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TRADE CODE SOLUTIONS, LLC

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Course Outline and Learning Objectives

NEC Grounding and Bonding for Electricians — 4.0 Core Credit Hours (Electrician)

Course title	NEC Grounding and Bonding for Electricians
Provider	Trade Code Solutions, LLC — a commercial continuing education provider related to the construction trades
Instructor	Fredrick B. McHugh, Master Electrician — Utah Master Electrician License 12229939-5502
Credit requested	4.0 Core credit hours, profession Electrician
Delivery	Internet (distance learning) — linear playback with periodic identity verification
Hour standard	Each credit hour consists of at least 50 minutes of instruction; the remaining ten minutes may be used for breaks (Utah Admin Code R156-55b-304(6)(a))
Examination	End-of-course examination verifies that the participant has learned the material presented; test questions are randomized for each participant (Utah Admin Code R156-55b-304(6)(g))
Code edition	National Electrical Code (NEC) citations reference the edition currently adopted by Utah under Utah Code Sec. 15A-2-103

This course teaches grounding and bonding under NEC Article 250 at the depth a working electrician uses on the jobsite: what each rule requires, where it lives in the Code book, and how to apply it to a real service, feeder, or branch circuit. Each hour closes with a knowledge check tied to the hour's material.

Hour 1 — Grounding and Bonding Foundations and System Grounding (50 minutes)

Topical outline

- Scope and arrangement of Article 250 — NEC 250.1
- Grounding, bonding, and the effective ground-fault current path as three distinct functions — NEC 250.4(A)(1), (A)(3), (A)(5)
- Objectionable current — NEC 250.6(A)
- Alternating-current systems required to be grounded — NEC 250.20(B); ground detectors for certain ungrounded systems — NEC 250.21(C)
- Grounding at the service: grounding electrode conductor connection and the main bonding jumper — NEC 250.24(A), (C)
- Separately derived systems and the system bonding jumper — NEC 250.30(A)(1)

Learning objectives — after Hour 1 the participant will be able to:

1. Distinguish grounding, bonding, and the effective ground-fault current path as three distinct functions and identify which part of NEC 250.4(A) governs each.
2. Identify which alternating-current systems must be grounded under NEC 250.20(B).
3. Locate the main bonding jumper at a service (NEC 250.24(C)) and the system bonding jumper at a separately derived system (NEC 250.30(A)(1)).

Hour 2 — The Grounding Electrode System (50 minutes)**Topical outline**

- All electrodes present must be bonded together into one grounding electrode system — NEC 250.50
- Permitted grounding electrodes — NEC 250.52(A), including metal underground water pipe, concrete-encased electrodes, and rod electrodes
- Grounding electrode installation and the supplemental-electrode rule for rod electrodes — NEC 250.53
- Sizing the grounding electrode conductor — NEC 250.66 and Table 250.66, including the sole-connection caps at 250.66(A), (B), and (C)
- Worked example: laying out a complete, code-compliant grounding electrode system for a dwelling service

Learning objectives — after Hour 2 the participant will be able to:

1. Identify the electrodes present at a building that must be bonded into the grounding electrode system per NEC 250.50 and 250.52(A).
2. Apply the supplemental-electrode requirement for rod electrodes per NEC 250.53.
3. Size the grounding electrode conductor using Table 250.66, including the caps that apply when the conductor is the sole connection to a rod, pipe, plate, or concrete-encased electrode.
4. Lay out a complete grounding electrode system for a service.

Hour 3 — Bonding of Enclosures, Raceways, and Metallic Systems (50 minutes)

Topical outline

- Bonding of enclosures and raceways downstream of the service — NEC 250.86, 250.90
- Service bonding methods and why a standard locknut alone does not qualify — NEC 250.92(B)
- The intersystem bonding termination — NEC 250.94
- Clean surfaces: removing paint and coatings at bonding connections — NEC 250.96
- Bonding for circuits over 250 volts to ground — NEC 250.97
- Bonding in hazardous (classified) locations — NEC 250.100
- Bonding of piping systems and exposed structural metal, including metal water piping — NEC 250.104

Learning objectives — after Hour 3 the participant will be able to:

1. Select a permitted service bonding method under NEC 250.92(B) and explain why a standard locknut alone is not one.
2. Apply the intersystem bonding termination requirements of NEC 250.94.
3. Apply the enhanced bonding rules for circuits over 250 volts to ground (NEC 250.97) and for hazardous locations (NEC 250.100).
4. Bond metal water piping, other piping systems, and exposed structural metal per NEC 250.104.

Hour 4 — Equipment Grounding Conductors: Types and Sizing (50 minutes)

Topical outline

- Permitted equipment grounding conductor types — NEC 250.118(A), including the conditional rules for the flexible conduit types; conductors not permitted — NEC 250.118(B)
- Identification of wire-type equipment grounding conductors — NEC 250.119
- Sizing the equipment grounding conductor — NEC 250.122 and Table 250.122
- Upsizing the equipment grounding conductor when ungrounded conductors are increased in size — NEC 250.122(B)
- One equipment grounding conductor for multiple circuits in the same raceway — NEC 250.122(C); motor-circuit rule — NEC 250.122(D)
- Parallel conductor installations: full table size in each raceway — NEC 250.122(F)
- Worked examples: sizing wire-type equipment grounding conductors for feeder and branch-circuit scenarios

Learning objectives — after Hour 4 the participant will be able to:

1. Identify permitted equipment grounding conductor types from NEC 250.118(A) and the conditions that apply to the flexible raceway types.
2. Apply the identification rules for wire-type equipment grounding conductors per NEC 250.119.
3. Size equipment grounding conductors using Table 250.122, including the upsized-circuit rule at NEC 250.122(B) and the parallel-conductor rule at NEC 250.122(F).

End-of-Course Examination

A graded end-of-course examination verifies that the participant has learned the material presented, per the distance-learning standard of Utah Admin Code R156-55b-304(6)(g). Test questions are randomized for each participant. Trade Code Solutions issues a certificate of completion containing the items required by R156-55b-304(6)(h) and submits verification of attendance and completion to the continuing education registry on behalf of each licensee.