Electrified Lines
Traction Bonding

Synopsis
This document mandates the requirements for electrified lines traction bonding.

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### References

The following parts are superseded by GLRT1210 Iss 1 as of 07/03/2015: Part of 4.1.3
Remaining requirements superseded by GLRT1212 Iss 1 on 05/12/2015
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Part A

Issue Record
This document will be updated when necessary by distribution of a complete replacement.

Amended or additional parts of revised pages will be marked by a vertical black line in the adjacent margin.

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Railway Group Standards are mandatory on all members of the Railway Group * and apply to all relevant activities that fall into the scope of each individual’s Railway Safety Case. If any of those activities are performed by a contractor, the contractor’s obligation in respect of Railway Group Standards is determined by the terms of the contract between the respective parties. Where a contractor is a duty holder of a Railway Safety Case then Railway Group Standards apply directly to the activities described in the Safety Case.

* The Railway Group comprises Railtrack and the duty holders of the Railway Safety Cases accepted by Railtrack.

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The provisions in this document are to be complied with from 3 June 2000.

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Part B

1 Purpose
The purpose of this document is to mandate the requirements for electrified lines traction bonding to:

- prevent the risk of injury from electric shock from accessible and touch voltages;
- reduce to a level as low as reasonably practicable the risk of explosion from arcing when flammable gases and liquids are being transferred; and
- reduce to a level as low as reasonably practicable the export of stray current from DC electrification systems;

2 Scope
The overall scope of Railway Group Standards is as specified in Appendix A of GA/RT6001.

Specifically the contents of this document apply to the traction bonding of all electrified lines, including fourth rail systems where the fourth rail is at running rail potential.

3 Definitions

**Traction Return Circuit**
The path by which the traction current returns from the traction unit to the feeder station, or substation, incorporating the traction return rails, bonding connections, return conductors and booster transformers as appropriate.

**Rail Potential (EN 50122-1)**
The voltage occurring under operating conditions when the running rails are utilised for carrying the traction return current or under fault conditions between running rails and earth.

**Accessible Voltage (EN 50122-1)**
That part of the rail potential under operating conditions which can be bridged by persons, the conductive path being conventionally from hand to both feet through the body or from hand to hand.

**Touch Voltage (EN 50122-1)**
Voltage under fault conditions between parts when touched simultaneously.

**Flammable Gases and Liquids**
For the purpose of this Standard these will be considered as those products which are dangerous goods with a flash point not exceeding 61ºC.

**Stray Current**
The part of a current which follows paths other than the intended paths.

4 Requirements

4.1 AC electric traction systems

4.1.1 AC electric traction systems shall be designed, installed and maintained to ensure connection of the traction return circuits to the general mass of earth.

4.1.2 AC electric traction systems and other infrastructure systems shall be designed, installed and maintained such that any exposed conductive part of the infrastructure, including signalling rails, which may be subject to AC electric traction system voltages due to flashover or by inadvertent contact with live parts does not present a risk of injury from electric shock or interference with the safe running of trains. This shall be achieved:

- by reliable and effective connection to the general mass of earth; or
- through other control measures.
4.1.3
The traction bonding of new, or major revisions to existing AC electric traction systems shall be designed, installed and maintained such that:

- the values of accessible and touch voltages as specified in EN 50122-1 are not exceeded;
- voltages associated with metal objects which may be connected to a remote earth, but not connected to the traction return circuit, do not exceed the values specified in EN 50122-1 for accessible and touch voltage; and
- surface or buried metal pipes and other metal objects do not develop voltages through induction from the AC electric traction system in excess of the values specified in EN 50122-1 for accessible and touch voltage.

If the traction load current or short circuit current level in an existing electric traction system increases such that the requirements of this standard may not be met, then the traction bonding shall be reviewed as necessary and upgraded as necessary.

4.2 DC electric traction systems

4.2.1 DC electric traction systems shall be designed so as to reduce to a level as low as reasonably practicable the probability of the export of stray currents.

4.2.2 DC electric traction systems shall be designed, installed and maintained so as to ensure that there are no deliberate low resistance points of contact between the traction return circuits and the general mass of the earth.

4.2.3 DC electric traction systems shall be designed, installed and maintained so that along-track resistance is as low as reasonably practicable.

4.2.4 The traction bonding of new, or major revisions to existing, DC electric traction systems shall be designed, installed and maintained so as to comply with the values of accessible and touch voltages as specified in EN 50122-1.

If the traction load current or short circuit current level in an existing electric traction system increases such that the requirements of this standard may not be met, then the traction bonding shall be reviewed, and upgraded as necessary.

4.3 Dual AC / DC electric traction systems

Where AC and DC electric traction systems are either installed on the same tracks, or installed on different tracks close to one another, then the requirements of Clause 4.1 shall be met, and additional control measures shall be taken such that DC stray currents are restricted to a level as low as reasonably practicable.

Insulated rail joints used to limit the flow of DC stray currents shall not result in hazardous voltages appearing between the vehicles of any train, nor cause damage to trains due to current forced to flow through them.

4.4 Interfaces

The design of traction bonding for electric traction systems shall take into account the need to avoid interference with train control and communications systems. It shall also take into account any special requirements at interfaces with other electrified railways and non-electrified railways, including those of other administrations.

4.5 Arcing

Installations where flammable gases and liquids are to be transferred shall be designed, installed, maintained and operated such that the risk of explosion from arcing generated by electric traction systems is as low as reasonably practicable.
5 Processes

5.1 Protective provisions against electric shock shall take precedence over provisions against the effects of DC stray current.

5.2 Processes shall be in place to ensure that:

- the design of and any modifications to traction bonding, including the level of redundancy, are recorded;
- the installation conforms to the current modification status of the recorded design;
- the traction bonding is inspected and is maintained to the designed standard and the results of this inspection and maintenance are recorded; and
- when, during inspection or maintenance, any part of the traction bonding is found to be faulty, corrective action is taken in a time-scale appropriate to the level of risk.

5.3 The Infrastructure Controller shall establish the maximum times allowable to correct faulty traction bonding, based on risk assessments and shall ensure that these times are not exceeded.

5.4 The Infrastructure Controller shall identify the possible failure modes of the DC stray current control measures. Systems or procedures shall be implemented for the detection of such failures, including as appropriate the provision of permanent test connections or monitoring equipment.

5.5 The Infrastructure Controller shall co-operate with third parties to mitigate potential unacceptable effects notified to him by those parties. The Infrastructure Controller shall co-operate with such parties to achieve satisfactory corrective action.
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References

GA/RT6001  Railway Group Standards Change Procedures

EN 50122-1  Railway applications - Fixed Installations,

Part 1. Protective provisions relating to electrical safety and earthing.

The Catalogue of Railway Group Standards (or Railway Group Standards CD ROM) should be consulted for the current issue number and status of the documents that are published by the Safety & Standards Directorate.