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Community
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Grounding and Bonding Training - Canadian Electrical Code Section 10

[View Course Details](#)

COURSE DATES AND TIMES

Improper grounding and bonding are common causes of electrical faults, equipment damage, and shock hazards in power systems. When grounding electrodes, bonding conductors, or fault-current return paths are improperly installed or poorly maintained, protective devices may not operate correctly, leaving hazardous voltages on equipment enclosures and structural components.

Our 12-hour instructor-led Grounding and Bonding Training course explains how properly designed grounding and bonding systems protect electrical installations and ensure safe fault-current operation. Participants learn how grounding electrodes, bonding conductors, and equipment bonding create effective fault-current return paths, allowing protective devices to clear faults quickly and safely.

Canadian Electrical Code Grounding and Bonding Requirements

Based on the Canadian Electrical Code (CEC), this course provides the knowledge required to design, install, and maintain effective electrical grounding systems in industrial, commercial, and institutional power systems. Participants gain a clear understanding of grounding principles, bonding requirements, and how electrical code rules apply in real installations.

Grounding Electrodes, Bonding Conductors, and Fault Current Paths

Effective grounding systems rely on properly installed grounding electrodes, bonding conductors, and equipment bonding connections. These components create low-impedance fault-current return paths that allow overcurrent protective devices to operate correctly during ground faults and maintain electrical system safety.

Grounding System Testing and Electrical System Diagnostics

This interactive two-day training program covers grounding fundamentals, bonding requirements, grounding electrode systems, and methods for testing grounding systems to verify electrical safety and system reliability. Participants learn which grounding tests can be performed while systems remain energized and which require a planned shutdown.

Electrical Safety and Ground Fault Protection

Proper grounding and bonding protect personnel and equipment by limiting dangerous voltages caused by lightning, line surges, accidental contact with higher-voltage systems, or ground-fault conditions. Effective grounding systems also support compliance with electrical safety regulations and Canadian Electrical Code requirements.

Why Proper Electrical Grounding and Bonding Are Critical

A significant percentage of electrical disturbances and equipment failures are related to inadequate grounding and bonding practices. Without proper grounding, sensitive electronic equipment may experience erratic operation, data loss, or catastrophic damage during transient overvoltage events or ground faults.

Through this Grounding and Bonding Training course, participants gain a practical understanding of grounding system design, installation practices, and troubleshooting techniques. The knowledge gained helps electrical professionals improve electrical safety and ensure installations comply with Canadian Electrical Code grounding and bonding requirements.

Increase Your Knowledge

- Focus on specific electrical grounding and bonding problems and consequences relating to fires, the safety of personnel, and damage to equipment
- Participate in a discussion of electrical grounding and bonding problems and how to overcome or avoid them
- Gain a firm foundation of knowledge for your next project involving electrical grounding and bonding
- Develop your knowledge of theory and practice

Learn About

- The requirements of the CECODE
- Specific grounding problems, installations, and Canadian Electrical Code requirements
- Testing procedures for industrial, commercial, and institutional electric power grounding systems
- Practical solutions to grounding problems

After Attending, You Will

- Work more safely and efficiently
- Have a better understanding of the CECode
- Make fewer installation mistakes and pass inspections more easily
- Be more aware of the benefits of good grounding and bonding systems
- Be better prepared to design your next grounding and bonding system

WHO SHOULD ATTEND

- Utility And Industrial Electrical Engineers And Engineering Technicians
- Project Engineers
- Design Engineers
- Field Technicians
- Electrical Technicians
- Electricians
- Plant Operators
- Plant Engineers
- Electrical Supervisors

STUDENTS RECEIVE

- Grounding and Bonding and Canadian Electrical Code Course Certificate
- 1.2 Continuing Education Unit (CEU) Credits (12 Professional Development Hours)
- 100-Page Digital Electrical Grounding Handbook - Value \$20 (details below)
- A FREE Magazine Subscription (Value \$25)
- \$100 Coupon toward any future Electricity Forum event (restrictions apply)
- Course Materials in PDF Format

COURSE OUTLINE

Grounding and Bonding Training - Canadian Electrical Code Section 10 Course Outline

DAY ONE

INDUSTRIAL, COMMERCIAL GROUNDING SYSTEMS

Session 1: Grounding and Bonding Overview

- Scope / Introduction
- Grounding Definitions
- Why Electrical Grounding
- Grounding Concepts
- Major cause of trouble in an Electrical Distribution System
- Faults in the electrical system
- Codes/Handbooks & Industry Standards
- CEC & NEC Object, Scope and Definitions
- IEEE Grounding Standards, Guidelines & Recommendations
- Grounding Subsystems

Session 2: Grounding Electrode System

- Earth Grounding Subsystems
- Soil Resistance, Resistance-to-Ground and Soil Resistivity
- Grounding Concept Frequency Limitations
- Grounding Electrodes- CEC 10-700
- Manufactured Grounding Electrodes
- In-Situ Grounding Electrodes
- Pipe Grounds, metallic water lines & steel piling
- Primary & Secondary Facility's Grounding Systems
- Grounding Electrode Connections
- Empirical, practical formulas of Grounding Electrodes
- Ground Rods, accessories and applications
- Other electrodes: conductor encased in concrete, conductive cement
- Resistance-to-Ground components
- Voltage & Current distribution in the soil
- Grounding connections & connectors (mechanical, compression, exothermic)
- Grounding Conductor's material, size
- Ground Resistance/Resistivity Testers – 3 & 4 pole earth ground measurements

Session 3: System and Circuit Grounding

- Electrical Grounding Methods
- Grounding of Alternating Current Systems
- Single-Phase, 3 wire Solidly Grounded System
- 3-phase, 4 wire Solidly Grounded System (mid-point grounded)
- 3-phase, 4 wire, Solidly Grounded System, WYE configuration
- 3-phase, 4 wire, solidly grounded system with no-neutral load
- Grounding connections for equipment in ungrounded systems
- Ground faults / Ground faults main consequences
- Floating Systems
- Grounding connections for two or more buildings supply from a single service
- Two ground faults on different lines on a 3-phase ungrounded Delta
- Simplified Electrical Distribution System Typical of Commercial & Industrial Facilities

Session 4: Resistance Grounding

- Resistance Grounding, Low & High Resistance (HRG)
- High Resistance Grounding considerations
- High Resistance of Medium Voltage Systems
- HRG Benefits
- HRG Current Sensing Alarm relays
- HRG, Advantages & Disadvantages
- HRG Fault Location Tracking
- HRG Design considerations. System Charging
- Zero Sequence Current Transformer
- Zero Sequence Charging Current
- CEC 10-1108 Conductors used with Neutral Grounding Devices

Session 5: Grounding of Generator to Supply Emergency Power

- Grounding Emergency Supply Systems (Generators & Motors)
- Objectives
- Sources of Power Supply
- Isolation Transformer Grounding
- Emergency Supply Grounding, 3 and 4 Pole ATS Systems
- Power from two sources with Neutral Grounded in one location
- Multiple Emergency Power Supplies Grounding
- UPS Grounding for various configurations
- Generators, Generator Disconnects Emergency Loads & other Loads
- Grounding a Portable generator

DAY TWO

Session 6: Bonding

- Objective, Rule 10-002 Bonding & grounding
- Bonding Conductor- Bonding Jumpers
- Bonding Conductor Sizing- Table 16A & 16 B
- Types of Bonding
- Means ensuring Continuity at Service Equipment
- Interlocking Armor of MC Cable/CSA Tech 90 Cable
- Color of Bonding Conductor
- Electrical Shock/Severity of an electrical shock
- Touch & Step Potential
- Grounding/Bonding Myths & Fatal Consequences
- Personal Protective Equipment
- Ground Fault Circuit interrupter (GFCI)
- Bonding indoor metal piping systems
- Effective Grounding- Code Requirement
- Effective Grounding Fault Current Path- Diagram
- Star Point Grounding- Petrochemical Industry
- Industrial Automation Wiring, Bonding & Grounding
- Grounding & Bonding AC Power Distribution System with Master Control relay
- Bonding to Racks/Cabinets in the Telecommunications Industry

Session 7: Renewable- Solar Photovoltaic Systems (PV) and Wind Power System

- Renewable Energy Systems
- System Grounding- Section 50
- Ungrounded Solar PV Systems
- Equipment Grounding in DC-Only Systems
- Grounding Options, New Bonding Conductor from Inverter
- Grounding in a Grid-tied PV System
- PV Array/AC Service Equipment/Generator/Inverter/Battery System
- Charge Controllers/ DC Subpanels
- PV arrangement/PV Inverter & Service Equipment Grounding Electrode System
- Renewable Energy Source/ DC Disconnect/Inverter/Utility Disconnect

Session 8: Grounding Computer Rooms/SCADA Systems

- Objectives
- Isolated Grounding Subsystem- Rule 10-904
- Isolated Bonding Conductors serving a receptacle
- Isolated Grounds with & without metallic conduits
- Signal Reference High Frequency Subsystems
- Signal Reference Grounding Systems for ADP High Frequency Equipment
- Design & Installation of a Signal Reference Grid
- SRG for Sensitive Electronic Equipment Grounding
- Power Supply Installation & Placement for ADP/Computer Room Power Center
- Equipment Mesh/Mats for SRG Systems
- Cable Management

Session 9: Electro Magnetic Interference (EMI) on Electronic Circuits

- Susceptibility of Components & Electronic Circuits
- Shielding/by Absorption & Reflection
- Considerations for utilizing Shields
- Data Processing Systems Protection
- Grounding Connections/Twin axial & Coax Cable
- Shielding of Shielded Cables
- Grounding for Differential Amplifiers
- Proper Bonding & Grounding for PLC applications
- PLC Enclosure Grounding
- Grounding Systems for Programmable Controllers
- Grounding for better communications (less noise) with PLC
- Formation of Ground Loops/Multiple loops in Instrumentation Grounding
- Multiple Circuits Common grounds
- Grounding of Shielded standard cable & cables equipped with inner shields
- Typical Single Point Ground Network for a Control System
- Recommended Process Automation Grounding Scheme (Typical CCR or PIB)
- How Not-to-Ground (IACS/DCS/PLC)

Session 10: Lightning Protection

- Lightning Data/Isoceraunic Maps
- Lightning Protection Subsystem Diagram- Rule 10-706/CAN/CSA-B72
- Types of Air Terminals
- Cable supports, bolted connectors, compression lugs, Ground Bars, Conductors, Ggrounding electrodes.
- Spacing & Interconnecting Grounding Electrodes
- Installation & Grounding of Lightning Arresters/Surge protection Devices (SPDs)
- Conventional Lightning Protection Systems Hardware
- Rule 10-706, NFPA 780, UL 96A. LPI 175, CAN/CSA-B72-M87, CEC 10-702 Requirements
- Metallic & Non-Metallic Tank's lightning protection
- Substation Shielding Design Methods
- Single Mast or Shield Wire, Two-Masts & principle of the Rolling Sphere
- Telecommunications Lightning Protection System

COURSE SCHEDULE:

Both days:

Start: 10 a.m. Eastern Time

Finish: 4:30 p.m. Eastern Time

Contact us Today for a FREE quotation to deliver this course at your company's location.

[Request Quote](#)