

# SAFE EARTHING & BONDING IN RAIL

**2-Day Training Course: Learn the Fundamentals of Rail Earthing & Electrical Risk Management**

A must-attend course that will benefit all those in the rail industry who have had only a little exposure to earthing & bonding – build your confidence & appreciation of the safety, due diligence & system requirements, design parameters & operational realities.

26-27 February 2019 • Perth

26-27 March 2019 • Sydney

15-16 May 2019 • Melbourne

26-27 June 2019 • Brisbane

24-25 September 2019 • Sydney

29-30 October 2019 • Brisbane

26-27 November 2019 • Melbourne



**Our Expert  
Course  
Instructor**



## Lachlan McKerrow

Lachlan is a senior engineer with Safearth and has significant experience presenting the Safearth earthing design training courses. His primary area of interest is lightning and the design of lightning protection systems for substations.

## Key Learning Objectives

- ▶ Illuminate the mislabelled 'Black Art' of earthing
- ▶ Discover the science and craft required to make wise decisions regarding earthing system requirements
- ▶ Discuss matters relevant to safety and earthing systems in organisations
- ▶ Appreciate the complex problems of inductive and conductive interrelationships between substation and power line earthing systems and other conductive assets such as tracks, cabling and fencing
- ▶ Recognise a coordinated approach to the design and management of power earthing systems, lightning protection systems and other rail systems
- ▶ Understand inspection and testing as imperative tools in earthing system management
- ▶ Investigate techniques for solving problems found in earthing system design, using both empirical and analytical computer based techniques

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## ABOUT THE COURSE

This course provides participants with a sound basis in science and practical examples for understanding and problem solving with earthing systems in the rail environment.

The course begins with an introduction to the physics of earthing including the areas of circuit fundamentals, conductive effects, proximity, mutual earth resistance and inductive coupling.

It will then cover soil resistivity fundamentals, field testing and model assessment and derivation before moving on to empirical and analytical voltage design methods and analysis issues for typical applications.

The course includes interactive practical sessions where we will 'see' how specific changes and errors affect outcomes which is invaluable in turning information into understanding.

Over the course, participants will be invited to present real life issues and examples they have wrestled with, which will then be analysed using the understanding and skills developed during the program.

## WHO WILL BENEFIT

**Course pre-requisite: Some understanding of electrical systems is required.**

This course will benefit:

- Those requiring an introduction to or an understanding of earthing systems in a rail environment.
- Non-technical people will attain a proper awareness of the issues while electrical engineers and experienced technicians will further benefit from methods for first pass planning and review.

## OUR EXPERT COURSE INSTRUCTOR



**Lachlan McKerrow**

Lachlan McKerrow received his BE(Elec) from the University of Newcastle, Australia in 1993. Following graduation he worked in heavy industry where he gained experience in the design, installation and commissioning of power and control systems associated with large bulk material handling plants.

Lachlan joined Ausgrid (formerly Energy Australia) in 1999 and gained experience in all aspects of earthing systems, both within Ausgrid and through external consulting work. His primary focus was the Major Substation Earthing review program which assessed all of the major substations in the Ausgrid franchise in a 15 year period. Externally he worked on projects ranging from mining, aluminium smelters and the instrumentation earthing for the replacement reactor at ANSTO in Sydney.

Lachlan is now a senior engineer with Safearth and has significant experience presenting the Safearth earthing design training courses. His primary area of interest is lightning and the design of lightning protection systems for substations. Outside of engineering he has interests in beer brewing and spending time with his family.

## Would You Like To Run This Course On-Site?

### Informa Corporate Learning: On-site & Customised Training

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*"Communicated the course information clearly and made it interesting."*

Signal Electrician, **ARA Security**

*"Good presenter of information, encouraged discussion, answered questions well, contributed experience and outside industry knowledge."*

Manager Traction Power Maintenance, **Queensland Rail**

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## 2-Day Course Outline

### Introduction and context

- What are earthing systems?
- Functions of an earthing system
- Why earthing system interest is increasing
- The importance of getting earthing systems right

### Overview of railway earthing systems

- Utility power supply
- Substations and distribution
- Traction power earthing requirements
- Bonding versus earthing
- Key hazards with the earthed infrastructure of the railway network
- Key design conflicts and challenges

### Safety, human factors and zero risk

- Risk assessment and risk management
- Applicable and background safety criteria sources
- Conditions for risk
- The physiological effects and risks, AC and DC
- Human electrical models and voltage criteria
- Review of changes to earthing standards and how they'll affect rail

### Soil as part of the circuit

- Key soil electrical characteristics
- Soil electrical resistivity
- Information sources on soil
- Resistivity test methods
- Analysis techniques and model determination

### Railway earthing system interactions

- Signalling
- Communications
- Low-voltage supplies
- The importance of correct coordination

### Earth grids

- Key grid components and what they do
- Conductor ratings
- Earth grid resistance
- Determining earth grid performance
- Step, touch and transfer voltages
- Empirical versus analytical analysis techniques
- Strategies in earth grid design
- Common pitfalls

### Earthing systems and alternate paths

- Transfer of energy
- Conductive current distribution
- Induction mechanisms in current distribution
- Inductive hazard creation including tracks, fences and other metallic paths

### DC railway electrification

- Key considerations in DC bonding and earthing in a DC traction environment
- Isolated systems and earth clamps for safety and performance

### AC railway electrification

- Key considerations in AC bonding and earthing in an AC traction environment
- Key considerations of booster transformers and auto-transformer systems

### Earthing strategies and issues

- Separation and isolation in earthing systems
- Interconnected and common bonded systems
- Rail return systems
- Drainage and transient bonding
- Unearthed and floating systems
- Effects of various systems on touch potentials

### Corrosion mechanisms and minimisation

- How stray current causes steel corrosion
- Procedures to control stray current

### Lightning protection

- Introduction to lightning mechanisms and risks
- Approaches to lightning risk management

### Earthing system commissioning and testing

- Benefits and risks associated
- Recommended strategies
- Test methods and equipment
- Common traps and sources of errors

**Demonstration, practical examples and class participation throughout**

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## Easy Ways to Register

**1 Web**  
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**2 Telephone**  
+61 (02) 9080 4395

**3 Email**  
training@informa.com.au

## Stay Connected



## Safe Earthing & Bonding in Rail

	Location	Course Dates	Super Early Bird price valid until		Early Bird price valid until		Standard price valid after			4+ Dels Discount
			PE - 18 Jan 19 SY - 15 Feb 19 ME - 5 Apr 19 BR - 17 May 19 SY2 - 16 Aug 19 BR2 - 20 Sep 19 ME2 - 18 Oct 19		PE - 8 Feb 19 SY - 8 Mar 19 ME - 26 Apr 19 BR - 7 Jun 19 SY2 - 6 Sept 19 BR2 - 11 Oct 19 ME2 - 8 Nov 19		PE - 8 Feb 19 SY - 8 Mar 19 ME - 26 Apr 19 BR - 7 Jun 19 SY2 - 6 Sept 19 BR2 - 11 Oct 19 ME2 - 8 Nov 19			
P19GT04PE	Perth	26-27 Feb 19	\$2,495 + \$249.50 GST	<b>\$2,744.50</b>	\$2,695 + \$269.50 GST	<b>\$2,964.50</b>	\$2,795 + \$279.50 GST	<b>\$3,074.50</b>	\$2,156 + \$215.6 GST	<b>\$2,371.60</b>
P19GT04SY	Sydney	26-27 Mar 19	\$2,495 + \$249.50 GST	<b>\$2,744.50</b>	\$2,695 + \$269.50 GST	<b>\$2,964.50</b>	\$2,795 + \$279.50 GST	<b>\$3,074.50</b>	\$2,156 + \$215.6 GST	<b>\$2,371.60</b>
P19GT04ME	Melbourne	15-16 May 19	\$2,495 + \$249.50 GST	<b>\$2,744.50</b>	\$2,695 + \$269.50 GST	<b>\$2,964.50</b>	\$2,795 + \$279.50 GST	<b>\$3,074.50</b>	\$2,156 + \$215.6 GST	<b>\$2,371.60</b>
P19GT04BR	Brisbane	26-27 Jun 19	\$2,495 + \$249.50 GST	<b>\$2,744.50</b>	\$2,695 + \$269.50 GST	<b>\$2,964.50</b>	\$2,795 + \$279.50 GST	<b>\$3,074.50</b>	\$2,156 + \$215.6 GST	<b>\$2,371.60</b>
P19GT04SY02	Sydney	24-25 Sep 19	\$2,495 + \$249.50 GST	<b>\$2,744.50</b>	\$2,695 + \$269.50 GST	<b>\$2,964.50</b>	\$2,795 + \$279.50 GST	<b>\$3,074.50</b>	\$2,156 + \$215.6 GST	<b>\$2,371.60</b>
P19GT04BR02	Brisbane	29-30 Oct 19	\$2,495 + \$249.50 GST	<b>\$2,744.50</b>	\$2,695 + \$269.50 GST	<b>\$2,964.50</b>	\$2,795 + \$279.50 GST	<b>\$3,074.50</b>	\$2,156 + \$215.6 GST	<b>\$2,371.60</b>
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### Informa Corporate Learning – On-site & Customised Training

Informa Corporate Learning has a long-standing track record of delivering very successful customised learning solutions achieving real and measurable value for our clients through our senior training consultants.

If you have 8+ interested people, an on-site course can be the ideal solution – giving you the opportunity to customise our course content to your specific training needs, as well as attracting significant savings compared to public course costs.

### Why Choose On-site With Informa Corporate Learning?

- 1. Custom design** – Together, we will identify the best blended learning solution for your culture, your people and your training objectives.
- 2. Quality Assured** – We design market-leading training programs, concepts and methodologies, with a 400+ course portfolio. Our rigorously selected 900+ instructor faculty are recognised experts in their field. Quality of their content and delivery methods is assured through continuous monitoring and evolution.
- 3. On-site training** is a cost effective way to train your people and achieve your defined outcomes.

### Our Long Standing Clients Include:

Ambulance Victoria, BHP, Department of Planning, Transport & Infrastructure, SA, Origin Energy, Electricity Generating Authority of Thailand (EGAT), ActewAGL, Ajilon, Arrow Energy, Barrick, Chevron Australia, Coffey International, ConocoPhillips, Dalrymple Bay Coal Terminal, Department of Education, ENI Australia, Fortescue Metals Group, IBM, Jemena, Office of the National Rail Safety Regulator, Pacific National, PT Freeport, Public Transport Authority – WA, QGC – BG Group, Rio Tinto, UBS, Woodside, IP Australia, ANU, Health Purchasing Victoria, Telstra, Queensland Rail, EY, Litmus Group and more...

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