

ELECTRICAL GROUNDING WEEK

FOR INDUSTRIAL, COMMERCIAL, INSTITUTIONAL AND TELECOMMUNICATIONS POWER SYSTEMS



2019



TORONTO, ONTARIO
NOVEMBER 12-15, 2019

- ✓ 2-day Low-Voltage/Medium-Voltage Industrial Electrical Grounding Training
- ✓ 1-day High-Voltage Electrical Grounding and Bonding For Utility and Industrial Applications
- ✓ 1-day Electrical Grounding and Bonding For Telecommunications Networks

www.electricityforum.com/electrical-training/toronto-grounding-week

ATTEND ALL THREE COURSES AND SAVE!!

Individual Courses Pricing:
2-day Basic Grounding Course - \$799
1-day HV Grounding Course - \$499
1-day Telecom Grounding Course - \$499

4-DAY TRAINING
\$1199

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EDUCATION UNITS (CEUS)

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■ DAY ONE

ELECTRICAL GROUNDING – Overview

- Grounding - Definitions
- Grounding methods
- System Grounding
- Single-Point Grounding
- Solid Grounding
- Impedance Grounding
- Reactance Grounding
- Resistance Grounding
- Isolated Grounding

ELECTRICAL GROUNDING METHODS

- Grounding Methods
- Solidly Grounded
- Low Resistance Grounding
- High Resistance Grounding
- Reactance Grounding
- Single Point Grounding

GROUNDING CONNECTIONS FOR SYSTEMS AND CIRCUITS

- Types of system grounding
- Current over grounding and bonding conductors
- Grounding connections for direct-current systems
- Grounding connections for alternating-current systems

GROUNDING OF GENERATOR TO SUPPLY EMERGENCY POWER

- Isolated Systems
- Transformer to supply a different voltage, to parts of a facility
- Two different three-phase, 4-wire solidly grounded systems (midpoint grounded)
- Three-phase, 3-wire ungrounded (delta) system

GROUNDING CONNECTIONS FOR TWO OR MORE BUILDINGS OR STRUCTURES SUPPLIED FROM A SINGLE SERVICE

- When the ungrounded and grounded conductors are extended to second building
- When the ungrounded, grounded and bonding conductors are extended to second building

CONDUCTOR TO BE GROUNDED FOR AC WIRING SYSTEMS

- Single-phase, 2-wire
- Single-phase, 3-wire
- Multi-phase systems having one wire common to all phases

CONDUCTOR ENCLOSURE BONDING

- Equipment bonding
- Fixed equipment, general
- Fixed equipment, specific
- Portable equipment
- Receptacles, plugs, and cords for portable equipment

BONDING METHODS

- Clean surfaces
- Dissimilar metals
- Bonding at service equipment
- Means of ensuring continuity at service equipment
- Metal armour cable
- Bonding equipment to grounded circuit conductor
- GFCI installation for spas and hot-tubs

■ DAY TWO

ELECTRICAL GROUNDING ELECTRODE SYSTEM

- Electrical Grounding Theory
- Parameters, Measurements and Calculations
- Types of grounds: Dirty Ground/Clean Ground
- Connecting IACS to the ground bed
- Star Point Ground, single point connection

GROUNDING AND BONDING CONDUCTORS

- Continuity of grounding and bonding conductors
- Material for system grounding conductors
- Material for bonding conductors
- Installation of system grounding conductors
- Installation of equipment bonding conductors
- Grounding conductor size for dc circuits
- Grounding conductor size for alternating-current systems and for service equipment
- Bonding conductor size
- Colour of conductors

GROUNDING and BONDING CONDUCTOR CONNECTIONS

- Grounding and Bonding Conductor Connections
- Bonding conductor connection to raceways
- Grounding conductor connection to water pipe electrodes
- Bonding conductor connection to circuits and equipment
- Grounding conductor connection to electrodes
- Tamper resistant receptacles and receptacles exposed to the weather

GROUNDING AN ELECTRICAL DISTRIBUTION SYSTEM

- Supply Transformers Configurations
- Electrical Grounding Supply Transformers
- Electrical Grounding Isolated Transformers
- Electrical Grounding a UPS System
- Electrical Grounding a Battery System
- Emergency Generator Grounding

INDUSTRIAL PROCESSES CONTROL SYSTEMS GROUNDING

- Production Information Systems/Monitoring Systems
- Integrated HMI & SCADA Systems
- Instrumentation & Controls Grounding
- Shields Against Inductive, Capacitive and RF Coupling
-

ELECTRICAL GROUNDING IN HEALTH CARE FACILITIES

- Electrical Grounding Methods
- Power Cord Grounding
- Equipment Grounding
- System Grounding
- Medium Voltage Systems
- Hospital Grade GFCI
-

LIGHTNING PROTECTION - ELECTRICAL GROUNDING

- Lightning - Characteristics
- Lightning Protection System Specifications

FOUR CASE HISTORIES INCLUDED

■ DAY THREE

OVERVIEW

- Basics Of High-Voltage Grounding
- Electrical Bonding of High Voltage Systems
- Proper Sizing of Conductors
- Grounding of Substations
- High-Voltage Surge Protection
- Electrical Grounding for Lightning Protection

DEFINITIONS AND INTERPRETATIONS

- Determination of Need of Personal Protective Grounding
- Basic Criteria for Safe Grounding Practices
- Electric Shock Hazard
- Grounding Practices
- Basic Design Options
- Soil Resistivity
- Ground Fault Currents
- Fault clearing Time

GROUNDING OPTIONS

- Ground Cable Assemblies
- Grounding Cable Ampacities
- Grounding Cable Reactance
- Parallel Grounds
- Grounding Clamps
- Grounding Insulated Power Cable
- Ground Potential Rise (GPR) in Medium- and High-Voltage Systems

GROUND GRID DESIGN FOR SUBSTATIONS

- Determination of Maximum Available Fault Current
- Exposure Voltage Calculations for Plants & Switchyards
- Touch and Step Potential
- Transferred Potential
- Elimination of Step and Touch Potential
- Selection of the Right Connector
- Horizontal Grid Design IEEE STD 80-2000
- Introduction to 2-Layer Soil Model
- Vertical Rods Connected by a Grid
- Temporary Grounding

SWITCHYARD AND SUBSTATION PROTECTIVE GROUNDING

- General Considerations for Placement of Protective Grounds
- Power Circuit Breakers and Transformers
- Disconnect Switches and Bus

- Insulated High Voltage Cable
- Cable Terminations
- Midsections and Splices
- Grounding Transformers and Phase Reactors
- Capacitor Banks

POWER LINE PROTECTIVE GROUNDING

- Grounding of Metal Transmission Structures
- Slip Joints
- Steel Pole Structures
- Overhead Ground Wires
- Structure Footing Ground

TECHNICAL CONSIDERATIONS IN PROTECTIVE GROUNDING IN SUBSTATIONS AND SWITCHYARDS

- Substation Grounding System
- Typical Shock Situations - Conditions of Danger

- Structure Touch
- Electric Circuit for Switch Operator Sources of Hazardous Current on De-energized Equipment
- Grounding and Jumpering Requirements
- IEE Std 80-2000

INTERNATIONAL AND LOCAL REGULATIONS

- CSA
- IEEE 80-2000, IEEE Guide for Safety in AC Substation Grounding, 2000
- ASTM F 855-97 Standard Specifications for Temporary Protective Grounds
- IEEE 1246-2002, IEEE Guide for Temporary Protective Grounding Systems Used in Substations
- IEEE 1048-2003, IEEE Guide for Protective Grounding of Power Lines, 2003

COURSES INSTRUCTOR: Pablo Diaz, Electricity Forum Electrical Grounding Consultant

ELECTRICAL GROUNDING AND BONDING FOR TELECOMMUNICATIONS NETWORKS

1-DAY
course

www.electricityforum.com/electrical-training/tower-grounding-training NOV 15, 2019

DAY FOUR

OVERVIEW

- Grounding concepts for the telecommunications industry
- How the telecommunications industry developed the concept of "Single Point Ground" system
- Utilization of banks of batteries and their grounding in a telecommunication site
- How to ground telecommunications towers.
- How to ground equipment and communications antennas installed on a communications tower

ELECTRICAL GROUNDING OVERVIEW

- Grounding- Definitions
- Grounding methods used in the telecommunications industry
- Grounding practices for cellular and digital microwave sites
- System grounding for transformers used in a communications site
- Telecommunications single point grounding
- Why the telecommunications industry uses a solid grounding system
- Impedance grounding for a telecommunication tower

GROUNDING ELECTRODE SYSTEM

- Grounding electrodes: construction and installation
- Ground resistance and resistivity
- Grounding electrode conductor
- Electrical grounding and corrosion

SYSTEM GROUNDING

- Circuit grounding
- Why systems and circuits are grounded
- Grounded conductor
- Direct current systems
- Alternating-current system
- Systems less than 50 Volts
- Grounding of transformers
- Grounding for telecommunications site

TOWER INSTALLATIONS

- Self-supporting tower installations
- Bonding the tower ground to the central office ground
- Pole Mounted Antennas
- Antenna towers mounted on top of buildings
- Antennas and connecting coaxial transmission lines and

- waveguides
- Protection of radio equipment
- Guyed tower installation
- Pole mounted installation
- Building mounted installation

TELECOMMUNICATIONS ELECTRICAL BONDING SYSTEM

- Equipment bonding and grounding
- Rack bonding
- Major requirements: leakage current, proper sizing
- Generators
- Transformers
- UPS systems: online, standby, line interactive, alternative
- Installation
- Sizing the equipment grounding
- Identification of the equipment grounding conductor
- Electric shock
- Grounding and electric shock

TELECOMMUNICATIONS STANDBY/EMERGENCY GENERATORS

- Separately derived systems (SDS)
- When an emergency generator is not a SDS
- Main bonding jumper
- Portable generators
- Vehicle mounted generators

DAY FIVE

LIGHTNING PROTECTION SYSTEM FOR A TELECOMMUNICATIONS SITE

- The phenomenon of lightning
- Development of lightning flash
- Flash parameters
- Lightning characteristics
- Electrical effects
- Basic protection requirements
- Protection systems
- Electro-geometric method
- Tower lightning protection system
- Rolling sphere concept
- Lightning protection system specifications

TELECOMMUNICATIONS INDUSTRY GROUNDING PRACTICES

- Telecommunication site grounding
- Single point ground system
- Grounding subsystems
- Exterior ground ring
- Exterior structural metal elements
- Interior ground ring - halo ground
- Master ground bar
- Cable entrance ground bar
- Telecommunications closets
- Cable trays or raceways
- Low frequency networks
- High frequency networks
- Waveguides grounding
- Racks, cabinets and enclosures
- Central office battery system

GROUNDING AGAINST ELECTROMAGNETIC INTERFERENCE (EMI/ESD/RFI)

- Electronic equipment grounding
- Introduction and definitions
- Telecommunication rooms and closets
- Data processing equipment grounding
- Electronic security equipment grounding
- EMI (Electromagnetic Interference)
- Inductive, capacitive and radiation coupling
- RFI (Radio frequency Interference)
- Electrostatic discharge
- Shields grounding
- Cable shielding and grounding
- Coaxial cables
- Telephone lines

TELECOMMUNICATIONS EQUIPMENT PROTECTION

- System reference zero
- Detection of a faulty neutral-ground system
- Sizing wiring to meet computer industry standards
- Grounding line treatment devices
- Transient overvoltage protector grounding
- Gas tubes
- Metal oxide varistors
- Silicon avalanche diodes
- Data Lines grounding - RS232

Review of expectations

Questions and Answers



(905) 686-1040



(905) 686-1078



ON-LINE:

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MAIL:

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ATTENDEE INFORMATION

To receive registration fee discounts, you must **REGISTER AND PREPAY** prior to the course date.

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REGISTRATION FEES

The registration fee to attend any two-day Grounding Course is **\$799.00 + tax**. The registration fee to attend one-day Grounding Course is **\$499.00 + tax**. Attend ALL THREE Grounding Courses for only **\$1,199.00 + tax**. **Register Early and SAVE \$100 - Just \$1,099**
The fee includes forum participation, refreshments and lunch.

BONUS FEATURES

- Our Latest Electrical Grounding/Power Quality Handbook (Value \$20)
- \$100 Coupon Toward any Future Electricity Forum Event (Restrictions Apply)
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WHEN & WHERE

The courses of the Electrical Grounding Week will be held at:

Hampton Inn and Suites Toronto Airport Hotel
3279 Caroga Dr., Mississauga, ON
Tel: 905-672-4820

(Please check the date/course which you want to attend)

- LOW-VOLTAGE/MEDIUM-VOLTAGE INDUSTRIAL ELECTRICAL GROUNDING COURSE - \$799
November 12-13, 2019**
- HIGH-VOLTAGE ELECTRICAL GROUNDING AND BONDING FOR UTILITY AND INDUSTRIAL APPLICATIONS COURSE - \$499
November 14, 2019**
- ELECTRICAL GROUNDING AND BONDING FOR TELECOM NETWORKS COURSE - \$499
November 15, 2019**



Limited Seating! Register Today!