

# POWER SYSTEM EARTHING

## TWO DAY COURSE:

**Covering Basic Earthing Concepts, Standards, Safety Criteria, Soil Resistivity Measurement & Interpretation, Earth Grid Design, Parallel Earth Paths, Fall of Potential, Fault Current Distribution & Earth Resistance Measurement.**

## WHY ATTEND?

The earthing system is there to ensure safety and is relied upon in the safety procedures for operational work on the electrical system. Its design and performance can have a major impact on safety, security of electricity supplies, power quality and construction costs. Despite this, it is often stated that earthing is one of the most misunderstood and least prepared aspects of electrical power system engineering. Earthing system design has become more complex in recent years, due to higher fault currents, limited substation areas - which are often on reclaimed land, use of cables with a PVC outer sheath, proximity of homes and third party equipment such as telecommunication cables. The standards concerning earthing are changing, introducing new concepts and design criteria. Finally, the financial consequences of an accident are now accepted to be more severe, with a greater readiness by claimants to pursue litigation.

For the above reasons, it is important that companies understand the changing situation, are aware of modern practice and are able to respond in the most cost-effective manner. This is likely to require changes in design policy and construction practice. Earthing is a difficult subject, but there are new design tools, measurement techniques and equipment to help the engineer.

The course endeavours to provide a practical and theoretical introduction to the subject. The practical sessions include measurement of soil resistivity and electrode resistance using a range of equipment and the opportunity to compare different measurements instruments. Course numbers are normally restricted to 12 to ensure a high quality interaction during the practical sessions, presentations and case studies. Delegates from past courses have given the highest possible ratings and we will be pleased to provide references if required.

## WHO SHOULD ATTEND?

Engineers or Managers concerned with Power System Design, Earthing, Substation Design and Operational Safety in the following organisations: Electricity Distribution Companies, Consultants, Engineering Contractors, Telecommunications and Pipeline Companies, Universities, Large Industrial Companies (e.g. Steel, Manufacturing, Power Generation).

In the past delegates have attended from companies such as: Megger, BP, Northern Powergrid, Balfour Beatty, Econnect, UKPN, Erico, ESB (Ireland), Fluor Daniel, Furse, Gridcom, Intergen, Jersey Electricity, Manx Electricity, NATS, National Grid, Northern Ireland Electricity, RWEN power, Omega Red Group, PB Power, Powersystems UK, Tenaga Nasional Berhad (Malaysia), Scottish Power, Scottish & Southern Energy, ENWL (United Utilities), VA Tech, Gibraltar Electricity Authority, Western Power Distribution and Electricity Authority of Cyprus.

## COURSE CONTENT:

### Introduction:

- Illustration of the importance of earthing.
- Reason for earthed systems and arrangements/equipment used within the transmission and distribution network.
- Illustration of what happens during an earth fault.
- Description and definition of touch, step and transfer potentials.
- Impact of earthing on safety procedures (permit to work).
- Relevant standards and how to design to meet their requirements.

### Soil Resistivity:

- Soil types and resistivity ranges.
- Wenner and other measurement techniques.
- Soil structures and developing an appropriate multi-layer soil model from measurement data.
- Use of geo-technical data.
- Case Studies

### Earth Resistance Measurement & Substation Earthing Assessment:

- The fall of potential method.
- How measurements are carried out (equipment used and limitations).
- How to interpret the measurement data.
- Problems experienced and how to overcome them.
- Measurement of individual component earth resistance.
- Visual inspection.
- Earth continuity resistance measurements.
- Buried electrode location.
- Measurement of surface potentials.

### Practical Session:

- Soil resistivity and earth resistance tests.
- Comparison of different instruments.
- Analysis of results using appropriate software.

### Statutory Requirements and Standards:

- Summary of legislation applicable to earthing.
- Health and Safety.
- UK Electricity Safety, Quality and Continuity Regulations.
- Brief overview of the relevant BS and ENA Standards.
- Options Available to Reduce Substation Resistance.
- Thermal ratings of earth conductors - calculation demonstration.
- Earth resistance calculations.

### Earthing System Components:

- Tower lines and cables – how they contribute towards reducing the substation earth value.
- Calculating the resistance of a tower base and the 'chain impedance' of a line of earthed towers.
- Accounting for the effect of cables.
- Estimating earth fault current distribution for lines and cables.

### Earthing System Design:

- Case study that includes main design considerations.
- Basic design principles.
- Typical past earthing systems.
- Brief coverage of Installation methods and materials used.
- More detailed example to show how a modern earthing design for a substation is developed.
- Fence earthing.
- Incorporating civil foundation structures into the earthing system.
- Earthing arrangements and equipment that requires special earthing.
- Q&A session and closing summary.

**To Book a Place Please Contact Us -**  
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