

## **Assessment of Compatibility of Rolling Stock and Infrastructure**

### **Synopsis**

This standard mandates requirements and responsibilities for the assessment of compatibility of rolling stock and infrastructure.

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# Assessment of Compatibility of Rolling Stock and Infrastructure

## Issue record

Issue	Date	Comments
One	February 2003	Original Document Superseded GO/RT3270 issue 2 and parts of GC/RT5161 issue 2, GE/RT8015 issue 1 and GE/RT8029 issue 1.
Two	01 October 2007	Replaces issue 1

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## Superseded documents

The following Railway Group documents are superseded, either in whole or in part as indicated:

Superseded documents	Sections superseded	Date when sections are superseded
GE/RT8270, issue one, Route Acceptance of Rail Vehicles including changes in Operation or Infrastructure	All	01 April 2008

## Supply

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# Assessment of Compatibility of Rolling Stock and Infrastructure

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## **Part 1 Purpose and Introduction**

### **1.1 Purpose**

- 1.1.1 Before any new or changed infrastructure or rolling stock is brought into use, it is essential that the change is assessed to ensure that compatibility between assets is maintained.
- 1.1.2 This document therefore mandates requirements and responsibilities for the assessment of compatibility between infrastructure and rolling stock, the arrangements by which the assessment of compatibility is undertaken and identifies those responsible for managing that assessment.
- 1.1.3 This document is also applicable when assessing compatibility between rolling stock and rolling stock, or infrastructure and infrastructure, where the assets concerned are the responsibility of different railway undertakings or infrastructure managers.

### **1.2 Introduction**

#### **1.2.1 Background**

- 1.2.1.1 European Directives concerning safety and interoperability have been implemented in the UK by the introduction of the Railways and Other Guided Transport Systems (Safety) Regulations 2006 and the Railways (Interoperability) Regulations 2006. Each railway undertaking and infrastructure manager is responsible for the safety of their own part of the railway system. Neither party gives permission to or has authority over the other. If authorisation for placing into service is required, this is given by the national safety authority. In Great Britain, the national safety authority is the Office of Rail Regulation (ORR).
- 1.2.1.2 The Railways and Other Guided Transportation System (Safety) Regulations 2006 mandate a 'duty of cooperation' between the parties responsible for the management of the railway system.
- 1.2.1.3 This has altered the manner in which rolling stock and infrastructure are brought into service. The previous method of the infrastructure controller permissioning rolling stock to operate over its infrastructure with a Certificate of Authority to Operate (in accordance with issue one of this document) has been replaced by a duty to cooperate and, where appropriate, to implement necessary risk control measures.
- 1.2.1.4 In respect of new or changed assets, this means that:
  - a) A railway undertaking is responsible for ensuring that its rolling stock is compatible with the infrastructure it operates over and with other rolling stock that operates on that infrastructure
  - b) An infrastructure manager is responsible for ensuring that its infrastructure is compatible with the rolling stock that operates over it and any other infrastructure with which it interfaces.

#### **1.2.2 Compatibility process covered by this document**

- 1.2.2.1 The compatibility process covered by this document is confined to the assessment of compatibility of infrastructure and rolling stock that is the responsibility of those railway undertakings and infrastructure managers required to comply with Railway Group Standards.

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1.2.2.2 However, the process in this document can be followed to assess compatibility with other railway parties (for example, London Underground).

1.2.2.3 In respect of compatibility with the railway's neighbours, specific legislation may apply to the individual parties (for example, the Noise Technical Specification for Interoperability (TSI) or electromagnetic compatibility (EMC) obligations).

## 1.2.3 Assessment of impact on risk from bringing new or changed assets into service

1.2.3.1 Health and safety legislation requires the impact on risk from bringing new or changed assets into service to be assessed. The compatibility between rolling stock and infrastructure forms only one contribution to the risk from bringing new or changed assets into service.

1.2.3.2 Other contributions to the risk will also need to be assessed. In some cases, these contributions to the risk can be eliminated or mitigated by the actions of the party proposing the change. In other cases elimination or mitigation of these contributions to the risk will require cooperation between infrastructure managers and railway undertakings, as provided for in Regulation 22 of the Railways and Other Guided Transport Systems (Safety) Regulations 2006.

## 1.2.4 Key stages of introducing a change

1.2.4.1 Noting the need to address risk in totality set out in section 1.2.3, there are three key stages to bringing rolling stock or infrastructure into use:

- a) Stage A – the rolling stock or infrastructure is demonstrated to conform to mandatory standards.
- b) Stage B – the rolling stock or infrastructure is demonstrated to be compatible with the rolling stock and / or infrastructure with which it is to be integrated.
- c) Stage C – commercial arrangements are put in place in respect of track access, vehicle change and / or network change, as appropriate.

1.2.4.2 Stage A and Stage B are safety processes covered by the Railways (Interoperability) Regulations 2006 and the Railways and Other Guided Transport Systems (Safety) Regulations 2006. Stage C is a commercial process described by the Railways Infrastructure (Access and Management) Regulations 2005.

1.2.4.3 This document only covers Stage B of the process.

## 1.2.5 Verifying compatibility

1.2.5.1 Compatibility is only subject to formal verification by Notified Bodies under the Railways (Interoperability) Regulations 2006 or Competent Persons under the Railways and Other Guided Transport Systems (Safety) Regulations 2006 when the relevant safety risk threshold in the regulations is triggered.

1.2.5.2 This document is however to be complied with by railway undertakings and infrastructure managers when making changes to their assets that might affect the compatibility of those assets, irrespective of whether external verification is required.

1.2.5.3 The use of the process set out in this document, and its outputs, will normally be used as the evidence to satisfy the verification body that compatibility has been established.

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## **Part 2 Process for Assessment of Compatibility**

### **2.1 Responsibilities of parties proposing any change**

- 2.1.1 The railway undertaking or infrastructure manager proposing a change (the proposer) shall determine whether an assessment of compatibility is required. An assessment of compatibility is required if:
- a) The proposed change is a material change (that is, a change that has the potential to affect physical or operational interfaces)
  - and
  - b) The physical or operational interfaces affect assets that are the responsibility of another railway undertaking or infrastructure manager (an affected party).
- 2.1.2 If an assessment of compatibility is required, the proposer shall identify all affected parties, and inform them of the proposed change. Section A.2 in Appendix A gives additional guidance on informing industry parties of other proposed changes.
- 2.1.3 The proposer shall decide on the method of engaging with affected parties for the purpose of exchanging information and reviewing the compatibility of the proposed change with the assets of the affected parties, taking into account the complexity and significance of the proposed change.
- 2.1.4 Where the proposer considers that the proposed change is simple or unlikely to have a significant impact on affected parties, it may be sufficient to engage with affected parties through an exchange of correspondence. However, where the proposer considers that the proposed change is complex or could have a significant impact on affected parties, a compatibility review forum shall be convened in accordance with section 2.2.
- 2.1.5 When informing affected parties of the proposed change, the proposer shall also advise them of the chosen method of engaging with them for the purpose of exchanging information and reviewing the compatibility of the proposed change.
- 2.1.6 Where the proposer does not intend to convene a compatibility review forum, but an affected party believes that a compatibility review forum is the most appropriate means of engagement, the affected party shall request that a compatibility review forum is convened, stating the reasons for the request.

### **2.2 Operation of a compatibility review forum**

- 2.2.1 The compatibility review forum shall be established with the purpose of facilitating a shared understanding of the proposed change; and to consider the issues raised by the affected parties and the effects of the change on those parties.
- 2.2.2 The scope of examination of the proposed change shall be limited to the compatibility of the railway system.
- 2.2.3 Members of a compatibility review forum shall include representatives of the proposer and the affected parties, together with their technical advisers.
- 2.2.4 Compatibility review forum attendees shall be members for the project under discussion and are not automatically invited to compatibility review forums established to consider other projects.

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- 2.2.5 The compatibility review forum shall be chaired by an individual nominated by the proposer who is independent of the outcome.
- 2.2.6 The chair shall seek to facilitate a meeting that allows all parties to explain their respective views. The chair shall assist all participants in understanding the issues at hand and, where possible, facilitate the development of a consensus.
- 2.2.7 Formal minutes shall be produced for each convened session of the compatibility review forum.

## 2.3 Assessment of compatibility

- 2.3.1 Technical requirements for undertaking an assessment of compatibility are set out in Part 3.

## 2.4 Compatibility File

- 2.4.1 The proposer shall assemble a Compatibility File.
- 2.4.2 The Compatibility File shall contain data that describes the new asset or the change to an asset, the methods used to assess compatibility, the decision criteria used to declare compatibility and how they have been derived.
- 2.4.3 The Compatibility File shall contain or reference all the evidence that demonstrates the compatibility of new or changed rolling stock with the infrastructure it operates over and with other rolling stock that operates on that infrastructure; or the compatibility of new or changed infrastructure with the rolling stock that operates over it and any other infrastructure with which it interfaces.
- 2.4.4 When a compatibility review forum has been established, the Compatibility File shall also contain or reference a copy of the minutes of the compatibility review forum.
- 2.4.5 The Compatibility File shall record any operational restrictions on which compatibility depends (for example, a speed restriction over particular sections of route) and the limiting conditions which cause the restriction to be necessary. In the case of interfaces that depend on the proximity of vehicles involved (see clause 3.4.2), the Compatibility File shall record the demands of the rolling stock as a proportion of the capacity of the infrastructure over particular sections of route.
- 2.4.6 The Compatibility File shall be passed to the owner of the asset. In the case where a technical file exists, the Compatibility File forms part of the technical file.

## 2.5 Review of assessment of compatibility

- 2.5.1 The proposer shall produce a draft Statement of Compatibility (see section 2.6). The proposer shall review the draft Statement of Compatibility for accuracy and completeness, and then forward it to all the affected parties for review.
- 2.5.2 The affected parties shall review the draft Statement of Compatibility and provide the proposer with their comments in a timely manner. Where necessary for the purpose of this review, it is permissible for affected parties to request access to those parts of the Compatibility File relevant to the assets for which they are responsible.
- 2.5.3 The proposer shall make the relevant parts of the Compatibility File available to affected parties when requested as set out in clause 2.5.2.

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- 2.5.4 Where a compatibility review forum has been convened, the compatibility review forum shall review the draft Statement of Compatibility, together with those parts of the Compatibility File it considers necessary.
- 2.5.5 The proposer shall take account of comments received from affected parties before authorising and issuing the Statement of Compatibility. They shall advise those making the comments of how their comments have been taken into account.
- 2.5.6 The review process shall be conducted with the objective of achieving a consensus that the proposed change is compatible with the assets of the affected parties, given the identified limitations, restrictions or requirements on which the compatibility depends.
- 2.5.7 It will not always be possible to reach a consensus. If it is apparent that there is no consensus, or if an affected party considers that its comments have not been fully taken into account, the following steps shall be taken to resolve outstanding issues:
- a) If engagement with affected parties has only been through an exchange of correspondence, a compatibility review forum shall be convened with the objective of achieving a consensus (see section 2.2).
  - b) If engagement with affected parties has been through a compatibility review forum and it is apparent that there is still no consensus, the proposer shall not implement the proposed change for 14 days. During this period, both parties shall determine whether or not to escalate the issue using the railway industry's accepted processes.
  - c) If either party chooses to escalate the issue, the change shall not be implemented until the issue is resolved.
  - d) During the period in which the issue has been escalated using the railway industry's accepted processes, all parties have the opportunity to determine whether or not to escalate the proposal to the Office of Rail Regulation (ORR), citing the duty of cooperation set out in the Railways and Other Guided Transport Systems (Safety) Regulations 2006.

## **2.6 Statement of Compatibility**

- 2.6.1 The proposer shall produce a written notification of compatibility between assets, known as the Statement of Compatibility. A copy of the Statement of Compatibility shall be held in the Compatibility File.
- 2.6.2 The Statement of Compatibility shall state specifically:
- a) The route, or sections of route, and elements of infrastructure or classes of rolling stock involved
  - b) The configuration and type of rolling stock or infrastructure for which compatibility has been assessed
  - c) Any limitations, restrictions or requirements on which the compatibility depends
  - d) The name and position of the proposer's representative who is endorsing the Statement of Compatibility
  - e) The date of issue.

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- 2.6.3 It is permissible to issue a Statement of Compatibility in respect of:
- a) A single vehicle, a group of vehicles of the same class, a fleet of vehicles of the same class or a generic type of installation (for example, trainborne GSM-R equipment)
- or
- b) A single installation of infrastructure or a generic type of installation (for example, type XYZ axle counters).
- 2.6.4 The proposer shall allocate a sequential number to each Statement of Compatibility it produces. The number shall be prefixed by a unique code indicating the name of the proposer.
- 2.6.5 The proposer shall send a copy of the Statement of Compatibility to all affected parties.
- 2.6.6 The proposer shall send a copy of the Statement of Compatibility to Network Rail, as publisher of the Sectional Appendix and local operating instructions (see GO/RT3215).

## 2.7 Outputs from the compatibility process

- 2.7.1 Following the issue of a Statement of Compatibility, all documentation needed to define any limitations, restrictions or requirements on which the compatibility depends shall be updated. Such documentation could include, but is not limited to, the safety management systems of the infrastructure managers and railway undertakings concerned, the Sectional Appendix, signallers' instructions, drivers' instructions, and maintenance plans.
- 2.7.2 Relevant data from the Compatibility File that describe asset characteristics relevant to compatibility shall be included in, or used to update, the data for assessment of compatibility required by section 2.10.1.

## 2.8 Testing

- 2.8.1 Testing is not within the scope of this document. Where testing is required, railway undertakings and infrastructure managers shall define a set of agreed conditions for controlling the risk during testing, including the risk from any potential incompatibility between assets, in accordance with their respective safety management systems.

## 2.9 Rolling stock having a keeper other than a railway undertaking

- 2.9.1 Guidance on undertaking the assessment of compatibility of rolling stock with a keeper other than a railway undertaking (for example Private Owner wagons, General Contract of Use (GCU) wagons, and heritage rolling stock) is given in section A.6 of Appendix A.

## 2.10 Ongoing responsibilities

### 2.10.1 Provision of data for assessment of compatibility

- 2.10.1.1 Railway undertakings and infrastructure managers shall maintain, update and make freely available to relevant parties the available data that describes asset characteristics relevant to compatibility. Guidance on the nature of the data used to describe asset characteristics is given in section A.7 of Appendix A.
- 2.10.1.2 Railway undertakings and infrastructure managers shall provide, in a timely manner, further interface data when requested, where such data can be reasonably and practicably obtained.

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## **2.10.2 Maintaining compatibility**

- 2.10.2.1 Unless a change is formally implemented, the infrastructure manager shall maintain infrastructure within the characteristics on which compatibility depends and the railway undertaking shall maintain rolling stock within the characteristics on which compatibility depends.
- 2.10.2.2 Where the infrastructure manager or railway undertaking proposes to change the characteristics of assets on which compatibility depends, prior to implementing the change they shall demonstrate that rolling stock remains compatible with the infrastructure it operates over and with other rolling stock that operates on that infrastructure; or that infrastructure remains compatible with the rolling stock that operates over it and any other infrastructure with which it interfaces, using the processes in this document.
- 2.10.2.3 The requirements of this section do not preclude the introduction of temporary performance restrictions affecting the infrastructure or rolling stock (for example, a temporary speed restriction).

## **2.11 Guidance on Part 2, Process for assessment of compatibility**

- 2.11.1 Guidance on the application of the requirements set out in this part of the document (Part 2) is given in Appendix A.
- 2.11.2 The key stages in the process for assessment of compatibility set out in this part of the document (Part 2) are illustrated by the flow chart given in section A.1 of Appendix A.

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## Part 3 Technical Requirements for Undertaking an Assessment of Compatibility

### 3.1 Changes requiring an assessment of compatibility

- 3.1.1 Where a change requires an assessment of compatibility (see section 2.1), the proposer shall:
- a) Identify all the physical and operational interfaces affected by the change
  - b) Establish the criteria by which compatibility can be determined
  - c) Request interface data, where not already available, from the relevant party to enable assessment of compatibility to be undertaken
  - d) Evaluate the interface data and undertake an assessment of compatibility, taking into account degraded and foreseeable fault conditions.

### 3.2 Assessing compatibility

- 3.2.1 Where both sides of an interface have been shown to conform to corresponding requirements in an integrated suite of standards, this fact is sufficient to demonstrate compatibility at that interface. For example, if track conforms to the High Speed Infrastructure TSI and wheelsets to the High Speed Rolling Stock TSI, the wheel / rail interface is compatible.
- 3.2.2 For the purposes of this document, the following are separate integrated suites of standards:
- a) High Speed TSIs
  - b) Conventional Rail TSIs
  - c) Railway Group Standards.
- 3.2.3 Where either side of an interface has not been shown to conform to an integrated suite of standards (or if it is not known whether one or other side of an interface has been shown to conform to an integrated suite of standards), and where Railway Group Standards exist that define criteria by which compatibility can be determined, the criteria set out in such standards shall be used as part of the assessment of compatibility process.
- 3.2.4 Where either side of an interface has not been shown to conform to an integrated suite of standards (or if it is not known whether one or other side of an interface has been shown to conform to an integrated suite of standards), and Railway Group Standards do not exist that define criteria by which compatibility can be determined, compatibility shall be determined by the party placing the asset into service using an appropriate risk assessment.
- 3.2.5 Appendix C sets out specific requirements for assessing gauging compatibility.
- 3.2.6 Appendix D sets out specific requirements for assessing electromagnetic compatibility.

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## **3.3 Assessing compatibility between rolling stock and rolling stock, or infrastructure and infrastructure**

- 3.3.1 In most cases where a change requires an assessment of compatibility, the required assessment will be between rolling stock and infrastructure. It is also necessary to assess the compatibility between the rolling stock proposed to be introduced onto a route and the existing rolling stock using that route (for example, in respect of coupling arrangements in the event of an emergency). Where the rolling stock concerned is the responsibility of different railway undertakings, the process set out in this document shall be used to assess the compatibility of the rolling stock.
- 3.3.2 Similarly, it is necessary to assess the compatibility of proposed changes to the infrastructure managed and operated by one infrastructure manager with the infrastructure managed and operated by another infrastructure manager (for example, alterations to the geometry of track adjacent to the platform of a station managed and operated by another infrastructure manager). In this case, the process set out in this document shall be used to assess the compatibility of the infrastructure.

## **3.4 Guidance on Part 3, Technical requirements for undertaking an assessment of compatibility**

- 3.4.1 The requirements of section 3.2 are illustrated by the flow chart given in section B.1 of Appendix B.
- 3.4.2 Section B.2 of Appendix B provides guidance in the case of interfaces that depend on the proximity of vehicles involved, and interfaces that depend on the cumulative number of vehicles intended to be operated.
- 3.4.3 Sections B.3 to B.8 of Appendix B draw attention to a number of particular instances where there are specific requirements in Railway Group Standards relating to the assessment of compatibility at important interfaces.

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## Part 4 Application of this document

### 4.1 Application - infrastructure managers

#### 4.1.1 Scope

- 4.1.1.1 The requirements of this document apply to all infrastructure managers.
- 4.1.1.2 Specifically, the requirements of sections 2.1 to 2.7 apply when a material change to infrastructure is proposed.

#### 4.1.2 Exclusions from scope

- 4.1.2.1 There are no exclusions from the scope specified in section 4.1.1 for infrastructure managers.

#### 4.1.3 General compliance date for infrastructure managers

- 4.1.3.1 This Railway Group Standard comes into force from 01 October 2007 and is to be complied with from 01 January 2008, except as specified in section 4.1.4.
- 4.1.3.2 Although this Railway Group Standard comes into force for infrastructure managers from 01 October 2007, note that in the case of railway undertakings, it is to be complied with from 01 January 2008. Infrastructure managers cannot therefore expect railway undertakings to respond as affected parties before this date.
- 4.1.3.3 Where it is considered not reasonably practicable to comply with the requirements, authorisation not to comply should be sought in accordance with the Railway Group Standards Code.

#### 4.1.4 Exceptions to general compliance date

- 4.1.4.1 Where the infrastructure manager is the proposer, this Railway Group Standard is to be complied with from 01 April 2008.
- 4.1.4.2 It is permissible to continue to comply with the requirements of GE/RT8270 Issue 1 for projects at an advanced stage of development at the time this document comes into force.

### 4.2 Application - railway undertakings

#### 4.2.1 Scope

- 4.2.1.1 The requirements of this document apply to all railway undertakings.
- 4.2.1.2 Specifically, the requirements of sections 2.1 to 2.7 apply when a material change to rolling stock is proposed.

#### 4.2.2 Exclusions from scope

- 4.2.2.1 There are no exclusions from the scope specified in section 4.2.1 for railway undertakings.

#### 4.2.3 General compliance date for railway undertakings

- 4.2.3.1 This Railway Group Standard comes into force from 01 October 2007 and is to be complied with from 01 January 2008, except as specified in section 4.2.4.
- 4.2.3.2 Although this Railway Group Standard comes into force for railway undertakings from 01 October 2007, note that in the case of infrastructure managers, it is to be complied with from 01 January 2008. Railway undertaking cannot therefore expect infrastructure managers to respond as affected parties before this date.

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4.2.3.3 Where it is considered not reasonably practicable to comply with the requirements, authorisation not to comply should be sought in accordance with the Railway Group Standards Code.

## **4.2.4 Exceptions to general compliance date**

4.2.4.1 Where the railway undertaking is the proposer, this Railway Group Standard is to be complied with from 01 April 2008.

4.2.4.2 It is permissible to continue to comply with the requirements of GE/RT8270 Issue 1 for projects at an advanced stage of development at the time this document comes into force.

## **4.3 Health and safety responsibilities**

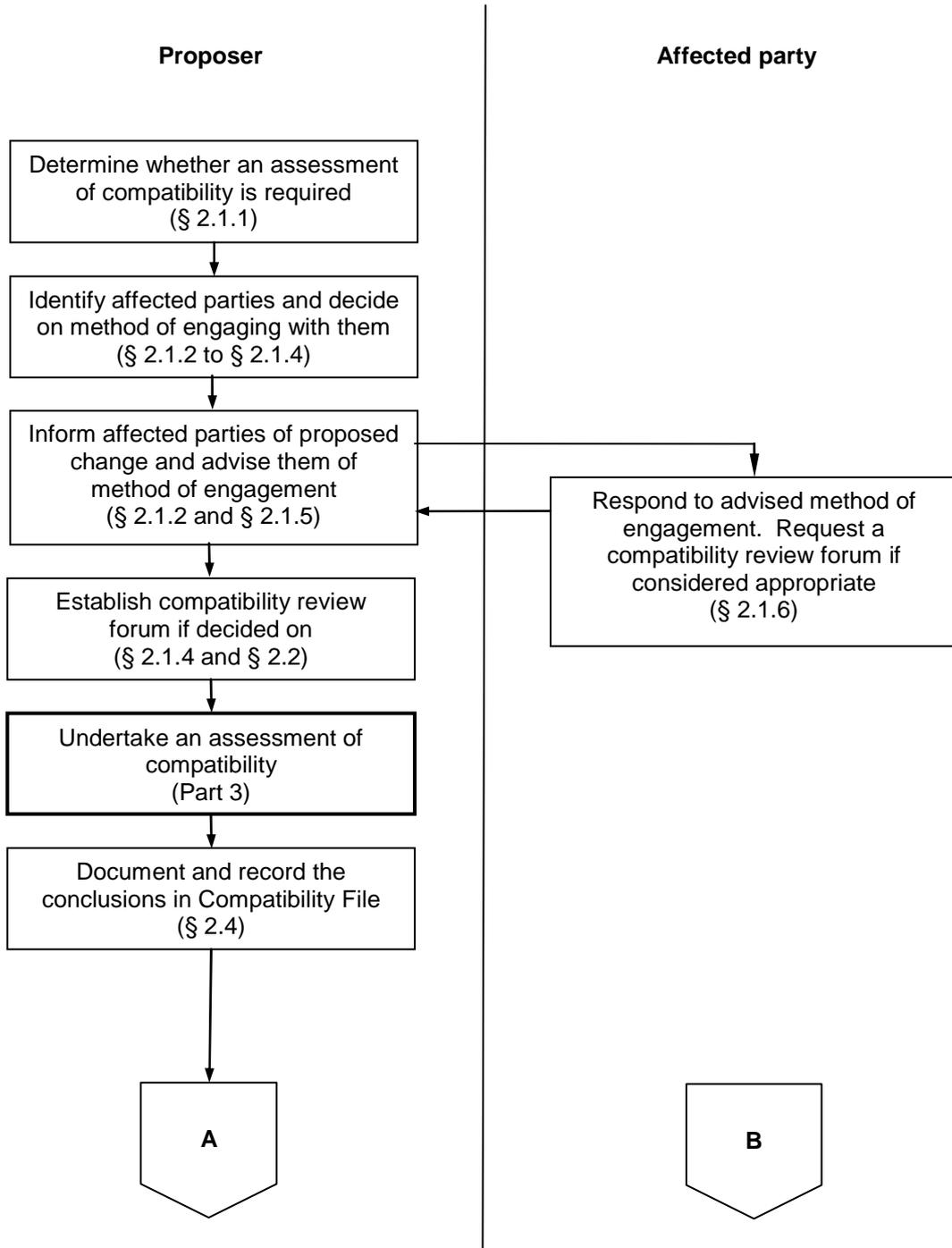
4.3.1 Users of documents published by RSSB are reminded of the need to consider their own responsibilities to ensure health and safety at work and their own duties under health and safety legislation. RSSB does not warrant that compliance with all or any documents published by RSSB is sufficient in itself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

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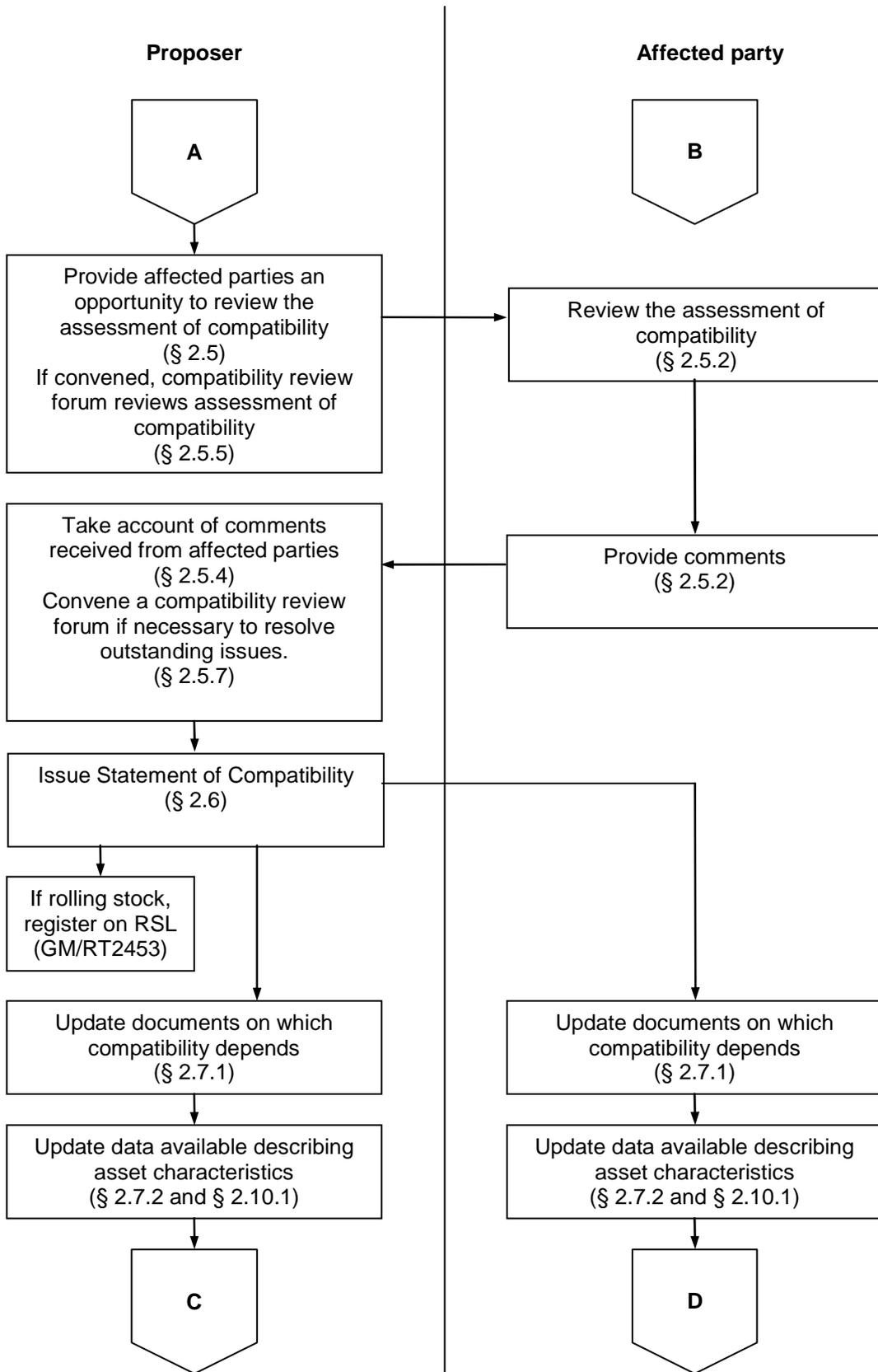
## Appendix A Guidance on Part 2, Process for Assessment of Compatibility

This Appendix is non-mandatory.

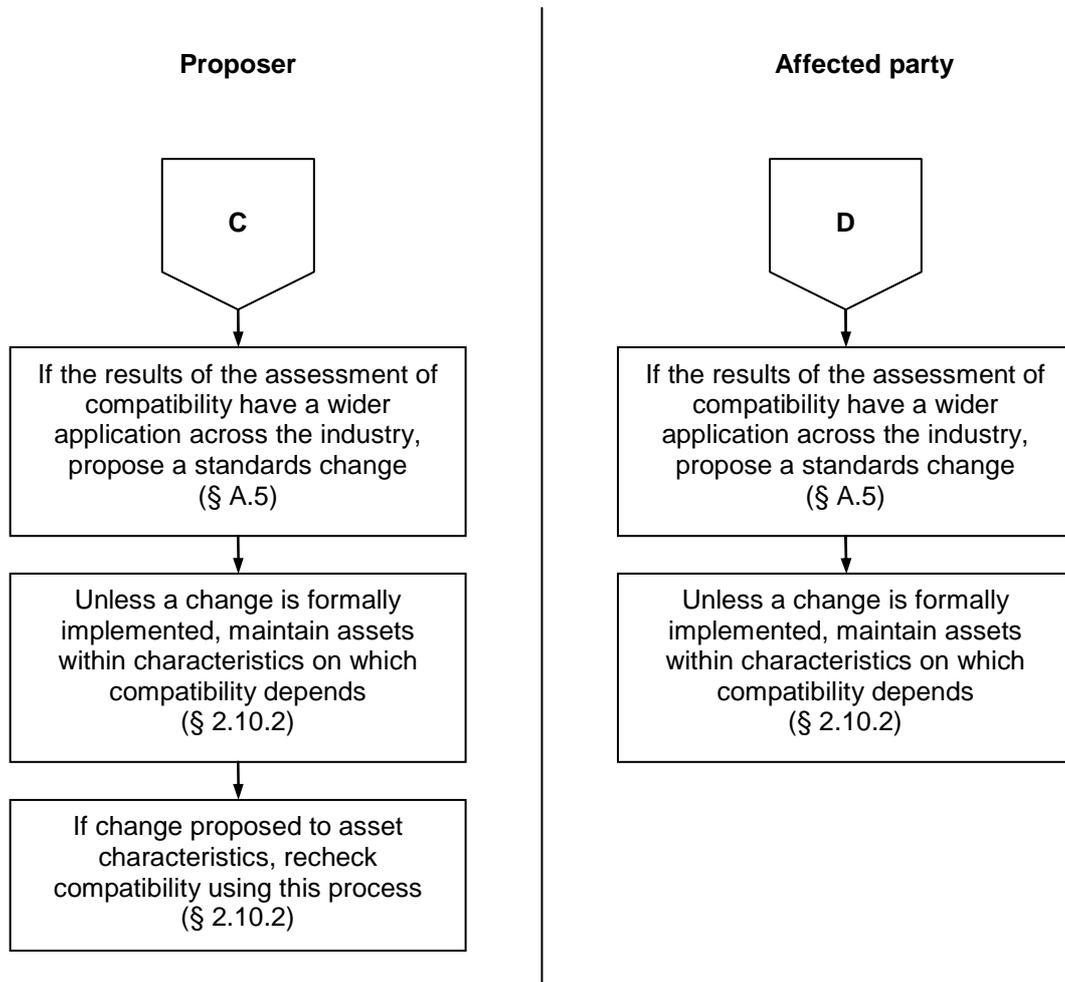
### A.1 Compatibility process flow chart (see section 2.11)



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## A.2 Responsibilities of parties proposing change (see section 2.1)

- A.2.1 Section 2.1 requires the proposer to identify all affected parties, and inform them of the proposed change if an assessment of compatibility is required. An assessment of compatibility is required when the proposed change is a material change (that is, a change that has the potential to affect a physical or operational interface). Where an assessment of compatibility is not required, because the change is not a material change, the proposer should consider informing other industry parties where the change is of significance.
- A.2.2 This gives those parties the opportunity to identify compatibility issues that were not identified by the proposer, for example because one or other party has made assumptions which may be invalidated by the change.

## A.3 Operation of a compatibility review forum (see section 2.2)

- A.3.1 Section 2.2 sets out the requirements for the operation of a compatibility review forum.
- A.3.2 Where appropriate, the participants of the compatibility review forum may also suggest potential improvements to the proposed change, with a view to seeking a consensus in support of the proposal.

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## **A.4 Review of assessment of compatibility (see section 2.5)**

- A.4.1 Clause 2.5.2 requires the affected parties to review the draft Statement of Compatibility and provide the proposer with their comments. It should be noted that this requirement does not alter the proposer's responsibility for decisions made regarding the compatibility of the proposed change with the railway system.

## **A.5 Outputs from the compatibility process (see section 2.7)**

- A.5.1 Section 2.7 requires that, following the issue of a Statement of Compatibility, all documentation needed to define any limitations, restrictions or requirements on which the compatibility depends shall be updated. GO/RT3215 requires that where such limitations, restrictions or requirements necessitate a change to local operating instructions, the proposer is to validate the text to be incorporated in the local operating instructions.
- A.5.2 Where the results of the assessment of compatibility have a wider application across the industry, a proposal for standards change can be made in accordance with the Railway Group Standards Code. This will enable the knowledge to be captured for the benefit of the industry.

## **A.6 Rolling Stock having a keeper other than a railway undertaking (see section 2.9)**

- A.6.1 Where the keeper of rolling stock is unable to assemble a Compatibility File, the keeper should seek the assistance of an infrastructure manager, a railway undertaking or a suitably qualified agent to assemble the file on his behalf.
- A.6.2 The keeper of the rolling stock should then make arrangements with a railway undertaking required to comply with Railway Group Standards to:
- a) Issue a Statement of Compatibility in accordance with the processes documented in the railway undertaking's safety management system
  - b) Register the rolling stock on the Rolling Stock Library in accordance with GM/RT2453.
- A.6.3 The railway undertaking need not necessarily be the railway undertaking operating the trains within which the rolling stock is intended to be formed.

## **A.7 Data used to describe asset characteristics (see section 2.10.1)**

- A.7.1 Section 2.10.1 requires railway undertakings and infrastructure managers to 'maintain, update and make freely available to relevant parties the available data that describe asset characteristics relevant to compatibility'. This section of Appendix A gives guidance on the nature of the data used to describe asset characteristics.
- A.7.2 The data should relate to the nature of the assets within the control of the railway undertaking or infrastructure manager concerned, and not to its relationship with assets that are controlled by others.
- A.7.3 Ideally therefore, the data provided should describe the rolling stock or element of infrastructure concerned, and should not contain implicit or explicit judgements about compatibility, as these are for the party making the change to assess. Rather, the data provided should include descriptive statements about conditions or limitations.

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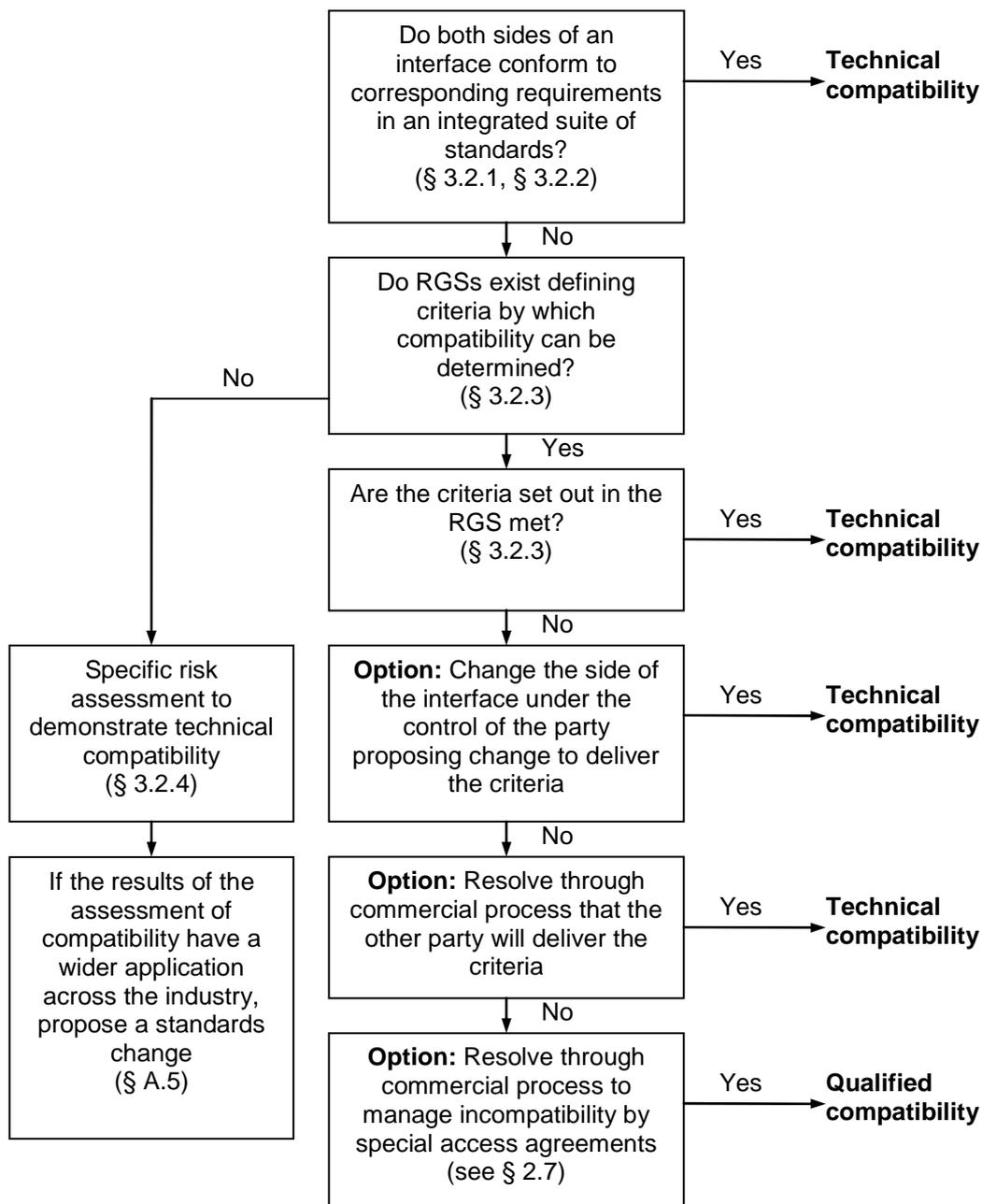
- A.7.4 As an example, it would not be appropriate for a railway undertaking to include in the data used to describe asset characteristics a statement to the effect that 'Type XYZ track circuits are not to be used on routes operated by Class 123 rolling stock'. Rather, the data should take the form 'shunt resistance over wheel sets of Class 123 rolling stock cannot be guaranteed to be less than x ohms'.
- A.7.5 Similarly it would not be appropriate for an infrastructure manager to include in the data used to describe asset characteristics a statement to the effect that 'Class 123 rolling stock is not permitted on routes fitted with type XYZ track circuits'. Rather, the statement should take the form 'The route is fitted with type XYZ track circuits set in the frequency range A to B'.

# Assessment of Compatibility of Rolling Stock and Infrastructure

## Appendix B Guidance on Part 3, Technical Requirements for Undertaking an Assessment of Compatibility

This Appendix is non-mandatory.

### B.1 Assessment of compatibility flow chart (see section 3.2)



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## **B.2 Types of interface**

### **B.2.1 Categories of interface**

B.2.1.1 For the purposes of assessing compatibility, there are three broad categories of interface to consider:

- a) Interfaces that do not depend on the proximity (spacing) or cumulative number of vehicles intended to be operated (see section B.2.2).
- b) Interfaces that depend on the proximity (spacing) of the vehicles intended to be operated (see section B.2.3).
- c) Interfaces that depend on the cumulative number of vehicles intended to be operated (see section B.2.4).

B.2.1.2 These categories of interface need to be considered for both changes to infrastructure and changes to rolling stock.

### **B.2.2 Interfaces that do not depend on the proximity or cumulative number of vehicles intended to be operated**

B.2.2.1 An example of an interface that does not depend on the proximity or cumulative number of vehicles intended to be operated is the clearance between infrastructure and rolling stock (gauge). If a single vehicle of a given type is shown to be clear of a particular infrastructure element, then all vehicles of that type are clear, irrespective of the number of vehicles passing the infrastructure element concerned. For this type of interface, it is sufficient to demonstrate the compatibility of a single vehicle of the given type.

B.2.2.2 In some cases, compatibility may only be achievable by adopting an operational restriction, typically the introduction of a speed restriction. Such operational restrictions fall into the scope of Stage C of introducing a change (see section 1.2.4).

### **B.2.3 Interfaces that depend on the proximity of the vehicles intended to be operated**

B.2.3.1 An example of an interface that depends on the proximity of the vehicles intended to be operated is the electrical load drawn by an electric locomotive, and the available capacity of a section of an electrified line. In this case, the number of vehicles that can be in a section together may be limited by the electrical load capacity of that section. For this type of interface, assessment of compatibility will need to include a consideration of the operational limitations imposed by the demands of the rolling stock and the capacity of the infrastructure.

B.2.3.2 The assessment of compatibility should therefore determine the demands of the rolling stock as a proportion of the capacity of the infrastructure. This is to permit, if necessary, appropriate operational rules to be developed to suit the particular service pattern proposed in Stage C of introducing a change (see section 1.2.4). Information about the total capacity of an infrastructure section, and the capacity already committed to other rolling stock, is to be provided by the infrastructure manager.

B.2.3.3 The boundaries of the sections of infrastructure to be considered when assessing compatibility will vary depending on the nature of the particular interface considered.

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## **B.2.4 Interfaces that depend on the cumulative number of vehicles intended to be operated.**

B.2.4.1 An example of an interface that depends on the number of vehicles involved is the cumulative gross tonnage of rolling stock using a section of track, and the rate at which track components and track geometry deteriorate. In this case the number of vehicles concerned is not a matter for assessment of compatibility, but is significant for the sustainability of any proposed service. As a result, consideration of these interfaces is not a matter for assessment of compatibility and falls into the scope of Stage C of introducing a change (see section 1.2.4).

## **B.3 Specific requirements in Railway Group Standards relating to the assessment of compatibility**

B.3.1 Sections B.4 to B.8 draw attention to a number of particular instances where there are specific requirements in Railway Group Standards relating to the assessment of compatibility at important interfaces.

B.3.2 The Railway Group Standards Catalogue gives details of all Railway Group Standards and associated Codes of Practice and Guidance Notes. Many of these set out requirements for the design or operation of assets, and are not specifically intended for assessment of compatibility. However, they can be used as a basis for identifying technical interfaces affected by a change, and for evaluating interface data and undertaking an assessment of compatibility.

## **B.4 Interfaces defining physical characteristics**

### **B.4.1 Gauging compatibility**

B.4.1.1 GC/RT5212 sets out requirements for defining and maintaining clearances. In particular, it defines a method of categorising clearances that depends on the method used to demonstrate gauging compatibility for a particular vehicle, as required by Appendix C of this document.

B.4.1.2 GM/RT2149 sets out requirements for defining and maintaining the size of railway vehicles. In particular, it:

- a) Prescribes the parameters that are required to define the envelope containing all dynamic movements and static deflections of a rail vehicle or combination of vehicles, relative to the track, over the permitted range of operating conditions.
- b) Identifies the permissible methods by which the magnitude of those parameters may be determined.
- c) Defines the format of the data for gauging purposes.

B.4.1.3 GE/RT8019 sets out particular requirements for the means by which Tilting Trains are permitted to utilise the tilt mechanism over routes, parts of which contain sections where tilting is prohibited due to clearance limitations.

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## **B.4.2 Compatibility of rail vehicle weights and the capacity of underline bridges**

- B.4.2.1 The compatibility of rail vehicle weights and the capacity of underline bridges is assessed by means of a Route Availability (RA) Number. The RA Number is derived in accordance with the provisions of GE/RT8006 to express either of the following:
- a) The assessed capacity of an underline bridge or route in terms of its capacity to carry the vertical static and dynamic loads due to different types of rail vehicle.
  - b) The static load characteristics of a rail vehicle type.

## **B.5 Interfaces defining dynamic interactions**

- B.5.1 GM/TT0088 sets out design and maintenance requirements for traction and rolling stock and for on-track plant, to ensure that interactive forces and stresses generated between vehicles and track are limited to acceptable levels. Vehicle performance limits relating to wheel loads, wheel diameters, unsprung masses and suspension characteristics are specified.
- B.5.2 GM/TT0088 permits combinations of static wheel loading, wheel diameter and wheel tread profile that are different from those specifically defined in the document, providing that the wheel-to-rail contact stresses and deformation rates can be maintained within safe limits. In such a case, an appropriate technical justification is required. The technical justification should form part of the assessment of compatibility.
- B.5.3 GM/TT0088 permits vehicles which exert forces that exceed the maximum values prescribed in the document provided this exceedance is supported by appropriate technical justification. The technical justification should form part of the assessment of compatibility.

## **B.6 Interfaces defining electrical characteristics**

- B.6.1 GE/RT8023 sets out requirements for assessing the compatibility between electric trains and electrification systems. In particular, it deals with:
- a) Introduction onto an electrified route of new or modified electric trains which are equipped with, or have been modified to incorporate, equipment not previously used on that route.
  - b) Modification of the working timetable or the speed, consist or formation of electric trains.
  - c) Modification of an existing electrification system, or the provision of a new electrification system.
- B.6.2 GE/GN8623 gives guidance for the change process associated with projects that affect operation between electric trains and an electrification system. It specifically addresses the introduction of new or modified electric trains or changes to train operations that affect power requirements on a route-by-route basis and to ascertain the compatibility between electric trains and electrification systems, for both railway undertakings and infrastructure managers.
- B.6.3 Additional guidance is also available in Network Rail Code of Practice NR/GN/ELP/27010. This document was originally produced to support GM/RT1000, the predecessor document to GE/RT8023.

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## **B.7 Interfaces defining electromagnetic characteristics**

- B.7.1 GE/RT8015 'defines the process for determining allowable train emission levels and allowable infrastructure susceptibility to ensure safe operation, in order to demonstrate electromagnetic compatibility ... This process ... ensures a safety margin between train emissions and infrastructure susceptibility ...'.
- B.7.2 Additional requirements for demonstration of electromagnetic compatibility are set out in Appendix D.

## **B.8 Interfaces with the control command and signalling subsystem**

- B.8.1 GK/GN0801, whilst not specifically intended to deal with the assessment of compatibility, gives guidance on using Railway Group Standards to support signal engineering safety cases and describes the hierarchy between standards and interworking requirements.
- B.8.2 Particular requirements relating to tilting trains are set out in GE/RT8012 and GE/RT8019. In particular the documents define requirements for tilt enable and supervision systems, and speed supervision and control systems. These systems have both infrastructure and rolling stock elements requiring an assessment of compatibility.

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## Appendix C Assessment of Gauging Compatibility

The content of this appendix is mandatory.

This appendix sets out the gauging procedures to be followed when assessing gauging compatibility.

### C.1 Absolute gauging

C.1.1 Absolute gauging shall be undertaken unless one of the alternative methods set out in sections C.2 to C.4 has been adopted.

### C.2 Gauging to standard vehicle gauges

C.2.1 Where a route has been published by the infrastructure manager as accepting a particular standard vehicle gauge, vehicles conforming to that standard vehicle gauge are, by definition, compatible with the gauge of the infrastructure on the route.

### C.3 Comparative gauging: comparison with vehicles already cleared for the route

C.3.1 Where comparative gauging using swept envelopes is to be used, the swept envelopes shall have been produced using compatible methodologies as set out in the requirements of GM/RT2149 (issue 2 or later).

C.3.2 Vehicles chosen for comparison shall be those that comprise significant and regular traffic on the route(s) being considered.

C.3.3 If all swept envelopes of the vehicle being gauged are within the swept envelopes of a comparator vehicle, or vehicles, at present using the section of track, then gauging compatibility is deemed to be achieved.

C.3.4 Any reduced or special reduced clearances agreed for the comparator vehicle shall be transferred to the vehicle being gauged, subject to confirmation that the risk assessment for special reduced clearances required by GC/RT5212 (issue 1) remains valid.

### C.4 Hybrid gauging

C.4.1 Where parts of swept envelopes of the vehicle being gauged are outside the swept envelopes of a comparator vehicle using the section of track, then either:

a) Those parts of the swept envelope exceeding the swept envelope of the comparator vehicle shall be demonstrated to be within the swept envelope of another class of vehicle as a valid comparator vehicle for the route

or

b) Absolute gauging shall be carried out on those parts of the vehicle for the specific features of each section of track causing the swept envelopes of the vehicle to exceed those of the comparator vehicle.

C.4.2 Any reduced or special reduced clearances established for the comparator vehicle shall be transferred to the vehicle being gauged, subject to confirmation that the risk assessment for special reduced clearances required by GC/RT5212 (issue 1) remains valid.

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## **C.5 Size of vehicles within the lower sector**

- C.5.1 For proposed introductions of vehicle types new to a route an assessment shall be carried out to determine whether there are any restrictions due to:
- a) The size of the vehicle at positions within the lower sector not complying with requirements for new vehicles (as set out in GM/RT2149 issue 2 or later).
  - b) Infrastructure on intended routes that does not yet conform to the lower sector structure gauge as set out in GC/RT5212 (issue 1).
  - c) Specific locations not conforming to the gauge but with derogations in place.

## **C.6 Records of vehicles gauged for each section of track**

- C.6.1 For each section of track the infrastructure manager shall record details of vehicles compatible to operate on that section and the speeds at which they are compatible to run.
- C.6.2 The compatible vehicles shall be classified as follows:
- a) Those which have been gauged in accordance with the requirements of this document and GM/RT2149 (issue 2 or later).
  - b) Those which have not been gauged in accordance with the requirements of this document and GM/RT2149 (issue 2 or later) - for example, vehicles for which limited gauging has been undertaken or which have been previously gauged using a system other than that set out in this document and GM/RT2149 (issue 2 or later).
- C.6.3 Specific restrictions at individual locations shall be recorded (for example, a speed restriction passing a particular structure).
- C.6.4 The infrastructure manager shall keep a record of the vehicle gauging portfolio (as set out in GM/RT2149) for each vehicle reflecting its status at the time the Statement of Compatibility was issued. These records shall be kept for a minimum period of three years after cessation of the vehicle's operation on a particular route.

# Assessment of Compatibility of Rolling Stock and Infrastructure

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## Appendix D Assessment of Electromagnetic Compatibility

The content of this appendix is mandatory.

This appendix sets out the assessment of electromagnetic compatibility required of a railway undertaking or infrastructure manager in the event of a change. It carries forward the requirements of Appendix C of GE/RT8270 Issue 1, which were in turn based on those parts of Appendix A of GE/RT8015 Issue 1 that were superseded by GE/RT8270 Issue 1. A new Railway Group Standard is in preparation that will supersede this Appendix in due course.

### D.1 Vehicles

- D.1.1 Where a new vehicle, a modified vehicle, or a vehicle new to the route, is to be introduced, or where a change to operations is proposed, the railway undertaking shall demonstrate its compatibility with the infrastructure systems as set out in sections D.1.2 to D.1.4 below. The railway undertaking shall also consider the compatibility with other vehicles using the route concerned.
- D.1.2 The railway undertaking shall demonstrate compatibility of modified vehicles, or vehicles new to the route, with the infrastructure systems, using the information provided by the infrastructure manager, and the methodology for demonstrating that compatibility as set out in GE/RT8015.
- D.1.3 The railway undertaking shall demonstrate that the safety performance of trainborne systems will not be compromised by electromagnetic interference from the infrastructure at the levels declared by the infrastructure manager.
- D.1.4 The railway undertaking shall, using the infrastructure susceptibility information provided by the infrastructure manager as set out in GE/RT8015, demonstrate that the safety performance of the system will not be reduced under normal ('as designed') and degraded conditions of the infrastructure throughout the period that the train formation will operate on the route. This shall take into account normal, degraded and foreseeable fault conditions of the vehicle and shall consider abnormal situations such as assisting a failed train.

### D.2 Infrastructure

- D.2.1 With the introduction of new or modified infrastructure, the infrastructure manager shall demonstrate compatibility of new or modified infrastructure systems with the vehicles using the route as set out in sections D.2.2 to D.2.4 below.
- D.2.2 The infrastructure manager shall demonstrate compatibility of the new or modified infrastructure with the vehicle systems, using the information provided by the railway undertaking, and the methodology for demonstrating that compatibility as set out in GE/RT8015.
- D.2.3 The infrastructure manager shall demonstrate that the safety performance of infrastructure systems will not be compromised by electromagnetic interference from the vehicle at the levels declared by the railway undertaking.
- D.2.4 The infrastructure manager shall, using the vehicle susceptibility information provided by the railway undertaking, as set out in GE/RT8015, demonstrate that the safety performance of the trainborne system will not be reduced under normal ('as designed') degraded and foreseeable fault conditions of the vehicle throughout the period that the train formation is intended to operate on the route. This shall take into account normal, degraded and foreseeable fault conditions on the infrastructure.

# **Assessment of Compatibility of Rolling Stock and Infrastructure**

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## **Definitions**

### **General definitions**

#### **Affected party**

A railway undertaking or infrastructure manager responsible for assets on the other side of a physical or operational interface affected by a proposed change.

#### **Assets**

For the purposes of this document, the term 'assets' refers to rolling stock or infrastructure falling within the scope of Railway Group Standards.

#### **Compatibility File**

The documents which demonstrate the conditions under which rolling stock and infrastructure compatibility has been assessed. This forms the basis for a Statement of Compatibility being issued.

#### **Compatibility review forum**

A meeting convened by a proposer with affected parties to exchange information and review the compatibility of a proposed change with the assets of the affected parties.

#### **Keeper [of rolling stock]**

As defined in the Uniform Rules concerning Contracts of Use of Vehicles in International Rail Traffic (CUV - Appendix D to the Convention concerning International Carriage by Rail (COTIF) of 9 May 1980 in the version of the Protocol of Modification of 3 June 1999).

#### **Material change**

Any change to an asset or the use of an asset which has the potential to affect physical or operational interfaces.

#### **Proposer**

The railway undertaking or infrastructure manager proposing a change.

#### **Route**

The physical path of a journey to be undertaken by rolling stock, where the path comprises a number of sections of track each of which has individually defined characteristics.

#### **Statement of Compatibility**

Written notification by an infrastructure manager or a railway undertaking of compatibility between the rolling stock and infrastructure. This notification specifies the equipment, the equipment configuration, operational requirements and limitations, route constraints and network factors within which compatibility has been assessed.

#### **Technical file**

As defined by the Railways (Interoperability) Regulations 2006.

#### **Technical Specification for Interoperability (TSI)**

Technical Specifications for Interoperability (TSIs) are mandatory standards forming part of the implementation of the European Interoperability Directives.

#### **Section of track**

Track bounded by identified limits such as junctions, terminals or points at which there is a significant change in traffic flow, or permissible speed.

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## Definitions specific to Appendix C, Assessment of Gauging Compatibility

### Absolute gauging

Absolute gauging of a vehicle is 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.

### Clearance

The minimum calculated distance between vehicles and fixed structures or between 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.

### Hybrid gauging

A combination of comparative and absolute gauging where absolute gauging is used to evaluate the clearances related to features of the vehicle projecting outside the envelope of the comparator vehicle.

### Gauging

The process by which swept envelopes of a vehicle are used to determine clearances on a section of track between the vehicle and fixed structures and between the vehicle and vehicles on adjacent tracks.

### Lower sector

The area up to and including 1100 mm above the plane of the rails.

### Reduced clearance

A clearance, less than a normal clearance, which requires special measures to maintain tracks relative to adjacent tracks and structures.

### 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).

### 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.

The swept envelopes referred to in this document exclude the effects of track tolerance and rail sidewear previously included in kinematic envelopes developed under GM/RT2149 issue 1 or earlier documents.

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## **Definitions specific to Appendix D, Assessment of Electromagnetic Compatibility**

### **Electromagnetic compatibility**

Compatibility of electrical and electronic systems, in respect of emission and immunity levels, to ensure that operation of one system is not adversely affected to an unacceptable extent by emissions from any other system or equipment. For the purposes of this document, electromagnetic compatibility (EMC) assessment shall include consideration of conductive, inductive, capacitive and radiated effects at all frequencies from DC to 2 GHz.

### **Infrastructure systems**

Fixed and portable systems and equipment forming part of the railway infrastructure provided or operated by the infrastructure manager. For the purposes of this document, infrastructure systems do not include:

- a) Trainborne equipment (including trainborne components of signalling, control or communication systems, even where such systems are mandated or specified by the infrastructure manager)
- b) Systems outside the boundary of the railway.

### **Interference**

The potential of any characteristic or feature of a vehicle to impact adversely on the infrastructure at any interface with that infrastructure, or the potential of any characteristic or feature of the infrastructure to impact adversely on a vehicle at any interface with that vehicle.

### **Susceptibility**

The sensitivity of a vehicle to characteristics or features of the infrastructure at any interface with the infrastructure, or the sensitivity of the infrastructure to characteristics or features of the vehicle at any interface with that vehicle.

# Assessment of Compatibility of Rolling Stock and Infrastructure

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## References

The Catalogue of Railway Group Standards and the Railway Group Standards CD-ROM give the current issue number and status of documents published by RSSB. This information is also available from [www.rgsonline.co.uk](http://www.rgsonline.co.uk).

### Documents referenced in the text

RGSC 01	The Railway Group Standards Code
<b>Railway Group Standards</b>	
GC/RT5212	Requirements for Defining and Maintaining Clearances
GE/RT8006	Interface between Rail Vehicle Weights and Underline Bridges
GE/RT8012	Controlling the Speed of Tilting Trains Through Curves
GE/RT8015	Electromagnetic Compatibility between Railway Infrastructure and Trains
GE/RT8019	Tilting Trains: Controlling Tilt Systems to Maintain Clearances
GE/RT8023	Compatibility Between Electric Trains and Electrification Systems
GM/RT2149	Requirements for Defining and Maintaining the Size of Railway Vehicles
GM/RT2453	Registration of Rail Vehicles and Mandatory Data Requirements
GM/TT0088	Permissible Track Forces for Railway Vehicles
GO/RT3215	Requirements for the Weekly Operating Notice, Periodical Operating Notice and Sectional Appendix (Expected to be published in December 2007)
<b>RSSB documents</b>	
GE/GN8623	Guidance on the Change Process for Projects Affecting Compatibility Between Electric Trains and Electrification Systems
GK/GN0801	Guidance on Using Railway Group Standards to Support Signal Engineering Safety Cases
<b>Other references</b>	
SI 2005/3049	The Railways Infrastructure (Access and Management) Regulations 2005
SI 2006/397	The Railways (Interoperability) Regulations 2006
SI 2006/599	The Railways and Other Guided Transport Systems (Safety) Regulations 2006
CUV	Uniform Rules concerning Contracts of Use of Vehicles in International Rail Traffic (Appendix D to the Convention concerning International Carriage by Rail (COTIF) of 9 May 1980 in the version of the Protocol of Modification of 3 June 1999)
NR/GN/ELP/27010	Compatibility between electric trains and electrification systems