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# High Voltage Grounding Training

[View Course Details](#)

## COURSE DATES AND TIMES

High Voltage Grounding training - This 6-Hour live online instructor-led course teaches students how to design, install and maintain effective high voltage utility and industrial electrical grounding systems.

A properly designed and installed grounding system ensures reliable performance of electrical substations. Fast clearing of faults, made possible by good grounding, improves the overall safety and reliability of an electrical system.

This 6-Hour live online, instructor-led High Voltage Grounding Training course will provide the basic principles of grounding a power supply network to ensure safety of personnel and equipment. Understanding these principles will provide the correct tools to design a grounding system applicable to utility networks and industrial plant distribution. This course covers the basic procedures in working safely on medium and high voltage systems.

This comprehensive course focuses on the latest practices and standards for grounding and bonding in high-voltage systems. Participants will gain a deep understanding of safe grounding methods, conductor sizing, substation grounding design, surge protection, and bonding practices, specifically tailored for utility and industrial applications.

## OVERVIEW

- Fundamentals of High-Voltage Grounding
- Electrical Bonding in High Voltage Systems
- Proper Sizing of Conductors for Grounding Applications
- Grounding of Substations – Best Practices and Design Criteria
- High-Voltage Surge Protection
- Electrical Grounding for Lightning Protection
- IEEE Std 80 and its Latest Revisions for Grounding Design

## WHAT YOU WILL LEARN:

- The basic principles of grounding of medium and high voltage electrical systems
- Protective or Safety grounding system
- Safe and unsafe working conditions
- Design considerations of a grounding grid for medium and high voltage
- Measuring of ground resistance, and resistivity in substations
- Protection of substations from lightning energy

## 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

- 100-Page Digital Electrical Grounding Handbook - Value \$20 (details below)
- 0.6 Continuing Education Unit (CEU) Credits (6 Professional Development Hours)
- A **FREE** Magazine Subscription (Value \$25)
- **\$50** Coupon toward any future Electricity Forum event (restrictions apply)
- Course Materials in PDF Format

## COURSE OUTLINE

# High Voltage Grounding and Bonding For Utility and Industrial Applications

## Session 1: Understanding Grounding Basics and Safety Considerations

Objective: Introduce the key principles of high-voltage grounding, focusing on personnel safety and system integrity.

### Definitions and Interpretations:

- Introduction to key terms in grounding and bonding for high-voltage systems.
- Overview of the latest grounding standards (e.g., IEEE Std 80, IEC 61936).

### **Need for Personal Protective Grounding:**

- Criteria for determining the necessity of personal protective grounding in utility and industrial settings.
- Electric Shock Hazard and understanding the physiology of electric shock.

### **Safe Grounding Practices:**

- Best practices for grounding high-voltage systems to protect against electric shock hazards and ensure compliance with safety standards.

### **Grounding Design Basics:**

- Essential considerations for substation grounding and the impact of system voltage, soil resistivity, and ground fault currents on design.
- Soil Resistivity: Understanding its role in grounding system performance.

### **Ground Fault Current and Fault Clearing Time:**

- Importance of correctly calculating ground fault current and designing systems that can handle fault clearing times to minimize risks.

## **Session 2: Advanced Grounding Options and Materials**

Objective: Explore advanced grounding methods, materials, and techniques used in high-voltage applications.

### **Grounding Cable Assemblies:**

- Overview of different grounding cable ampacities and how to select appropriate cable sizes based on fault currents.

### **Parallel Grounds and Reactance:**

- How to utilize parallel grounds to distribute fault currents, and understanding the impact of grounding cable reactance.

### **Ground Potential Rise (GPR):**

- Detailed analysis of Ground Potential Rise (GPR), including methods to mitigate risks in medium- and high-voltage systems.

### **Grounding Clamps and Insulated Power Cable:**

- Selection of appropriate grounding clamps and understanding the importance of properly grounding insulated power cables.

## **Session 3: Ground Grid Design for Substations**

Objective: Learn how to design effective grounding grids in substations, with an emphasis on safety and compliance with modern standards.

### **Determining Maximum Available Fault Current:**

- Methods to calculate the maximum available fault current for substation systems.

### **Touch and Step Potential:**

- Understanding touch and step potential hazards in substations and switchyards, and how to calculate and mitigate these risks.

### **Exposure Voltage Calculations:**

- Exposure voltage calculations for plants and switchyards, based on IEEE Std 80 guidelines.

### **Two-Layer Soil Model and Horizontal Grid Design:**

- Introduction to the two-layer soil model for designing effective ground grids, and its role in mitigating grounding hazards.
- Design considerations for horizontal grid designs, vertical grounding rods, and the use of conductors to ensure low impedance paths.

### **Temporary Grounding:**

- Best practices for temporary grounding in substation environments to maintain safety during maintenance and construction activities.

## **Session 4: Switchyard and Substation Protective Grounding**

Objective: Explore protective grounding techniques specifically for switchyards and substations.

### **Placement of Protective Grounds:**

- Strategic placement of protective grounds to ensure maximum safety in high-voltage environments.

### **Grounding for Power Circuit Breakers, Transformers, and Bus Systems:**

- Grounding considerations for circuit breakers, transformers, bus systems, and the importance of grounding critical components.

### **Grounding Insulated High Voltage Cables:**

- Proper grounding techniques for insulated high-voltage cables, including cable terminations, splices, and midsections.

### **Capacitor Banks and Grounding Reactors:**

- How to ground capacitor banks, phase reactors, and other high-voltage equipment to minimize electrical hazards and ensure operational reliability.

## **Session 5: Power Line Protective Grounding**

Objective: Understand the principles of grounding for transmission and distribution lines, including grounding for metal and wood pole structures.

### **Grounding Metal Transmission Structures:**

- Effective methods for grounding metal transmission structures and ensuring safety from fault currents.

### **Slip Joints, Steel Poles, and Overhead Ground Wires:**

- Grounding considerations for steel pole structures, slip joints, and the role of overhead ground wires in providing protection from lightning and fault currents.

### **Wood Pole Transmission Structures:**

- Grounding solutions for wood pole transmission lines, including the use of transmission line terminal ground switches.

### **Vehicle and Surface Equipment Grounding:**

- How to properly ground surface equipment and vehicles in proximity to high-voltage transmission lines to ensure operator safety.

## **Session 6: Modern Considerations for High Voltage Grounding Systems**

Objective: Examine modern technical considerations and standards in high-voltage protective grounding for substations and switchyards.

### **Substation Grounding Systems and IEEE Standards:**

- An in-depth look at substation grounding systems and the latest recommendations from IEEE Std 80 for designing safe and effective grounding grids.

### **Typical Shock Situations and Dangerous Conditions:**

- Overview of typical shock scenarios, how they occur, and steps to mitigate the risks.

### **Structure Touch Hazards and Electric Circuits:**

- Addressing structure touch and contact hazards in substations and how to manage these risks through proper grounding.

### **De-Energized Equipment Hazards:**

- Identifying sources of hazardous currents on de-energized equipment and understanding the grounding and jumpering requirements to maintain safety.

## **COURSE SCHEDULE:**

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.

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