SCANDINAVIAN ACADEMY

Training and Development

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Course: System Earthing and Protective Earthing in Utilities and Industrial Electrical Networks

Code	City	Hotel	Start	End	Price	Language - Hours
EE-426	Hamburg (Germany)	Hotel Meeting Room	2026-12-28	2027-01-01	5950 €	En - 25

Introduction

This training program focuses on system earthing and protective earthing practices in utility and industrial electrical networks. It covers earthing system configurations, protective conductors, earth fault behavior, touch and step voltage considerations, grounding design principles, testing methods, and practical earthing applications in substations, distribution systems, and industrial facilities.

The program is designed to strengthen participants' understanding of how proper earthing contributes to personnel safety, equipment protection, fault current management, protection system performance, and overall electrical network reliability.

IEC 60364-5-54 addresses earthing arrangements, protective conductors, and protective bonding conductors for the safety of electrical installations, while IEEE grounding references cover system grounding in industrial and commercial power systems and safe grounding practices in AC substations.

General Objective

To enable participants to understand, apply, evaluate, and improve system earthing and protective earthing arrangements in utility and industrial electrical networks, with emphasis on safety, fault current behavior, protection coordination, equipment grounding, substation grounding, and practical testing requirements.

Detailed Objectives

By the end of this program, participants will be able to:

- Understand the principles and purposes of system earthing and protective earthing.
- Differentiate between system earthing, equipment earthing, protective earthing, and bonding.
- Identify common earthing arrangements used in utility and industrial networks.
- Analyze earth fault current paths and their impact on protection systems.
- Understand touch voltage, step voltage, transferred voltage, and related safety risks.
- Evaluate earthing requirements for substations, distribution networks, and industrial plants.
- Understand grounding electrode systems and protective conductor applications.
- Review earthing practices for transformers, generators, switchgear, motors, and cable systems.
- Apply testing and inspection methods for earthing systems.
- Interpret earth resistance and continuity test results.
- Identify common earthing defects and propose corrective actions.
- Recommend practical improvements to enhance personnel safety and network reliability.

Target Audience

This program is designed for:

- Electrical power engineers.
- Utility engineers.
- Industrial electrical engineers.
- Operation and maintenance engineers.

- Substation engineers.
- Protection and control engineers.
- Testing and commissioning engineers.
- Electrical safety engineers.
- Maintenance supervisors.
- Advanced electrical technicians working in power networks and industrial facilities.

Course Outline

Day 1: Fundamentals of System Earthing and Protective Earthing

- Fundamentals of electrical earthing and grounding.
- Purpose of system earthing in power networks.
- Purpose of protective earthing for personnel and equipment safety.
- Difference between earthing, grounding, bonding, and equipotential bonding.
- Common earthing arrangements in utility and industrial networks.
- Neutral earthing concepts and applications.
- Relationship between earthing systems and electrical protection performance.

Day 2: Earth Faults, Safety Voltages, and Earthing System Performance

- Earth fault current behavior in electrical networks.
- Fault current paths through earthing systems.
- Earth potential rise and safety implications.
- Touch voltage and step voltage concepts.
- Transferred voltage risks in substations and industrial sites.
- Effect of soil resistivity on earthing performance.
- Impact of earthing design on fault detection and protection operation.

Day 3: Earthing Design for Utilities and Industrial Electrical Networks

- Earthing system design principles.
- Grounding electrodes and earthing grids.
- Earthing of substations and switchyards.
- Earthing of transformers, generators, and switchgear.
- Earthing of motors, cable trays, metallic structures, and enclosures.
- Protective conductors and bonding conductors.
- Integration of earthing systems with lightning and surge protection.
- Common design errors in industrial and utility earthing systems.

Day 4: Earthing, Protection Systems, and Network Reliability

- Influence of earthing arrangements on protection systems.
- Earth fault protection in low-voltage and medium-voltage networks.
- Restricted earth fault and sensitive earth fault protection.
- Neutral grounding methods and their protection implications.
- Solid grounding, resistance grounding, and impedance grounding.
- Coordination between earthing design and protective relays.
- Earthing-related causes of nuisance tripping and protection failure.
- Practical review of earthing problems in industrial networks.

Day 5: Testing, Inspection, Troubleshooting, and Practical Case Reviews

- Earthing system inspection and maintenance.
- Earth resistance testing methods.
- Soil resistivity measurement.
- Continuity testing of protective conductors and bonding conductors.
- Testing of substation earthing grids.
- Interpretation of test results and acceptance considerations.
- Troubleshooting high earth resistance and poor bonding.
- Practical case reviews and corrective action planning.

The Scandinavian Academy for Training and Development adopts the latest scientific and professional methodologies in training and human resource development, aiming to enhance the efficiency of individuals and organizations. Training programs are delivered through a comprehensive approach that includes:

- Theoretical lectures supported by PowerPoint presentations and visual materials (videos and short films).
- Scientific evaluation of participants before and after the program to measure progress and knowledge acquisition.
- Brainstorming sessions and practical role-playing to simulate real-life scenarios.
- Case studies tailored to align with the training content and participants work nature.
- Assessment tests conducted at the end of the program to evaluate the achievement of training objectives.

Each participant will receive comprehensive training materials, including theoretical content, practical exercises, and supporting resources, provided in both printed and digital formats. Detailed reports, including attendance records, final results, and overall program evaluations, are also provided.

Training materials are prepared professionally by a team of experts and specialists in various fields. At the end of the program, participants are awarded a professional attendance certificate, signed and accredited by the Scandinavian Academy for Training and Development.

Program Timings:

- 9:00 AM to 2:00 PM in Arab cities.
- 10:00 AM to 3:00 PM in European and Asian cities.

The program includes:

- A daily Coffee Break provided during the sessions to ensure participants comfort.

Our Success Partners

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