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## Substation Grounding Training

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

<https://www.electricityforum.com/onsite-training-rfq>

Safety remains a primary concern for substation owners, specifically in terms of protecting human life, and ensuring reliable network operation. Both electric utility and industrial substation equipment is protected by comprehensive grounding infrastructures. High voltage electrical grounding systems are subject to weathering, corrosion, damage and general wear. System integrity must be inspected and tested on a regular basis. Substation engineers must accurately assess the condition of grounding systems to ensure they are capable of dissipating additional fault current.

This substation grounding course covers effective relaying and insulation of equipment; and also the safety of the personnel is the governing criterion through the proper design of substation grounding. This course will discuss how to maintain, test, and inspect a proper grounding system for the electrical power substation.

This substation grounding course covers the ideas behind effective substation grounding system design and describes test methods and numerical models to characterize soil resistivity into a two layer soil model. Participants learn test methods to measure other important grounding system parameters, such as interconnected grounding impedance,

neutral and over head ground wire current splits. Then, functional requirements of temporary working grounds are discussed followed by their installation configuration, maintenance and testing.

This 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 Substation Grounding course will deal with all of these important issues.

#### **After Attending, You Will Understand:**

- The 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

#### **WHO SHOULD ATTEND**

This course is designed for engineering project managers, engineers, and technicians from utilities who have built or are considering building or retrofitting substations or distribution systems with SCADA and substation integration and automation equipment.

- Utility and Industrial Electrical Engineers and Engineering Technicians
- Transmission planning engineers
- Distribution planning engineers

- Substation Design Engineers
- Consulting Electrical Engineers
- Substation network management engineers
- Substation maintenance and construction engineers & technologists

### **STUDENTS RECEIVE**

- **FREE** T&D Automation And AMR/AMI Systems Handbook Vol. 2 (Value \$20)
- **\$100 Coupon** Toward Any Future Electricity Forum Event (Restrictions Apply)
- 1.4 Continuing Education Unit (CEU) Credits
- **FREE** Electricity Today Magazine Subscription (Value \$25.00)
- Forum Presentations In Paper Format

### **COURSE OUTLINE**

#### **DAY ONE**

#### **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

#### **SUBSTATION GROUNDING DESIGN**

## **SESSION 1: 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

## **SESSION 2: 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

## **SESSION 3: 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

## **DAY TWO**

### **SESSION 4: 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

### **SESSION 5: POWER LINE PROTECTIVE GROUNDING**

- Grounding of Metal Transmission Structures
- Slip Joints
- Steel Pole Structures
- Overhead Ground Wires
- Structure Footing Ground
- Grounding on Wood Pole Transmission Structures
- Transmission Line Terminal Ground Switches
- Grounding on Distribution Lines
- Surface Equipment and Vehicle Grounding

## **SESSION 6: 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**

- 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

**Review of expectations  
Questions and Answers**

## **COURSE TIMETABLE**

**Both days:**

Start: 8:00 a.m.

Coffee Break: 10:00 a.m.

Lunch: 12:00 noon

Restart: 1:15 p.m.

Finish: 4:30 p.m.

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