



**Two –Day Workshop on**  
**Earthing/Grounding**  
**Lightning & Surge Protection**



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# Two –Day Workshop on Earthing/Grounding Lightning & Surge Protection

## 1. Introduction

Earthing (Grounding) plays a major function in power systems because of the particular influence of earthing on the performance, protection, security and reliability of power supply. For proper operation, improved system performance and maintenance of electric and electronic equipment it is important to understand and maintain correct earthing system in the domestic, commercial, and industrial electrical and electronic systems.

A single lightning strike to a mission-critical facility poses unacceptable risks which can cripple operations. Surges from secondary effects of lightning strikes and power switching operations are smaller but are more numerous and can devastate modern electronic equipment.

The workshop is intended to provide theoretical and practical knowledge that enables the participants to have an in-depth understanding of earthing practices, direct and indirect effects of lightning, risk assessment and protection of electrical and electronic equipment. At the conclusion of this course participants should clearly understand the concepts of lightning protection and earthing practices as required by the relevant National and International Standards and Regulations.

In fact, discussion on topics like grounding/earthing associated with lightning protection, surge protection, shielding of electrical and electronic systems leads a lot of controversy and arguments. This workshop looks at these issues from a fresh yet practical perspective and enables you to better understand the various types of earthing and bonding equipment, lightning arresters and surge protection devices (SPDs) and their basic operation.

This workshop is designed to presents the subject in a clear, straightforward manner by including a lot of practical examples, needs-based case-studies, task-based activities and problem solving sessions.

## 2. Who should attend?

- Design Engineers
- Installers / Technicians
- Operation Managers
- Business Development Managers
- Consulting Professionals
- Project Engineers
- Technical Support Engineers
- Maintenance Engineers
- Project Managers
- Sales Engineers/Managers
- Marketing Engineers
- Marketing Managers

## 3. Objectives

At the end of this workshop participants will gain a detailed appreciation of the following:

- Basic concepts and underlying principles of earthing.
- Design, install and testing of an effective earthing system for electronic equipment/facility.
- Understand principles of protection against lightning.
- Understand direct and indirect effects of lightning and risk assessment.
- Design of external lightning protection with protection angle, roll of sphere and mesh methods.
- Need to protect modern electronic equipment from lightning and transient surges.
- Selection of SPDs using lightning protection zone concept.
- Practices to mitigate transient surge and earthing problems in electrical and electronic equipment.
- Understanding of various national and international standards on lightning protection and earthing systems.



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## 4. Training Methodology

Each course participant will receive a copy of the comprehensive course notes. The presenter will outline and discuss the topics using power point presentations, product displays and video recordings. The course is designed to have an interactive format to maximize participant participation. Questions and answers are encouraged throughout the training sessions. Needs-based case-studies and examples will be discussed in problem solving workshop sessions. This gives participants the opportunity to discuss with other participants and the presenter their specific problems and appropriate solutions.

## 5. Practical Sessions

Workshop includes practical examples, and case studies.

## 6. Personal Impact

On successful completion of this course participants will be able to:

- Appreciate the importance of earthing for safety, protection and power quality.
- Become familiar with the basic concepts and underlying principles of earthing.
- Design, install, test and commission the earthing system.
- Perform soil resistivity and earth resistance measurements.
- Understand damage due to lightning and transient surges.
- Design various types of external lightning protection systems.
- Understand surge protection components and their basic operation.
- Design surge protection system with class B, C & D surge protection devices.
- Be aware of hazards and safety precautions associated with lightning and earthing.
- Aware of various national and international standards on Earthing and Lightning Protection

## 7. Organizational Impact

The course will allow participants to interact and gain from shared experiences of others. Carefully selected practical examples and case studies will be used to illustrate the material being discussed and in particular, emphasis will be given to ensure that the material is appropriate to the organization. Each participant should leave with awareness and in-depth understanding of the theoretical and practical issues relevant to lightning protection, surge protection and earthing.

## 8. Competencies Developed

At the end of the course the participants will be aware of earthing/grounding, lightning and surge protection systems. Participants should be able to better understand the various types of earthing and bonding equipment. Participants should be able to design an effective and efficient lightning protection system for the structures and, surge protection systems for the equipment. Participants should also be able to perform soil resistivity and earth resistance measurements to design and install an earthing system. Participants should be able to carry out serviceability check of lightning and surge arresters.



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## 9. Course Outlines

### Day 1 (First Half) –Protection against Lightning

- Physics of lightning
- Probability of lightning strike
- Effects of lightning on structures and equipment
- Lightning protection for buildings
- Direct and indirect surges due to lightning strikes
- Induced surges due to adjacent lightning strikes
- Lightning & Surge current waveforms
- Planning for lightning protection- Risk assessment
- Methods of Lightning protection
- Protection Angle, Roll of Sphere and Mesh Methods
- Advanced Lightning Protection using ESE Devices
- Lightning Protection Risk assessment
- Overview on IS 2309, BS 6651 and IEC 62305-2 standards.
- Examples, case studies and workshop discussion session

### Day 1 (Second Half) – Surge Protection

- What is surge?
- Surge protection
- Surge protection components
- Various kind of surge protection devices
- International Standards on surge protection
- Lightning protection zones
- Classes of surge protection devices
- Achieving graded surge protection
- Power Line Protection
- Data Line Protection
- Positioning and selecting surge protection.
- Installation of SPDs.
- Serviceability testing of SPDs.
- Troubleshooting of SPDs
- Practical installation of SPDs

### Day 2 (First Half) - Introduction, General Principles and Requirements of Earthing

- Overview on common causes of power equipment failure
- Operation of Protective Devices
- Shock Hazards to the human body
- Earthing principles, basic requirements System earthing, safety earthing
- Earth loops, common impedance coupling , common bonding network and equipotentialization.
- Classification of earthing
- Safety Earthing, System Earthing
- Protective earthing
- Clean earthing
- Importance of low resistance earthing
- Soil resistivity
- Measurement of soil resistivity
- Resistance of single rod electrode, multiple rod grid system
- Material for earth electrode
- Earthing electrodes, Corrosion
- Shapes of electrodes
- Current carrying capacity of an electrode and earthing conductors.
- Resistance of vertical electrode and strip electrode.
- Strip (horizontal) electrode shape and effect on resistance.
- Equipotential Bonding- Isolation Spark Gap
- Overview on IS 3043, UL 467 standards.
- Measurement of soil resistivity.
- Measurement of earth resistance

### Day 2 (Second Half) – Practical on Earthing / Grounding

- Measurement of Soil Resistivity
- Installation of Strip Electrode
- Installation of Vertical Electrode
- Exothermic welding for Permanent Connections
- Measurement of earth resistance

**For more information please contact:**

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