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COURSE BROCHURE

# Railway Earthing, Bonding and Stray Current Control Training Course

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Geneva

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Registered in the United Kingdom and Saudi Arabia

# Railway Earthing, Bonding and Stray Current Control Training Course

**Ref:** 1177_44239 **Date:** 12 – 16 April 2027 **Location:** Geneva **Fees:** 7500 GBP

Railway Earthing, Bonding and Stray Current Control is a 1-week training course for traction power engineers, overhead line and third-rail maintainers and depot electrical staff, and it produces an earthing and bonding scheme review. As electrified networks grow and share corridors with pipelines, utilities and stations, poor return paths can expose people to dangerous voltages and corrode buried steel. Jupiter Prime Training runs this course on railway earthing, bonding and stray current control.

## Why Railway Earthing, Bonding and Stray Current Control Matter Now

Three pressures make earthing and bonding a live issue. New metro, light rail and mainline electrification projects place traction systems beside stations, viaducts and buried services. Utility owners and asset managers increasingly ask rail operators to prove that stray current is not attacking pipelines, rebar or cable sheaths. Maintenance teams, meanwhile, inherit bonds and cross-bonds that are missing, loose or undocumented after years of track renewals. A railway that controls return paths keeps passengers, staff and neighbouring assets safe; one that does not risks electric shock incidents, corrosion claims and costly structural repairs. The course draws on established electrical safety principles for traction systems.

## Who Gains Most from Railway Earthing, Bonding and Stray Current Control

- Those who design or review traction return and earthing arrangements
- Those who install and maintain rail bonds, cross-bonds and impedance bonds
- Those who measure touch voltages at platforms, depots and level crossings
- Those who monitor stray current and corrosion on structures and buried services
- Those who approve isolations and protective earthing before work on electrified lines

A rail operator or electrification contractor gains most when its traction power, track and structures engineers attend together.

## Railway Earthing, Bonding and Stray Current Control Capabilities

Participants learn to trace where traction current really flows and to keep people and steel out of its path.

- Assess traction return circuits for continuity, resistance and alternative paths — traction power engineer
- Calculate expected touch and step voltages at platforms and structures — safety assurance
- Specify bonding and cross-bonding layouts for track, viaducts and stations — design authority
- Test rail-to-earth resistance and stray current levels in the field — maintenance supervisor
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Weigh mitigation options such as insulation, drainage bonds and voltage limiting devices — asset owner
- Communicate corridor findings to utility and pipeline owners — third-party interface managers

## Key Railway Earthing, Bonding and Stray Current Control Terms

- Traction return circuit — the path, usually through the running rails, by which traction current flows back to the substation.
- Touch voltage — the voltage a person can experience between a conductive part and the ground they stand on.
- Step voltage — the voltage between a person's feet caused by current flowing through the ground.
- Stray current — traction current that leaves the intended return path and flows through earth or buried metal.
- Cross-bond — a conductor joining rails or tracks to share return current and equalise rail potential.
- Voltage limiting device — equipment that connects a structure to the return circuit when its voltage rises above a safe threshold.

## Railway Earthing, Bonding and Stray Current Control Day by Day

### Day 1: Traction Power and Return Paths

- AC and DC Traction System Layouts — Feeding and Return Arrangements
- Running Rails as Return Conductors — Resistance and Insulation Trade-Offs
- Earthing Versus Bonding — Purpose of Each in Rail Systems
- Corridor Interfaces — Stations, Viaducts, Tunnels and Utilities
- Electrical Safety Hazards for Staff and Passengers — Shock Routes

### Day 2: Touch and Step Voltage Safety

- Rail Potential Rise Calculation — Normal and Fault Conditions
- Platform and Depot Touch Voltage Zones — Accessible Metalwork
- Step Voltage Near Masts and Substations — Ground Gradients
- Voltage Limiting Devices — Selection, Settings and Testing
- Protective Earthing for Possessions — Safe Work on Isolated Lines

### Day 3: Stray Current and Corrosion

- Stray Current Mechanisms in DC Systems — Leakage From Rails
- Corrosion of Rebar, Pipelines and Cable Sheaths — Anodic Zones
- Stray Current Collection Mats and Drainage Bonds — Control Options
- Monitoring Points and Reference Electrodes — Measuring Structure Potential
- Interaction With Third-Party Cathodic Protection — Coordinating Owners

## Day 4: Bonding Design, Testing and Maintenance

- Bonding Layout Drawings — Rail Bonds, Cross-Bonds and Impedance Bonds
- Rail-to-Earth Resistance Testing — Methods and Acceptance Values
- Bond Condition Inspection — Theft, Damage and Track Renewal Losses
- Signalling Compatibility — Track Circuits and Return Current
- Defect Records and Repair Priorities — Ranking Corridor Risks

## Day 5: Practising the Earthing and Bonding Scheme Review

- Metro Station Touch Voltage Case — Applying Day 2 Calculations
- Viaduct and Pipeline Crossing Case — Applying Day 3 Controls
- Depot Bonding Survey Results — Applying Day 4 Tests
- Mitigation Option Comparison — Cost, Safety and Disruption
- Earthing and Bonding Scheme Review — Findings, Actions and Owners

## Applying Railway Earthing, Bonding and Stray Current Control After the Course

- Walk one station or depot with the bonding drawings and record missing or damaged bonds and cross-bonds.
- Set up stray current monitoring at two structure points and share the readings with the nearest utility owner.

## Railway Earthing, Bonding and Stray Current Control Questions FAQ

### What is railway earthing, bonding and stray current control and why does it matter now?

It is the work of managing where traction current flows so people stay safe and structures do not corrode. Expanding electrified networks bring more shared corridors and more exposure.

### Which roles gain most from railway earthing, bonding and stray current control training?

Traction power engineers, overhead line and third-rail maintainers, depot electrical staff and structures engineers gain most.

### How does railway earthing, bonding and stray current control differ from a general cathodic protection course?

It starts from the railway's traction return circuit and passenger safety. A general cathodic protection course designs protection for pipelines and tanks without the traction system, track circuits or platform touch voltages.

## What do you bring back from railway earthing, bonding and stray current control training?

You bring back a scheme review with corridor findings, voltage calculations and a ranked list of bonding repairs.

## Railway Earthing, Bonding and Stray Current Control: The Way Forward

The earthing and bonding scheme review records each return path, bond, measured voltage and stray current reading along a corridor. Its first use is deciding which bonds and voltage limiting devices to repair first, and it serves traction, track and structures engineers. After the first monitoring cycle, revisit whether readings near utilities have fallen.