



Fundamentals of Earthing Design

3 Day Training Course

Auckland | Brisbane | Hobart | Melbourne | Newcastle | Perth | Townsville

This is the premier earthing design training course in the region – an intensive program in fundamental earthing principles and the practice of earthing system design.

Participants will develop an understanding of the science behind earthing, the associated mechanisms that lead to earthing related risk, and an ability to manage them through effective design.

Safearth is Australia's leading provider of services and solutions in earthing and lightning protection.

Safearth has designed and tested thousands of earthing and lightning protection systems and has been a key force behind the national and international development of earthing theory and practice. Now you too can learn from the masters and develop your own expertise to support your business.

This course provides essential foundational knowledge and skills for all involved with electrical power system earthing.

Who Should Attend?

This in depth course is designed for electrical engineers, project engineers, maintenance managers, asset managers, HV specialists, consultant, regulators and other technical staff responsible for power system or other assets that rely on earthing systems for their safe and correct operation.

A solid background in electrical engineering is essential.



Course Objective

The complexities of earthing system design are explained and modelled in this course through the application of theoretical and practical sessions.

This 3-day course provides a comprehensive treatment of the principles and practices used in the design and testing of earthing systems to effectively manage and assess their performance, condition and risk.

The course is structured to provide a clear presentation of principles and includes lectures with practical examples, as well as personal involvement in problem solving by computer analysis.

Course Deliverables

Provide participants with the knowledge and skills necessary to design and manage earthing systems associated with the electricity supply infrastructure and industrial installations.

Address the complex problems of inductive and conductive inter-relationships between substation and powerline earthing systems and metalwork.

Investigate techniques for solving problems found in earthing system design, using both empirical and analytical computer based techniques.

Pricing

Standard price for this course varies depending on location – please see our website for details. Discounts are available for early-bird payments and for group bookings.

Payments can be made by credit card via our website, by direct deposit or by purchase order in advance.

Further information is available on our website.

What You Will Learn During This Course

Legal Obligations

- Is designing to standards good enough?
- What is a defensible position?

Risk Management

- How do I use risk? Am I already using risk?
- How do I make sense of options available?

What is Safe?

- How does current cause death?
- What safety criteria are applicable and how do I decide which ones to use?
- How do I determine acceptable step and touch voltages?

Earthing Standards

- What do the standards require and which one should I use?
 - AS 2067
 - AS/NZS 1768
 - AS/NZS 3000
 - AS/NZS 3007
 - AS/NZS 3835
 - AS/NZS 4853
 - AS/NZS 60479
 - AS/NZS 7000
 - EG-0, EG-1
 - IEC 61936
 - IEEE 80
 - IEEE 998

Soil Resistivity

- What are the electrical properties of soil?
- How do they vary and how can I measure them?
- How can I recognise inadequate test results?

Earthing System Design

- What is the right process?
- How do I design an earth grid, taking into account soil resistivity, protection settings, network configuration and auxiliary paths?
- What's the difference between earth grid design and earthing system design?

Earth Potential Rise (EPR)

- What happens when current flows into the ground?
- How and where do touch voltages appear?
- How do I determine the optimum model?
- When should I use multi-layer soil models?

The Earth Fault Circuit

- Where does earth fault current actually flow?
- Are interconnections to other earthing systems helpful or hazardous?
- What is inductive coupling and how does it guide current flow?

Transferred Hazards

- How do earth faults cause hazards on other systems, like comms, pipes, fences, conveyors and railway lines?
- What is electromagnetic coupling and how can it lead to unexpected voltages?
- How do I manage these risks?

Overhead Line Earthing

- What are overhead earth wires for?
- How do overhead earth wires, affect touch voltages?
- How do I model earth wires, shield wires and neutrals?

Cable Earthing

- What makes cable earthing different?
- How much current flows in a cable screen?
- What are coupling factor and screening factor?
- What is the impact of cable selection (heavy/light duty, coaxial/screened, single-/multi-core)?
- Where and how should I earth my cable screens (both ends/single point / cross-bonded)?
- How can underground to overhead transitions cause higher touch voltages?

What Participants Say

"Course material was presented in a straightforward, easy to understand manner."

"When we asked questions, they had answers."

"The presentations were interesting and to the point."

Lightning and Surge Protection

- How does lightning compare with other power system transients?
- How does my earthing design affect surge protection performance?
- What are the methods for lightning protection design (rolling sphere, collection volume, other)?
- What is Early Streamer Emitter technology, and does it work?

Distribution Earthing

- What resistance should the earth grid be?
- Should HV and LV be common bonded or separately earthed?
- What is CMEN? What is DBZS?

Design Case Studies

- What is unique about earthing design for each of distribution, industrial and transmission substations?
- How do large interconnected earthing systems and the MEN impact our designs?

Design Benefits

How can good design:

- effectively manage earthing risk?
- help achieve operational security?
- reduce project installation cost?
- reduce lifetime costs?
- improve reliability?
- improve testability?

For specific course dates, or to apply for this course, visit safearth.com/training

About Safearth Training

Safearth have been at the forefront of earthing in Australia for more than 30 years. We delivered Australia's first public earthing training course in the early 1990s and have since trained hundreds of people both here and around the world.

Our trainers are all earthing experts with substantial experience in both R&D and practical application. We know about real-world problems and constraints, and have provided thousands of solutions, in design, testing and refurbishment of assets across all industries.

Safearth also helped develop the standards you use – we were key in the development of EG-1 and EG-0 and serve on the committees for AS 2067, AS/NZS 1768, AS/NZS 3007, IEEE 80, IEEE 81, IEEE 998 and others.

All our training courses include a balance of theoretical background and practical application. Most include the use of computer programs, including Safearth software and other readily available applications. All courses include real-world examples and, where appropriate, field demonstrations.

For detailed course information, or to apply for a course, visit safearth.com/training

Other Safearth Training Courses

Safearth offers a wide range of public and customised courses to suit your needs, including:

- Fundamentals of Earth Testing — 3 days
- AS2067:2016 – The Changes and Impacts — 2 days
- Earthing Awareness — ½ day (4 hrs)
- Introduction to Routine Earth Testing — 1 day
- Introduction to Earthing Design — 1 day
- Earthing for Project Managers — 1 day
- Earthing System Management Planning — 1 day
- Distribution Earthing Design & Testing — 1 day

And ask us about licencing our award-winning training video for non-electrical staff and contractors.

More About Safearth

Safearth Consulting is a specialist engineering group providing world recognised expertise in all areas relating to earthing systems.

Safearth provides products and services for the design, specification, installation support and commissioning of new earthing systems, as well as ongoing testing and refurbishment support for existing systems.

Our experience extends to all areas of power generation, reticulation and use, including substations, transmission and distribution systems, power stations, industrial plants and mining operations.



As well as our training services, we also offer:

Consulting

Safearth can provide engineering support for all your earthing needs, including design/test, policy and standards development, incident investigation and asset management.

Instruments

We design and build earthing test instruments with a focus on robust and reliable measurements of new and in-service earthing systems.

Software

Safearth has a long history of developing software for analysing earthing related problems. We are now making some of this software commercially available.

Why not tell us what you need?

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Trusted provider of valuable solutions in every aspect of earthing system management for more than 30 years.

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