RAIL SAFETY AND STANDARDS BOARD

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DC Energy Subsystem and Interfaces to Rolling Stock Subsystem

This document sets out requirements for the 750 V direct current (dc) conductor rail energy subsystem and the interfaces to rolling stock operating over it.

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Synopsis

This document sets out requirements for the 750 V direct current (dc) conductor rail energy subsystem and the interfaces to rolling stock operating over it.

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Issue record

Issue	Date	Comments
One	March 2026 [proposed]	Original document. Created from the relevant non-national technical rule (NTR) content of GLRT1212 issue one and associated content in GLGN1612.

Revisions have not been marked by a vertical black line in this issue because this is a new document.

Superseded documents

The following Railway Group documents are superseded, either in whole or in part as indicated:

Superseded documents	Sections superseded	Date when sections are superseded
GLRT1212 issue one	2.11.2, 2.11.3, 2.11.4, 3.4.5, 3.4.6, Appendix D	March 2026 [proposed]
GLGN1612 issue one	G 2.11.2, G 2.11.3, G 2.11.4, G 3.4.5, G 3.4.6, Appendix D	March 2026 [proposed]

Supply

The authoritative version of this document is available at www.rssb.co.uk/standards-catalogue. Enquiries on this document can be submitted through the RSSB Customer Self-Service Portal https://customer-portal.rssb.co.uk/.

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Part 1 Purpose and Introduction

1.1 Purpose

1.1.1 This document sets out requirements which can be used on a new, renewed or upgraded GB mainline 750 V dc energy subsystem, using top contact ground level conductor rail including its interfaces with the rolling stock subsystem.

1.1.2 The requirements are additional to those set out in the Energy (ENE) National Technical Specification Notice (NTSN) and national technical rules in GLRT1212. They do not meet the criteria for national technical rules set out in the Standards Code and relevant legislation.

1.2 Application of this document

1.2.1 Compliance requirements and dates have not been specified because these are the subject of internal procedures or contract conditions.

1.2.2 If you plan to do something that does not comply with a requirement in this document, you can ask a standards committee to comment on your proposed alternative. To get their opinion, submit an application to RSSB. You can find advice and guidance on using alternative requirements on RSSB's website.

1.3 User's responsibilities

1.3.1 Industry experts representing railway industry stakeholders are involved in the process for setting the content of documents that are prepared in accordance with the procedures set out in the Railway Standards Code and Manual.

1.3.2 Users of documents published by RSSB are expected to be competent or should take specialist advice before following or applying any practices or principles contained within them and are reminded of the need to consider their own responsibilities to ensure safe systems of work and operation, health and safety at work and compliance with their own duties under health and safety legislation. While documents published by RSSB can be used to help inform and devise safe practices and systems of work, their content has not been designed or prepared for:

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1.4 Structure of this document

1.4.1 This document sets out a series of requirements that are sequentially numbered. This document also sets out the rationale for the requirement, explaining why the requirement is needed and its purpose and, where relevant, guidance to support the requirement. The rationale and the guidance are prefixed by the letter 'G'.

1.4.2 Some subjects do not have specific requirements but the subject is addressed through guidance only and, where this is the case, it is distinguished under a heading of 'Guidance' and is prefixed by the letter 'G'.

1.5 Approval and authorisation of this document

1.5.1 The content of this document will be approved by Energy Standards Committee on 13 November 2025 [proposed].

1.5.2 This document will be authorised by RSSB on 17 December 2025 [proposed].

Part 2 Electrical requirements

2.1 Warning to crews on trains of a traction system changeover

Guidance

G 2.1.1 Requirements for traction system changeover signage are in RIS-3784-TOM and RIS-2713-RST.

2.2 Short circuiting bar and hook switch operating tools

2.2.1 The following equipment appropriate for each route shall be provided:

a) Short circuiting bars
b) Hook switch operating tools.

Rationale

G 2.2.2 The requirement in 2.2.1 sets out the equipment which can be used to switch off the power in relevant parts of the energy subsystem in emergency conditions.

Guidance

G 2.2.3 The procedures to switch off traction power supply in an emergency using a short circuit bar are set out in GERT8000-DC 'Using a short-circuiting bar'.

2.3 Prohibiting the use of short circuiting bar

2.3.1 In areas where the use of a short circuiting bar is prohibited, guard boarding shall be provided or an insulating shroud shall be fitted to the underside of the conductor rail.

Rationale

G 2.3.2 This identifies places where short circuit bars are not to be used.

Guidance

G 2.3.3 Where guard boarding is provided for this purpose, a single board between conductor rail and running rail can be used.

2.4 Tunnel emergency circuits

2.4.1 On lines where emergency tunnel pinch wires are provided, the use of the pinch wires shall:

a) Remove power from the conductor rails on all affected lines
b) Prevent inadvertent re-energisation

Rationale

G 2.4.2 Pinch wires enable the driver of a train to remove the power supply in an emergency without having to leave the cab of the train.

Guidance

G 2.4.3 If operation of the isolation system requires special equipment such as telephone handsets, details of the compatible equipment and operating instructions are made available.

Part 3 Mechanical requirements

3.1 Compatibility with position of signals

3.1.1 The conductor rail layouts shall be designed so that, when trains come to a stand at stop signals or movement stop marker boards, at least one collector shoe remains in contact with a conductor rail.

3.1.2 The conductor rail layouts shall be designed so that, when trains come to a stand at stop signals or movement stop marker boards, the collector shoes shall not bridge a gap between two or more sections of conductor rail that can be isolated from each other by remote switching.

Rationale

G 3.1.3 The design requirement in 3.1.1 is to protect against a train stopping in normal operation such that it cannot receive electrical power.

G 3.1.4 The design requirement in 3.1.2 is to protect against the hazard of a train stopping in an area in normal operation such that it is creating a hazard by energising a section of rail that is not intentionally live.

Guidance

G 3.1.5 The assessment of compatibility with conductor rails includes a check that stop signals are positioned so that the stopping position of the dc current collectors when trains stop at each signal is compatible for all rail vehicles permitted or intended to be used on the route.

3.2 Compatibility of the contact system with heat emissions from trains

3.2.1 As a result of heat emitted from rolling stock, the contact system, including support insulators, associated cabling, conductor rail shrouds and guard boarding shall withstand a surface temperature of at least 70^0 C for five minutes.

Rationale

G 3.2.2 This provides protection against damage to vulnerable components in the conductor rail system from hot emissions from stationary rolling stock.

Guidance

G 3.2.3 Whilst the temperature limit is 70^0 C, it is good practice to withstand at least 100^0 C.

3.3 Requirements for 4th Rail Areas

3.3.1 In 3rd rail areas where passage of London Underground 4th rail rolling stock under DC traction is required, an additional 4th rail conductor shall be provided.

3.3.2 The static and dynamic position of the conductor rail relative to the running rails shall comply with the position limits set out in *Table 1*. The reference datum shall be the

plane of the upper surface of the running rails, and the gauge faces of the running rails.

3.3.3 Where a 4th rail is provided on lines with a 3rd rail electrification system, the 4th rail shall be bonded to the traction return system.

Rationale

G 3.3.4 These measures are required to ensure compatibility between the conductor rail and the working range of DC current collectors of London Underground Limited (LUL) 4th rail rolling stock. The bonding of the 4th rail provides continuity of the traction return circuit for these vehicles when operating over lines electrified for 3rd rail operation.

G 3.3.5 The 4th rail is provided for compatibility with LUL vehicles.

Dimension	Nominal design position	Maintenance target	Dynamic position limits
Vertical height (relative to plane of top of running rails)	+38 ± 3 mm	+38 +10, -5 mm	+38 + 20 mm, -12 mm
Rate of change of vertical height (facing or trailing)	5 mm per m	5 mm per m	≤ 25 mm per m
Lateral position (relative to dead centre of running rails)	0 ± 10 mm	0 ± 15 mm	0 ± 13 mm
Vertical alignment (twist) relative to line normal to plane of top of running rails	± 3 degrees	± 3 degrees	± 5 degrees

Table 1: 4th rail conductor rail position

Definitions

DC conductor rail energy subsystem	The DC conductor rail energy subsystem consists of: a) Substations: connected on the primary side to the high voltage grid, with transformation of the high voltage to a voltage and / or conversion to a power supply system suitable for the trains. On the secondary side, substations are connected to the railway contact line system. b) Sectioning locations: electrical equipment located at intermediate locations between substations to supply and parallel contact lines, and to provide protection, isolation and auxiliary supplies. c) Contact line system: a system that distributes the electrical energy to the trains running on the route and transmits it to the trains by means of current collectors. The contact line system is also equipped with manually or remotely controlled disconnectors which are required to isolate sections or groups of the contact line system according to operational necessity. Feeder lines are also part of the contact line system. d) Return circuit: all conductors which form the intended path for the traction return current and which are additionally used under fault conditions. Therefore, so far as this aspect is concerned, the return circuit is part of the energy subsystem and has an interface with the infrastructure subsystem.
current collector	Equipment fitted to the rail vehicle and intended to collect current from a contact wire or conductor rail. [IEV ref 811-32-01]
contact line system	A system that distributes the electrical energy to the trains running on the route and transmits it to the trains by means of current collectors.
subsystem [railway system]	A subdivision (in whole or in part) of the railway system as specified in the Railways (Interoperability) Regulations 2011 (as amended). Subsystems can be structural or functional.
train	An operational train which may consist of locomotives, wagons, coaches, multiple units or a single fixed formation unit.

References

The Standards catalogue gives the current issue number and status of documents published by RSSB: http://www.rssb.co.uk/standards-catalogue.

The governance arrangements for Railway Group Standards, Rail Industry Standards, National Operations Publications, and industry recommendations for revisions to National Technical Specification Notices are set out in the Railway Standards Code. Detailed management arrangements are in the complementary Standards Manual. Both documents are available on the RSSB website.

	Rail Safety and Standards Board (2024), Railway Standards Code
	Rail Safety and Standards Board (2024), Standards Manual

Railway Group Standards

GLRT1212	DC Energy Subsystem and Interfaces to Rolling Stock Subsystem

RSSB documents

GERT8000-DC	Rule Book Module - DC electrified lines
RIS-0733-CCS	Lineside Operational Signs

Other references

ENE NTSN	Energy National Technical Specification Notice (ENE NTSN). Published by the Secretary of State on 1 January 2021 pursuant to regulation 3b of the Railways (Interoperability) Regulations 2011.