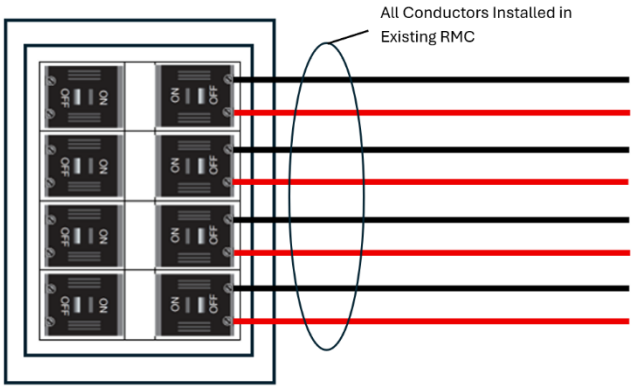
Table 310.15(C)(1) Adjustment Factors
8 current-carrying conductors = 70%
65 A × 0.70 = 45.5 A

6 AWG in 60°C column = 55 A
Ampacity = 45.5 A does not exceed the 60°C value but it is not large enough for the 50 A OCP so it is not permitted.

Answer: 45.5 A

Question 3

Eight 6 AWG THHN copper current-carrying conductors are installed to replace existing wiring within an existing single rigid metal conduit. The area of installation has an ambient temperature of 30°C. The new eight 6 AWG THHN conductors are connected to existing 50-ampere 2-pole circuit breakers with a marked terminal temperature rating of 60°C. What is the ampacity of the conductors, and is this an acceptable installation?



E. 45.5 A
F. 52.5 A
G. 55 A
H. 75 A

Solution:

Section 110.14(C)(1)
Table 310.14(1)
Table 310.16 Ampacity
6 AWG THHN at 90°C = 75 A

Table 310.15(C)(1) Adjustment Factors
8 current-carrying conductors = 70%
75 A × 0.70 = 52.5 A

6 AWG in 60°C column = 55 A
Ampacity = 52.5 A does not exceed the 60°C value so it is permitted.

Answer: 52.5 A

- Continuous loads and branch circuit 210.20

Question 1

What is the minimum standard branch circuit size required for a 208-volt, single-phase, 8-kW continuous load, assuming terminations are rated for 75°C?

A. 40 A
B. 45 A
C. 50 A
D. 60 A

Solution:
Section 210.20(A)

$$\text{Load} = \frac{8{,}000}{208}$$

$$\text{Load} = 38.46 \text{ A}$$

Continuous load adjustment = Load x 125%
CL = 38.46 x 1.25
CL = 48.08 A

Table 240.6(A)
Next standard breaker size = 50A

Answer: C. 50 A is the next standard breaker size

Question 2

A 277-volt, single-phase circuit supplies a 6-kW continuous load and an 8 kW noncontinuous load.

1. What is the minimum standard size inverse-time circuit breaker (with terminations dual rated and marked at 60°C/75°C?

A. 45 A
B. 50 A
C. 60 A
D. 70 A

2. Determine the minimum size XHHW-2 copper circuit conductors for this branch circuit.

A. 6 AWG
B. 4 AWG
C. 2 AWG
D. 1 AWG

Solution Part 1 OCPD Size:

Calculation 1
Continuous Load (CL)

$$CL = \frac{6{,}000}{277}$$

$$CL = 21.7 \text{ A}$$

Calculation 2
Noncontinuous Load (NCL)

$$NCL = \frac{8{,}000}{277}$$

$$NCL = 28.9 \text{ A}$$

Calculation 3
Section 210.20(A)
Minimum standard size inverse-time circuit breaker

Min. OCPD = (CL x 125%) + NCL
Min. OCPD = (21.7 x 125) + 28.9
Min. OCPD = 56 A
Table 240.6(A)
Next standard size rating is 60 A

Answer: C. 60 A circuit breaker rated 60°C/75°C

Solution Part 2 Conductor Size:
210.19(A)

Min. Ampacity = (CL x 125%) + NCL
Min. Ampacity = (21.7 x 125) + 28.9
Min. Ampacity = 56 A

Section 110.14(C)(1)(a)(3)
90°C rated conductors connected to a circuit breaker rated 60°C/75°C
Table 310.16 Ampacity using 75°C
6 AWG XHHW-2 at 75°C is good for 65 A and can be protected by the 60A OCPD
Answer: A. 6 AWG XHHW-2

- Continuous loads and feeders 215.3

Question 1

A 3-phase, 4-wire feeder supplies a continuous load of 75 amperes and a noncontinuous load of 75 amperes to a second-floor equipment distribution switchboard.

Determining the minimum ampacity for this feeder, select the proper AWG XHHW-2 copper conductor size. The terminals of the circuit breaker and switchboard are rated 75°C.

A. 1/0 AWG
B. 2/0 AWG
C. 3/0 AWG
D. 4/0 AWG

Solution:
215.2(A)(1) Minimum Rating and Size

Min. Ampacity = (CL x 125%) + NCL
Min. Ampacity = (75 x 125) + 75
Min. Ampacity = 168.75 A

Section 110.14(C)(1)(a)(3)
XHHW-2 Conductors are rated for 90°C but the terminals are rated for 75°C.

Table 310.16 Ampacity using 75°C
2/0 AWG XHHW-2 at 75°C is good for 175A

Answer: B. 2/0 AWG XHHW-2

Question 2

A feeder supplies a continuous load of 100 amperes and a noncontinuous load of 35 amperes.

1. What is the minimum standard rating of time-delay fuses used for the feeder overcurrent protection?

A. 150 A
B. 175 A
C. 200 A
D. 225 A

2. What size THWN copper conductors are needed?

A. 1 AWG
B. 1/0 AWG
C. 2/0 AWG
D. 3/0 AWG

Solution:

Calculation 1
Section 215.3 OCPD selection
Min. OCPD = (CL x 125%) + NCL
Min. OCPD = (100 x 125%) + 35
Min. OCPD = 160 A

Table 240.6(A)
Next standard size rating is 175 A
Answer: B. 175 A time-delay fuse

Calculation 2
Section 215.2(A)(1) Minimum Rating and Size
Table 310.16
2/0 AWG THWN has an ampacity of 175 A and has adequate ampacity for 160 A load.

Answer: C. 2/0 AWG THWN

- Table 300.5(A) Minimum Cover Requirements

Question 1

A homeowner would like to add a 120/240-volt four circuit panel for lights and receptacles to a shed located 75 feet from the house. They have an extra bundle of EMT and wire from a previous project and want to use that instead of buying new conduit. What is the minimum burial depth for the EMT?

A. EMT is not permitted for direct burial
B. 12 inches
C. 18 inches
D. 24 inches

Solution:
Table 300.5(A)
Column 3 for One-and two-family dwellings 18 inches

Answer: C. 18 inches

Question 2

You are installing a 24-volt lighting circuit for an outdoor decorative fountain in a landscaped public area. The power source is a listed Class 2 power supply, and the lighting circuit is limited to not more than 30 volts**.** The circuit is run underground using Type UF cable with GFCI protection and overcurrent protection not exceeding 20 amperes.

A. 6 inches
B. 12 inches
C. 18 inches
D. 24 inches

Solution:
Table 300.5(A)

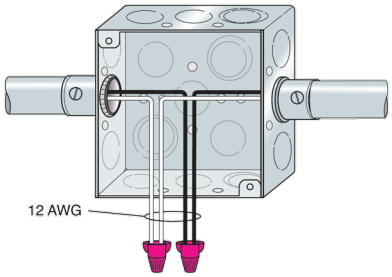
Table 300.5(A), Note 2**,** low-voltage circuits (≤30V) with GFCI and ≤20A protection may be buried at 6 inches using direct burial cable such as UF.

Answer: A. 6 inches

- Adding conductors to an existing box 314

Question 1

What is the maximum number of 14 AWG conductors that can be added and pulled through the 4 x 1 ½ square box?



A. 4
B. 6
C. 8
D. 10

Solution:
Table 314.16(A)

Volume of a 4 × 1 ½ square box = 21 $in.^3$

Table 314.16(B)(1)

Existing 12 AWG = 2.25 $in.^3$

Total occupied space is 4 conductors: 4 x 2.25 cubic inches = 9

Unoccupied space: 21 – 9 = 12 $in.^3$

Table 314.16(B)(1)

14 AWG = 2 $in.^3$ with 12 cubic inches remaining

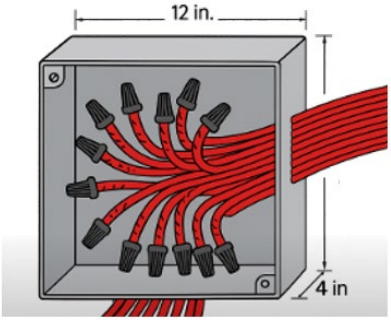
Number of conductors = 12 / 2

= 6

Answer: B. 6 additional 14 AWG conductors

Question 1

Determine the maximum number of additional 12 AWG conductors that can be added and added and spliced in a 12 in. × 12 in. × 4 in. junction box when it already contains 12 spliced 12 AWG conductors.



A. 244 additional conductors
B. 256 additional conductors
C. 286 additional conductors
D. 290 additional conductors

Solution:

Step 1: Determine the Junction Box Volume
12 in. × 12 in. × 4 in.
Volume = 576 cubic inches

Step 2: Volume Allowance per Conductor
Table 314.16(B)
12 AWG = 2.25 cubic inches

Step 3: Volume Used by Existing Conductors
12 – 12 AWG Spliced conductors x 2.25 cubic inches = 27 cubic inches

Step 4: Remaining Box Volume
576 cu in − 27 cu in = 549 cubic inches remaining

Step 5: Determine How Many Additional Spliced Conductors Can be Added
Each spliced conductor = 1 box fill unit = 2.25 cu in

$$\frac{549}{2.25} = 244 \text{ additional conductors}$$

Answer: A. 244 additional conductors

- Maximum number of conductors spliced in a conduit body 314.16(C)

Question 1

Determine the maximum number of 6 AWG THW conductors that can be spliced in a 2-inch EMT conduit body that is marked with a volume allowance of 82 cubic inches.?

A. 8
B. 10
C. 14
D. 16

Solution:
Section 314.16(C)

Table 314.16(B)(1)
Step 1: Volume Allowance Required per Conductor
6 AWG = 5 $in.^3$

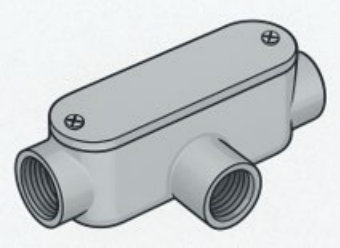
Step 2: Calculate the Maximum Number of Spliced 6 AWG Conductors

$$\frac{82}{5} = 16.4$$

Answer: 16 Conductors

Question 2

A Type T conduit body is used as a junction box installation. It has a volume marked as 20.0 cubic inches. What is the maximum number of 12 AWG THHN conductors that may be spliced inside this conduit body.



A. 6
B. 8
C. 9
D. 10

Solution:

Solution:
Section 314.16(C)

Table 314.16(B)(1)
Step 1: Volume Allowance Required per Conductor
12 AWG = 2.25 $in.^3$

Step 2: Calculate the Maximum Number of Spliced 12 AWG Conductors

$$\frac{20}{2.25} = 8.8$$

Answer: B. 8 Conductors

- Voltage drop examples

Question 1

Calculate the voltage drop on a single-phase circuit with 32 amperes of load, 320 feet from the load to the panelboard, and served by 8 AWG copper THHN conductors.

A. 13 V
B. 14 V
C. 15 V
D. 16 V

Solution:

Where:

K = 12.9 for copper or 21.2 for aluminum
I = 32 A
D = 320 ft
CM = Circular mils of the conductor

Chapter 9, Table 8
8 AWG copper = 16,510 CM

$$V_d = \frac{2 \times K \times I \times D}{CM}$$

$$V_d = \frac{2 \times 12.9 \times 32 \times 320}{16{,}510}$$

$$V_d = \frac{263{,}424}{16{,}510}$$

$$V_d = 15.95 \text{ V}$$

Answer: D. 16 V

Question 2

A 480-volt branch circuit is to be installed with three 1/0 AWG THWN copper conductors serving a 140-ampere, 3-phase load. Determine the maximum length of the conductors, with the voltage drop not exceeding 3%.

A. 460 feet
B. 477 feet
C. 493 feet
D. 502 feet

Solution:

210.19 Informational Note

$V_d = V_{Supply} \times 3\%$

$V_d = 480 \times 0.03$

$V_d = 14.4\ V$

Chapter 9 Table 8

1/0 AWG = 105,600 cmil

$$L = \frac{CM \times V_d}{1.73 \times K \times I}$$

$$L = \frac{105{,}600 \times 14.4}{1.73 \times 2.9 \times 140}$$

$L = 477$ feet

Answer: B. 477 feet