Railway Group Standard
GIRT7073
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Requirements for the Position of Infrastructure and for Defining and Maintaining Clearances

Synopsis

This document sets out requirements for positioning infrastructure and maintaining the position of track relative to infrastructure to achieve gauge compatibility with rolling stock.

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Issue record

Issue	Date	Comments
One	December 2015	Original document. Supersedes GCRT5212 issue one, Requirements for Defining and Maintaining Clearances. Requirements out of scope of the RGS Code issue four are not taken forward in GIRT7073 issue one. Lower sector infrastructure gauge replaces lower sector structure gauge. Requirements for new infrastructure, alterations to reduce stepping distances at platforms and cross-winds clarified.
Two	June 2018	Replaces issue one. Revisions to section 3.1.2.2, Categorisation of clearances, and Appendix A.1, Lower sector infrastructure gauge dimensions, to reflect changes to platform height requirements within GIRT7020, issue one (formerly contained within GIRT7016, issue five). Cross-referencing to GIRT7016 (withdrawn) changed to GIRT7020 and RIS-7016-INS throughout. Other editorial changes.

Issue	Date	Comments
Three	March 2023 (proposed)	Replaces issue two. Rationale and Guidance added for Requirements throughout. Minor revisions throughout. Principles and Structure sections added in Part 1. Title of 2.2.3 Additional clearances at vehicle window level for infrastructure, changed to show scope applies to all infrastructure. Clarifications added to clause 2.2.3.1 regarding the infrastructure that is within scope from AM002, and that clearances are referred to the static envelope. Title of section 3.1 changed to Application and categorisation of clearances. New requirements added as clauses 3.4.2 and 3.4.3 from AM001. Section 4.1 Scope revised. New Appendix A Considerations for structure gauges on new lines added, incorporating guidance from GEGN8573. Appendices A and B in GIRT7073 issue two become Appendices B and C in issue three. Definitions added and revised. References updated to include additional documents referenced.

Revisions have not been marked by a vertical black line in this issue because the document has been revised throughout.

Superseded documents

The following Railway Group documents are superseded, either in whole or in part as indicated:

Superseded documents	Sections superseded	Date when sections are superseded
GIRT7073 issue two, Requirements for the Position of Infrastructure and for Defining and Maintaining Clearances	All	4 March 2023 (proposed)
GEGN8573 issue four, Guidance on Gauging and Platform Stepping Distances	All	4 March 2023 (proposed)

Supply

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Part 1 Purpose and Introduction

1.1 Purpose

1.1.1 This document sets out requirements for positioning infrastructure and maintaining the position of track relative to infrastructure to achieve gauge compatibility with rolling stock.

1.2 Introduction

1.2.1 Background

1.2.1.1 The gauging principles set out in this document, RIS-8273-RST and GMRT2173 are based upon a requirement for maintaining adequate clearances between the vehicle and adjacent structures, and maintaining adequate passing clearances between the vehicle and other vehicles operating on adjacent tracks. This is critical for the safe operation of rail vehicles on the infrastructure.

1.2.1.2 The prime requirement is that there are always to be positive clearances between rolling stock and rolling stock, or rolling stock and infrastructure (excluding items designed to be in contact). In order to provide this, the documents in *1.2.4* set out control measures which become progressively more stringent as clearances decrease. Thus, where large clearances exist, few control measures are required. Where small clearances exist, controls are required to maintain adequate clearances. Clearances are categorised as normal, reduced or special reduced.

1.2.2 Principles

1.2.2.1 The requirements of this document are based on the following principles.

1.2.2.2 This document sets out requirements that meet the characteristics of national technical rules (NTRs) and are applicable to the Great Britain (GB) mainline railway system. Compliance with NTRs is required under the Railways Interoperability Regulations (RIR) 2011 (as amended).

1.2.2.3 National Technical Specification Notices (NTSNs) are published by the Secretary of State pursuant to regulation 3B of the RIR 2011 (as amended). These NTSNs replace and substantially reproduce the provisions of Technical Specifications for Interoperability (TSIs), except where there are GB specific alternatives which are identified as Specific Cases in the relevant NTSNs.

1.2.2.4 The NTRs in this document are used for the purpose of supporting GB or UK Specific Cases in NTSNs.

1.2.3 Structure of this document

1.2.3.1 Where relevant, the national technical rules relating to relevant NTSN parameters have been identified together with the relevant clause from the NTSN.

1.2.3.2 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'.

1.2.3.3 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'.

1.2.4 Related requirements in other documents

1.2.4.1 The following Railway Group Standards contain requirements that are related to the scope of this document:

a) GERT8073, Application of Standard Vehicle Gauges – this document defines standard vehicle gauges and the associated application rules for rolling stock and for infrastructure. GERT8073 defines lower sector vehicle gauge (LSVG).
b) GIRT7020, GB Requirements for Platform Height, Platform Offset and Platform Width – this document sets out GB requirements in scope of NTRs for platform height, platform offset and platform width.
c) GMRT2173, Size of Vehicles and Position of Equipment – this document sets out the methods of determining, and the requirements for maintaining, the swept envelope of rail vehicles. It sets out the format of the prescribed parameters for defining the size of railway vehicles and sets out particular requirements for components required to interface with the infrastructure.
d) GLRT1210, AC Energy Subsystem and Interfaces to Rolling Stock Subsystem – this document sets out the requirements for the ac energy system and the interfaces to rolling stock operating over the ac electrified railway.
e) GLRT1212, DC Conductor Rail Energy Subsystem and Interfaces to Rolling Stock Subsystem – this document defines the requirements for the dc conductor rail energy subsystem and the interfaces to rolling stock operating over the dc electrified railway.
f) GCRT5021, Track System Requirements – this document sets out requirements for track geometry, track system, track components, and switches and crossings (S&C) to provide for the safe guidance and support of rail vehicles.

1.2.5 Supporting documents

1.2.5.1 The following Railway Group documents support this Railway Group Standard:

a) RIS-2773-RST, Format and Methods for Defining Vehicle Gauging Data – this document provides a standard format for defining the swept envelope of a vehicle for the purposes of compatibility assessment when undertaking absolute or comparative gauging. The data can also be used for the purposes of assessment against standard dynamic vehicle gauges
b) RIS-8270-RST, Route Level Assessment of Technical Compatibility between Vehicles and Infrastructure – this document sets out requirements and responsibilities for the assessment of technical compatibility at route level for vehicles and infrastructure
c) RIS-7016-INS Interface between Station Platforms, Track, Trains and Buffer Stops – this document sets out requirements for the design and maintenance of station platforms for their safe interface with trains, track and buffer stops

d) RIS-8273-RST, Assessment of Compatibility of Rolling Stock and Infrastructure – Gauging and Stepping Distances – this document sets out requirements for assessing route compatibility of rolling stock and infrastructure with respect to gauging and to stepping distances from train to platform
e) RIS-7773-INS, Format for Infrastructure Gauging Data – this document sets out requirements for the format of infrastructure data for the purposes of gauging compatibility assessment
f) RIS-3781-TOM, Requirements for the Operation of Freight Trains and the Conveyance of Dangerous Goods by Any Train – this document provides guidance to assist the development of plans and controls to assist with complying with fundamental operational principle 5, 'Trains must not be allowed to begin or continue their journeys until it is clear that it is safe for them to do so'
g) RIS-8034-CCS, Maintenance of Signal and Operational Sign Visibility – this document sets out the requirements necessary to ensure that the visibility and alignment of signals, and operational signs that perform the function of signals, are not adversely affected during the life of the equipment.

1.3 Approval and authorisation of this document

1.3.1 The content of this document will be approved by Infrastructure Standards Committee (INS SC) on 10 January 2023 [proposed].

1.3.2 This document will be authorised by RSSB on 27 January 2023 [proposed].

Part 2 Requirements for new infrastructure and alterations to infrastructure

2.1 Introduction

Guidance

G 2.1.1 The Infrastructure National Technical Specification Notice (INF NTSN) sets out requirements for gauge included in the relevant category of line. There is a Great Britain (GB) Specific Case that permits the use of National Rules for all categories of line, except new dedicated high speed lines of category P1.

G 2.1.2 Requirements for gauge clearance are related to either the upper sector or lower sector. The boundary between upper sector and lower sector is considered to be 1100 mm above rail level. *Part 3 – Management of Clearances* sets out the framework for clearances related to each sector.

Note: For the purpose of this document, an alteration to existing infrastructure is the modification of track alignment or associated lineside structures which form part of an infrastructure project subsystem requiring an authorisation for placing into service under the Railways (Interoperability) Regulations (RIR) 2011 (as amended). If the modification does not form part of such an infrastructure project subsystem, then the applicant will need to consider whether the change provides a reasonable opportunity to bring the items relevant parts of the subsystem concerned into conformity with the requirements of this document in order to meet their wider safety and other obligations outside RIR 2011 (as amended).

2.2 Requirements for new infrastructure for the upper sector

2.2.1 Requirements for new infrastructure on a new railway line

2.2.1.1 New infrastructure on a new railway line shall be designed to accommodate:

a) The installation of overhead line equipment (OLE);
b) At least normal clearances in the upper sector to all standard vehicle gauges in GERT8073;
c) At least normal clearances in the upper sector to all types of rolling stock which the infrastructure manager (IM) may reasonably foresee using the route in future; and
d) Access for staff (for example, lineside access routes and cess walkways).

2.2.1.2 The required clearances shall be calculated in accordance with *3.2*.

Rationale

G 2.2.1.3 Specific Case 7.7.17.2 of the INF NTSN sets out permission for defining the upper sector in accordance with NTRs.

G 2.2.1.4 The rules defined in this document form part of a suite of requirements that manage the risk of collision of vehicles with infrastructure by maintaining adequate clearances between the vehicle and adjacent structures.

G 2.2.1.5 It is economically good practice to avoid the need for increases in clearances when there are modifications to infrastructure and/or rolling stock design/operations in the future, such as upgrading the route to carry larger vehicles; the provision of overhead electrification on non-electrified lines; increases in speed requiring, for example, an increase in the distance between cess walkways and continuous positions of safety or the distance to the running edge of the nearest rail.

G 2.2.1.6 Railway infrastructure generally has a long life and, once built, it is difficult and expensive to alter, so it is good practice to make it as future-proof as possible.

Guidance

G 2.2.1.7 Gauges have been developed through research projects and are representative of today's traffic and that of the foreseeable future, and normal clearances have been developed through industry practice.

G 2.2.1.8 Factors to be taken into account when determining clearances to allow space for OLE and access for staff are given in *Appendix A*.

G 2.2.1.9 Where lines are electrified, and particularly where they are electrified using the 25 kV OLE system, adequate electrical clearances are provided between structures and live parts of the electrification equipment and of electrical equipment on trains. These electrical clearances, for example to pantographs, can be greater than the physical clearances required in this document (see *3.1.2*).

G 2.2.1.10 GLRT1210 sets out some design requirements for the avoidance of direct contact between persons and live parts of electrification equipment and of electrical equipment on trains. Requirements for electrical clearances to infrastructure to avoid electric shock due to indirect contact are also included.

G 2.2.1.11 GMRT2111 sets out requirements for all rolling stock operating over the ac electrified railway, in order to manage interfaces with the ac energy subsystem. Requirements for electrical clearances to avoid electric shock due to indirect contact are also included.

G 2.2.1.12 The height of the contact wire, plus required clearances, determines the height of structures above a railway electrified using the 25 kV OLE system. However, the height of the contact wire depends on a number of factors, including the size and characteristics of vehicles to be accommodated. *Appendix A* of this document discusses the development of structure gauges, making allowance for the height of the contact wire.

G 2.2.1.13 GLRT1210 sets out the minimum height requirements for the lowest live part of the OLE above the road surface of a public road level crossing.

G 2.2.1.14 Other than where the railway runs in a tunnel, it is usually necessary to make space for the access of authorised people along running lines, for example, for maintenance.

2.2.2 Requirements for new infrastructure on an existing section of railway

2.2.2.1 New infrastructure on an existing section of railway shall be designed to provide at least normal clearances in the upper sector (see *3.1.2*) to all types of rolling stock that use the route or have a statement of compatibility for the route involved.

2.2.2.2 New infrastructure on an existing section of railway shall be designed to accommodate the installation of OLE.

2.2.2.3 The required clearances shall be calculated in accordance with *3.2*.

Rationale

G 2.2.2.4 Specific Case 7.7.17.2 of the INF NTSN sets out permission for defining the upper sector in accordance with NTRs.

G 2.2.2.5 The rules defined in this document form part of a suite of requirements that manage the risk of collision of vehicles with infrastructure by maintaining adequate clearances between the vehicle and adjacent structures.

G 2.2.2.6 It is economically good practice to avoid the need for increases in clearances when there are modifications to infrastructure and/or rolling stock design/operations in the future.

Guidance

G 2.2.2.7 Factors to be taken into account are given in *Appendix A* when determining clearances to allow space for infrastructure systems (for example signalling and electrification systems) and access for staff.

G 2.2.2.8 Where lines are electrified, and particularly where they are electrified using the 25 kV OLE system, adequate electrical clearances are provided between structures and live parts of the electrification equipment and of electrical equipment on trains. These electrical clearances, for example to pantographs, can be greater than the physical clearances required in this document (see *3.1.2*).

G 2.2.2.9 GLRT1210 sets out some design requirements for the avoidance of direct contact between persons and live parts of electrification equipment and of electrical equipment on trains. Requirements for electrical clearances to infrastructure to avoid electric shock due to indirect contact are also included.

G 2.2.2.10 GMRT2111 sets out requirements for all rolling stock operating over the ac electrified railway, in order to manage interfaces with the ac energy subsystem. Requirements for electrical clearances to avoid electric shock due to indirect contact are also included.

G 2.2.2.11 The height of the contact wire, plus required clearances, determines the height of structures above a railway electrified using the 25 kV OLE system. However, the height of the contact wire depends on a number of factors, including the size and characteristics of vehicles to be accommodated. *Appendix A* of this document discusses the development of structure gauges, making allowance for the height of the contact wire.

G 2.2.2.12 GLRT1210 sets out the minimum height requirements for the lowest live part of the OLE above the road surface of a public road level crossing.

G 2.2.2.13 New infrastructure includes temporary infrastructure, for example scaffolding or temporary alignments during staged works, which can be a greater hazard than permanent infrastructure where clearances are limited, as its presence might not be known to users of the railway.

2.2.3 Additional clearances at vehicle window level for infrastructure

2.2.3.1 For new infrastructure and alterations (as defined), the following clearances shall be provided to the static envelope at the level of opening vehicle windows between 2000 mm and 3000 mm above the plane of the rails:

a) 450 mm where passenger vehicles operate with opening windows allowing passengers to lean out.
b) 250 mm where vehicles operate with opening windows for the use of train crew only.

Rationale

G 2.2.3.2 These clearances reduce the risks to passengers and train crew of striking passing infrastructure when leaning out of open vehicle windows.

G 2.2.3.3 These clearances are based on historical values.

Guidance

G 2.2.3.4 The Office of Rail and Road (ORR) has set the date of March 2023 to be by when opening windows for passengers are to be removed from heritage rolling stock on the network, or for the risk to be physically mitigated. The ORR envisages that all heritage stock on the mainline will be fitted with internal door handles and lockable windows; the issue is complicated as some windows may be required to open, at least partially, to provide ventilation. Other measures being considered are providing bars on windows, warning signage, making announcements and providing personnel in vestibules to monitor the actions of passengers.

2.3 Lower sector infrastructure gauge for new infrastructure

2.3.1 New infrastructure shall not intrude inside the lower sector infrastructure gauge (LSIG), as set out in *B.1*.

2.3.2 New track shall be positioned to ensure adjacent infrastructure does not intrude inside the LSIG, as set out in *B.1*.

2.3.3 When designing new infrastructure, allowance shall be made for construction tolerances to ensure the above requirements are met once the infrastructure has been built.

Rationale

G 2.3.4 Specific Case 7.7.17.2 of the INF NTSN sets out permission for defining the lower sector in accordance with NTRs.

G 2.3.5 The rules defined in this document form part of a suite of requirements that manage the risk of collision of vehicles with infrastructure by maintaining adequate clearances between the vehicle and adjacent structures.

G 2.3.6 The principles around the LSIG have been substantively the same since the earliest versions of railway standards and before, with minor alterations since for areas

allowed for equipment designed to come into close contact with vehicles. These clearances are based on historical values.

Guidance

G 2.3.7 When considering the position of new, altered or temporary infrastructure adjacent to the tracks, the geometry of the track is taken into account. Track maintenance or renewal work may take place that could alter the position of the track, both horizontally and vertically.

G 2.3.8 GCRT5021 specifies design values for track geometry parameters and sets out requirements for the management of track geometry faults.

G 2.3.9 Requirements for platform height, and for the tapering of any discrepancy in height or alignment of the platform edge where a platform is altered or extended, are set out in GIRT7020.

G 2.3.10 Station platforms are necessarily close to trains to enable safe boarding and alighting. Additional requirements for platforms are set out in RIS-7016-INS. Requirements for footsteps for passenger use on new trains are set out in GMRT2173.

G 2.3.11 In some cases, it could be advantageous to adopt reduced or special reduced clearances to gain safety benefits in stepping distances, see *2.6.2*.

2.4 Particular requirements for equipment in LSIG

2.4.1 Certain items of equipment have to be in close proximity to rolling stock for system compatibility. The equipment set out in Table *1* shall be positioned as shown in the appendices.

Equipment	Appendix
Conductor rails	*B.2*
Conductor rail guard boarding	*B.3*
Automatic power control (APC) magnets	*B.4*
Mechanical trainstops	*B.5*
Tripcock testers	*B.6*
Automatic warning system (AWS) magnets	*B.7*
Treadle actuating arms	*B.8*

Table 1: Equipment in the LSIG

Rationale

G 2.4.2 Specific Case 7.7.17.2 of the INF NTSN sets out permission for defining the lower sector in accordance with NTRs.

G 2.4.3 There is a need for equipment to exist in the space between the LSVG and the LSIG in order to fulfil their functions. It is important that the positions of this equipment are controlled for technical compatibility with the rolling stock.

Guidance

G 2.4.4 Whilst conductor rail side entry ramps are not permitted where tripcocks are operational (see GLRT1212), a conflict may arise where vehicles with tripcocks fitted traverse different infrastructure systems, for example on track machines working across both Network Rail and Transport for London infrastructure.

G 2.4.5 Additional control measures might be identified as part of the route compatibility assessment (see RIS-8270-RST). Additional controls could include physical modification to the infrastructure, vehicle and/or implementation of operational control.

2.5 Track intervals for new infrastructure

2.5.1 For each section of track the track intervals to be used for new infrastructure shall ensure:

a) The provision of normal clearances, as set out in *2.2*;
b) The provision of additional clearances for opening windows, as set out in *2.2*; and
c) The space needed for trackside equipment, for example, signals and speed signs.

Rationale

G 2.5.2 This is the NTR to fulfil the alternative requirements for track intervals permitted by clause 7.7.17.3 of the INF NTSN.

G 2.5.3 Track intervals are designed to avoid vehicle collisions with infrastructure, other vehicles or with people leaning out of opening windows.

Guidance

G 2.5.4 The NTR states that the nominal distance between track centres is 3400 mm on straight track and on curved track with a radius of 400 m or greater.

G 2.5.5 Where topographical constraints prevent a nominal distance of 3400 mm between track centres being achieved, the distance between track centres can be reduced, provided mitigation is put in place to ensure a safe passing clearance between trains.

G 2.5.6 GB practice is to use a nominal interval between running edges of 1970 mm. This gives a distance between track centres of 1970 mm + 1435 mm = 3405 mm, which is consistent with the nominal 3400 mm.

G 2.5.7 Note that for renewed or upgraded lines, the options for increasing track centres are constrained by existing infrastructure and railway boundaries. The INF TSI recognises that the distance between track centres is, to an extent, governed by (structure) gauge and passing clearances.

2.6 Alterations to existing infrastructure

2.6.1 Alterations other than to permit the passage of larger rail vehicles

2.6.1.1 Where existing infrastructure conforms to the LSIG, any alterations shall not intrude inside the LSIG.

2.6.1.2 When existing infrastructure is altered for reasons other than to permit the passage of larger rail vehicles, the alteration shall be designed so that the gauge capability in terms of standard vehicle gauges and vehicle classes is maintained.

Rationale

G 2.6.1.3 This is the NTR to fulfil the alternative requirements permitted by clause 7.7.17.2 of the INF NTSN.

G 2.6.1.4 These requirements are to prevent collisions between vehicle underbody equipment and any parts of the LSIG.

Guidance

G 2.6.1.5 Examples of these alterations are situations where a low platform is raised or track is relayed or renewed perhaps to improve platform stepping distances. In all cases, the existing gauge capability is not compromised.

G 2.6.1.6 When making alterations to existing infrastructure which does not conform to the LSIG, it is often not practical to achieve conformance. Existing clearances are maintained or, if practical, improved.

G 2.6.1.7 If existing infrastructure is altered to permit the passage of larger rail vehicles then the agreed new clearances will determine the position of the infrastructure, see *2.6.3*.

2.6.2 Alterations to reduce stepping distances at platforms

2.6.2.1 It is permissible for platforms to be altered to reduce stepping distances by making clearances smaller to vehicles that use the route, or have a statement of compatibility for the route involved, provided the control measures appropriate to the resulting clearance category, for example, reduced clearance, are implemented.

Rationale

G 2.6.2.2 This is the NTR to fulfil the alternative requirements permitted by clause 7.7.17.2 of the INF NTSN.

Guidance

G 2.6.2.3 Requirements for the altering of platforms relative to adjacent track are set out in RIS-7016-INS.

G 2.6.2.4 Requirements for the assessment of platform stepping distances if a change is made to the platform edge or to the track adjacent to the platform edge are set out in RIS-8273-RST.

G 2.6.2.5 In some cases it may be advantageous to adopt less than normal clearances to achieve a safety benefit. However, the requirements on the infrastructure set out in GIRT7020 are for the platform to be in the compliant nominal position plus tolerances. Stepping distances do not take precedence over platform position, and some clearance could be sacrificed to obtain better stepping distances, but a compliant platform position cannot be sacrificed to get better stepping distances.

2.6.3 Alterations to permit the passage of vehicles with a larger swept envelope

2.6.3.1 When existing infrastructure is altered to permit the passage of vehicles with a larger swept envelope, it is permissible for the alteration to be limited to that which is sufficient to allow the passage of the vehicle with a larger swept envelope, provided the control measures appropriate to the resulting clearance category (see *3.1.2*), for example reduced clearance, are implemented.

Rationale

G 2.6.3.2 This is the NTR to fulfil the alternative requirements permitted by clause 7.7.17.2 of the INF NTSN.

Guidance

G 2.6.3.3 For existing infrastructure it might be difficult to accommodate vehicles with larger swept envelopes whilst maintaining normal clearances. Using smaller clearances with appropriate controls could permit such vehicles to run.

G 2.6.3.4 This document does not require that alterations to infrastructure achieve an improvement in clearances to trains. However, at locations with existing reduced or special reduced clearances, there is a long-term benefit to be gained in reduced maintenance costs if the alteration results in normal clearances being provided. Generally, it is good practice to improve any clearance where the nature of the alteration permits this to be done with little increased cost or other implications.

G 2.6.3.5 The swept envelopes referred to within this document exclude the effects of track tolerance and rail sidewear, previously included in kinematic envelopes developed in earlier documents.

Part 3 Management of clearances

3.1 Application and categorisation of clearances

3.1.1 Application of clearances

3.1.1.1 For both upper sector and lower sector, a minimum clearance between the swept envelope / gauge of a vehicle and the infrastructure and / or swept envelope / gauge of a vehicle on an adjacent track shall be calculated.

3.1.1.2 Clearances shall be calculated using conditions leading to the generation of that minimum clearance.

3.1.1.3 Clearances shall be determined by consideration of the aggregation of all system tolerances and allowances (track, structure and swept envelope) together with the application of vehicle dynamic movements, taking account of measurement accuracies.

3.1.1.4 Where clearances are being calculated in the upper sector / lower sector boundary area (for example, the infrastructure is in the lower sector and the vehicle step height is in the upper sector), the categorisation of clearance (that is normal, reduced or special) shall be related to the vehicle or standard vehicle gauge.

Rationale

G 3.1.1.5 This is the NTR to fulfil the alternative requirements for the calculations of structure gauge permitted by clause 7.7.17.2 of the INF NTSN.

G 3.1.1.6 These requirements have been developed by industry over many years, and lead to the calculation of worst case clearances.

Guidance

G 3.1.1.7 This document sets out requirements that provide for a reduction in clearance associated with the risk regimes of normal, reduced and special reduced clearances. This is achieved through the differentiation between clearances and tolerances, removing double counting where tolerances had previously been incorporated in clearance values.

G 3.1.1.8 IMs' standards set out how to consider allowances for measurement accuracy, required when working on their managed infrastructure

G 3.1.1.9 Measurements of infrastructure generally comprise those taken from multiple measuring systems. For example, a structure profile measurement will often be provided with measures of installed cant and curvature. Each system will have an intrinsic measurement accuracy, and could be considered as part of the total accuracy of the measuring system.

G 3.1.1.10 RIS-7773-INS sets out requirements for infrastructure gauging data, and also sets out the most commonly used data format for the exchange and interpretation of infrastructure data used in the process of gauging compatibility assessment.

G 3.1.1.11 It is industry practice that the accuracy value to be used in clearance calculations is that achieved in 95 % (2.12 standard deviations) of cases, measuring to infrastructure

in the immediate vicinity of the rail vehicle, that is in the clearance zone of interest. The measurement accuracy is that of the entire measuring system, including that of the means by which the infrastructure measurement is related to the rail datum. This includes, but is not necessarily limited to:

a) Accuracy of the measuring equipment (for example, scanner)
b) Effect of measuring speed
c) Accuracy of the calibration
d) Accuracy of rail referencing including effects of:
    i) Vehicle yaw
    ii) Vehicle pitch
    iii) Overthrow
    iv) Flange / rail clearance
e) Environmental conditions.

G 3.1.1.12 GMRT2173 section 2.2 uses the term 'statistically significant probability of occurrence' when referring to all possible movement scenarios. The gauging standards also have many references to tolerances and allowances, but the method of aggregation is neither prescribed nor mandated. However, historically tolerances have been applied additively.

G 3.1.1.13 Subject to agreement with the IM, an alternative approach is to apply uncertainty principles to system tolerances and allowances (track, structure and vehicle swept envelope) and vehicle dynamic movements.

G 3.1.1.14 Uncertainty analysis considers both the range of tolerances and allowances, and their probability of occurrence to determine the values that should be used to provide a given level of statistical certainty, and hence risk.

G 3.1.1.15 Using uncertainty principles, calculated clearances can be modified by an amount equivalent to the inaccuracy of measurement of any systems used to determine the relative positions of tracks and infrastructure. Although accuracy of measurement is often specified as a single value, this would have been derived from a statistical distribution, and the use of such a statistically generated value is not precluded by GMRT2173.

G 3.1.1.16 For information on the application of uncertainty analysis to the infrastructure, refer to RSSB research project T373 'Reducing uncertainty in structure gauging'.

G 3.1.1.17 For information on the application of uncertainty analysis to rolling stock, refer to RSSB project T670 'Investigation of the accumulative effect of vehicle tolerances on gauging'.

G 3.1.1.18 Where analysis processes are capable of analysing the effect of individual components of a measuring system, the effects of such allowances can be analysed as part of their effects. For example, errors in measuring curvature will have an effect on overthrow and on curving forces, which affect sway.

G 3.1.1.19 Where analysis processes cannot accommodate individual measuring system component tolerances, an appropriate aggregation of the system tolerances at that location is applied.

G 3.1.1.20 It is good practice at the commencement of a project, that the values and combinations of values used in an approach using uncertainty analysis are agreed with the relevant parties.

3.1.2 Categorisation of clearances

3.1.2.1 Clearances in the upper sector between structures and vehicles, and between vehicles, shall be categorised as normal, reduced or special reduced, as set out in Table 2.

Category	Speed (See 3.2.5)	
	≤ 125 mph (200 km/h)	> 125 mph (200 km/h) and ≤ 140 mph (225 km/h)
Normal clearance	≥ 100 mm	≥ 100 mm
Reduced clearance	≥ 50 mm to < 100 mm	Not applicable
Special reduced clearance	> 0 mm and < 50 mm	> 0 mm and < 100 mm

Table 2: Clearances in the upper sector to structures and between vehicles

3.1.2.2 Clearances in the lower sector between structures and vehicles, and between vehicles, shall be categorised as normal, reduced or special reduced, as set out in Table 3.

Category	Speed (See 3.2.5)	
	≤ 125 mph (200 km/h)	> 125 mph (200 km/h) and ≤ 140 mph (225 km/h)
Normal clearance	≥ 50 mm (see notes a) and c))	≥ 50 mm
Reduced clearance	≥ 25 mm to < 50 mm (see notes b) and c))	Not applicable
Special reduced clearance	> 0 mm and < 25 mm (see note b))	> 0 mm and < 50 mm

Table 3: Clearances in the lower sector to structures and between vehicles

Note:

a) In platform areas, the normal clearance is greater than or equal to 40 mm to take into account the additional build / maintenance tolerance of +10 mm for platform heights.

b) In platform areas, the reduced clearance is greater than or equal to 15 mm and the special reduced clearance is less than 15 mm to take into account the additional build/maintenance tolerance of +10 mm for platform heights.

c) In the case of suspension failure (see GMRT2173), a clearance greater than or equal to 25 mm (greater than or equal to 15 mm in platform areas) is categorised as a normal clearance, and reduced clearance is not therefore applicable.

Rationale

G 3.1.2.3 This is the NTR to fulfil the alternative requirements permitted by clause 7.7.17.2 of the INF NTSN.

G 3.1.2.4 Clearances are categorised to indicate the control measures required; normal clearances require minimal control measures, reduced clearances require better management of track position, and special reduced clearances require stringent controls.

Guidance

G 3.1.2.5 These requirements were introduced in 2003 and the values have been widely used without incident.

3.2 Calculation of clearances (method of calculation)

3.2.1 Method of calculation – Calculation of an effective position of track

3.2.1.1 The maintained position of the track, relative to adjacent structures or tracks, shall be adjusted to allow for track tolerances and the accuracy of measurements to arrive at an effective position of the track relative to adjacent structures or tracks.

Rationale

G 3.2.1.2 This is the NTR to fulfil the alternative requirements for the calculations of structure gauge permitted by clause 7.7.17.2 of the INF NTSN.

G 3.2.1.3 This helps to reduce the risk that an adverse combination of track tolerances leads to a track position such that a collision can occur between vehicles on adjacent tracks, or between vehicles and infrastructure.

Guidance

G 3.2.1.4 The relevant track tolerances are given in *3.3*.

3.2.2 Calculation of clearances to standard vehicle gauges

3.2.2.1 Structure clearances shall be determined using the minimum calculated distance between structures and the standard vehicle gauge on track in its effective position(s).

3.2.2.2 Passing clearances shall be determined using the minimum calculated distance between the standard vehicle gauge and either a swept envelope or a standard vehicle gauge associated with a vehicle demonstrated to have gauging compatibility on the adjacent track, on tracks in their effective position(s).

Rationale

G 3.2.2.3 This is the NTR to fulfil the alternative requirements for the calculations of structure gauge permitted by clause 7.7.17.2 of the INF NTSN.

G 3.2.2.4 This helps to reduce the risk that a collision between vehicles and infrastructure occurs by basing clearances on the minimum distances between swept envelopes and structures.

Guidance

G 3.2.2.5 Calculating clearances using the effective track position provides clearance values that could be observed during a maintenance cycle allowing for the tolerances for track movement.

3.2.3 Calculation of clearances for absolute gauging

3.2.3.1 Structure clearances shall be determined using the minimum calculated distance for upper sector and lower sector between structures and the vehicle swept envelope, on track in its effective position(s).

3.2.3.2 Passing clearances shall be determined using the minimum calculated distance between the vehicle swept envelope and either a swept envelope or a standard vehicle gauge associated with a vehicle demonstrated to have gauging compatibility on the adjacent track, on tracks in their effective position(s).

Rationale

G 3.2.3.3 This is the NTR to fulfil the alternative requirements for the calculations of structure gauge permitted by clause 7.7.17.2 of the INF NTSN.

G 3.2.3.4 This helps to reduce the risk that a collision between vehicles and infrastructure occurs by basing clearances on the minimum distances between swept envelopes and structures.

Guidance

G 3.2.3.5 Requirements for the vehicle swept envelope are given in *3.2.4*.

G 3.2.3.6 Calculating clearances using the effective track position provides clearance values that could be observed during a maintenance cycle allowing for the tolerances for track movement.

3.2.4 Selection of relevant swept envelope for absolute and comparative gauging

3.2.4.1 The relevant swept envelope shall be selected to achieve clearance compatibility with the infrastructure at the location under consideration, taking the particular track parameters at the location into account (see *3.6*).

3.2.4.2 For comparative gauging, the relevant swept envelopes applicable to the comparator vehicle shall be used.

Rationale

G 3.2.4.3 This is the NTR to fulfil the alternative requirements for the calculations of structure gauge permitted by clause 7.7.17.2 of the INF NTSN.

G 3.2.4.4 This helps to reduce the risk that a collision occurs between vehicles and infrastructure by choosing local track parameters to select the relevant swept envelopes.

Guidance

G 3.2.4.5 Requirements for vehicle swept envelopes to be determined are set out in GMRT2173, and include:

a) The full permissible range of operating speeds, cant excesses and cant deficiencies for which the vehicle has been designed
b) Movements caused by dynamic inputs from track on the routes for which gauging compatibility is required
c) The range of design and maintenance tolerances for the vehicle and its failure modes.

3.2.5 Vehicle speeds to be used for calculation of clearances

3.2.5.1 The speeds to be used for the calculation of structure clearances and passing clearances shall be those that are associated with determining the minimum calculated clearance distances all around the vehicle (see *3.2.3*).

3.2.5.2 Where the permissible or enhanced permissible speed is higher than the maximum vehicle operating speed, it is permissible to use the maximum vehicle operating speed for the purpose of calculating clearances.

Rationale

G 3.2.5.3 This is the NTR to fulfil the alternative requirements for the calculations of structure gauge permitted by clause 7.7.17.2 of the INF NTSN.

G 3.2.5.4 This helps to reduce the risk that a collision can occur between vehicles and infrastructure, or between vehicles on adjacent tracks, by choosing the vehicle speeds which give minimum clearances.

Guidance

G 3.2.5.5 In the case of cant excess, intermediate speeds can be associated with minimum clearance on the inside of curves.

G 3.2.5.6 In the case of cant deficiency, permissible or enhanced permissible speeds can be associated with minimum clearances on the outside of curves.

3.3 Track tolerances

3.3.1 Track fixity

3.3.1.1 The track fixity appropriate to specific directions shall be used when calculating the effective position of the track.

Rationale

G 3.3.1.2 This is the NTR to fulfil the alternative requirements for the calculations of structure gauge permitted by clause 7.7.17.2 of the INF NTSN.

G 3.3.1.3 This helps to reduce the risk that a collision can occur between vehicles and infrastructure, or vehicles on adjacent track, by allowing for the possible movements in the track position due to track fixity.

Guidance

G 3.3.1.4 Track can have different fixities laterally and vertically and can exhibit asymmetric lateral fixity, for example, where track is strutted against a platform.

G 3.3.1.5 Changes to track fixity can be achieved by either construction works or through management and intervention to maintain the position of the track. For instance, solid-faced platforms (and other similar structures), ballast gluing or reinforcement with polyurethane, or the use of lateral reinforcement plates provide increased track fixity.

G 3.3.1.6 The allowances for track tolerances to be made when calculating the effective position of the track in accordance with *3.2.1* depend on track fixity. For this purpose, track fixity is classified as follows:

a) High track fixity – track with fixity equivalent to slab track.
b) Medium track fixity – track with fixity equivalent to undisturbed glued ballast.
c) Low track fixity – track with fixity equivalent to normal ballasted track.
d) Defined track fixity – track with a specific fixity no less restrained than track with low track fixity.

3.3.2 Allowance for track tolerances

3.3.2.1 The allowances for track tolerances set out in *3.3.3*, *3.3.4*, *3.3.5* and *3.3.6* shall be used when calculating the effective position of the track in accordance with *3.2.1*.

3.3.2.2 The allowances for defined track fixity shall be determined on a case-by-case basis within the allowances set out in *3.3.3*, *3.3.4*, *3.3.5* and *3.3.6*.

3.3.2.3 At specific locations, for example on embankments subject to seasonal settlement, track tolerance values exceeding those set out in *3.3.3*, *3.3.4*, *3.3.5* and *3.3.6* can reasonably be expected. At such locations, the allowances for tolerances shall be assessed.

3.3.2.4 It is permissible for the allowances for track tolerances set out in *3.3.3*, *3.3.4*, *3.3.5* and *3.3.6* to be reduced by 25 % when calculating the clearance between a vehicle and vehicles on adjacent tracks.

Rationale

G 3.3.2.5 This is the NTR to fulfil the alternative requirements for the calculations of structure gauge permitted by clause 7.7.17.2 of the INF NTSN.

G 3.3.2.6 These requirements ensure that the calculation of clearances takes into account the movement of track position during a maintenance cycle.

Guidance

G 3.3.2.7 Temporary effects on tolerances can occur during track renewals due to settlement.

G 3.3.2.8 Some track forms or works need more allowance for tolerances than others. Site specific consideration of the appropriate track tolerances, taking into account the local track fixity, are used to maximise the available clearance or reduce the infrastructure works required to achieve the desired clearance.

G 3.3.2.9 In platform areas the vertical track fixity, and the effect on track cant, is an important factor.

3.3.3 Allowance for variation in lateral alignment

3.3.3.1 The allowances set out in Table *4* shall be applied as a change in the position of the track, applied in the plane of the rails.

Track fixity	Allowance
High track fixity	NIL
Medium track fixity	± 15 mm
Low track fixity	± 25 mm

Table 4: Allowance for variation in lateral alignment

Rationale

G 3.3.3.2 This is the NTR to fulfil the alternative requirements for the calculations of structure gauge permitted by clause 7.7.17.2 of the INF NTSN.

G 3.3.3.3 The fixity of the track affects the lateral track alignment and can reduce clearances between rolling stock and infrastructure, and could increase the possibility of collision between rolling stock and infrastructure if not taken into account.

G 3.3.3.4 These clearances are based on historical values.

Guidance

G 3.3.3.5 Lateral alignment is the possible sideways movement of track over its maintenance cycle caused by the passage of rolling stock. Track is maintained primarily to provide the track geometry for the smooth and reliable running of trains. Where no specific reference points or position controls are in place, it is assumed that the track can move during its normal maintenance cycle and make full use of the available tolerances.

3.3.4 Allowance for variation in vertical alignment

3.3.4.1 The allowances set out in Table 5 shall be applied as a change in the position of the track, applied perpendicularly to the plane of the rails.

Track fixity	Allowance
High track fixity	NIL
Medium track fixity	+ 15 mm / - 10 mm
Low track fixity	+ 15 mm / - 10 mm

Table 5: Allowance for variation in vertical alignment

Rationale

G 3.3.4.2 This is the NTR to fulfil the alternative requirements for the calculations of structure gauge permitted by clause 7.7.17.2 of the INF NTSN.

G 3.3.4.3 The fixity of the track affects the track vertical alignment and can reduce clearances between rolling stock and infrastructure, and could increase the possibility of collision between trains and infrastructure if not taken into account.

G 3.3.4.4 These clearances are based on historical values.

Guidance

G 3.3.4.5 Track level deteriorates over time due to rolling stock movements, as track settles following construction and maintenance, and allowances for movement depends on track fixity. Track level can be higher than the design value immediately following construction or maintenance. It affects the position of rolling stock relative to infrastructure.

3.3.5 Allowance for variation in cross-level

3.3.5.1 The allowances set out in Table 6 shall be applied as an increase or decrease in cant.

Track fixity	Allowance
High track fixity	NIL
Medium track fixity	± 7.5 mm
Low track fixity	± 10 mm

Table 6: Allowance for variation in cross-level

Rationale

G 3.3.5.2 This is the NTR rule to fulfil the alternative requirements for the calculations of structure gauge permitted by clause 7.7.17.2 of the INF NTSN.

G 3.3.5.3 The fixity of the track affects cross-level and can reduce clearances between rolling stock and infrastructure, and could increase the possibility of collision between trains and infrastructure if not taken into account.

G 3.3.5.4 These clearances are based on historical values.

Guidance

G 3.3.5.5 Cross level error is the difference between designed cross level (or cant) and that which exists, and is caused by differences in settlement beneath the track rails. It affects the position of rail vehicles relative to infrastructure. This difference is maintained within tolerances that depend on the fixity of the track.

3.3.6 Allowance for variation in sidewear

3.3.6.1 The allowances set out in Table *7* shall be applied as a change in the position of the track, applied in the plane of the rails, towards the side of curved track that exhibits, or has exhibited, sidewear.

Permissible speed	Allowance
≤ 125 mph (200 km/h)	4.5 mm
> 125 mph (200 km/h)	3 mm

Table 7: Allowance for sidewear

Rationale

G 3.3.6.2 This is the NTR to fulfil the alternative requirements for the calculations of structure gauge permitted by clause 7.7.17.2 of the INF NTSN.

G 3.3.6.3 Rail sidewear affects the lateral position of trains on the rails, and hence clearances to infrastructure, and could increase the possibility of collision between rolling stock and infrastructure if not taken into account.

G 3.3.6.4 These clearances are based on historical values.

Guidance

G 3.3.6.5 Rails will usually exhibit sidewear due to passing train wheel lateral forces on tight curves, usually on the high rail.

3.4 Adjustment for cross-wind

3.4.1 The effect of cross-wind on clearances shall be assessed, taking into consideration the requirements for swept envelopes set out in GMRT2173, and appropriate mitigation measures taken at exposed locations where reduced or special reduced structure and passing clearances are proposed.

3.4.2 The pantograph sway displacement relative to the centreline of the track at a specific site shall be calculated using the wind speed at the site of the location being assessed as defined in the UK National Annex to BS EN 1991-1-4:2005+A1:2010, with a reference height correction factor of 0.793 applied.

3.4.3 Pantograph sway limit values from GMRT2173 at 4.3 m or 5.3 m above the plane of the rails shall be determined using only the corrected wind speed and the average cant deficiency at the site.

Rationale

G 3.4.4 This is the NTR to fulfil the alternative requirements for the calculations of structure gauge permitted by clause 7.7.17.2 of the INF NTSN.

G 3.4.5 This helps to reduce the risk that a collision occurs between vehicles and infrastructure by allowing for the possible dynamic vehicle movements due to wind.

Guidance

G 3.4.6 Requirements are set out in GMRT2173 for the determination of the swept envelopes of vehicles for ten minute mean cross-wind speeds acting over the whole height of the vehicle of 0 m/s and 22 m/s, and any higher cross-wind speeds for particularly exposed locations identified by the IM.

G 3.4.7 The following is an example of how to determine the relevant site wind speed. The extreme mean wind speed from the UK National Annex to BS EN 1991-1-4:2005+A1:2010 is 25.0 m/s. The average site cant deficiency is 125 mm. The corrected wind speed is 25 x 0.793 = 19.8 m/s, so the pantograph sway at 4.3 m from Table 1 in GMRT2173 is 203 mm (using a 4th order interpolation).

3.5 Track quality data for dynamic analysis

3.5.1 Appropriate speed bands shall be specified for generic track quality data to be used for determining vehicle swept envelopes, as set out in GMRT2173.

3.5.2 The generic track quality data shall be such that, at any given time, at least 90 % of the track within the speed band is of a higher quality than the generic data.

3.5.3 Track quality data shall take the form of a series of files containing track irregularity data, appropriate to the speed at which the vehicle is to run over it. The irregularity data shall be representative of the track quality over which the vehicle is to operate

Rationale

G 3.5.4 This is the NTR to fulfil the alternative requirements for the calculations of structure gauge permitted by clause 7.7.17.2 of the INF NTSN.

G 3.5.5 This helps to reduce the risk that a collision occurs between vehicles on adjacent tracks or vehicles and infrastructure by allowing for the possible dynamic vehicle movements of rolling stock due track irregularities.

Guidance

G 3.5.6 Requirements are set out in GMRT2173 for vehicle swept envelopes to be determined for 'the range of ... track quality appropriate to the route(s) for which gauging clearance is required'.

G 3.5.7 Requirements and guidance for track quality data are set out in RIS-2773-RST.

3.6 Determining the relative positions of tracks and structures

3.6.1 Where measurements are required

3.6.1.1 Measurements to determine the relative positions of structures and tracks shall be taken and recorded where any of the following apply:

a) Clearances to structures in the upper sector are likely to be less than twice the normal clearance defined in *3.1.2*
b) Structures are likely to be within 200 mm of the LSIG shown in *B.1*
c) Passing clearances between vehicles are likely to be less than twice the normal clearance defined in *3.1.2*.

Rationale

G 3.6.1.2 This is the NTR to fulfil the alternative requirements permitted by clause 7.7.17.9 of the INF NTSN.

G 3.6.1.3 It is important to know where clearances might require additional controls to avoid the risk of collision between vehicles on adjacent tracks or vehicles and infrastructure.

G 3.6.1.4 The relative positions of structures and tracks are used when calculating clearances.

Guidance

G 3.6.1.5 RIS-7773-INS sets out requirements for infrastructure gauging data, and also sets out the most commonly used data format for the exchange and interpretation of infrastructure data used in the process of gauging compatibility assessment.

3.6.2 Relating measurements to the maintained position of the track

3.6.2.1 All measurements shall be related to the maintained position of the track, that is, the position in which the track should be placed during maintenance.

3.6.2.2 Where the maintained position of the track has not been established by design, it is permissible to take the actual track position at the time of measurement as the maintained position.

Rationale

G 3.6.2.3 This is the NTR to fulfil the alternative requirements permitted by clause 7.7.17.9 of the INF NTSN.

G 3.6.2.4 A datum position for measurements is needed for the calculation of clearances to reduce the risk that a collision between vehicles on adjacent tracks or vehicles and infrastructure is not increased by an inappropriate choice.

Guidance

G 3.6.2.5 The use of the maintained position of the track, or a suitable design alignment, reduces the possibility that temporary, undesirable features in the actual alignment have an undue influence on the clearances.

3.6.3 Determination of the maintained position of the track - Data to be recorded

3.6.3.1 The following data shall be recorded at regular longitudinal (spatial) intervals at the location under consideration, and for 10 m beyond:

a) Measurements to define horizontal track alignment, including curve radius, cant, transitions and cant gradients
b) Measurements to define track vertical alignment, including radii of vertical curves where less than 1000 m
c) Measurements to define track intervals
d) Whether any rails on curves are subject to sidewear
e) Track fixity
f) The permissible or enhanced permissible speed.

Rationale

G 3.6.3.2 This is the NTR to fulfil the alternative requirements permitted by clause 7.7.17.9 of the INF NTSN.

G 3.6.3.3 To identify the likely tightest clearances, it is important to define the track profile and relevant parameters using sufficient points.

Guidance

G 3.6.3.4 Where structures are in close proximity to the track, then, typically, longitudinal measurements are taken at 5 m intervals, and at such additional locations as necessary to accommodate specific features of the infrastructure profile.

G 3.6.3.5 On simple structures (such as platforms), key points are normally measured. On smooth curved structures, industry practice has been to take measurements at no more than 100 mm intervals. On rough surfaces, all protrusions may need to be measured where these are likely to represent the minimum clearance(s) at that location.

G 3.6.3.6 In any survey, the engineer's line reference and route mileage is used to relate to other infrastructure features.

G 3.6.3.7 RIS-7773-INS sets out requirements for infrastructure gauging data, and also sets out the most commonly used data format for the exchange and interpretation of infrastructure data used in the process of gauging compatibility assessment.

3.6.4 Intervals between longitudinal (spatial) measurements

3.6.4.1 The intervals between longitudinal (spatial) measurements shall be determined based on:

a) The minimum assessed clearances and vehicles to which they apply;
b) The horizontal curvature of the track; and
c) The relative levels and cants of the adjacent tracks.

Rationale

G 3.6.4.2 This is the NTR to fulfil the alternative requirements permitted by clause 7.7.17.9 of the INF NTSN.

G 3.6.4.3 The spatial interval between longitudinal measurements is chosen considering parameters that could change over distance, leading to reductions in safe clearances.

Guidance

G 3.6.4.4 Clearances can reduce over distance due to alignment changes, particularly features like S&C, changes in the relative positions of adjacent structures and the stability of conditions, such as a retaining wall moving due to cutting slope movement.

3.6.5 Determination of the profile of the structure

3.6.5.1 The profiles of structures relative to the track shall be established by measurement, with the number of points at which measurements are taken to define a profile being determined based on:

a) The closeness of the structure to the track;
b) The curvature of the surface of the structure; and
c) The irregularity (vertical and horizontal) of the surface of the structure.

Rationale

G 3.6.5.2 This is the NTR to fulfil the alternative requirements permitted by clause 7.7.17.9 of the INF NTSN.

G 3.6.5.3 To identify the likely tightest clearances, it is important to capture the relative location and profile of structures and their relevant parameters using sufficient points.

Guidance

G 3.6.5.4 The locations of critical parts of structures adjacent to track include those extending from top of rail to cant rail height, including the waist height of vehicles using the route, and any parts near overhead line equipment (OLE).

3.6.6 Records of the relative positions of structures and tracks

3.6.6.1 Records of the relative positions of structures and tracks shall be kept for all locations where the circumstances set out in *3.6.1* apply.

3.6.6.2 The records shall be related to the maintained position of the track (see *3.6.2*).

3.6.6.3 Records of relative positions of structures and tracks shall be kept up-to-date. Records shall be retained until such time as the circumstances set out in *3.6.1* cease to apply at the location to which the record applies.

Rationale

G 3.6.6.4 This is the NTR to fulfil the alternative requirements permitted by clause 7.7.17.9 of the INF NTSN.

G 3.6.6.5 These records are important for rapidly responding to irregular traffic flows and emergency diversions, and establishing the feasibility for new rolling stock.

Guidance

G 3.6.6.6 Records of the relative positions of track and structures can be readily shared between relevant parties to improve the confidence in infrastructure data, contribute to gauging databases, and provide records of temporary approved traffic flows.

3.6.7 Records of clearances and control measures

3.6.7.1 Where calculated clearances are below those categorised as normal, the following records shall be kept:

a) Location, including identity of the structure, identity of track and track mileage
b) Vehicle type(s) or gauge(s) compatible with the route and speed(s) to which clearance applies
c) Value of the calculated clearance
d) Method and date of the measurement used for gauging compatibility assessment
e) Frequency of measurement, for example, annual
f) Any special enhanced track fixity or track maintenance requirements
g) Risk assessment, where deemed appropriate
h) Any local circumstances that could affect clearances, such as exposure to high winds, embankment liable to subsidence.

Rationale

G 3.6.7.2 This is the NTR to fulfil the alternative requirements permitted by clause 7.7.17.9 of the INF NTSN.

G 3.6.7.3 These records are important for rapidly responding to irregular traffic flows and emergency diversions, and establishing the feasibility for new rolling stock.

Guidance

G 3.6.7.4 Records of clearances and control measures can be readily shared between relevant parties to improve the confidence in infrastructure data, contribute to gauging databases, and provide records of temporary approved traffic flows.

3.6.8 Records of vehicles gauged for each section of track

3.6.8.1 For each section of track, details of vehicles compatible to operate on that section and the speeds at which they are compatible to run shall be recorded.

3.6.8.2 The compatible vehicles shall be classified as:

a) Those which have been gauged in accordance with the requirements of either:
    i) This document; or
    ii) GMRT2149 (including the relevant issue number); or
    iii) GMRT2173 (including the relevant issue number); or

b) Those which have been gauged, but not in accordance with the requirements of i) to iii).

3.6.8.3 Specific restrictions at individual locations shall be recorded, for example a speed restriction passing a particular structure.

Rationale

G 3.6.8.4 This is the NTR to fulfil the alternative requirements permitted by clause 7.7.17.9 of the INF NTSN.

G 3.6.8.5 These records are important for rapidly responding to irregular traffic flows and emergency diversions, and establishing the feasibility for new rolling stock.

Guidance

G 3.6.8.6 Records of vehicles for each section of track can be readily shared between relevant parties to improve the confidence in infrastructure data, contribute to gauging databases, and provide records of temporary approved traffic flows.

G 3.6.8.7 Records of vehicles which are compatible with each section of track are used to assist in determining suitable comparator vehicles for assessing new or cascaded vehicles for the same section of track.

3.7 Data to be provided to railway undertaking (RUs) and their suppliers

3.7.1 Requirement to provide information

3.7.1.1 The information set out below shall be maintained and made available to RUs and their suppliers, when legitimately required for the execution of their business:

a) Locations with reduced and special reduced clearances and the vehicle type(s) to which the clearances apply (see *3.6.7*)
b) Exposed locations where the ten minute mean wind speed acting over the whole height of the vehicle in excess of 22 m/s is likely to be experienced (see *3.4*)
c) Generic track quality data for different speed bands to be used for determining vehicle swept envelopes in accordance with GMRT2173 (see *3.5*)
d) Locations of sections of track maintained to different standards than that to which the generic track quality data apply, together with the specific track quality data applicable to the identified sections of track (see *3.5*)
e) Records of the relative positions of structures and tracks, for all locations where the circumstances set out in *3.6.1* apply (see *3.6.7*)
f) The availability of sections of track in terms of standard vehicle gauges
g) Information concerning locations with temporary or permanent deviations against the requirements of this document.

Rationale

G 3.7.1.2 These requirements are required for technical compatibility with rolling stock.

Guidance

G 3.7.1.3 The information referred to in this section relates only to the scope of this document. To fully describe the infrastructure, other information is also required, for example, signalling system and electrification system.

3.7.2 Processes for providing information

3.7.2.1 The processes shall be published by which the information required by *3.7.1* is to be provided, including:

a) A point of contact for the supply of information.
b) A schedule of information that can be provided on application, and its format
c) A schedule of information available for reference only, and where it can be viewed
d) The notice period required for provision of information
e) Details of any publications, in the form of catalogues or bulletins, which the IM intends circulating to RUs and their suppliers.

Rationale

G 3.7.2.2 This is important to enable responses to requests for new traffic flows and emergency diversions, and the specified information is required in order for relevant parties to assess the implications of any change they are proposing.

Guidance

G 3.7.2.3 Parties proposing to introduce new vehicles, or make a change to the infrastructure will find this information of use.

3.8 Gauging conditions for passage of exceptional loads

3.8.1 The IM shall determine the gauging and route availability conditions for the passage of exceptional loads. In determining these conditions for out-of-gauge loads, consideration shall be given to a number of factors, including:

a) Proposed carrying vehicle
b) Dimensions of the load
c) Any eccentricity of the load
d) Any dynamic behaviour of the load
e) Required routing.

Rationale

G 3.8.2 It is important to know the conditions and routes under which exceptional loads can be accommodated, to avoid the possibility of collisions of such loads with infrastructure and other rolling stock.

Guidance

G 3.8.3 Requirements for the operational controls for the transport of exceptional loads are given in section 2.7 of RIS-3781-TOM.

Part 4 Application of this document

4.1 Scope

4.1.1 If a change to the position of infrastructure or track relative to infrastructure is considered new, renewal or upgrade as defined in the Railways (Interoperability) Regulations 2011 (as amended), then all or part of the position of infrastructure or track relative to infrastructure is required to comply with the INF NTSN and other relevant NTSNs and NTRs, unless given exemptions allowed for in the Regulations.

4.1.2 The requirements of this document apply to all new and modified (excluding like-for-like replacement of components) relevant parts of the infrastructure and track where *4.1.1* applies to the subsystem.

4.1.3 Action to bring existing positions of infrastructure, or track relative to infrastructure, into compliance with the requirements of this document is not required.

4.1.4 Where it is known, or becomes known, that the position of existing infrastructure does not comply with the requirements of this document, action to bring them into compliance is required as follows:

a) When the position of existing infrastructure is modified;
b) When a track is renewed as a whole (for example rail, sleepers and ballast); and
c) When any major component of a structure is replaced.

4.1.5 The requirements of *Part 2* apply to all new infrastructure and alterations to existing infrastructure.

4.1.6 The requirements of *Part 3* apply to all existing infrastructure.

4.1.7 The requirements of this document apply to all work that affects the provision of adequate clearance between the vehicle and adjacent infrastructure, and maintaining clearance between the vehicle and other vehicles operating on adjacent tracks, whether new or alteration.

4.1.8 Compliance with the requirements of this document relating to inspection, maintenance and in-service condition of infrastructure is mandatory.

4.2 Exclusions from scope

4.2.1 There are no exclusions from the scope.

4.3 General enter into force date

4.3.1 The requirements in this document enter into force from 3 June 2023 [proposed], except where exceptions to the general enter into force date are specified.

4.4 Exceptions to general enter into force date

4.4.1 There are no exceptions to the general enter into force date.

4.5 Applicability of requirements for projects already underway

4.5.1 The Office of Rail and Road (ORR) can be contacted for clarification on the applicable requirements where a project seeking authorisation for placing into service is already underway when this document enters into force.

4.6 Deviations

4.6.1 Where it is considered not reasonably practicable to comply with the requirements of this document, permission to comply with a specified alternative should be sought in accordance with the deviation process set out in the Railway Group Standard Code.

4.6.2 In the case where NTSN compliance is required for a new, renewed or upgraded vehicle or structural subsystem, the exemption process to be followed is set out in the Railways (Interoperability) Regulations 2011 (as amended).

4.7 Health and safety responsibilities

4.7.1 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.

Appendices

Appendix A Considerations for structure gauges on new lines

Note: The content of this appendix is provided as guidance in support of *2.2.1*.

A.1 National structure gauges

Guidance

G A.1.1 The provision of upper sector infrastructure gauges for the GB railway network is a commercial issue, and such gauges are determined by the IM. However, the development of infrastructure gauges can be undertaken by third parties, particularly on major projects.

G A.1.2 The terms 'vertical' and 'lateral' are used to describe dimensions perpendicular to, and parallel with, the plane of the rails respectively, irrespective of track cant.

G A.1.3 The following considerations set out in *A.2* relate to straight and level track. Adjustments are made for the effects of curvature.

A.2 Lateral clearances

A.2.1 Basis for lateral clearances

Guidance

G A.2.1.1 Lateral clearance is determined according to the widest dynamic envelope of rolling stock, and the clearances to cess walkways required, depending on speed. There are additional requirements at platforms.

A.2.2 Allowance for access

Guidance

G A.2.2.1 For efficient and effective maintenance of a route, provision is made for access along the railway. This can range from cess walkways to road vehicle access depending on site constraints and the need to bring in heavy materials.

A.2.3 Allowance for platforms

Guidance

G A.2.3.1 The lateral platform offset is increased according to curve radius using the formula set out in *Appendix C*, and where required for specific vehicles.

G A.2.3.2 Platform clearances are subject to the maintenance of required stepping distances. These are normally calculated and assessed using the static vehicle envelope subject to overthrow, and are vehicle specific. See RIS-8273-RST for information on assessing platform stepping distances.

A.2.4 Allowance for tilting trains

Guidance

G A.2.4.1 The clearances may need to be increased if tilting trains are required to operate in potential tilt failed mode. It is not possible to provide detailed guidance about this within the scope of this document.

A.2.5 Allowance for electrification

Guidance

G A.2.5.1 Where OLE is present, additional clearance provision might be required to accommodate electrical clearances in relation to pantograph sway, particularly through arched structures. This can be calculated using absolute gauging techniques according to vehicle characteristics described in GMRT2173.

G A.2.5.2 To achieve vertical clearance through structures for overhead line construction, track lowering has been carried out on a number of routes. In some cases, this can be a suitable long term solution, but there can be associated longer term problems such as foundation stability of adjacent structures (for example platforms), formation performance and drainage.

A.3 Vertical clearances

A.3.1 Basis for vertical clearances

Guidance

G A.3.1.1 Vertical clearance is determined according to the tallest dynamic envelope of rolling stock, and whether OLE is present.

G A.3.1.2 The maximum static height of any vehicle currently permitted on the GB railway network is 3965 mm (W6a gauge). An additional 25 mm is allowed for dynamic bounce, generating a maximum vertical swept envelope on straight and level track of 3990 mm.

A.3.2 Routes where 25 kV overhead electrification is not foreseeable

Guidance

G A.3.2.1 The case for electrifying non-electrified routes depends on many factors and will almost certainly change over time as ac electrification schemes are implemented. For any new or replacement over line structure it is essential that future considerations for ac electrification are taken into account to avoid unnecessary future modification costs.

G A.3.2.2 Table *8* sets out target minimum allowances for a range of clearance regimes for routes where 25 kV overhead electrification is not foreseeable.

Clearance regime	Normal clearance	Reduced clearance
Minimum bridge soffit gauge height	4240 mm	4140 mm

Clearance regime	Normal clearance	Reduced clearance
Bridge construction allowance	50 mm	50 mm
Clearance (physical)	100 mm	50 mm
Dynamic bounce allowance	25 mm	25 mm
Load gauge height	3965 mm	3965 mm
Track lift allowance	100 mm	50 mm

Table 8: Target allowances and clearances for routes where 25 kV electrification is not foreseeable

A.3.3 Existing routes with 25 kV overhead electrification

Guidance

G A.3.3.1 On existing routes where 25 kV overhead electrification exists, or is planned to be installed, the vertical clearance is based on the required wire height and overhead line construction arrangement. Table *9* sets out the target minimum allowances.

	Free running design (not attached to bridge)	Supported from bridge		Notes
Clearance regime		**Electrical dimensions providing basic insulation**	**Electrical dimensions providing functional insulation**	
Minimum bridge soffit gauge height	**6335 mm**	**5130 mm**	**4850 mm**	
Bridge construction allowance	50 mm	50 mm	50 mm	See Factors to be allowed for on 25 kV OLE routes *a)*
Electrical clearance	600 mm	≥370 mm	≥270 mm	See Factors to be allowed for on 25 kV OLE routes *e)*

	Free running design (not attached to bridge)	Supported from bridge		Notes
Clearance regime		**Electrical dimensions providing basic insulation**	**Electrical dimensions providing functional insulation**	
OLE uplift	Within system height	80 mm	80 mm	See Factors to be allowed for on 25 kV OLE routes *c)*
OLE system height	1000 mm	120 mm	120 mm	See Factors to be allowed for on 25 kV OLE routes *h)*
OLE construction allowance	75 mm	25 mm	10 mm	See Factors to be allowed for on 25 kV OLE routes *g)*
OLE contact wire height	**4610 mm**	**4485 mm**	**4320 mm**	
OLE construction allowance	75 mm	25 mm	10 mm	See Factors to be allowed for on 25 kV OLE routes *g)*
Contact wire sag	75 mm	—	—	See Factors to be allowed for on 25 kV OLE routes *f)*

	Free running design (not attached to bridge)	Supported from bridge		Notes
Clearance regime		**Electrical dimensions providing basic insulation**	**Electrical dimensions providing functional insulation**	
Electrical clearance	370 mm	370 mm	270 mm	See Factors to be allowed for on 25 kV OLE routes *e)*
Dynamic bounce allowance	25 mm	25 mm	25 mm	See *Table 8*
Load gauge height	3965 mm	3965 mm	3965 mm	See *A.3.1*
Track lift allowance	100 mm	100 mm	50 mm	See Factors to be allowed for on 25 kV OLE routes *d)*

Table 9: Target minimum dimensions for new 25 kV OLE electrification

Note: Definitions for basic insulation and functional insulation are set out in GLRT1210.

G A.3.3.2 For optimum current collection, the contact wire remains level under the bridge structure and is supported in a similar manner to the contact wire away from the bridge. This requires a substantial height between the bridge soffit and the contact wire, unless low profile equipment is used.

G A.3.3.3 Compromises are possible to reduce the space required by the electrification equipment, but these may bring with them an impact on the quality of current collection and may also impose limits on the speed of operation. Such compromises include the use of components supported from the bridge, and a reduction in system height and contact wire height under the bridge.

G A.3.3.4 There is considerable variation in the height of the contact wire used in GB. Typically the contact wire height is 4700 mm, but the range is 4165 mm (or even lower in certain special circumstances) to 5900 mm at public level crossings. The minimum permitted contact wire height above a level crossing is 5800 mm or in some cases 5600 mm.

G A.3.3.5 Standard contact wire heights defined by the Energy National Technical Specification Notice (ENE NTSN) and the associated GB Specific Case will determine the contact wire height on routes where compliance with the ENE NTSN is required.

A.3.4 Factors to be allowed for on 25 kV OLE routes

Guidance

G A.3.4.1 Factors to be allowed for in the derivation of a structure gauge in areas electrified using 25 kV OLE are set out here.

G A.3.4.2 These factors can be used to determine a contact wire height. However, the type of traffic and speed of operation of the line may determine that the required height of the contact wire is significantly higher than the minimum value determined by these factors:

a) Bridge construction allowance – a further bridge construction allowance could be appropriate for different types of bridge design and construction methods, typically 50 mm, in determining a structure gauge.
b) Vertical track curvature – the effect on the rolling stock height of a concave track dip at a bridge may increase the effective height of long vehicles.
c) Uplift – this is the amount by which the contact wire is lifted by the passage of a pantograph.
d) Track lift allowance – where necessary, allowance is be made for any likely future designed track lift, for example to increase cant (and so permit increased speeds), or as a result of a change from 113 A rail section to 60 E 1 (UIC 60) rail, or replacement of timber sleepers by concrete sleepers. Consideration is also given to maintenance lifts over the whole life of the track, rather than simply considering the single-cycle maintenance allowance.
e) Electrical clearance – GLRT1210 sets out the minimum static electrical clearances and circumstances when reduced clearances are acceptable.
f) Contact wire (or beam) sag below supported height – where appropriate an allowance should be made for ice loading, weight of the beam (if used) between supports and other external influences.
g) Construction allowance – applied above and below the designed contact wire height. This is usually 75 mm, but can be reduced to 10 mm with special measures. This is also known as installation allowance.
h) System height – the system height is typically taken from the top of the supported catenary wire to the bottom of the contact wire. The support arrangement may vary widely depending on the style of the construction and the intended speed of the operation. This can be as little as 120 mm for a bridge supported arrangement to 1000 mm plus for a 'free-running' arrangement not supported from the bridge.
i) Flashover protection and secondary insulation – above the extreme height of live equipment, protection is given to some types of bridge if live parts are less than 600 mm below the soffit. The protection could include 50 mm for flashover protection and, in some cases, an additional 120 mm for secondary insulation. The bridge construction and function will determine whether these additional precautions are required.
j) Other features such as track arrangement, electrical sectioning and proximity of level crossings are also considered.

Note: On very high-speed lines, or in long tunnel installations, aerodynamic forces are increased and their effect on uplift are considered. Further guidance on uplift is given in RIS-2773-RST.

A.3.5 Allowance for vertical deflections of overbridges

Guidance

G A.3.5.1 The above calculations make no allowance for vertical deflections of overbridges under load. These can be significant, particularly for steel overbridges. When calculating the electrical clearances, these are increased to allow for the deflection of the bridge under loading where this is necessary.

Appendix B Lower sector infrastructure gauge

Note: The content of this appendix relates to requirements in *2.3*.

B.1 LSIG outline

B.1.1 On tight radius curves where designed track gauge widening applies, the dimensions shall not be adjusted by the gauge widening value.

B.1.2 The offset from the running edge of the nearest rail to the platform edge shall be no less than the minimum values given in *Appendix C*.

B.1.3 Figure *2* shows the LSIG – items intended for close proximity as a semi-width, dimensioned with respect to track centre line and running edge. The semi-width gauge shall be applied symmetrically about the track centre line.

Rationale

G B.1.4 Gauge widening does not alter the requirement to maintain clearances to infrastructure, which are referenced to track centreline.

G B.1.5 Setting minimum values for the offset between the nearest rail and the platform edge should ensure positive clearance between the sides of vehicles and the platform.

G B.1.6 Equipment that is required in the lower sector will not cause clearances issues if suitably located.

Guidance

G B.1.7 The LSIG is set out in this appendix as a series of diagrams and associated application rules and notes. Figure *1* shows the area available for all infrastructure that does not need to be in close proximity for specific system functionality.

G B.1.8 Figure *3* shows the position of the conductor rail.

G B.1.9 Sections *B.2* to *B.8* set out particular requirements for items of equipment that need to be positioned to interface with train-mounted equipment.

G B.1.10 The following notes apply to Figures *1* to *7*:

a) All lines are parallel to, or at right angles to, the plane of the rails.
b) All dimensions are measured relative to the maintained position of the track.
c) All dimensions are in millimetres.
d) Except for the area for wheel flanges, locations below the plane of the rails are available for infrastructure.

G B.1.11 See *Appendix C* for the platform edge area and structures that are close to the track.

G B.1.12 Items of equipment that are required to be in the lower sector can be positioned along the track, so that they do not create a conflict.

G B.1.13 Gauge widening is typically applied on curves with radii tighter than 200 m to ease the passage of trains through the curves.

G B.1.14 The platform recess is to provide a space for a person to escape from a train if they fall off the platform and to provide access for emergency services for persons trapped between the train and the platform.

G B.1.15 As the platform recess is situated outside the limit of area for all infrastructure, placing items of equipment within it will not infringe clearances. Therefore, it can be used for discrete items of equipment that are required to be in the platform area, for example datum plates.

G B.1.16 An example of the positioning of equipment in the lower sector which does not create a conflict is installing a gap in conductor rails to provide the clear space for a trainstop.

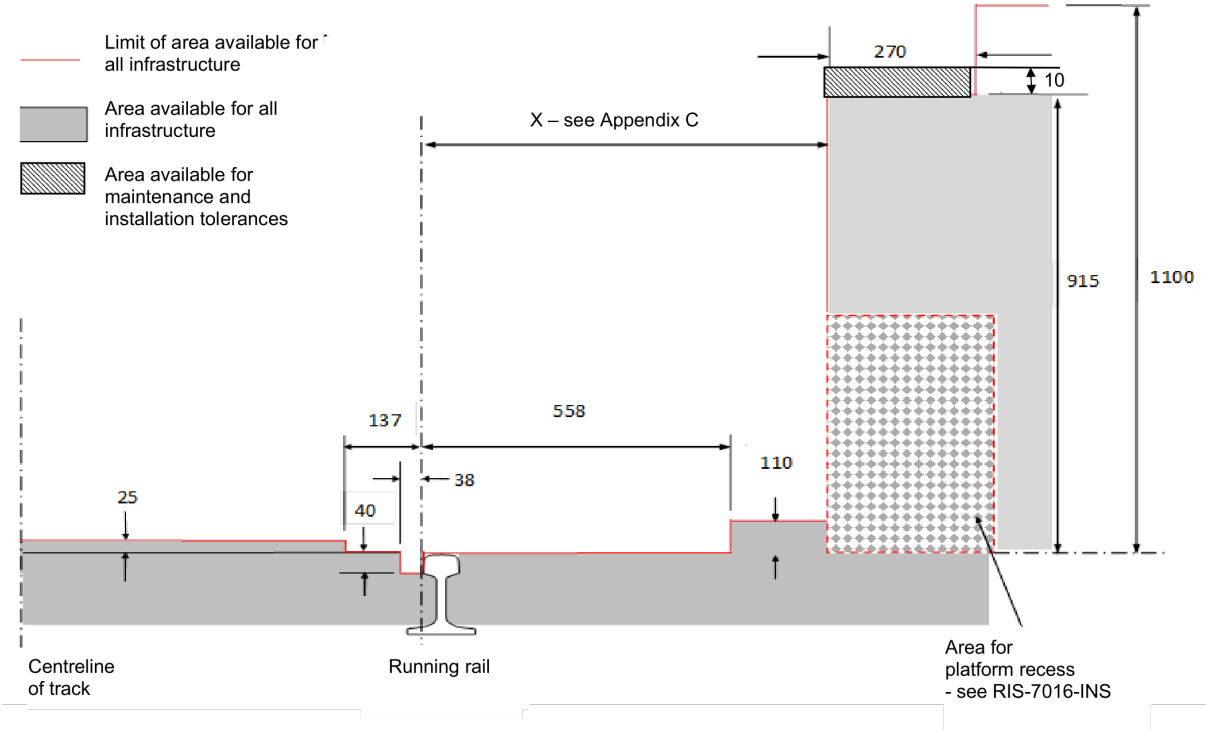
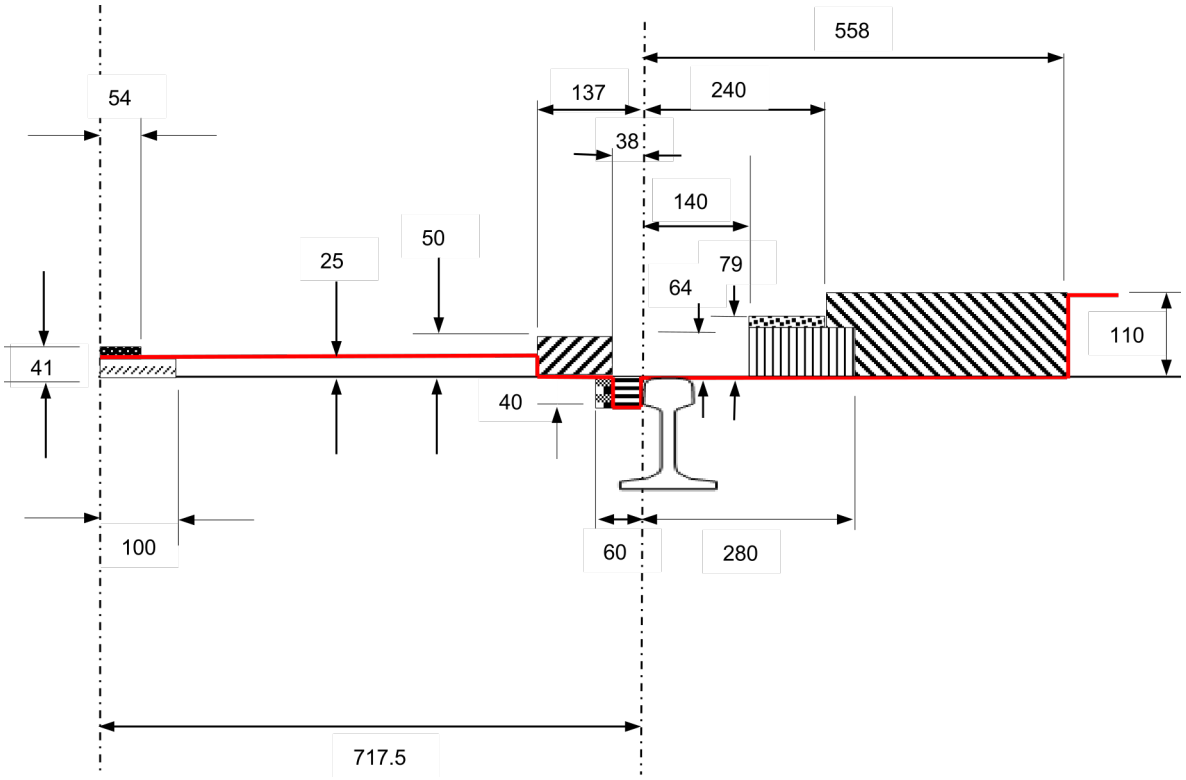


Figure 1: LSIG – Area available for all infrastructure (not to scale)



Key:

- Limit of area available for all infrastructure
- Area for conductor rail equipment (fourth rail). See Appendix B.2 for position of conductor rails
- Area for train control and warning equipment. See Appendix B.7 for position of AWS magnets
- Area for check rails
- Area additionally required for free wheel passage, for example at heel of switches
- Area for wheel flanges, flange application lubricators and treadles. See Appendix B.8 for position of treadle actuating arms
- Area for guard rails, (except where trains fitted with non-retractable shoes for electric current collection operate) and trainstops. See Appendix B.5 for position of trainstops
- Area for trainstop in effective position and tripcock tester. See Appendix B.5 for position of trainstops. See Appendix B.6 for tripcock tester
- Area for conductor rail equipment (including side ramps), guard boards and APC magnets. See Appendix B.2 for position of conductor rails, B.3 for position of guard boards and B.4 for position of APC magnets

Figure 2: LSIG - Items intended for close proximity (not to scale)

B.2 Position of conductor rails with respect to running edge

B.2.1 The LSIG position of conductor rails is shown in Figure *3* as a semi-width dimensioned with respect to the running edge. The semi-width gauge shall be applied symmetrically about the track centre line.

Rationale

G B.2.2 The conductor rail can be positioned to the outside of either running rail, depending on the direction of travel of the train.

Guidance

G B.2.3 None.

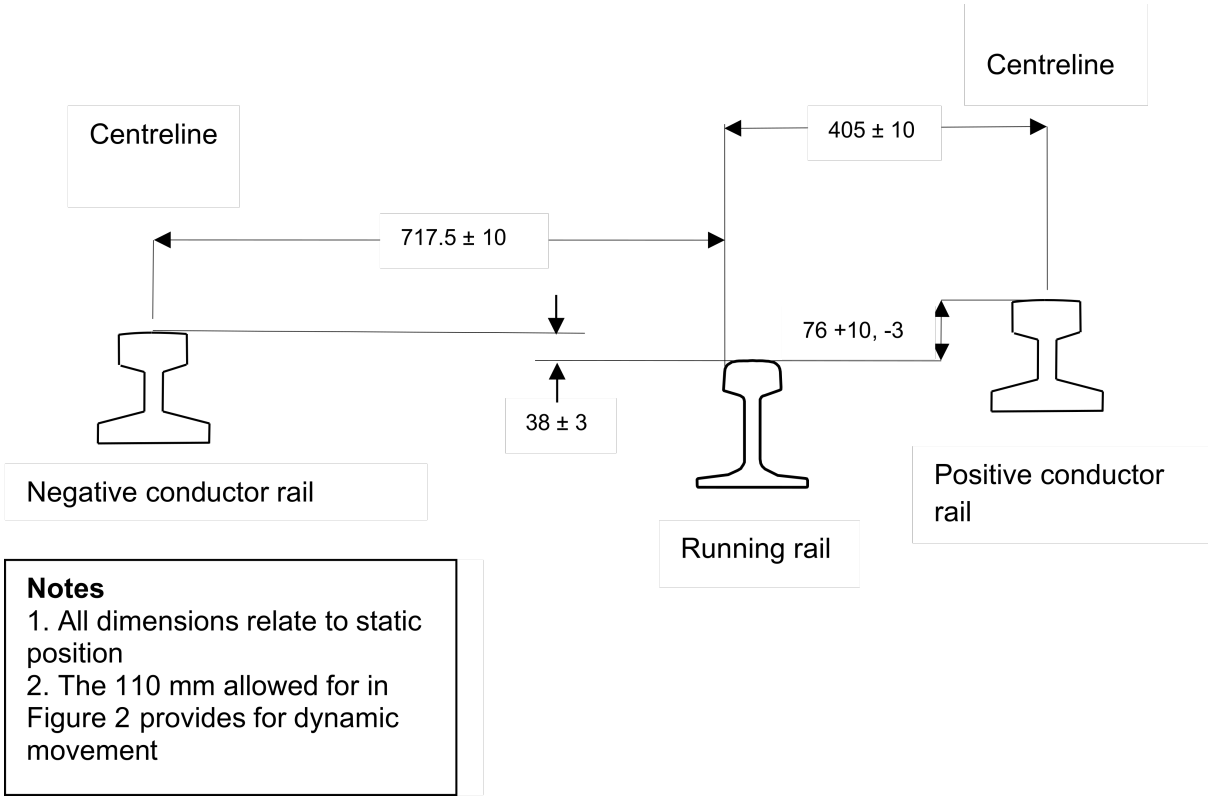


Figure 3: Position of conductor rail (not to scale)

B.3 Position of conductor rail guard boarding with respect to running edge

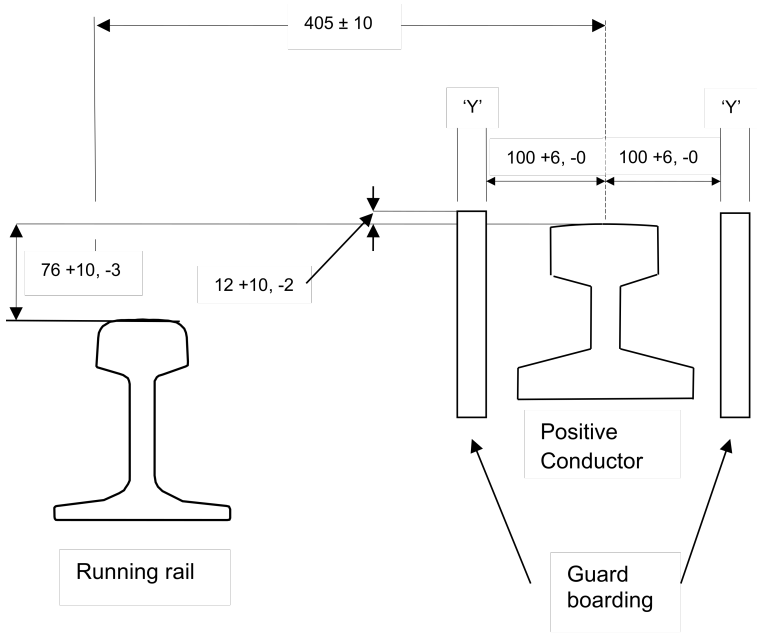
B.3.1 The LSIG position of conductor rail guard boarding is shown in Figure 4 as a semi-width dimensioned with respect to the running edge. The semi-width gauge shall be applied symmetrically on each side of the track.

Rationale

G B.3.2 Conductor rail boarding can be positioned to the outside of either running rail, depending on the direction of travel of the train.

Guidance

G B.3.3 None.



Notes
1. All dimensions in millimetres
2. Timber guard boarding based on nominal section of 175 mm x 38 mm ('Y')
3. For routes where trains fitted with trip cocks operate, timber guard boarding dimension Y is less than or equal to 25 mm

Figure 4: Position of conductor rail guard boarding (not to scale)

B.4 Position of APC magnets with respect to running edge

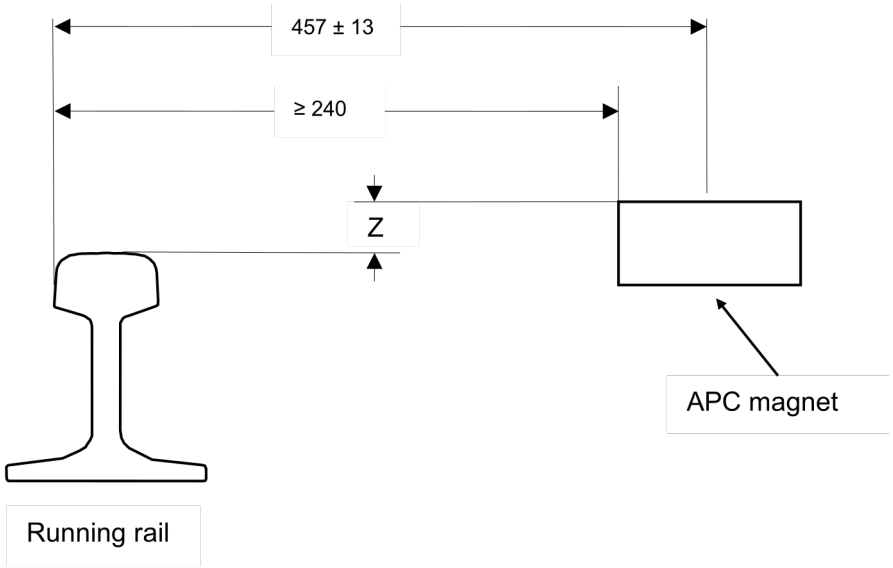
B.4.1 The LSIG position of the APC magnet is shown in Figure *5* as a semi-width dimensioned with respect to the running edge. The semi-width gauge shall be applied symmetrically on each side of the track.

Rationale

G B.4.2 APC magnets can be positioned to the outside of either running rail, depending on the direction of travel of the train.

Guidance

G B.4.3 None.



Notes
1. All dimensions in millimetres
2. Maximum height of APC magnet: Z = 45 mm + 6 mm

Figure 5: Position of APC magnets (not to scale)

B.5 Position of mechanical trainstop arm with respect to running edge

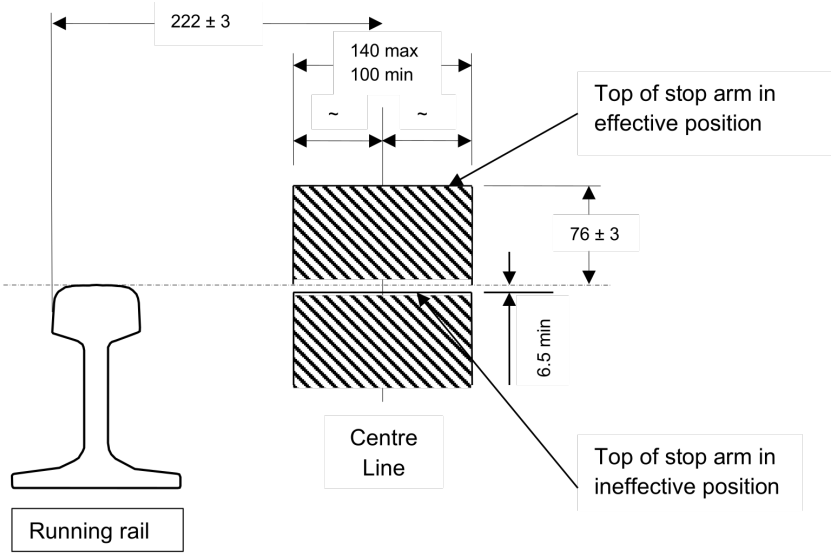
B.5.1 The LSIG position of the mechanical trainstop arm is shown in Figure 6 as a semi-width dimensioned with respect to the running edge. The semi-width gauge shall be applied symmetrically on each side of the track.

Rationale

G B.5.2 Mechanical trainstop arms can be positioned to the outside of either running rail, depending on the direction of travel of the train.

Guidance

G B.5.3 None.



Notes
1. All dimensions in millimetres
2. Body of train
3. View is in direction of travel of the trainstop mechanism is set below rail level

Figure 6: Position of mechanical trainstops (not to scale)

B.6 Position of tripcock tester with respect to running edge

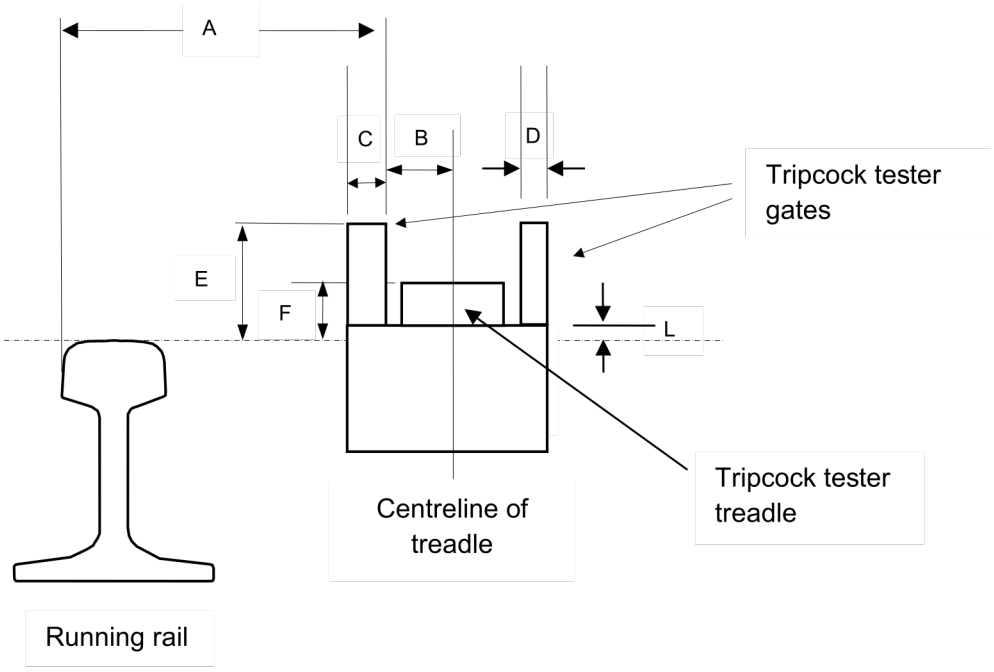
B.6.1 The LSIG position of tripcock tester is shown in Figure *7* as a semi-width dimensioned with respect to the running edge. The semi-width gauge shall be applied symmetrically on each side of the track.

Rationale

G B.6.2 Tripcock testers can be positioned to the outside of either running rail, depending on the direction of travel of the train.

Guidance

G B.6.3 None.



Notes

1. All dimensions in millimetres
2. Body of tripcock tester mechanism is set below rail level

Key for tripcock tester dimensions

A. Left inside edge of tripcock tester gate from running edge: 171.5 mm
B. Left inside edge of tripcock tester gate from centreline of treadle: 51 mm
C. Left width of gate: 32 mm
D. Right width of gate: 19 mm
E. Top of gates above rail level: 76 mm
F. Top of treadle above rail level: 63.5 mm
L. Leading edge of treadle above rail level: 19 mm

Figure 7: Position of tripcock tester (not to scale)

B.7 Position of AWS magnets with respect to rail level

B.7.1 The uppermost surfaces of AWS magnets shall not be more than 12 mm above rail level.

Rationale

G B.7.2 This is to ensure that the AWS magnets work and that trains do not hit them.

Guidance

G B.7.3 None.

B.8 Position of treadle actuating arms with respect to running edge

B.8.1 The ends of the arms of treadles shall be no closer than 8 mm from the running edge of the rail and not higher than 10 mm below rail level.

Rationale

G B.8.2 This is to ensure that the treadle actuating arms work and that trains do not hit them.

Guidance

G B.8.3 None.

Appendix C Position of the platform edge

Note: The content of this appendix relates to requirements of *Appendix B*.

C.1 Values of X for the standard case

C.1.1 The offset from the running edge of the nearest rail at a position 14 mm below the head of the rail to the platform edge shall be no less than the minimum value X as set out in Table *10*.

Track curvature R (m)	Minimum offset X (mm)
Straight track and curved track with R ≥ 360	730
Curved track with 160 m ≤ R < 360 m	658 + (26000 / R)

Table 10: Allowance for variation in lateral alignment - standard case

Rationale

G C.1.2 This ensures that there is clearance between the train and the platform edge.

Guidance

G C.1.3 The minimum offset from the running edge of the nearest rail to platform edge is labelled X in Figure *1* in Appendix B.

G C.1.4 Tolerances for the platform offset are given in GIRT7020.

G C.1.5 The formula quoted gives the following results for selected radii:

Radius (m)	X (mm)
360	730
300	745
250	762
200	788
160	821

Table 11: Examples of platform offsets for selected radii for the standard case

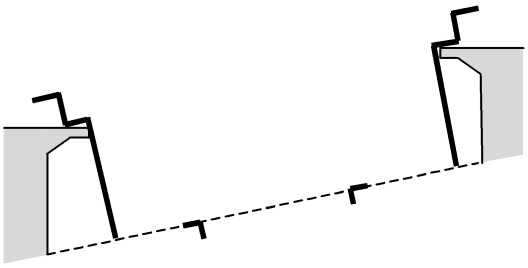


Figure 8: Example of LSIG applied to a standard platform adjacent to canted track (not to scale)

C.2 Values of X for special cases

C.2.1 Application of values of X for Class 373 routes

C.2.1.1 The offset from the running edge of the nearest rail at a position 14 mm below the head of the rail to the platform edge for Class 373 routes shall be no less than the minimum value X as set out in Table *12*.

Track curvature R (m)	Minimum offset X (mm)
Straight track and curved track with R ≥ 360	760
Curved track with 160 m ≤ R < 360 m	688 + (26000 / R)

Table 12: Allowance for variation in lateral alignment - Class 373 routes

Rationale

G C.2.1.2 This ensures that there is clearance between the train and the platform edge.

Guidance

G C.2.1.3 The special cases permitted by Class 373 routes require non-standard platform positions. Where such special cases are introduced onto a route, the requirements set out in RIS-8273-RST are applicable.

G C.2.1.4 Tolerances for the platform offset are given in GIRT7020.

G C.2.1.5 The formula quoted gives the following results for selected radii:

Radius (m)	X (mm)
360	760
300	775
250	792
200	818
160	851

Table 13: Examples of platform offsets for selected radii for Class 373 routes

C.2.2 Application of values of X for 2.6 m wide container routes

C.2.2.1 The offset from the running edge of the nearest rail at a position 14 mm below the head of the rail to the platform edge for 2.6 m wide container routes shall be no less than the minimum value X as set out in Table *14*.

Track curvature R (m)	Minimum offset X (mm)
Straight track and curved track with: R ≥ 360 for the outside of curved track or R ≥ 500 for the inside of curved track	730
The outside of curved track with 160 ≤ R < 360 The inside of curved track with 160 ≤ R < 500	658 + (26000 / R) 664 + (33000 / R)

Table 14: Allowance for variation in lateral alignment - 2.6 m wide container routes

Rationale

G C.2.2.2 This ensures that there is clearance between the train and the platform edge.

Guidance

G C.2.2.3 The special cases permitted by 2.6 m container routes require non-standard platform positions. Where such special cases are introduced onto a route, the requirements set out in RIS-8273-RST are applicable.

G C.2.2.4 Tolerances for the platform offset are given in GIRT7020.

G C.2.2.5 The formula quoted gives the following results for selected radii:

Radius (m)	X (mm)
500	730
360	756
300	774
250	796
200	829
160	870

Table 15: Examples of platform offsets (inside of curved track) for selected radii for 2.6 m container routes

C.2.3 Structures adjacent to curves with radii less than 160 metres

C.2.3.1 Structures adjacent to curves with radii less than 160 m shall be subject to a special assessment.

Rationale

G C.2.3.2 On tight curves specific measures are needed to ensure adequate clearances considering vehicle dynamic movements and track geometry changes caused by train curving forces.

Guidance

G C.2.3.3 Special checks are made for new traffic and for checking gauging after track maintenance. The use of datum plates to monitor track movements relative to structures, or check rails can help.

G C.2.3.4 RIS-8273-RST sets out specific requirements and responsibilities for the assessment of gauge compatibility between rolling stock and infrastructure.

G C.2.3.5 Tolerances for the platform offset are given in GIRT7020.

Definitions

absolute gauging (of a vehicle)	A full assessment of clearances on a section of track between the vehicle and fixed infrastructure, and between the vehicle and vehicles on adjacent tracks.
alterations to infrastructure	The modification of track alignment or associated lineside structures which form part of an infrastructure project subsystem requiring an authorisation for placing into service under the Railways (Interoperability) Regulations (RIR) 2011 (as amended).
clearance	The minimum calculated distance between the swept envelope of a vehicle and fixed infrastructure, or between swept envelopes of two vehicles on adjacent tracks.
comparative gauging	The process of comparing the swept envelopes of a vehicle new to a route, with the swept envelopes of a vehicle or vehicles which have been demonstrated to be able to use the proposed route.
effective position of the track	A position that the track could credibly occupy in relation to structures or an adjacent track at some point within its maintenance cycle, giving the smallest clearances.
enhanced permissible speed (EPS)	The speed permitted over a section of line that applies to a specific type of train operating at cant deficiencies in excess of those permitted at the permissible speed. There may be more than one enhanced permissible speed applicable to a given section of line.
exceptional load	A vehicle or vehicle load that is subject to special operating arrangements, which are determined before authority to travel is granted.
exposed location	An exposed route is an existing railway route for which the value of the fundamental basic wind velocity before the altitude correction is applied, $v_{b,map}$ is ≥ 22 m/s. $v_{b,map}$ is given in Figure NA.1 in the National Annex (NA) to BS EN 1991-1-4:2005.
gauge	A vehicle gauge or structure gauge where the context makes it clear which is meant.
gauging	The process by which swept envelopes of a vehicle or a standard vehicle gauge are used to determine clearances on a section of track between the vehicle and fixed infrastructure and between the vehicle and vehicles on adjacent tracks.
infrastructure	The principal elements are track and structures in combination, but also include railway equipment and support systems (for example, cables and cable supports and signs).
load	The physical size of the payload carried by a wagon.
lower sector	The area up to and including 1100 mm above the plane of the rails.

maintained position of the track	The position in which the track should be placed during maintenance.
new infrastructure	The parts of an infrastructure subsystem other than those parts that already exists, and excluding disused infrastructure that is brought back into use without alteration, which require an authorisation for placing into service under the Railways (Interoperability) Regulations (RIR) 2011 (as amended).
new railway line	A line that creates a route where none currently exists (as set out in *INF NTSN*).
normal clearance	A clearance between a structure and a vehicle or between passing vehicles on adjacent tracks which does not require specific controls on the position of the track, but which does require the relative locations of structures and adjacent tracks to be monitored and maintained.
out-of-gauge load	An exceptional load, by virtue of its size.
overthrow	A geometric projection of a vehicle when on curved track.
passing clearance	The minimum calculated distance between the swept envelopes of two specific types of rail vehicle as they pass on adjacent tracks at nominated speeds, taking account of appropriate track tolerances and accuracy of measurement.
permissible speed	The authorised maximum speed over a section of line, either for all trains or (where differential or enhanced permissible speeds are applied) for specific types of trains, as set out in the Sectional Appendix.
plane of the rails	An imaginary surface co-planar with the top of both rails of a track.
reduced clearance	A clearance, less than a normal clearance, which requires special measures to maintain tracks relative to adjacent tracks and structures.
route	The physical path of a journey to be undertaken by a vehicle or a collection of vehicles, where the path is comprised of a number of track sections, each of which has individually defined characteristics.
section of route	Track bounded by identified limits such as junctions, terminals or points at which there is a significant change in traffic flow or permissible speed.
special reduced clearance	A clearance, less than a reduced clearance, which requires a specific risk assessment to be undertaken and the implementation of appropriate controls to demonstrate that risks have been reduced to as low as reasonably practicable (ALARP).
standard vehicle gauge	An outline drawing or specification of a notional vehicle, which prescribes maximum permissible vehicle and loading dimensions,

	certain suspension displacements, and certain curve overthrow limitations, for example, W6a gauge.
static envelope	The maximum envelope relative to the effective position of the track that a tare vehicle is permitted to be built to, or loaded to, at a particular cross-section. The static gauge requires adjustment to include the effects of a geometric overthrow of the particular cross-section on curved track. Unless specifically stated wheel / rail clearances are taken account of elsewhere.
structure	An element of the infrastructure adjacent to, or crossing over, a railway track. Includes but not limited to: a) train control and communications equipment such as signals b) station platforms c) overhead line equipment supporting structures at earth potential, excluding insulators d) civil engineering structures such as retaining walls, tunnels and bridges e) other isolated structures f) temporary works.
structure [gauge]	An outline drawing or specification, complete with application rules, defining a line relative to the track inside which structures are not permitted to intrude.
structure clearance	The minimum calculated distance between a structure and the swept envelope of a specific type of rail vehicle passing at nominated speeds, taking account of appropriate track tolerances and accuracy of measurement.
swept envelope	A cross-sectional profile, taken at right angles to the track, enclosing all dynamic movements, static deflections and overthrows of all points along the surface of the vehicle that can reasonably be expected to occur under the appropriate range of operating conditions as it sweeps past a theoretical track location. A family of swept envelopes is required to define a vehicle's behaviour on a route.
ten minute mean wind speed	Speed of the instantaneous wind averaged over 10 minutes, as defined in BS EN 1991-1-4 2005, Eurocode 1, wind actions.
track fixity	The degree to which a track is restrained from movement in any direction. Track fixity can be different laterally and vertically, and can be asymmetric.
track interval	The distance between the running edges of the nearest rails of adjacent tracks measured 14 mm below the plane of the rails.
upper sector	The area above 1100 mm above the plane of the rails.

vehicle gauge	The maximum envelope that a vehicle conforming to the gauge is permitted to occupy statically and dynamically, which prescribes maximum permissible vehicle and loading dimensions, certain suspension displacements, and certain curve overthrow limitations, for example, W6a gauge.

References

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

RGSC 01	Railway Group Standards Code
RGSC 02	Standards Manual

Documents referenced in the text

Railway Group Standards

GLRT1210	Energy Subsystem and Interfaces to Rolling Stock Subsystem
GLRT1212	Conductor Rail Energy Subsystem and Interfaces to Rolling Stock Subsystem
GMRT2111	Rolling Stock Subsystem and Interface to AC Energy Subsystem
GMRT2149	Requirements for Defining and Maintaining the Size of Railway Vehicles (withdrawn)
GMRT2173	Size of Vehicles and Position of Equipment
GCRT5021	Track System Requirements
GIRT7020	Requirements for Platform Height, Platform Offset and Platform Width
GERT8073	Application of Standard Vehicle Gauges

RSSB documents

RIS-2773-RST	Format for and Methods for Defining Vehicle Gauging Data
RIS-3781-TOM	Requirements for the operation of freight trains and the conveyance of dangerous goods by any train
RIS-7016-INS	Interface between Station Platforms, Track, Trains and Buffer Stops
RIS-7773-INS	Format for Infrastructure Gauging Data
RIS-8034-CCS	Maintenance of Signal and Operational Sign Visibility
RIS-8270-RST	Route Level Assessment of Technical Compatibility between Vehicles and Infrastructure
RIS-8273-RST	Assessment of Compatibility of Rolling Stock and Infrastructure - Gauging and Stepping Distances
RSSB Research Report T373 (2007)	Reducing Uncertainty in Structure Gauging
RSSB Research Report T670 (2007)	Investigation of the Accumulative Effect of Vehicle Tolerances on Gauging

Other references

BS EN 1991-1-4 2005+A1:2010	Eurocode 1: Actions on structures – Part 1-4, General actions - Wind actions
BS EN 50124-1:2017	Railway applications. Insulation coordination. Basic requirements. Clearances and creepage distances for all electrical and electronic equipment
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.
INF NTSN	Infrastructure National Technical Specification Notice (INF 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) 1299/2014 of 18 November 2014 (the INF TSI) and includes relevant amendments made by Commission Implementing Regulation (EU) 2019/776 which came into force in June 2019.
NA to BS EN 1991-1-4:2005	UK National Annex to Eurocode 1 – Actions on structures, Part 1-4: General actions – Wind actions
Railways (Interoperability) Regulations 2011	