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Rail Industry Standard on AC Energy Subsystem and Interfaces to Rolling Stock Subsystem

Synopsis

This document sets out requirements and guidance for new, renewed and upgraded ac energy subsystem, and the interfaces to rolling stock and operation and traffic management subsystems.

Published by RSSB

Issue record

Issue	Date	Comments
One	04/12/2022 [Proposed]	Original document.

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Superseded documents

The following Railway Group documents are superseded, either in whole or in part as indicated:

Superseded documents	Sections superseded	Date when sections are superseded
GLRT1210 issue two	2.1.1, 2.1.2, 2.3, 3.2, 3.8,	04/03/2023 [Proposed]
GLGN1610 issue two	G2.1.1 to G2.1.5, G2.1.6 to G2.1.9, G2.1.10 to G2.1.18, G2.1.19 to G2.1.22, G2.1.25 to G2.1.28, G2.3.3, G2.3.4, G2.3.5 to G2.3.7, G3.2.1 to G3.2.4, G3.8.1	04/03/2023 [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 contains guidance and requirements which can be used on a new, renewed or upgraded (ac) energy 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 GLRT1210. However, as they do not meet the criteria for for national rules set out in the Standards Code and relevant legislation they are included in this Rail Industry Standard (RIS).

1.1.3 Parts 2 and 3 of this document contains guidance in relation to aspects of the ENE subsystem power supply and the overhead contact line respectively.

1.1.4 The requirements, rationale and associated guidance provided in Parts 4 and 5 of this document can be used by project entities to help:

a) Meet the essential requirements for Safety applicable to the ENE subsystem as set out set in 2.2.1 of Schedule 2 of Railways (Interoperability) Regulations 2011 (as amended) (RIR); and
b) Specify the ENE (structural) subsystem signage which supports the network operating rules associated with the operation and traffic management (functional) subsystem.

1.1.5 This document also contains an informative annex that summarises the main ac system characteristics for rolling stock compatibility. It does not cover the harmonic frequency related information for rolling stock compatibility and the compatibility with other interfaces such as signalling and telecommunication systems.

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 RIS, you can ask a Standards Committee to comment on your proposed alternative. If you want a Standards Committee to do this, please submit your deviation application form to RSSB. You can find advice and guidance on using alternative requirements on RSSB's website www.rssb.co.uk.

1.3 Health and safety responsibilities

1.3.1 Users of documents published by RSSB are reminded of the need to consider their own responsibilities to ensure health and safety at work and their own duties under health and safety legislation. RSSB does not warrant that compliance with all or any documents published by RSSB is sufficient in itself to ensure safe systems of work or operation or to satisfy such responsibilities or duties.

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 10 November 2022 [proposed].

1.5.2 This document will be authorised by RSSB on 01 December 2022 [proposed].

Part 2 Traction power supply

2.1 System voltage

Guidance

G 2.1.1 The UK has published its National Implementation Plan for the ENE NTSN on the Department for Transport's website. Section 7.2.2 of the ENE NTSN requires any decisions on the implementation plan for voltage and frequency to be taken on technical and economic grounds. Given the number of different power supply configurations (25 kV ac overhead contact line (OCL), 1.5 kV dc OCL and 750 V dc conductor rail) in the UK, clauses 5.1 and 5.2 of the National Implementation Plan for the ENE NTSN indicate the system types to be used for future electrification, which are subject to an authorisation under the UK's interoperability legislation.

G 2.1.2 ENE NTSN 4.2.3(2) refers to BS EN 50163:2004 + A1:2007 clause 4.1, which in clause 3.16 of BS EN 50163:2004 + A1:2007, defines normal operating conditions and the power supply equipment being operated according to standard rules. Good practice for design is where:

a) The voltage limits corresponding to 'normal operation' apply when the system is fully operational and also when one non-adjacent single outage of the traction supply system occurs; and
b) The voltage limits corresponding to 'abnormal operation' apply when the system is degraded when two or more adjacent single outages of the traction supply system occur.

G 2.1.3 *Appendix A* sets out a summary of ac system characteristics related to the contact line voltage. Handling the overvoltage caused by ac electric train harmonic emissions at their switching frequencies is not in the scope as set out in 1.1.5.

2.2 Frequency

Guidance

G 2.2.1 The ENE NTSN references BS EN 50163:2004 which describes the nominal frequency as 50 Hz, and this frequency is used on the GB main line railway.

G 2.2.2 The applicable frequency limits are specified in BS EN 50163:2004+A3:2022 clause 4.2 for systems with 'synchronous connections.'

G 2.2.3 *Appendix A* sets out a summary of ac system characteristics related to the contact line fundamental power frequency.

2.3 Power factor of trains and short circuit characteristics

Guidance

G 2.3.1 Legacy rolling stock which are not compliant with the ENE NTSN and BS EN 50388 can have less favourable power factors. The influence of legacy vehicles' power factors might need consideration if it is likely to materially affect the validity of the results when undertaking system modelling.

G 2.3.2 The worst-case asymmetry of the ac waveform occurs during a short circuit where one half of a sine wave is at its maximum value and returns to symmetrical conditions over several cycles, according to the value of the circuit's time constant. It is good practice to know the maximum short circuit time constant that can exist so that the main circuit breaker on electric rail vehicles can be correctly specified to ensure technical compatibility according to the value of the traction supply circuit's time constant at the interface with a vehicle's pantograph.

G 2.3.3 *Annex A* sets out the target value for the maximum contact line fault current in an ac energy system for rolling stock compatibility.

2.4 Current at standstill

Guidance

G 2.4.1 The ENE NTSN does not specify requirements for current at standstill for ac systems. BS EN 50367:2020, clause 7.2, Table 5 specifies a limit of 80 A per pantograph at vehicle standstill, assuming two 40 mm wide contact strips. RSSB research project T1185 (2021) undertook tests to ascertain current capacity of different types and configurations of contact wires.

Part 3 Overhead contact line and pantograph interface

3.1 Dynamic behaviour and quality of current collection

Guidance

G 3.1.1 Operating vehicle configurations that are not compliant with the Rolling Stock - Locomotive and Passenger (LOC&PAS) NTSN on an ENE NTSN compliant electrification system can, in some cases, require additional enhancements to the ENE NTSN compliant design, in relation to shorter pantograph spacings and current collection.

G 3.1.2 To help establish current collection performance criteria between the pantograph and the overhead contact line when this is not based on compliance with relevant NTSNs, it is good practice to consider pantograph types and spacings intended to operate on a route. Further details regarding the compatibility between typical combinations of pantographs and overhead line designs are given in RSSB research report T1244 along with a compatibility matrix (containing pantograph speed/spacing – OCL combinations) to support such considerations during technical compatibility assessments at route level.

G 3.1.3 It is good practice for new line of route electrification projects and route-wide electrification renewal projects to consider the stagger and sweep characteristics to be applied during the design. The aim is to manage the possibility of uneven (asymmetric) contact strip wear, where curves on a part of the network might have an inherent bias. This can adversely influence contact strip wear if the majority of vehicles operations are concentrated in these areas. Further details for managing the pantograph strip and contact wire wear are set out in RSSB research report T876 (2012).

3.2 Vertical movement of the contact point

Guidance

G 3.2.1 BS EN 50367:2020 sets out requirements for checking the vertical movement of the contact point at a registration position by measuring the contact wire uplift for representative design types of steady arms. Checking this aspect by measurement is most effective when used for assessment of the overhead contact line basic design. This might not be an appropriate approach to identify allocation design and construction errors and other techniques might be more cost-effective.

3.3 Trackside pantograph monitoring sites

Guidance

G 3.3.1 It is good practice for each trackside pantograph monitoring site to be capable of reading the automatic vehicle identification (AVI) and radio frequency identification tag on electric rail vehicles passing the system. The facility to read this tag simplifies the subsequent data processing and reduces the possibility of vehicle identification errors occuring when seeking to identify pantograph related faults detected by trackside monitoring sites.

G 3.3.2 RSSB project report COF-UOH-58 (2021), sets out the different monitoring systems available for the pantograph / overhead contact line interface.

3.4 Harmonic characteristics of the OCL system

Guidance

G 3.4.1 For the purposes of interoperability, harmonic characteristics of the OCL system are covered by ENE NTSN clause 4.2.8 and BS EN 50388-1:2022. When considering this aspect during route compatibility, refer to RIS-8270-RST.

Part 4 Overhead contact line and current collector zones

4.1 Overhead contact line and current collector zone dimensions

4.1.1 For contact lines without a catenary wire, the dimension for parameter X, set out in BS EN 50122-1:2022, Figure 1 shall be 4 m.

4.1.2 For contact lines which include a catenary wire, the dimension for parameter X, set out in BS EN 50122-1:2022, Figure 1 shall be either:

a) X = 4 m; or
b) X = HP × tan(30°)

4.1.3 Overhead Contact Line (OCL) dimension for parameter Y set out in BS EN 50122-1:2022, Figure 1 shall be 1.4 m.

4.1.4 OCL dimension for parameter Z shall be equal to 'SH' - 'HP', where the maximum height of the current collector zone 'SH' is 6800 mm and 'HP' is the highest point of the OCL, set out in BS EN 50122-1:2022.

Rationale

G 4.1.5 This requirement can be used to support compliance to ENE NTSN clause 4.2.18 for controlling hazards associated with indirect contact electric shock from exposed conductive parts. This requirement provides dimensions for parameters which specify the extent of these zones. Exposed conductive parts of traction/non traction power supply which are located in the contact line or current collector zone are connected to the return circuit.

G 4.1.6 The OCL zone and current collector zone are defined in BS EN 50122-1:2022 clause 4.1 and Figure 1, but the dimensions X, Y and Z are to be determined according to 'National Regulations' for which this rail industry standard provides national values. These requirements align with and are based on experience from approved deviation applications against GLRT1210 issues one and two, and will reduce the need for lineside assets to be upgraded, relocated or bonded with resulting savings in costs and time.

Guidance

G 4.1.7 When values for X using both methods 'a' and 'b' are available in clause 4.1.2, it is good practice to select the method with the lower value of X in order to reduce costs associated with bonding.

G 4.1.8 Where necessary, the dimension X can be increased by a minimum of 2 m beyond the horizontal position of the live parts of 25 kV out of running or terminating contact lines.

G 4.1.9 A catenary wire height (HP) of 7.0 m and a 30° angle for parameter θ aligns with the guiding dimension of 4.0 m in BS EN 50122-1:2022 for overhead contact line zone parameter X. Further information is provided in GLRT1210 clause 3.3.2 and BS EN 50122-1:2022 clause 4.1.

Part 5 Overhead contact line signage

5.1 Overhead contact line structure identification plate

5.1.1 Every OCL structure shall be provided with an identification plate giving the structure reference code (unique within a defined area).

5.1.2 The size and location of structure identification plates shall be such that the text is readable from the cab of a stationary train.

Rationale

G 5.1.3 Overhead contact line structures have identification plates so that staff can give a precise location by using them as a common position reference. They can be used when reporting faults such as damaged parts of OCL to the signaller or electrical control room, as required in GERT8000-AC.

Guidance

G 5.1.4 It is good practice to locate identification plates so that maintenance is possible without the requirement for exposed live parts of the energy subsystem to be isolated and earthed.

G 5.1.5 Structure identification plates historically consist of letters representing an electrified route, a number representing distance in mile or kilometre intervals and a number representing the individual structure within a mile or kilometre interval. These are arranged over three lines of text. Current practice for new electrification is to align the alpha labelling to the Engineers Line Reference (ELR) and to express the location of structures in the form X over Y, where X is the distance in kilometre intervals and Y is the metre interval within that kilometre.

G 5.1.6 The size of structure number plates vary depending on their application however font heights are typically a minimum of 45 mm. Further details are available from the applicable OCL basic design range or from the infrastructure manager.

5.2 Indicating phase separation sections to train drivers

5.2.1 The start of each OCL phase separation section shall be made visible using lineside operational sign AJ02.

5.2.2 Lineside operational sign AJ01 shall be provided on each line with a signalled approach to sign AJ02, except for lines where trains cannot approach under electric power from the OCL.

Rationale

G 5.2.3 Integration with the train driving task:

a) Lineside operational signs AJ01 and AJ02 are distinctive visible cues that remind train drivers of the location of an OCL phase separation section. They also support train driver learning and route knowledge retention.

b) Train drivers interpret sign AJ01 to confirm that the train is approaching an OCL phase separation section and understand when to take an appropriate train driving response.
c) Train drivers interpret sign AJ02 to confirm the start of the OCL phase separation section.

G 5.2.4 Conformity with requirements 5.2.1 and 5.2.2 can be used to mitigate the risk of:

a) A driver inadvertently stopping an electric train at or near an OCL phase separation section, giving rise to the possibility of not being able to restart the train successfully using the traction power supply;
b) An electric train unexpectedly losing traction power when entering an OCL phase separation section; and
c) Damage due to electrical arcing at the OCL phase separation section.

Guidance

G 5.2.5 Train driver route knowledge and experience includes the location of OCL phase separation sections.

G 5.2.6 Phase separation sections are also referred to as as 'neutral sections'.

G 5.2.7 It is good practice to locate sign AJ02 either at the preceding structure or adjacent to the automatic power control magnet at the start of the OCL phase separation section.

G 5.2.8 The distance from sign AJ01 to sign AJ02 is determined using the maximum permissible speed applicable to electric trains and an assessment of the train driving task on the approach to the OCL phase separation section. It is good practice to confirm the location of sign AJ01 using a driveability assessment so that the time available takes into account all of the elements of the train driving task on the approach to sign AJ02.

G 5.2.9 However, on non-electrified lines at junctions (or in similar situations) when the phase separation section can be approached, lineside operational sign AJ01 is not necessary.

G 5.2.10 RIS-0737-CCS sets out further requirements and guidance on:

a) The process used to confirm that signs AJ01 and AJ02 are positioned so that they are readable and interpretable in the operational context; and
b) Requirements for calculating the minimum response time (MRT) of lineside operational signs. Signs AJ01 and AJ02 are subject to a baseline response time (BRT) of 4 seconds because they require train drivers to take an action in response to the presented information.

   Historically, AJ01 has been located approximately 1.6 km from the rear of the neutral section in order to allow for locomotives with tap changers to run down to zero from full power in advance of the neutral section. Assuming a 200 km/h operational line speed, this corresponds to an MRT of approximately 29 seconds. This includes a supplementary response time (SRT) of approximately 25 seconds and a baseline time of 4 seconds. Distances smaller than 1.6 km might be more practicable based on lower line speeds or smaller MRTs.

5.3 Warning to crews on trains of a traction system changeover

Guidance

G 5.3.1 At power changeover locations with interfaces to 25 kV ac electrified routes, signs are provided and positioned in accordance with RIS-3784-TOM.

G 5.3.2 Warning signs are provided as necessary at OCL system separation sections to advise the driver of a train to prepare for and undertake the action necessary to achieve power changeover. This is to give a smooth operational changeover between energy subsystems and adequate continuity of supply to the train.

G 5.3.3 Further requirements for lineside operational signs at 25 kV ac electrification system boundaries and locations that necessitate traction changeover are set out in RIS-0733-CCS.

5.4 Warning signs at level crossings

5.4.1 The safety and protection arrangements provided at a level crossing where OCL is present shall include signs that warn level crossing users of the presence of overhead live wires and precautions to avoid danger from electric shock.

Rationale

G 5.4.2 Conformity with this requirement is used to mitigate the risk of a level crossing user inadvertently being too close to the OCL such that danger can arise.

Guidance

G 5.4.3 The provisions made under the Level Crossing Act 1983 place an obligation on the Operator of the Level Crossing to implement safety and protection arrangements at the level crossing.

G 5.4.4 Public level crossings are subject to the provisions of a Level Crossing Order, made under the Level Crossing Act 1983, which specifies the safety and protection arrangements at the level crossing. The Level Crossing Regulations 1997, made under the same Act, place obligations on the infrastructure manager to comply with Level Crossing Orders. The Traffic Signs Regulations and General Directions 2016 define the signs to be used to warn of hazards.

G 5.4.5 Private level crossings are subject to the provisions of the Private Crossings (Signs and Barriers) Regulations 1996 (PCR), which place obligations on the operator of the level crossing (infrastructure manager) to provide signs and gates, and prescribes the signs to be used to warn of overhead live wires.

G 5.4.6 The DfT is consulting (Summer 2022) on the withdrawal of the Private Crossings (Signs and Barriers) Regulations 1996 and the introduction of a new suite of signs that might supersede PCR signs CB01, CC13 and CC17.

Appendices

Appendix A AC System Characteristic for Rolling Stock Compatibility

A.1 AC System Characteristics for Rolling Stock Compatibility

Guidance

Note: The content of this appendix is not mandatory and is provided for information only

G A.1.1 This appendix summarises values relevant to *2.1* and and *2.2*.

Ref	System characteristic	Symbol	Value	EN source	RIS-1853-ENE
1. Contact line voltage					
1.1	Nominal voltage.	U_mn	25,000 V AC	BS EN 50163:2004+ A3:2022, clause 4.1 and Table 1.	2.1
1.2	Highest permanent voltage.	U_{max1}	27,500 V AC	BS EN 50163:2004+ A3:2022, clause 4.1 and Table 1.	2.1
1.3	Highest non-permanent voltage (maximum duration five minutes).	U_{max2}	29,000 V AC	BS EN 50163:2004+ A3:2022, clause 4.1 and Table 1.	2.1
1.4	Lowest permanent voltage.	U_{min1}	19,000 V AC	BS EN 50163:2004+ A3:2022, clause 4.1, Table 1.	2.1
1.5	Lowest non-permanent voltage (maximum duration two minutes).	U_{min2}	17,500 V AC	BS EN 50163:2004 +A3:2022, clause 4.1, Table 1.	2.1

Ref	System characteristic	Symbol	Value	EN source	RIS-1853-ENE
1.6	Lowest non-permanent voltage (lines not yet upgraded) (maximum duration 10 minutes).	U_{min2} a	14,000 V AC	BS EN 50163:2004+ A3:2022, clause 4.1, Table 1, and Annex B.	2.1
1.7	Lowest non-permanent voltage (lines not yet upgraded) (maximum duration two minutes).	U_{min2} b	12,500 V AC	BS EN 50163:2004+ A3:2022, clause 4.1, Table 1, and Annex B.	2.1
2. Contact line frequency					
2.1	Nominal frequency.	F_n	50 Hz	BS EN 50163:2022+ A3:2022, clause 4.2.	2.2
2.2	Maximum frequency for 99.5 % of the year.	F_{max1}	50.5 Hz	BS EN 50163:2004+ A3:2022, clause 4.2.	2.2
2.3	Minimum frequency for 99.5 % of the year.	F_{min1}	49.5 Hz	BS EN 50163:2004+ A3:2022, clause 4.2.	2.2
2.4	Maximum frequency for 100 % of the time.	F_{max2}	52 Hz	BS EN 50163:2004+ A3:2022, clause 4.2.	2.2
2.5	Minimum frequency for 100 % of the time.	F_{min2}	47 Hz	BS EN 50163:2004+ A3:2022, clause 4.2.	2.2
3. Contact line fault current					

Ref	System characteristic	Symbol	Value	EN source	RIS-1853-ENE
3.1	Maximum rms fault current.	I_{sc} rms	15 kA (target)	BS EN 50388-1:2022, clause 11.2 and Table 6.	2.3

Table 1: AC system characteristic for rolling stock compatibility

Appendix B Speed Conversions

B.1 Speed Conversions

Guidance

G B.1.1 Where there is a reference in any EN or NTSN to a speed in km/h, the following conversion to mph is a good practice.

Infrastructure, Rolling Stock, and Energy subsystem speed conversions	
km/h	**mph**
2	1
3	1
5	3
10	5
15	10
20	10
30	20
40	25
50	30
60	40
80	50
100	60
120	75
140	90
150	95
160	100
170	105
180	110
190	120
200	125
220	135
225	140
230	145
250	155

Infrastructure, Rolling Stock, and Energy subsystem speed conversions	
km/h	**mph**
280	175
300	190
320	200
350	220
360	225

Table 2: INF, RST and ENE speed conversions

Definitions

alternating current (AC) energy subsystem	The Energy NTSN (ENE NTSN) states that the AC energy subsystem consists of: 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. Sectioning locations: electrical equipment located at intermediate locations between substations to supply and parallel contact lines, and to provide protection, isolation and auxiliary supplies. Separation sections: equipment required to provide the transition between electrically different systems or between different phases of the same electrical system. 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. 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.
electric shock	Physiological effect resulting from an electric current passing through a human or animal body *Source: IEV 195-01-04*
exposed conductive part	A conductive part of equipment which can be touched and which is not a live part but which may become live under fault conditions. *Source: IEV ref 441-11-10*
level crossing	An intersection at the same elevation of a road, footpath or bridleway and one or more rail tracks. Source: *IEV 821-07-01*, modified
live part	Any conductor and any conductive part of electrical equipment intended to be energised in normal use. *Source:IEV 195-02-19 modified* **Note:** Insulators are considered to be live parts
National Technical Specification Notice (NTSN)	Document published by the Secretary of State pursuant to regulation 3B of the Railways (Interoperability) Regulations 2011 (as amended) which sets out the standards, technical specifications and technical rules in use in the United Kingdom as amended or varied from time to time. These may be standards to be complied

	with in relation to the design, construction, placing in service, upgrading, renewal, operation and maintenance of the parts of the rail system. For the purposes of these Regulations, the essential requirements for a project subsystem conforms with applicable National Technical Specification Notices and National Technical Rules. Source: *RIR*
overhead contact line (OCL)	Contact line placed above (or beside) the upper limit of the rail vehicle gauge and supplying vehicles with electric energy through roof-mounted current collection equipment. Sources: *IEV 811-33-02, ENE NTSN* **Note:** Where this includes, in addition to all current-collecting conductors, the following elements: reinforcing feeders; cross-track feeders; disconnectors; section insulators; overvoltage protection devices; supports that are not insulated from the conductors; insulators connected to live parts; along-track feeders; conductors connected permanently to the contact line for supply of other electrical equipment; earth wires and return conductors.
rail vehicle	Any vehicle, moving either under its own power (locomotives fixed formation units and multiple units) or hauled by another vehicle (coaches, railcar trailers, vans and wagons), on-track machine, road-rail vehicle or rail-mounted maintenance machine.
return circuit	All conductors which form the intended path for the traction return current. **Note:** 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. Source: *ENE NTSN*
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 formation consisting of one or more units. Source: *LOC&PAS NTSN*

Abbreviations

ac	alternating current
BRT	Baseline Response Time
dc	direct current
DfT	Department for Transport
ENE	Energy Subsystem
MRT	Minimum Response Time
OCL	Overhead Contact Line
RST	Rolling Stock Subsystem
TSI	Technical Specification for Interoperability

References

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

RGSC 01	Railway Group Standards Code
RGSC 02	Standards Manual

Documents referenced in the text

Railway Group Standards

GLRT1210	AC Energy Subsystem and Interfaces to Rolling Stock Subsystem
GMRT2130	Vehicle Fire, Safety and Evacuation

RSSB documents

COF-UOH-58 RSSB (2021)	Real Time Electrification System Monitoring
GLGN1610	Guidance on AC Energy Subsystem and Interfaces to Rolling Stock Subsystem
T876 RSSB (2012)	Testing of overhead line contact wire and collector strip wear - UIC project CoSTRIM
T1185 RSSB (2021)	Current Limit at Stand Still
T1244 RSSB (due late 2022)	Characterising the compatibility of Pantographs and Overhead Contact Systems

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. This Notice replaces and substantially reproduces the provisions of Commission Regulation (EU) 1301/2014 of 18 November 2014 (the ENE TSI) and includes relevant amendments made by Corrigendum of 20 January 2015, Commission Implementing Regulation (EU) 2018/868 of 13 June 2018, and Commission Regulation (EU) 2019/776 which came into force in June 2019.
LOC&PAS NTSN	Locomotive and Passenger National Technical Specification Notice (LOC&PAS NTSN). Published by the Secretary of State on 1 January 2021 pursuant to regulation 3B of the Railways (Interoperability) Regulations 2011. This NTSN replaces and substantially reproduces the provisions of Commission Regulation (EU) 1302/2014 (the LOC&PAS TSI), and includes relevant amendments made by Commission Implementing Regulation (EU) 2019/776 which came into force in June 2019.

BS EN 50122-1:2022	Railway applications. Fixed installations. Electrical safety, earthing and the return circuit. Part 1: Protective provisions against electric shock
BS EN 50163:2004+A3:2022	Railway applications. Supply voltages of traction systems
BS EN 50367:2020	Railway applications - Fixed installations and rolling stock - Criteria to achieve technical compatibility between pantographs and overhead contact line
BS EN 50388-1:2022	Railway applications - Fixed installations and rolling stock. Technical criteria for the coordination between electric traction power supply systems and rolling stock to achieve interoperability
	The Level Crossings Act 1983
SI/1996/341	The Health and Safety (Safety Signs and Signals) Regulations
SI/1997/487	The Level Crossings Regulations 1997
SI/1996/1786	The Private Crossings (Signs and Barriers) Regulations 1996
SI/2016/362	The Traffic Signs Regulations and General Directions 2016

Other relevant documents

RSSB documents

Sign AJ01	Neutral section warning board
Sign AJ02	Neutral section indication board
GERT8000-AC	AC Electrified Lines
RIS-0713-CCS	Lineside Signalling Layout Driveability Assessment Requirements
RIS-0733-CCS	Lineside Operational Signs
RIS-0737-CCS	Rail Industry Standard for Signal Sighting Assessment Requirements
RIS-3440-TOM	Operation of Heritage Trains
RIS-3784-TOM	Provision of Signage at Power Changeover Locations