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# LIGHTNING, SURGE PROTECTION AND EARTHING OF ELECTRICAL AND ELECTRONIC SYSTEMS IN INDUSTRIAL NETWORKS



## **YOU WILL LEARN HOW TO:**

- Select and apply an appropriate lightning dissipation system
- Understand how earth electrodes work and their role in preventing lightning and surges from damaging equipment
- List the types of systems that cannot be earthed
- Describe what systems can be operated unearthed
- Correctly select and apply surge protection appropriate to the type of equipment being protected
- Apply practical knowledge of surge and transient protection
- Troubleshoot and fix earthing and surge problems
- Design, install and test an effective earthing system for electronic equipment
- Understand lightning and how to minimise its impact on your facility
- Protect sensitive equipment from lightning

## **WHO SHOULD ATTEND:**

- Instrumentation and Control Engineers
- Consulting Engineers
- Electrical Engineers and Contractors
- Project Engineers
- Maintenance Engineers
- Consulting Engineers and Safety Professionals
- Electricians and Electrical Inspectors
- Power System Protection and Control Engineers
- Building Service Designers
- Data Systems Planners and Managers
- Electrical and Instrumentation Technicians

## The Workshop

Few topics generate as much controversy and argument as that of lightning and surge protection of electrical and electronic systems. Poor practices in earthing, and incorrect application and selection of lightning and surge protection devices can be the cause of continual and intermittent problems in a facility, often resulting in lost production and equipment failure.

This workshop looks at these issues from a fresh yet practical perspective and enables you to reduce expensive down time on your plant and equipment by the correct application of these principles. Essentially the workshop is broken down into the methods used to prevent lightning entering a facility such as dissipation arrays and those that divert surge energy away from sensitive equipment. Dissipation systems are discussed with associated earthing systems. The unique properties of various surge protection devices are reviewed, enabling you to select the correct device suited to the application required. Earthing and surge protection for telecommunications and IT systems are examined in detail as well as the impact of lightning and simple techniques for minimising its impact.

### Pre-requisites

Some working knowledge of basic electrical engineering principles is required, although there will be a revision at the beginning of the workshop. Experience with earthing problems will enable the workshop to be placed in context.

## The Program

### INTRODUCTION AND BASICS

- Fundamentals of earthing
- Bonding
- Lightning
- Surge protection
- Dissipation arrays

### RECOMMENDED DESIGN AND INSTALLATION PRACTICES

- Wiring and earthing for safety and performance
- Wiring and distribution systems
- Dedicated and derived neutral systems
- Earthing and bonding equipment
- Earth electrodes and earth mats
- Supplementary earthing systems (chemical earths)

### FUNDAMENTALS FOR BUILDING ELECTRICAL SYSTEMS

- Earthing of building systems
- Which electrical systems can be operated unearthed?
- Proper methods of earthing building electrical systems
- Location of the service earthing connection
- Proper sizing of earthed (neutral) conductors

### TYPICAL RULES TO BE APPLIED

- Rules for multiple services to one building
- Rules for low impedance and high impedance systems
- Rules for bonding requirements at building service equipment
- Earthing electrodes, systems and conductors
- Bonding enclosures and equipment
- Equipment earthing conductor types
- Enclosure and equipment earthing
- Earthing of separately derived systems
- Earthing at more than one building
- Disconnecting means for separate buildings

### EARTHING AND NOISE CONTROL

- Misconceptions of performance earthing
- Single point versus multi point techniques
- Noise and zero signal reference grid
- Shielding

### ELECTRICAL FAULTS

- Earth fault circuit interrupters
- Equipment earth fault protection systems

### APPLICATIONS OF EARTHING AND BONDING

- Earthing and bonding in hazardous (classified) locations
- Earthing and bonding for health care
- Earthing and bonding for swimming pools, hot tubs and spas
- Static and electricity: earthing and bonding requirements
- Common violations
- Building electrical inspection procedures
- How to recognise hazards

### LIGHTNING

- Need for a lightning protection system
- Which protection systems work and which don't
- Best location for IT equipment
- Optimum earthing for building
- Pitfalls of isolated earthing
- Shielding and bonding of electronics and communications
- Optimum location of surge protection devices

### SURGE AND TRANSIENT PROTECTION

- Lightning phenomena
- Protection of power supply
- Protection of electric communications circuits
- Power system faults and switching surges
- Mitigation techniques
- Case studies

### POWER CONDITIONING

- Power conditioners
- Uninterruptible power systems
- Power quality alternative sources

### SUMMARY, OPEN FORUM AND CLOSING