A special three-day training course on the theory, practice, and design of electrical grounding and bonding systems...

Electrical Grounding and Bonding

May 7–9, 2013
Madison, Wisconsin

Join us for this practical course covering

☑ Specific grounding problems
☑ Installation and code requirements
☑ Performance and prescriptive requirements

A special three-day training course on the theory, practice, and design of electrical grounding and bonding systems...

Electrical Grounding and Bonding

May 7–9, 2013
Madison, Wisconsin

Please route this brochure to colleagues who would also benefit by attending.
Electrical Grounding and Bonding
A special three-day training course on the theory, practice, and design of electrical grounding and bonding systems
May 7–9, 2013 in Madison, Wisconsin

Increase Your Knowledge
Focus on specific grounding problems and consequences relating to fires, safety of personnel, and damage to equipment.

➠ Participate in discussion of grounding problems and how to overcome or avoid them.
➠ Gain a firm foundation of knowledge for your next project involving grounding and bonding.
➠ Develop your knowledge of theory and practice.

Learn About
• The requirements of the NEC® Article 250
• Requirements for grounding and bonding in several other articles in the NEC®
• Specific grounding problems, installations and code requirements
• Practical solutions to grounding and bonding problems

Your Instructor
Phil Simmons, owner of Simmons Electrical Services, specializes in training, publications, consulting, and electrical inspections. He serves on the NEC® Code Making Panel 5, which covers grounding and bonding. He previously served on Code Panels 1, 17, and 19. A master electrician, Phil served as chief electrical inspector for the State of Washington and was executive director for the International Association of Electrical Inspectors (IAEI). His vast experience includes being an electrician, electrical contractor, electrical inspector, plans examiner, chief electrical inspector, author, and lecturer.

Phil has written several electrical texts, including:
• Electrical Grounding and Bonding (Delmar—2004, 2007 and 2010)
• Electrical Wiring Commercial (Delmar—2010)
• Electrical Wiring Residential (Delmar—2010)
• Significant Changes in the 2005 NEC® (Delmar–2004)
• Soares Book on Grounding (IAEI–4th-7th editions)
• Analysis of NEC Changes (IAEI 1993, 1996, and 1999)
• Electrical Systems in One- and Two-Family Dwellings (IAEI 1st–4th editions)

He has written numerous technical articles published in IAEI News. He has also conducted training on topics related to electrical codes and safety at numerous seminars throughout the United States and other countries.

After Attending, You Will…
• Have a better understanding of Article 250 in the NEC®
• Select grounding and bonding conductors with confidence
• Be more aware of the benefits of good grounding systems
• Be better prepared to design your next grounding system

How You Will Learn
• Learn in an informal, relaxed atmosphere
• Participate in team discussions on grounding systems
• Study practical problems and solutions
• Bring your specific questions and situations for discussion

Who Should Attend
This course is a must for:
• Designers, engineers, contractors, and consultants responsible for the design and installation of electrical grounding systems
• Electricians, technicians, inspectors, safety personnel, and other employees responsible for the operation and maintenance of electrical grounding and bonding systems in a commercial, industrial, institutional, or utility setting

Special Course Materials
As a participant in this course you will receive a copy of Electrical Grounding and Bonding, 3rd Edition (Delmar—2010) plus a notebook of selected technical materials for use in your work.

National Electrical Code® and NEC® are registered trademarks of the National Fire Protection Association.

ENROLL ONLINE TODAY! Or visit our Web site
Definitions
- Defining the terms related to grounding and bonding
- Understanding the difference between “grounding” and “bonding”
- Differentiating between a short-circuit and a ground-fault
- What is a system grounded conductor and a grounding electrode conductor?
- What is an equipment grounding conductor?
- What is a grounded conductor?
- When is a neutral conductor a grounded conductor?

Low-Impedance Fault Return Path
- Definition of effective ground-fault current path
- Requirements for effective ground-fault current path
- Purpose and function of effective ground-fault current path
- Earth return prohibited
- Installing parallel sets of conductors

System Grounding Requirements
- Reducing objectionable current flow over grounding conductors
- Systems that are required to be grounded and those that are permitted to be grounded
- Choosing a grounded or ungrounded system
- High and low-resistance grounding applications
- Grounding the neutral of a wye-connected system
- Grounding the mid-point of a delta system
- Corner-grounded delta systems
- Purpose of the grounding electrode system on an ungrounded system

Purpose of the Grounded Conductor on a Grounded System
- Providing a low-impedance path for fault-clearing capability
- The function of the main bonding jumper and system bonding jumper
- Sizing the neutral for services with a single and parallel set of supply conductors
- Maintaining neutral isolation on load side of service or source of separately derived system

The Grounding Electrode System
- What grounding electrodes are required to be used if present
- Types of grounding electrodes; What is a Ufer ground?
- How to determine if grounding electrodes qualify for use
- Bonding requirements for the grounding electrode system
- Using busbars for connecting grounding electrode system components
- Optional grounding electrode system connections
- Understanding the purpose of the grounding electrode
- Bonding requirements for all grounding electrodes, including those installed for lightning protection systems, communication systems, and data processing systems

Separately Derived Systems
- What is a separately derived system?
- How is this type of system grounded?
- Sizing neutral, bonding and grounding electrode conductors
- When is an on-site generator a separately derived system?
- Requirements if the source is outdoors

Grounding and Bonding at Separate Buildings
- When a grounding electrode is not required
- Choosing a grounding and bonding scheme at separate buildings
- When the neutral is permitted to be grounded at separate buildings
- Sizing grounding electrode conductors at separate buildings
- Buildings or structures supplied by a separately derived system

Equipment Grounding Conductors
- When equipment is required to be grounded
- Metal raceways as equipment grounding conductors
- How to calculate the maximum length of metal conduits where used as equipment grounding conductors
- Supplementing metal raceways with equipment grounding conductors
- Sizing equipment grounding conductors for motor circuits and for parallel conduit runs
- Sizing equipment grounding conductors for available short-circuit current
- Color code requirements
- Branch circuit extensions and GFCI protection of replacement receptacles

Ground Fault Protection
- Types of ground fault protection
- Capacitive charging current effects
- Coordinating GFP settings with downstream protection

Grounding and Bonding Conductor Connections
- Types of connections: welded, brazed and pressure type
- Selecting connectors for the application

Bonding Requirements
- Bonding requirements for service equipment
- Intersystem bonding requirements
- Bonding of metal piping systems
- Bonding of metal frames of buildings
- Bonding requirements for areas supplied by separately derived systems
- Bonding requirements for receptacles and boxes

Use of the Neutral for Bonding
- When it is permitted to use the neutral for bonding and when it is not
- Use of the neutral for line-side bonding
- Use of the neutral for equipment grounding

Isolated Equipment Grounding
- Isolated grounding of equipment
- Isolated grounding of receptacles

Special Occupancy Grounding and Bonding
- Grounding and bonding for hazardous locations
- Requirements for patient care areas of health care facilities
- Grounding and bonding for agricultural buildings
- Requirements for mobile and manufactured homes

Daily Schedule
Registration will be at 7:30 a.m. on the first day. Class will begin at 8:00 a.m. on all three days and continue until 5:00 p.m. on the first two days, with final adjournment at noon on the last day of the course. The daily schedule will include refreshments prior to the start of the course, morning and afternoon refreshment breaks and lunch on the first two days. Lunch on the third day is on your own.
Mark Your Calendar For These Valuable Courses

Introduction to Electrical Energy Storage Devices and Systems
March 12–14, 2013, Madison, Wisconsin
Course #N876

Protection of Industrial and Commercial Electric Power Distribution Systems
March 19–22, 2013, Madison, Wisconsin
Course #N777

Fundamentals of Substation Equipment and Control Systems
March 25–27, 2013, Lake Buena Vista, Florida
Course #N463

Introduction to Power Electronics
April 9–11, 2013, Madison, Wisconsin
Course #N372

National Electrical Code
April 16–18, 2013, Madison, Wisconsin
Course #N372

Introduction to Utility Electrical Distribution Maintenance
May 14–16, 2013, Madison, Wisconsin
Course #N765

For more information call 800-462-0876, or e-mail custserv@epd.engr.wisc.edu.

Valuable Take-home References
As part of your course fee, you will receive:
- A copy of Electrical Grounding and Bonding, 3rd Edition
- A binder of technical information on the electrical code for use in your job

Continuing Education Credit
This course provides 18 Professional Development Hours (PDH).
This course provides 18 hours of credit toward the following State of Wisconsin credentials: Commercial Electrical Inspector, Journeyman Electrician, Master Electrician, and UDC Electrical Inspector.

Fee Covers
Course materials, Electrical Grounding and Bonding book, break refreshments, two lunches, certificate, professional development hours (PDH), and rosters. Hotel accommodations are not included in enrollment fee. Course participants are encouraged to bring a NEC book and a calculator.

Course Location and Accommodations
This course will be held at The Pyle Center, 702 Langdon Street, on the University of Wisconsin–Madison campus. We have reserved a block of guest rooms (rates starting at $89, including continental breakfast) at the Lowell Center, 610 Langdon Street, Madison, WI. Reserve a room online at epd.engr.wisc.edu/lodgingN364 or call 866-301-1753 or 608-256-2621. Room requests after April 9 will be subject to availability. Other fees and restrictions may apply. We have reserved a second block of guest rooms (rates starting at $89, including parking and Madison Taxi's silver cab from airport) at the Campus Inn, 601 Langdon Street, Madison, WI. Reserve a room online at epd.engr.wisc.edu/lodgingBN364 or call 800-589-6285 or 608-257-4391 and indicate that you will be attending this course under group code 120664. Room requests after April 15 will be subject to availability. Other fees and restrictions may apply.

Cancellation
If you cannot attend please notify us at least seven days prior to the course start, and we will refund your fee. Cancellations received after that date and no-shows are subject to a $150 administrative fee per course. You may enroll a substitute at any time before the course starts.

General Information
Program Director: Mitch Bradt, PE
bradt@wisc.edu
Program Associate: Helene Demont
demont@engr.wisc.edu
Or e-mail custserv@epd.engr.wisc.edu

Additional Enrollees
Name ____________________________ ____________________________
Title ____________________________ ____________________________
Phone (______) __________________ Fax (______) __________________
E-mail __________________________

Billing Information
- Bill my company
- P.O. or check enclosed (Payable in U.S. funds to UW - Madison)
- Please check the box if you are a person with a disability and desire special accommodations. A customer service representative will contact you. Requests will be kept confidential.

Cardholder's Name ____________________________ Expires __________
Card No. ____________________________

Fax: 800-462-0876 or 608-262-1299 (TDD 265-2370)
Phone: 800-442-4214 or 608-265-3448
Mail to: The Pyle Center
Attn: Engineering Registration
702 Langdon Street
Madison, Wisconsin 53706

Internet: epd.engr.wisc.edu/webN364
ENROLL ONLINE TODAY!  Or visit our Web site