Department for Transport

National Technical Specification Notice

Infrastructure (INF)

Issue 2

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Rail Interoperability – The Railways (Interoperability) Regulations 2011

Notice to all:

- Manufacturers and distributors of railway equipment
- Infrastructure managers and railway undertakings
- Railway infrastructure and train: builders, designers, operators, owners and managers
- Certifying authorities, approved bodies, designated bodies, recognised organisations and railway consultants

This Notice has been published by the Secretary of State for Transport pursuant to regulation 3B of the Railways (Interoperability) Regulations 2011 (RIR 2011).

Summary

1. Objectives and target outcomes of rail interoperability in Great Britain

RIR 2011 supports the railway to function as one modern integrated system through rail equipment meeting common baseline requirements of technical compatibility, reliability and availability, accessibility, environmental protection, health, and safety (See Schedule 2 to RIR 2011 'Essential Requirements' for further details). By taking a long-term whole-system view, it seeks to progressively improve Britain's railway in the following ways:

- More consistently reliable, efficient and accessible services for rail customers;
- Reduced technical barriers for the railway to adapt to meet changing customer demand for passenger and freight services;
- Increased choice of potential rolling stock and service routes for operators;
- Reduced industry production, delivery and maintenance costs through use of standardised products and economies of scale;

- An open and competitive supply chain for rail projects;
- Increased potential for international passenger and international and domestic freight services;
- Reduced environmental impact.

2. Function of this National Technical Specification Notice (NTSN)

RIR 2011 requires new, upgraded or renewed rail vehicles, infrastructure and some components to meet minimum specifications linked to the six 'essential requirements' of interoperability: i.e. technical compatibility, reliability and availability, accessibility, environmental protection, health, and safety. NTSNs set these minimum specifications for different 'subsystems' of Great Britain's (GB) rail system, and key components defined as 'interoperability constituents'. In some cases, NTSNs codify international standards (e.g. European Standards set by CEN-CENELEC) or refer out to supplementary National Technical Rules to set these minimum requirements. NTSNs also set rules for third party assessment of conformity to the 'essential requirements', the placing of interoperability constituents on the GB market, and operation and maintenance of railway 'subsystems'.

This NTSN covers the Infrastructure 'subsystem' and associated 'interoperability constituents' (See article 1 for details). See Table 1 of section 3 of this NTSN for a breakdown of the basic parameters corresponding to each of the six 'Essential Requirements'.

3. How this NTSN should be read

This NTSN consists of two parts: the Articles and the Annex. The Articles set out information concerning scope, application and key definitions. The Annex sets the technical specifications, codified standards and assessment criteria for meeting the 'Essential Requirements' of RIR 2011.

Rail projects that concern the introduction or re-introduction of infrastructure onto the GB railway should check article 1 'Scope' and article 2 'Application' of this NTSN to identify whether they are legally obliged to apply requirements in the Annex. Projects in scope should review the applicable requirements in the Annex at the earliest stage of project development and factor these into cost benefit analyses on designs and procurement specifications so that implementation, or a need for an exemption to apply alternative measures, can be planned accordingly (See Summary subsection 7 'Exemptions from this NTSN').

4. Changes from Issue 1 published on 1 January 2021

NTSNs were created for EU Exit to take the place of EU regulations called Technical Specifications for Interoperability (TSIs). Issue 1 of the Infrastructure NTSN substantially

reproduced Commission Regulation (EU) No 2019/776 – the Infrastructure TSI – which applied in Britain until 31 December 2020.

Changes from Issue 1 to 2 of this NTSN primarily focus on sections where the TSI was amended in 2023 by Commission Implementing Regulation (EU) 2023/1694 and sections where the British rail sector or Government identified a need for change and agreed solutions. Changes to technical content, including decisions on whether to maintain alignment with the Infrastructure TSI, were made on the principles that mandatory requirements in NTSNs should be strictly necessary for achieving interoperability in GB, outcome focused where appropriate, supported by GB-focused analysis, and tested with those who will be obliged to apply them. To support use of this NTSN in line with these principles, Issue 2 also contains a substantial redraft of the Summary and Articles section to improve clarity, reflect Government NTSN policy, and align application with the objectives and target outcomes of rail interoperability in GB.

The core structure and format of this NTSN has not changed in this Issue 2 and still reflects that of the Infrastructure TSI. It still contains parts labelled as 'Open Points' or 'Specific Cases' where the 'essential requirements' are to be met either through application of bespoke requirements, supplementary National Technical Rules, or a choice of NTSN or National Technical Rule specifications.

There are also various provisions that are still labelled 'left intentionally blank'. This has been done to preserve consistency of clausal reference points within this NTSN and with other interfacing NTSNs, recognising that the changes from Issue 1 to 2 were limited to specific sections.

5. Relationship with rail safety obligations

Conformity to this NTSN to meet obligations under RIR 2011 does not guarantee that safety obligations under the Railways and Other Guided Transport Systems (Safety) Regulations 2006, the Health and Safety at Work Act 1974, or other legislation pertaining to rail safety are met. Some NTSN specifications are intended to fulfill the safety 'essential requirement' of interoperability, ensuring a common baseline of safe design. However, meeting these requirements alone does not mean that a railway subsystem is safe. Rail safety law, which focuses on controlling risk 'as low as reasonably practicable' (ALARP) to assure system safety, requires entities making significant changes to the railway to apply the Common Safety Method for Risk Evaluation and Assessment in determining risk controls, and in all cases to identify hazards and apply appropriate mitigations for the circumstance. This may identify that additional or alternative measures to the standardised safety 'essential requirements' are needed to ensure the safety of the subsystem.

6. Relationship with other rail standards

Entities that are obliged to apply this NTSN may have other obligations concerning the application of standards covering the same topics. Within the context set out in article 1

'Scope' and article 2 'Application', this NTSN's mandatory requirements take precedence over all other rail technical standards covering the same topics, including those set by individual companies or cross-industry bodies, unless otherwise indicated within this NTSN's Annex (e.g. there is an applicable UK Specific Case or transitional provision), the National Implementation Plan for this NTSN, a formal exemption granted by the Department for Transport as 'competent authority' (See Summary subsection 7 'Exemptions from this NTSN', or – in the case of international rail services – the Convention Concerning International Carriage by Rail (COTIF) Uniform Technical Prescriptions (UTPs) apply.

7. Exemptions from this NTSN

The UK Government recognises that the specifications set in the Annex may not always be the most effective way of achieving the 'Essential Requirements' of RIR 2011 or its objectives and target outcomes. For example, cost benefit analysis, customer insights and safety risk assessments may identify that alternatives more appropriate to the project budget, value for money, customer need, and identified safety hazards and risks, can deliver the same intended result as an applicable NTSN provision. Government also recognises that technology may change faster than standardised requirements, necessitating flexibility to benefit from innovation.

Under regulation 14 of RIR 2011 'Exemption from need to conform with NTSNs (exemptions)', the Department for Transport as 'Competent Authority' has the power to exempt rail projects in scope of RIR 2011 from NTSN requirements in the following circumstances:

- The project is at an advanced stage of development (i.e. its *"…planning or construction stage has reached a point where the impact of a change in technical specifications would present a significant legal, contractual, economic, financial, social or environmental impediment to the project concerned"*) or the project is the subject of a contract in the course of performance when the applicable NTSN is published.

- The project concerns the renewal or upgrading of an existing subsystem, where the loading gauge, track gauge, space between tracks or electrification voltage in the applicable NTSN is not compatible with those of the existing subsystem.

- Any proposed renewal, extension or upgrading of an existing subsystem where the application of an applicable NTSN would compromise the economic viability of the project or the compatibility of the project with the rail system.

- Following an accident or natural disaster, where the conditions for the rapid restoration of the network do not economically or technically allow for partial or total application of an applicable NTSN.

- A project which employs innovative solutions which either do not comply with the relevant NTSNs or to which the assessment methods in those NTSNs cannot be applied.

Under regulation 13 of RIR 2011 'Authorisation requirements for the renewal or upgrading of subsystems', the Department also has the power to decide whether an authorisation to place into service is needed for an upgraded or renewed subsystem, and the extent to which NTSN requirements apply for authorisation.

Where projects identify that alternatives to this NTSN's requirements may better deliver this NTSN's intended outcomes in their circumstance without compromising safety or the interoperability of the railway, and one of the above circumstances applies, they should contact the Department to enquire whether an exemption may be possible. Exemption requests should be made in writing using the template published on Gov.uk and sent to interoperability@dft.gov.uk

Requests must cover the mandatory criteria in regulation 14A of RIR 2011 'Application for exemptions' and offer an evidence-based explanation of how proposed alternative arrangements would be at least as effective as the NTSN requirements in meeting this NTSN's objectives. They must also give due consideration to the 'Essential Requirements', objectives and target outcomes of Great Britain's rail interoperability framework. Where requests concern safety requirements, they must be accompanied by risk assessment evidence. Where they concern accessibility requirements, they must be accompanied by evidence from any equality impact assessments and consultation with user groups, including impacts on consistency of rail passenger or staff experience on the GB network.

Requests should be made at the earliest phase of a rail project, and not after completion of the design phase. In order to permit equal levels of due diligence, including consultation as appropriate, to make informed and balanced policy decisions on exemptions, applicants should allow four months for a decision from the Department for Transport.

Infrastructure

National Technical Specification Notice

Articles

Article 1

Scope

1. The geographic scope of this NTSN is the GB railway system (including conventional and high-speed mainline networks) and the UK section of the Channel Tunnel, except for parts named on the approved list of exclusions published by the Secretary of State pursuant to regulation 3(2) or described in regulation 3(5) of RIR 2011. TSIs continue to have direct effect in Northern Ireland.

2. This NTSN covers the Infrastructure subsystem of the railway, associated maintenance subsystems and interoperability constituents.

3. The Infrastructure subsystem, as defined in Schedule 3 to RIR 2011 'Subsystems', includes:

    - Track
    - Points
    - Engineering structures (bridges, tunnels etc)
    - Associated station infrastructure (platforms, zones of access including the needs of persons of reduced mobility etc)
    - Safety and protective equipment

4. The maintenance subsystem associated with the Infrastructure subsystem includes:

    - Washing plants for external cleaning of trains
    - Water restocking
    - Refuelling
    - Fixed installations for toilet discharge
    - Electrical shore supplies

See Chapters 2 and 4 of the Annex for further details.

5. The interoperability constituents for the Infrastructure subsystem are:

   - The Rail
   - The rail fastening systems
   - Track Sleepers

   See point 5.2 of the Annex for further details.

Article 2

Application

1. This NTSN principally applies to rail projects that require an authorisation to be placed into service as per regulation 4 of RIR 2011 'Requirement for authorisation'.

2. Compliance with this NTSN is mandatory for rail projects that will place new Infrastructure subsystems in service after 2nd May 2025, without prejudice to any transitional arrangements specified in the Annex or exemptions granted by the Department for Transport.

3. Compliance is also mandatory for rail projects meeting the definitions of 'upgrading' (i.e. any major modification work on a subsystem or part of a subsystem which improves the overall performance of the subsystem) or 'renewal' (any major substitution work on a subsystem or part of a subsystem which does not change the overall performance of the subsystem) under regulation 2 of RIR 2011 'Interpretation', or otherwise specified in the list published by the Secretary of State pursuant to regulation 12 of RIR 2011 'List of projects for the renewal or upgrading of subsystems', that will seek authorisation to place into service after 2nd May 2025, without prejudice to any transitional arrangements specified in the Annex or exemptions granted by the Department for Transport.

4. Operators of Infrastructure subsystems that were authorised to be placed into service against this NTSN are required to operate and maintain the subsystem in conformity with this NTSN or subsequent updated versions, as per regulation 20 of RIR 2011 'Continuing duty on operator in relation to standards'.

5. Operators of Infrastructure subsystems authorised against Issue 1 of this NTSN or a version of the Infrastructure TSI that preceded it may voluntarily choose to apply this NTSN to their operation and maintenance of the subsystem, unless otherwise specified in the corresponding National Implementation Plan.

Article 3

Verification of conformity to this NTSN

1. An Infrastructure subsystem's conformity to the requirements of this NTSN shall be confirmed by a UK Declaration of Verification following the procedures set out in Schedule 4 'UK verification assessment procedure for subsystems' and Schedule 5 'UK declaration of verification of subsystems' to RIR 2011.

2. The procedures specific to this NTSN for assessment of conformity, suitability for use and UK verification are set out in Chapter 6 of the Annex, and shall be based on the modules established in the NTSN concerning modules for the procedures for assessment of conformity or suitability for use and UK verification (the 'Modules NTSN'). Chapter 6 of the Annex specifies the modules from the 'Modules NTSN' that can be applied to assess conformity to this NTSN.

3. It is the responsibility of the applicant for an authorisation to place a subsystem into service to choose the conformity assessment module(s) that are to be applied by the Approved Body from the options listed in Chapter 6 of the Annex. The applicant should consider which module is most proportionate and cost effective for the project.

4. Without prejudice to paragraph 5 of this article an interoperability constituent's conformity to the requirements of this NTSN shall be confirmed by a UK declaration of conformity or suitability for use. This is required for placing these constituents on the market in Great Britain.

5. Where interoperability constituent specifications in the Infrastructure TSI are equivalent to those of this NTSN, an EC declaration of conformity or suitability for use is valid for demonstrating compliance with this NTSN and for placing these interoperability constituents on the market.

6. Where a 'UK Specific Case' applies to an interoperability constituent, additional assessment may be needed against the Specific Case requirements. See point 7.7 of the Annex for further details.

7. UK certificates which have been issued according to the requirements of Issue 1 of the Infrastructure NTSN remain valid, without a need for a new conformity assessment, until the expiry date originally established. In order to renew a certificate, the design or type shall be re-assessed only against new or modified requirements set out in the Annex to this NTSN.

8. Subject to the reassessment requirements under RIR 2011, and the procedure set out in the NTSN concerning the further assessment of interoperability constituents which hold an EC declaration of conformity or suitability for use, EC certificates which have been issued according to the requirements of the Infrastructure TSI

remain valid, without a need for a new conformity assessment, until the expiry date originally established. In order to renew a certificate the design or type shall be re-assessed only against new or modified requirements set out in the Annex to this NTSN.

ANNEX

TABLE OF CONTENTS

1. INTRODUCTION

1.1. TECHNICAL SCOPE

The technical scope of this NTSN is defined in Article 1(2) of the NTSN.

1.2. GEOGRAPHICAL SCOPE

The geographical scope of this NTSN is defined in Article 1(1) of the NTSN.

1.3. *This provision has been left intentionally blank*

2. DEFINITION AND SCOPE OF SUBSYSTEM

2.1. DEFINITION OF THE INFRASTRUCTURE SUBSYSTEM

This NTSN covers:

(a) the infrastructure structural subsystem

(b) the part of the maintenance functional subsystem relating to the infrastructure subsystem (that is: washing plants for external cleaning of trains, water restocking, refuelling, fixed installations for toilet discharge and electrical shore supplies).

The elements of the infrastructure subsystem are described in paragraph 2.1 of Schedule 3 to the RIR 2011.

The elements of the maintenance subsystem are described in paragraph 2.8 of Schedule 3 to the RIR 2011.

The scope of this NTSN therefore includes the following aspects of the infrastructure subsystem:

(a) Line layout,

(b) Track parameters,

(c) Switches and crossings,

(d) Track resistance to applied loads,

(e) Structures resistance to traffic loads,

(f) Immediate action limits on track geometry defects,

(g) Platforms,

(h) Health, safety and environment,

(i) Provision for operation,

(j) Fixed installations for servicing trains.

Further details are set out in point 4.2.2 of this NTSN.

2.2. INTERFACES OF THIS NTSN WITH OTHER NTSNS

Point 4.3 of this NTSN sets out the functional and technical specification of the interfaces with the following subsystems, as defined in the relevant NTSNs:

(a) Rolling stock subsystem,

(b) Energy subsystem,

(c) Control command and signalling subsystem,

(d) Traffic operation and management subsystem.

Interfaces with the Accessibility NTSN (ACC NTSN) are described in point 2.3 below.

Interfaces with the Safety in Railway Tunnels NTSN (SRT NTSN) are described in point 2.4 below.

2.3. INTERFACES OF THIS NTSN WITH THE ACCESSIBILITY NTSN

All requirements relating to the infrastructure subsystem for the access of persons with reduced mobility to the railway system are set out in the Accessibility NTSN.

2.4. INTERFACES OF THIS NTSN WITH THE SAFETY IN RAILWAY TUNNELS NTSN

All requirements relating to the infrastructure subsystem for safety in railway tunnels are set out in the Safety in Railway Tunnels NTSN.

2.5. RELATION TO THE SAFETY MANAGEMENT SYSTEM

Necessary processes to manage safety and operations according to the requirements in the scope of this NTSN, including interfaces to humans, organisations or other technical systems, shall be designed and implemented in the

infrastructure manager's safety management system as required by the Railways and Other Guided Transport Systems (Safety) Regulations 2006.

2.6. *This provision has been left intentionally blank*

3. ESSENTIAL REQUIREMENTS

The following table indicates basic parameters of this NTSN and their correspondence to the essential requirements as set out and numbered in Schedule 2 to the RIR 2011.

Table 1

Basic Parameters of the infrastructure subsystem corresponding to the essential requirements

NTSN point	Title of NTSN point	Safety	Reliability Availability	Health	Environmental protection	Technical compatibility	Accessibility
4.2.3.1	Structure gauge	1.1.1, 2.1.1				1.5	
4.2.3.2	Distance between track centres	1.1.1, 2.1.1				1.5	
4.2.3.3	Maximum gradients	1.1.1				1.5	
4.2.3.4	Minimum radius of horizontal curve	1.1.3				1.5	
4.2.3.5	Minimum radius of vertical curve	1.1.3				1.5	
4.2.4.1	Nominal track gauge					1.5	
4.2.4.2	Cant	1.1.1, 2.1.1				1.5	1.6.1
4.2.4.3	Cant deficiency	1.1.1				1.5	
4.2.4.4	Abrupt change of Cant deficiency	2.1.1					

NTSN point	Title of NTSN point	Safety	Reliability Availability	Health	Environmental protection	Technical compatibility	Accessibility
4.2.4.5	Equivalent conicity	1.1.1, 1.1.2				1.5	
4.2.4.6	Railhead profile for plain line	1.1.1, 1.1.2				1.5	
4.2.4.7	Rail inclination	1.1.1, 1.1.2				1.5	
4.2.5.1	Design geometry of switches and crossings	1.1.1, 1.1.2, 1.1.3				1.5	
4.2.5.2	Use of swing nose crossings	1.1.2, 1.1.3					
4.2.5.3	Maximum unguided length of fixed obtuse crossings	1.1.1, 1.1.2				1.5	
4.2.6.1	Track resistance to vertical loads	1.1.1, 1.1.2, 1.1.3				1.5	
4.2.6.2	Longitudinal track resistance	1.1.1, 1.1.2, 1.1.3				1.5	
4.2.6.3	Lateral track resistance	1.1.1, 1.1.2, 1.1.3				1.5	
4.2.7.1	Resistance of new bridges to traffic loads	1.1.1, 1.1.3				1.5	
4.2.7.2	Equivalent vertical loading for new geotechnical structures, earthworks and earth pressure effects	1.1.1, 1.1.3				1.5	
4.2.7.3	Resistance of new structures over or adjacent to tracks	1.1.1, 1.1.3				1.5	

NTSN point	Title of NTSN point	Safety	Reliability Availability	Health	Environmental protection	Technical compatibility	Accessibility
4.2.7.4	Resistance of existing structures (bridges, geotechnical structures and earthworks) to traffic loads	1.1.1, 1.1.3				1.5	
4.2.8.1	The immediate action limit for alignment	1.1.1, 1.1.2	1.2				
4.2.8.2	The immediate action limit for longitudinal level	1.1.1, 1.1.2	1.2				
4.2.8.3	The immediate action limit for track twist	1.1.1, 1.1.2	1.2				
4.2.8.4	The immediate action limit of track gauge as isolated defect	1.1.1, 1.1.2	1.2				
4.2.8.5	The immediate action limit for Cant	1.1.1, 1.1.2	1.2				
4.2.8.6	The immediate action limit for switches and crossings	1.1.1, 1.1.2	1.2			1.5	
4.2.9.1	Usable length of platforms	1.1.1, 2.1.1				1.5	
4.2.9.2	Platform height	1.1.1, 2.1.1				1.5	1.6.1
4.2.9.3	Platform offset	1.1.1, 2.1.1				1.5	1.6.1
4.2.9.4	Track layout alongside platforms	1.1.1, 2.1.1				1.5	1.6.1
4.2.10.1	Maximum pressure variations in tunnels and underground structures	1.1.1, 2.1.1				1.5	
4.2.10.2	Effect of cross winds	1.1.1, 2.1.1	1.2			1.5	

NTSN point	Title of NTSN point	Safety	Reliability Availability	Health	Environmental protection	Technical compatibility	Accessibility
4.2.10.3	Aerodynamic effect on ballasted track	1.1.1	1.2			1.5	
4.2.11.1	Location markers	1.1.1	1.2				
4.2.11.2	Equivalent conicity in service	1.1.1, 1.1.2				1.5	
4.2.12.2	Toilet discharge	1.1.5	1.2	1.3.1		1.5	
4.2.12.3	Train external cleaning facilities		1.2			1.5	
4.2.12.4	Water restocking	1.1.5	1.2	1.3.1		1.5	
4.2.12.5	Refuelling	1.1.5	1.2	1.3.1		1.5	
4.2.12.6	Electric shore supply	1.1.5	1.2			1.5	
4.4	Operating rules		1.2				
4.5	Maintenance rules		1.2				
4.6	Professional qualifications	1.1.5	1.2				
4.7	Health and safety conditions	1.1.5	1.2	1.3	1.4.1		

4. DESCRIPTION OF THE INFRASTRUCTURE SUBSYSTEM

4.1. INTRODUCTION

(1) The GB rail system, of which the infrastructure and maintenance subsystems are parts, is an integrated system whose consistency needs to be verified. This consistency must be checked in particular with regard to the specifications of the infrastructure subsystem, its interfaces in relation to the other subsystems of the GB rail system in which it is integrated, as well as the operating and maintenance rules.

(2) The limiting values set out in this NTSN are not intended to be imposed as usual design values. However the design values must be within the limits set out in this NTSN.

(3) The functional and technical specifications of the infrastructure and part of the maintenance subsystems and their interfaces, as described in points 4.2 and 4.3, do not impose the use of specific technologies or technical solutions, except where this is strictly necessary for the safe and uninterrupted movement of trains which accomplish the required levels of performance for those lines.

(4) Innovative solutions for interoperability which do not fulfil the requirements specified in this NTSN and/or which are not assessable as stated in this NTSN require new specifications and/or new assessment methods. The process for obtaining an exemption for innovative solutions is described in Summary subsection 7 'Exemptions from this NTSN'.

(5) Where reference is made to EN standards, any variations called 'national deviations' in the EN do not apply, unless otherwise specified in this NTSN.

(6) Where line speeds are stated in [km/h] as a category or performance parameter in this NTSN, it shall be allowed to translate the speed to equivalent [mph] as in Appendix G, for Great Britain networks.

4.2. FUNCTIONAL AND TECHNICAL SPECIFICATIONS OF THE INFRASTRUCTURE SUBSYSTEM

4.2.1. NTSN Categories of Line

(1) *This provision has been left intentionally blank*.

(2) The NTSN category of line shall be a combination of traffic codes. For lines where only one type of traffic is carried (for example, a freight only line), a single code may be used to describe the performances; where mixed traffic runs the category will be described by one or more codes for passenger and freight. The combined traffic codes describe the envelope within which the desired mix of traffic can be accommodated.

(3) These NTSN categories of line shall be used for the classification of existing lines to define a target system so that the relevant performance parameters will be met.

(4) Lines shall be classified based on the type of traffic (traffic code) characterised by the following performance parameters:

— structure gauge,

— axle load,

— line speed,

— train length

— usable length of platform.

The values in the columns for ‘structure gauge’ and ‘axle load’, which directly affect train running, shall be mandatory minimum levels according to the traffic code. The columns for ‘line speed’, ‘usable length of platform’ and ‘train length’ are indicative of the range of values that are typically applied for different traffic types and they do not directly impose restrictions on the traffic that may run over the line.

(5) The performance parameters listed in Table 2 and Table 3 are not intended to be used for compatibility checks between rolling stock and infrastructure. Route compatibility checks are subject to point 4.2.2.5 of the OPE NTSN.

(6) Information defining minimum capability requirements for existing structures in relationship to different train types is given in Appendix E. For the mainline railway of Great Britain, information defining the relation between maximum axle load and maximum speed in accordance with type of vehicle is given in Appendix F.

(7) The performance levels for types of traffic are set out in Table 2 and Table 3 .

Table 2

Infrastructure performance parameters for passenger traffic

(route compatibility checks are subject to point 4.2.2.5 of the OPE NTSN

Traffic code	**Structure gauge**	**Axle load [t]**	**Line speed [km/h]**	**Usable length of platform [m]**
P1	GC	17 ([1]) / 21.5 ([2])	250-350	400
P2	GB	20 ([1]) / 22.5 ([2])	200-250	200-400
P3	DE3	22,5 ([3])	120-200	200-400
P4	GB	22,5 ([3])	120-200	200-400
P5	GA	20 ([3])	80-120	50-200
P6	G1	12 ([3])	n.a.	n.a.
P1520	S	22,5 ([3])	80-160	35-400
P1600	IRL1	22,5 ([3])	80-160	75-240

([1]) Minimum required values of axle load to be used for checks of bridges using a dynamic appraisal, based on design mass in working order for power heads and locomotives and operational mass under normal payload for vehicles capable of carrying a payload of passengers or luggage (mass definitions in accordance with the specification referenced in Appendix T Index [1.1] .

([2]) Minimum required values of axle load to be used for checks of infrastructure using a static loading, based on design mass under exceptional payload for vehicles capable of carrying a payload of passengers or luggage (mass definitions in accordance with the specification referenced in Appendix T Index [1.1] with regard to the national technical rule). This axle load may be linked to limited speed.

([3]) To be used for checks of infrastructure using a static loading, based on design mass in working order for power heads and locomotives and design mass under exceptional payload for other vehicles(mass definitions in accordance with the specification referenced in Appendix T Index [1.1] with regard to the national technical rule). This axle load may be linked to limited speed .

Table 3

Infrastructure performance parameters for freight traffic

(route compatibility checks are subject to point 4.2.2.5 of the OPE NTSN

Traffic code	**Structure gauge**	**Axle load [t]**	**Line speed [km/h]**	**Train length [m]**
F1	GC	22,5 ([1])	100-120	740-1050
F2	GB	22,5 ([1])	100-120	600-1050
F3	GA	20 ([1])	60-100	500-1050
F4	G1	18 ([1])	n.a.	n.a.
F1520	S	25 ([1])	50-120	1050
F1600	IRL1	22,5 ([1])	50-100	150-450

([1]) To be used for static based loading checks of infrastructure, based on design mass in working order for power heads and locomotives and design mass under normal payload for other vehicles (mass definitions in accordance with the specification referenced in Appendix T Index [1.2]). This axle load may be linked to limited speed.

Note: Tables 2 and 3 are not to be used for compatibility checks between rolling stock and infrastructure

(8) For structures and track, axle load by itself is not sufficient to set out the requirements for infrastructure. Requirements are specified as follows:

— for new structures in point 4.2.7.1 and 4.2.7.2,

— for existing structures in point 4.2.7.4,

— for track in point 4.2.6.

(9) Passenger hubs, freight hubs and connecting lines are included in the above traffic codes, as appropriate.

(10) It is permitted to design new and upgraded lines able to accommodate:

— Larger vehicle gauges,

— Increased vehicle axle loads,

— Increased permissible line speeds,

— Increased useable length of platforms,

— Increased train lengths,

than those specified in Table 2 and Table 3.

(11) Not used.

(12) It is permissible for specific locations on the line to be designed for any or all of the performance parameters line speed, usable length of platform and train length less than those set out in Table 2 and Table 3, where duly justified to meet geographical, urban or environmental constraints.

Note: There are UK specific cases relevant to point 4.2.1 for GB (see point 7.7.17.1, and for HS2 infrastructure see point 7.7.20.1).

4.2.2. Basic parameters characterising the infrastructure subsystem

4.2.2.1. List of Basic Parameters

The Basic Parameters characterising the infrastructure subsystem, grouped according to the aspects listed in point 2.1, are:

A. Line layout:

(a) Structure gauge (4.2.3.1),

(b) Distance between track centres (4.2.3.2),

(c) Maximum gradients (4.2.3.3),

(d) Minimum radius of horizontal curve (4.2.3.4),

(e) Minimum radius of vertical curve (4.2.3.5),

B. Track parameters:

(a) Nominal track gauge (4.2.4.1),

(b) Cant (4.2.4.2),

(c) Cant deficiency (4.2.4.3),

(d) Abrupt change of Cant deficiency (4.2.4.4),

(e) Equivalent conicity (4.2.4.5),

(f) Railhead profile for plain line (4.2.4.6),

(g) Rail inclination (4.2.4.7),

C. Switches and crossings

(a) Design geometry of switches and crossings (4.2.5.1),

(b) Use of swing nose crossings (4.2.5.2),

(c) Maximum unguided length of fixed obtuse crossings (4.2.5.3),

D. Track resistance to applied loads

(a) Track resistance to vertical loads (4.2.6.1),

(b) Longitudinal track resistance (4.2.6.2),

(c) Lateral track resistance (4.2.6.3),

E. Structures resistance to traffic loads

(a) Resistance of new bridges to traffic loads (4.2.7.1),

(b) Equivalent vertical loading for new geotechnical structures, earthworks and earth pressure effects (4.2.7.2),

(c) Resistance of new structures over or adjacent to tracks (4.2.7.3),

(d) Resistance of existing structures (bridges, geotechnical structures and earthworks) to traffic loads (4.2.7.4),

F. Immediate action limits on track geometry defects

(a) The immediate action limit for alignment (4.2.8.1),

(b) The immediate action limit for longitudinal level (4.2.8.2),

(c) The immediate action limit for track twist (4.2.8.3),

(d) The immediate action limit of track gauge as isolated defect (4.2.8.4),

(e) The immediate action limit for Cant (4.2.8.5),

(f) The immediate action limits for switches and crossings (4.2.8.6),

G. Platforms

(a) Usable length of platforms (4.2.9.1),

(b) Platform height (4.2.9.2),

(c) Platform offset (4.2.9.3),

(d) Track layout alongside platforms (4.2.9.4),

H. Health, safety and environment

(a) Maximum pressure variation in tunnels and underground structures (4.2.10.1),

(b) Effect of crosswinds (4.2.10.2),

(c) Aerodynamic effect on ballasted track (4.2.10.3)

I. Provision for operation

(a) Location markers (4.2.11.1),

(b) Equivalent conicity in service (4.2.11.2)

J. Fixed installations for servicing trains

(a) General (4.2.12.1),

(b) Toilet discharge (4.2.12.2),

(c) Train external cleaning facilities (4.2.12.3),

(d) Water restocking (4.2.12.4),

(e) Refuelling (4.2.12.5),

(f) Electric shore supply (4.2.12.6),

K. Maintenance rules

(a) Maintenance plan (4.5.2).

4.2.2.2. Requirements for Basic Parameters

(1) These requirements are described in the following paragraphs, together with any particular conditions that may be allowed in each case for the basic parameters and interfaces concerned.

(2) The values of basic parameters specified are only valid up to a maximum line speed of 350 km/h

Note: There is a UK specific case relevant to point 4.2.2.2(2) for HS2 infrastructure (see 7.7.20.2).

(3) This provision has been left intentionally blank

(4) In case of multi-rail track, requirements of this NTSN are to be applied separately to each pair of rails designed to be operated as separate track.

(5) Requirements for lines representing specific cases are described under point 7.7.

(6) A short section of track with devices to allow transition between different nominal track gauges is allowed.

(7) Requirements are described for the subsystem under normal service conditions. Consequences, if any, of the execution of works, which may require temporary exceptions as far as the subsystem performance is concerned, are dealt with in point 4.4.

(8) The performance levels of trains can be enhanced by adopting specific systems, such as vehicle body tilting. Special conditions are allowed for running such trains, provided they do not entail restrictions for other trains not equipped with such systems.

4.2.3. Line layout

4.2.3.1. Structure gauge

(1) The upper part of the structure gauge shall be set on the basis of the gauges selected in accordance with point 4.2.1, which are set out in the specification referenced in Appendix T Index [3.1].

(2) The lower part of the structure gauge shall be GI2 as set out in the specification referenced in Appendix T Index [3.2]. Where tracks are equipped with rail brakes, structure gauge GI1 as set out in the same specification Annex C of EN 15273-3:2013 shall apply for the lower part of the gauge.

(3) Calculations of the structure gauge shall be done using the kinematic method in accordance with the requirements of the specification referenced in Appendix T Index [3.3].

Note: There is a UK specific case relevant to point 4.2.3.1 for GB (see point 7.7.17.2).

4.2.3.2. Distance between track centres

(1) The distance between track centres shall be set on the basis of the gauges selected according to point 4.2.1.

(2) The nominal horizontal distance between track centres for new lines shall be specified for the design and shall not be smaller than the values from the Table 4; it considers margins for aerodynamic effects.

Table 4

Minimum nominal horizontal distance between track centres

Maximum allowed speed [km/h]	**Minimum nominal horizontal distance between track centres [m]**
160 < v ≤ 200	3,80
200 < v ≤ 250	4,00
250 < v ≤ 300	4,20
v > 300	4,50

(3) The distance between track centres shall at least satisfy the requirements for the limit installation distance between track centres, defined in accordance with the specification referenced in Appendix T, Index [3.4].

Note: There are UK specific cases relevant to point 4.2.3.2 for GB (see point 7.7.17.3, and for HS2 infrastructure see point 7.7.20.3).

4.2.3.3. Maximum gradients

(1) Gradients of tracks through passenger platforms of new lines shall not be more than 2,5 mm/m, where vehicles are intended to be regularly attached or detached.

(2) Gradients of new stabling tracks intended for parking rolling stock shall not be more than 2,5 mm/m unless specific provision is made to prevent the rolling stock from running away.

(3) Gradients as steep as 35 mm/m are allowed for main tracks on new P1 lines dedicated to passenger traffic at the design phase provided the following 'envelope' requirements are observed:

(a) the slope of the moving average profile over 10 km is less than or equal to 25 mm/m.

(b) the maximum length of continuous 35 mm/m gradient does not exceed 6 km.

4.2.3.4. Minimum radius of horizontal curve

The minimum design radius of horizontal curve shall be selected with regard to the local design speed of the curve.

(1) The minimum horizontal design curve radius for new lines shall not be less than 150 m.

(2) Reverse curves, except in marshalling yards where wagons are shunted individually, with small radii for new lines shall be designed to prevent buffer locking.

For straight intermediate track elements between the curves, the specification referenced in Appendix T, Index [4.1] shall apply, whose values are based on the reference vehicles defined in the same specification. To prevent buffer locking for existing vehicles that do not fulfil the assumptions of the reference vehicles, it may be necessary to specify longer lengths of the straight intermediate element.

For non-straight intermediate track elements, a detailed calculation shall be made in order to check the magnitude of the end throw differences.

4.2.3.5. Minimum radius of vertical curve

(1) The radius of vertical curves (except for humps in marshalling yards) shall be at least 500 m on a crest or 900 m in a hollow.

(2) For humps in marshalling yards the radius of vertical curves shall be at least 250 m on a crest or 300 m in a hollow.

4.2.4. Track parameters

4.2.4.1. Nominal track gauge

(1) The GB track gauge shall be the European standard nominal track gauge of 1 435 mm.

4.2.4.2. Cant

(1) The design Cant for lines shall be limited as defined in Table 7.

Table 7

Design Cant [mm]

	Freight and mixed traffic	**Passenger traffic**
Ballasted track	160	180
Non ballasted track	170	180

(2) The design Cant on tracks adjacent to station platforms where trains are intended to stop in normal service shall not exceed 110 mm.

(3) New lines with mixed or freight traffic on curves with a radius less than 305 m and a Cant transition steeper than 1 mm/m, the Cant shall be restricted to the limit given by the following formula

$D \leq (R - 50)/1{,}5$

where D is the Cant in mm and R is the radius in m.

4.2.4.3. Cant deficiency

(1) The maximum values for Cant deficiency are set out in Table 8.

Table 8

Maximum Cant deficiency [mm]

Design speed [km/h]	**v ≤ 160**	**160 < v ≤ 300**	**v > 300**
For operation of rolling stock conforming to the Locomotives and Passenger TSI or NTSN that replaces and/or substantially reproduces it	153		100
For operation of rolling stock conforming to the Freight Wagons TSI or NTSN that replaces and/or substantially reproduces it	130	—	—

(2) It is permissible for trains specifically designed to travel with higher Cant deficiency (for example multiple units with axle loads lower than set out in table 2; vehicles with special equipment for the negotiation of curves) to run

with higher Cant deficiency values, subject to a demonstration that this can be achieved safely.

4.2.4.4. Abrupt change of Cant deficiency

(1) The maximum values of abrupt change of Cant deficiency shall be:

(a) 130 mm for v ≤ 60 km/h,

(b) 125 mm for 60 km/h < v ≤ 200 km/h,

(c) 85 mm for 200 km/h < v ≤ 230 km/h

(d) 25 mm for v > 230 km/h.

(2) Where v ≤ 40 km/h and Cant deficiency ≤ 75 mm both before and after an abrupt change of curvature, the value of abrupt change of Cant deficiency may be raised to 150 mm.

4.2.4.5. Equivalent conicity

(1) The limiting values for equivalent conicity quoted in Table 10 shall be calculated for the amplitude (y) of the wheelset's lateral displacement:

— y = 3 mm, if (TG – SR) ≥ 7mm

— $y = \left(\frac{(TG-SR)-1}{2}\right)$, if 5mm ≤ (TG – SR) < 7mm

— y = 2 mm, if (TG – SR) < 5mm

where TG is the track gauge and SR is the distance between the flange contact faces of the wheelset

(2) No assessment of equivalent conicity is required for switches and crossings.

(3) Design track gauge, rail head profile and rail inclination for plain line shall be selected to ensure that the equivalent conicity limits set out in Table 10 are not exceeded.

Table 10

Equivalent conicity design limit values

	Wheel profile
Speed range [km/h]	**S1002, GV1/40**
v ≤ 60	Assessment not required
60 < v ≤ 200	0,25
200 < v ≤ 280	0,20
v > 280	0,10

(4) The following wheelsets, as defined in the specification referenced in Appendix T, Index [6.1 for (a) and (b)] and Index [6.2 for (c) and (d)] , shall be modelled passing over the designed track conditions (simulated by calculation in accordance with the specification referenced in Appendix T, Index [5.1]:

(a) S 1002 with SR1.

(b) S 1002 with SR2.

(c) GV 1/40 with SR1.

(d) GV 1/40 with SR2.

For SR1 and SR2 the following values apply:

(a) For the 1 435 mm track gauge system SR1 = 1 420 mm and SR2 = 1 426 mm.

Note: There is a UK specific case relevant to point 4.2.4.5 for GB (see point 7.7.17.3.bis).

4.2.4.6. Railhead profile for plain line

(1) The railhead profile shall be selected from the range set out in one of the specifications referenced in Appendix T, Index [7.1] and Index [8.1] or shall be in accordance with point (2).

(2) The design of railhead profiles for plain line shall comprise:

(a) a lateral slope on the side of the railhead angled to between vertical and 1/16 with reference to the vertical axis of the railhead;

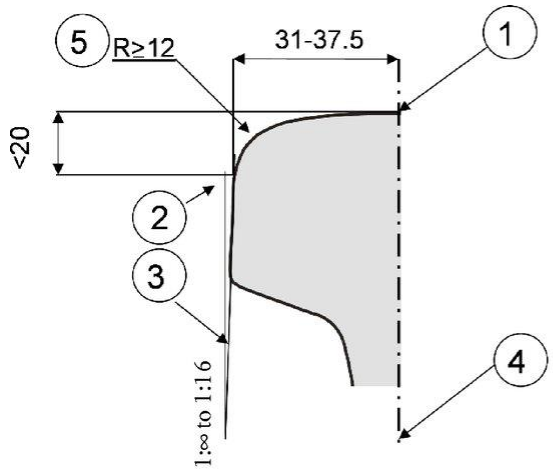
(b) the vertical distance between the top of this lateral slope and the top of the rail shall be less than 20 mm;

(c) a radius of at least 12 mm at the gauge corner;

(d) the horizontal distance between the crown of the rail and the tangent point shall be between 31 and 37,5 mm.

Figure 1

Railhead profile



1 crown of rail
2 tangent point
3 lateral slope
4 vertical axis of rail head
5 gauge corner

(3) These requirements are not applicable to expansion devices.

4.2.4.7. Rail inclination

4.2.4.7.1. Plain line

(1) The rail shall be inclined towards the centre of the track.

(2) For tracks intended to be operated at speeds greater than 60 km/h, the rail inclination for a given route shall be selected from the range 1/20 to 1/40.

(3) For sections of not more than 100 m between switches and crossings without inclination where the running speed is no more than 200 km/h, the laying of rails without inclination is allowed.

4.2.4.7.2. Requirements for switches and crossings

(1) The rail shall be designed to be either vertical or inclined.

(2) If the rail is inclined, the designed inclination shall be selected from the range 1/20 to 1/40.

(3) The inclination can be given by the shape of the active part of the rail head profile.

(4) Within switches and crossings where the running speed is more than 200 km/h and no more than 250 km/h, the laying of rails without inclination is allowed provided that it is limited to sections not exceeding 50 m.

(5) For speeds of more than 250 km/h the rails shall be inclined.

4.2.5. Switches and crossings

4.2.5.1. Design geometry of switches and crossings

Point 4.2.8.6 of this NTSN defines immediate action limits for switches and crossings that are compatible with geometrical characteristics of wheelsets as defined in the rolling stock NTSNs. It will be the task of the infrastructure manager to decide geometrical design values appropriate to its maintenance plan.

4.2.5.2. Use of swing nose crossing

For speeds higher than 250 km/h switches and crossings shall be equipped with swing-nose crossings.

4.2.5.3. Maximum unguided length of fixed obtuse crossings

The design value of the maximum unguided length of fixed obtuse crossings shall be in accordance with the requirements set out in Appendix J to this NTSN.

Note: There is a UK specific case relevant to point 4.2.5.3 for GB (see point 7.7.17.4).

4.2.6. Track resistance to applied loads

4.2.6.1. Track resistance to vertical loads

The track design, including switches and crossings, shall take into account at least the following forces:

(a) the axle load selected according to point 4.2.1;

(b) maximum vertical wheel forces. Maximum wheel forces for defined test conditions are set out in the specification referenced in Appendix T, Index [9.1].

(c) vertical quasi-static wheel forces. Maximum quasi-static wheel forces for defined test conditions are set out in the specification referenced in Appendix T, Index [9.1].

4.2.6.2. Longitudinal track resistance

4.2.6.2.1. Design forces

The track, including switches and crossings, shall be designed to withstand longitudinal forces equivalent to the force arising from braking of 2,5 m/s2 for the performance parameters chosen in accordance with point 4.2.1.

4.2.6.2.2. Compatibility with braking systems

(1) The track, including switches and crossings, shall be designed to be compatible with the use of magnetic braking systems for emergency braking.

(2) Provisions for the use of eddy current braking systems on track shall be defined at operational level by the infrastructure manager on the basis of the specific characteristics of the track, including switches and crossings. The conditions of use of this braking system are registered in accordance with Commission Implementing Regulation (EU) 2019/777[1] (RINF).

Note: There is a UK specific case relevant to point 4.2.6.2.2 for HS2 infrastructure (see point 7.7.20.4).

4.2.6.3. Lateral track resistance

The track design, including switches and crossings, shall take into account at least the following forces:

(a) lateral forces; maximum lateral forces exerted by a wheel set on the track for defined test conditions are set out in the specification referenced in Appendix T, Index [9.2].

(b) quasi-static guiding forces; maximum quasi-static guiding forces Y_{qst} for defined radii and test conditions are set out in the specification referenced in Appendix T, Index [9.1].

1 Commission Implementing Regulation (EU) 2019/777 of 16 May 2019 on the common specifications for the register of railway infrastructure and repealing Implementing Decision 2014/880/EU. This EU legislation is retained EU law under section 3 of the European Union (Withdrawal) Act 2018.

4.2.7. Structures resistance to traffic loads

The requirements of the specifications referenced in Appendix T, Index [10.1] and Index [11.1] specified in this point of the NTSN are to be applied in accordance with the corresponding points in the national annexes to those specifications if they exist.

4.2.7.1. Resistance of new bridges to traffic loads

4.2.7.1.1. Vertical loads

(1) Bridges shall be designed to support vertical loads in accordance with the following load models, set out in the specification referenced in Appendix T, Index [10]:

(a) Load Model 71, as set out in the specification referenced in Appendix T, Index [10.2]

(b) In addition, for continuous bridges, Load Model SW/0, as set out in the specification referenced in Appendix T, Index [10.3]

(2) The load models shall be multiplied by the factor alpha (α) as set out in the specification referenced in Appendix T, Index [10.4].

(3) The value of factor alpha (α) shall be equal to or greater than the values set out in Table 11.

Table 11

Factor alpha (α) for the design of new bridges

Type of traffic	**Minimum factor alpha (α)**
P1, P2, P3, P4	1,0
P5	0,91
P6	0,83
P1520	1
P1600	1,1
F1, F2, F3	1,0
F4	0,91
F1520	1,46
F1600	1,1

4.2.7.1.2. Allowance for dynamic effects of vertical loads

(1) The load effects from the Load Model 71 and Load Model SW/0 shall be enhanced by the dynamic factor phi (Φ) as set out in the specification referenced in Appendix T, Index [10.5].

(2) For bridges for speeds over 200 km/h where the specification referenced in Appendix T, Index [10.6] requires a dynamic analysis to be carried out, the bridge shall additionally be designed for HSLM defined in the specification referenced in Appendix T, Index [10.7].

(3) It is permissible to design new bridges such that they will also accommodate an individual passenger train with higher axle loads than covered by HSLM. The dynamic analysis shall be undertaken using the characteristic value of the loading from the individual train taken as the design mass under normal payload in accordance with Appendix K with an allowance for passengers in standing areas in accordance with Note (1) of Appendix K.

Note: There is a UK specific case relevant to point 4.2.7.1.2 for HS2 infrastructure (see point 7.7.20.5).

4.2.7.1.3. Centrifugal forces

Where the track on a bridge is curved over the whole or part of the length of the bridge, the centrifugal force shall be taken into account in the design of bridges as set out in the specification referenced in Appendix T, Index [10.8].

4.2.7.1.4. Nosing forces

The nosing force shall be taken into account in the design of bridges as set out in the specification referenced in Appendix T, Index [10.9].

4.2.7.1.5. Actions due to traction and braking (longitudinal loads)

Traction and braking forces shall be taken into account in the design of bridges as set out in the specification referenced in Appendix T, Index [10.10].

4.2.7.1.6. Design track twist due to rail traffic actions

The maximum total design track twist due to rail traffic actions shall not exceed the values set out in the specification referenced in Appendix T, Index [11.2].

Note: There is a UK specific case relevant to point 4.2.7.1.6 for HS2 infrastructure (see point 7.7.20.6).

4.2.7.2. Equivalent vertical loading for new geotechnical structures, earthworks and earth pressure effects

(1) Geotechnical structures and earthworks shall be designed and earth pressure effects shall be specified taking into account the vertical loads produced by the Load Model 71, as set out in the specification referenced in Appendix T, Index [10.2].

(2) The equivalent vertical loading shall be multiplied by the factor alpha (α) as set out in the specification referenced in Appendix T, Index [10.4]. The value of α shall be equal to or greater than the values set out in Table 11.

4.2.7.3. Resistance of new structures over or adjacent to tracks

Aerodynamic actions from passing trains shall be taken into account as set out in the specification referenced in appendix T, Index [10.11].

Note: There is a UK specific case relevant to point 4.2.7.3 for HS2 infrastructure (see point 7.7.20.7).

4.2.7.4. Resistance of existing structures (bridges, geotechnical structures and earthworks) to traffic loads

(1) Bridges, geotechnical structures and earthworks shall be brought to a specified level of interoperability in accordance with the NTSN category of line as defined in point 4.2.1.

(2) The minimum capability requirements for structures for each traffic code are given in Appendix E and must be met for the line to be declared interoperable.

(3) The following conditions apply:

(a) Where an existing structure is replaced by a new structure then the new structure shall be in accordance with the requirements of point 4.2.7.1 or point 4.2.7.2.

(b) If the minimum capability of the existing structures satisfy the requirements in Appendix E then the existing structures satisfy the relevant interoperability requirements.

(c) Where the capability of an existing structure does not satisfy the requirements in Appendix E and works (e.g. strengthening) are being carried out to raise the capability of the structure to meet the requirements of this NTSN (and the structure is not to be replaced by a

new structure) then the structure shall be brought into conformity with the requirements in Appendix E.

(4) For the networks of Great Britain, in points (2) and (3) the EN line category may be replaced by Route Availability (RA) number (delivered in accordance with the national technical rule) and consequently reference to Appendix E are replaced by reference to Appendix F.

4.2.8. Immediate action limits on track geometry defects

4.2.8.1. The immediate action limit for alignment

(1) The immediate action limits for isolated defects in alignment are set out in the specification referenced in Appendix T, Index [12.1]. Isolated defects shall not exceed the limits of wavelength range D1.

(2) The immediate action limits for isolated defects in alignment for speeds of more than 300 km/h are an open point.

4.2.8.2. The immediate action limit for longitudinal level

(1) The immediate action limits for isolated defects in longitudinal level are set out in the specification referenced in Appendix T, Index [12.2]. Isolated defects shall not exceed the limits of wavelength range D1.

(2) The immediate action limits for isolated defects in longitudinal level for speeds of more than 300 km/h are an open point.

4.2.8.3. The immediate action limit for track twist

(1) The immediate action limit for track twist as an isolated defect is given as a zero to peak value. Track twist is set out in the specification referenced in Appendix T, Index [13.1]

(2) The track twist limit is a function of the measurement base applied in accordance with the specification referenced in Appendix T, Index [12.3].

(3) The infrastructure manager shall set out in the maintenance plan the base-length on which it will measure the track in order to check compliance with this requirement. The base-length of measurement shall include at least one base between 2 and 5 m.

4.2.8.4. The immediate action limit of track gauge as an isolated defect

(1) The immediate action limits of track gauge as an isolated defect are set out in Table 12.

Table 12

Immediate action limits of track gauge

Speed [km/h]	Dimensions [mm]	
	Minimum track gauge	**Maximum track gauge**
v ≤ 120	1 426	1 470
120 < v ≤ 160	1 427	1 470
160 < v ≤ 230	1 428	1 463
v > 230	1 430	1 463

(2) This provision has been left intentionally blank

4.2.8.5. The immediate action limit for Cant

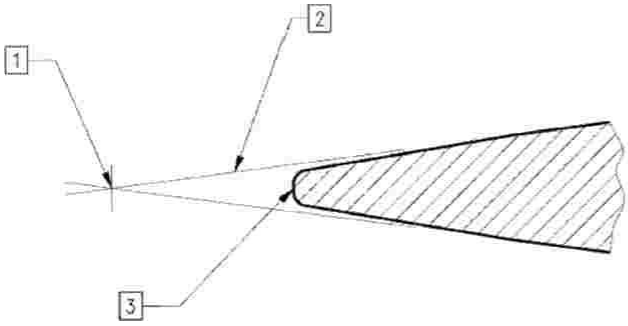
(1) The maximum Cant allowed in service is 180 mm.

(2) The maximum Cant allowed in service is 190 mm for dedicated passenger traffic lines.

4.2.8.6. The immediate action limits for switches and crossings

Figure 2

Point retraction in fixed common crossings



1 Intersection point (IP)

2 Theoretical reference line

3 Actual point (RP)

(1) The technical characteristics of switches and crossings shall comply with the following in-service values:

(a) Maximum value of free wheel passage in switches: 1 380 mm.

This value can be increased if the infrastructure manager demonstrates that the actuation and locking system of the switch is able to resist the lateral impact forces of a wheelset.

(b) Minimum value of fixed nose protection for common crossings: 1 392 mm.

This value is measured 14 mm below the running surface, and on the theoretical reference line, at an appropriate distance back from the actual point (RP) of the nose as indicated in Figure 2.

For crossings with point retraction, this value can be reduced. In this case the infrastructure manager shall demonstrate that the point retraction is sufficient to guarantee that the wheel will not hit the nose at the actual point (RP).

(c) Maximum value of free wheel passage at crossing nose: 1 356 mm.

(d) Maximum value of free wheel passage at check rail/wing rail entry: 1 380 mm.

(e) Minimum flangeway width: 38 mm.

(f) Minimum flangeway depth: 40 mm.

(g) Maximum height of check rail: 70 mm.

(2) All relevant requirements for switches and crossings are also applicable to other technical solutions using switch rails, for example side modifiers used in multi-rail track.

Note: There is a UK specific case relevant to point 4.2.8.6 for GB (see point 7.7.17.5).

4.2.9. Platforms

(1) The requirements of this point are only applicable to passenger platforms where trains are intended to stop in normal service.

(2) For the requirements of this point it is permissible to design platforms required for the current service requirement provided provision is made for the reasonably foreseeable future service requirements. When specifying the interfaces with trains intended to stop at the platform, consideration shall be given to both the current service requirements and the reasonably foreseeable service requirements at least 10 years following the bringing into service of the platform.

4.2.9.1. Usable length of platforms

The usable length of a platform shall be defined according to point 4.2.1.

4.2.9.2. Platform height

(1) The nominal platform height shall be 550 mm or 760 mm above the running surface for radii of 300 m or more.

(2) For smaller radii the nominal platform height may be adjusted depending on the platform offset to minimise the stepping distance between the train and the platform.

(3) For platforms where only passenger trains that are explicitly listed as excluded from the scope of the LOC&PAS NTSN in its point 1.1 are intended to stop in normal service, different provisions for the nominal platform height might apply.

Note: There are UK specific cases relevant to point 4.2.9.2 for GB (see point 7.7.17.6, and for HS2 infrastructure see point 7.7.20.8).

4.2.9.3. Platform offset

(1) The distance between the track centre and the platform edge parallel to the running plane (b_q), as defined in the specification referenced in Appendix T, Index [3.5], shall be set on the basis of the installation limit gauge (b_{qlim}). The installation limit gauge shall be calculated on the basis of the gauge G1.

(2) The platform shall be built close to the gauge within a maximum tolerance of 50 mm. The value for b_q shall therefore respond to:

$b_{qlim} \leq b_q \leq b_{qlim} + 50$ mm.

Note: There is a UK specific case relevant to point 4.2.9.3 for GB (see point 7.7.17.7, and for HS2 infrastructure see point 7.7.20.9).

4.2.9.4. Track layout alongside platforms

(1) Track adjacent to the platforms for new lines shall preferably be straight, but shall nowhere have a radius of less than 300 m.

(2) No values are specified for an existing track alongside new, renewed or upgraded platforms.

4.2.10. Health, safety and environment

4.2.10.1. Maximum pressure variations in tunnels and underground structures

(1) Any new, renewed or upgraded tunnel or underground structure in the categories described in Table 12A has to ensure that the maximum pressure variation, caused by the passage of a train running at the maximum allowed speed in the tunnel or underground structure, does not exceed 10 kPa during the time taken for the train to pass through the tunnel or underground structure.

Table 12A

Methods applicable for the full conformity assessment of tunnels and underground structures

Design speed of the tunnel or underground structure *v* [km/h]	**Length [m]**	**Methods**
Any	$L_{tu} \leq 100$	No requirement
$200 < v$	$100 < L_{tu} \leq 12{,}000$ m	Assessment of maximum pressure change according to 6.2.4.12
$200 > v$	$100 < L_{tu} \leq 12{,}000$ m	No requirement
Any	$L_{tu} > 12{,}000$	Specific investigations

(2) The requirement of point (1) has to be fulfilled along the outside of any train complying with the LOC&PAS NTSN.

4.2.10.2. Effect of crosswinds

(1) A line is interoperable from the crosswind point of view if safety is ensured for a reference train running along that line under the most critical operational conditions.

(2) The rules for proving conformity shall take into account the characteristic wind curves of the reference trains defined in the LOC&PAS NTSN.

(3) If safety cannot be achieved without mitigating measures, either due to the geographic situation or to other specific features of the line, the

infrastructure manager shall take the necessary measures to maintain the safety, for example by:

— locally reducing train speeds, possibly temporarily during periods at risk of storms,

— installing equipment to protect the track section concerned from cross winds,

— other appropriate means.

(4) It shall be demonstrated that safety is achieved after measures taken.

4.2.10.3. Aerodynamic effect on ballasted track

(1) The aerodynamic interaction between rolling stock and infrastructure may cause the lifting and further blowing away of ballast stones from the track bed in plain line and switches and crossings (Ballast pick up). This risk shall be mitigated.

(2) The requirements for the infrastructure subsystem aimed at mitigating the risk for "ballast pick up" apply only to lines intended to be operated at speed greater than 250 km/h.

(3) The requirements of point (2) above are an open point.

4.2.11. Provision for operation

4.2.11.1. Location markers

Location markers shall be provided at nominal intervals along the track of not more than 1 000 m.

4.2.11.2. Equivalent conicity in service

(1) If ride instability is reported, the railway undertaking and the infrastructure manager shall localise the section of the line in a joint investigation according paragraphs (2) and (3) hereafter.

Note: This joint investigation is also specified in point 4.2.3.4.3.2 of NTSN LOC & PAS for action on rolling stock.

(2) The infrastructure manager shall measure the track gauge and the railhead profiles at the site in question at a distance of approximate 10 m. The mean equivalent conicity over 100 m shall be calculated by modelling with the wheelsets (a) – (d) mentioned in paragraph 4.2.4.5(4) of this NTSN in order to

check for compliance, for the purpose of the joint investigation, with the limit equivalent conicity for the track specified in Table 14.

Table 14

Equivalent conicity in service limit values for the track (for the purpose of joint investigation)

Speed range [km/h]	Maximum value of mean equivalent conicity over 100 m
v ≤ 60	assessment not required
60 < v ≤ 120	0,40
120 < v ≤ 160	0,35
160 < v ≤ 230	0,30
v > 230	0,25

(3) If the mean equivalent conicity over 100 m complies with the limit values in Table 14, a joint investigation by the railway undertaking and the infrastructure manager shall be undertaken to specify the reason for the instability.

Note: There is a UK specific case relevant to point 4.2.11.2 for GB (see point 7.7.17.8).

4.2.12. Fixed installations for servicing trains

4.2.12.1. General

This point 4.2.12 sets out the infrastructure elements of the maintenance subsystem required for servicing trains.

4.2.12.2. Toilet discharge

Fixed installations for toilet discharge shall be compatible with the characteristics of the retention toilet system specified in the LOC & PAS NTSN.

4.2.12.3. Train external cleaning facilities

(1) Where a washing plant is provided it shall be able to clean the outer sides of single or double-deck trains between a height of:

(a) 500 to 3 500 mm for a single-deck train,

(b) 500 to 4 300 mm for double-deck trains.

(2) The washing plant shall be designed so that trains can be driven through it at any speed between 2 km/h and 5 km/h.

4.2.12.4. Water restocking

(1) Fixed equipment for water restocking shall be compatible with the characteristics of the water system specified in the LOC & PAS NTSN.

(2) Fixed equipment for drinking water supply on the interoperable network shall be supplied with drinking water meeting the requirements of Council Directive 98/83/EC[2].

4.2.12.5. Refuelling

Refuelling equipment shall be compatible with the characteristics of the fuel system specified in the LOC & PAS NTSN.

4.2.12.6. Electrical shore supply

Where provided, electrical shore supply shall be by means of one or more of the power supply systems specified in the LOC & PAS NTSN.

4.3. FUNCTIONAL AND TECHNICAL SPECIFICATION OF THE INTERFACES

From the standpoint of technical compatibility, the interfaces of the infrastructure subsystem with the other subsystems are like described in the following points.

2 Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption. Implemented by the Natural Mineral Water, Spring Water and Bottled Drinking Water (England) Regulations 2007, the Water Supply (Water Quality) Regulations 2016 No 614 and the Private Water Supplies (England) Regulations 2016 No 618. This EU legislation is EU derived domestic legislation under section 2 of the European Union (Withdrawal) Act 2018, and has been amended under that Act by the Food (Amendment) (England) (EU Exit) Regulations 2019 and the Floods and Water (Amendment etc.) (EU Exit) Regulations 2019.

4.3.1. Interfaces with the rolling stock subsystem

Table 15

Interfaces with the subsystem 'Rolling stock - locomotives and passenger'

Interface	Reference in INF NTSN	Reference in LOC & PAS NTSN
Track gauge	4.2.4.1 Nominal track gauge 4.2.5.1 Design geometry of switches and crossings 4.2.8.6 The immediate action limits for switches and crossings	4.2.3.5.2.1 Mechanical and geometrical characteristics of wheelset 4.2.3.5.2.3 Variable gauge wheelsets
Gauge	4.2.3.1 Structure gauge 4.2.3.2 Distance between track centres 4.2.3.5 Minimum radius of vertical curve 4.2.9.3 Platform offset	4.2.3.1 Gauging
Axle load and axle spacing	4.2.6.1 Track resistance to vertical loads 4.2.6.3 Lateral track resistance 4.2.7.1 Resistance of new bridges to traffic loads 4.2.7.2 Equivalent vertical loading for new geotechnical structures, earthworks and earth pressure effects 4.2.7.4 Resistance of existing structures (bridges, geotechnical structures and earthworks) to traffic loads	4.2.2.10 Load conditions and weighed mass 4.2.3.2.1 Axle load parameter
Running characteristics	4.2.6.1 Track resistance to vertical loads 4.2.6.3 Lateral track resistance 4.2.7.1.4 Nosing forces	4.2.3.4.2.1 Limit values for running safely 4.2.3.4.2.2 Track loading limit values
Ride stability	4.2.4.4 Equivalent conicity	4.2.3.4.3 Equivalent conicity

Interface	Reference in INF NTSN	Reference in LOC & PAS NTSN
	4.2.4.6 Railhead profile for plain line 4.2.11.2 Equivalent conicity in service	4.2.3.5.2.2 Mechanical and geometrical characteristics of wheels
Longitudinal actions	4.2.6.2 Longitudinal track resistance 4.2.7.1.5 Actions due to traction and braking (longitudinal loads)	4.2.4.5 Braking performance
Minimum horizontal curve radius	4.2.3.4 Minimum radius of horizontal curve	4.2.3.6 Minimum curve radius Annex A, A.1 Buffers
Running dynamic behaviour	4.2.4.3 Cant deficiency	4.2.3.4.2 Running dynamic behaviour
Maximum deceleration	4.2.6.2 Longitudinal track resistance 4.2.7.1.5 Actions due to traction and braking	4.2.4.5 Braking performance
Aerodynamic effect	4.2.3.2 Distance between track centres 4.2.7.3 Resistance of new structures over or adjacent to tracks 4.2.10.1 Maximum pressure variations in tunnels and underground structures 4.2.10.3 Aerodynamic effect on ballasted track	4.2.6.2.1 Slipstream effects on passengers on platforms and on trackside workers 4.2.6.2.2 Head pressure pulse 4.2.6.2.3 Maximum pressure variations in tunnels 4.2.6.2.5 Aerodynamic effect on ballasted tracks
Crosswind	4.2.10.2 Effect of crosswinds	4.2.6.2.4 Crosswind
Installations for servicing trains	4.2.12.2 Toilet discharge 4.2.12.3 Train external cleaning facilities 4.2.12.4 Water restocking 4.2.12.5 Refuelling	4.2.11.3 Toilet discharge system 4.2.11.2.2 Exterior cleaning through a washing plant

Interface	Reference in INF NTSN	Reference in LOC & PAS NTSN
	4.2.12.6 Electric shore supply	4.2.11.5 Interface for water refilling 4.2.11.7 Refuelling equipment 4.2.11.6 Special requirements for stabling of trains

Table 16

Interfaces with the subsystem 'Rolling stock – freight wagons

Interface	Reference in INF NTSN	Reference in WAG NTSN
Track gauge	4.2.4.1 Nominal track gauge 4.2.4.6 Railhead profile for plain line 4.2.5.1 Design geometry of switches and crossings 4.2.8.6 The immediate action limits for switches and crossings	4.2.3.6.2 Characteristics of wheelsets 4.2.3.6.3 Characteristics of wheels
Gauge	4.2.3.1 Structure gauge 4.2.3.2 Distance between track centres 4.2.3.5 Minimum radius of vertical curve 4.2.9.3 Platform offset	4.2.3.1 Gauging
Axle load and axle spacing	4.2.6.1 Track resistance to vertical loads 4.2.6.3 Lateral track resistance 4.2.7.1 Resistance of new bridges to traffic loads 4.2.7.2 Equivalent vertical loading for new geotechnical structures, earthworks and earth pressure effects 4.2.7.4 Resistance of existing structures (bridges, geotechnical structures and earthworks) to traffic loads	4.2.3.2 Compatibility with load carrying capacity of lines
Running dynamic behaviour	4.2.8 Immediate action limits on track geometry defects	4.2.3.5.2 Running dynamic behaviour

Interface	Reference in INF NTSN	Reference in WAG NTSN
Longitudinal actions	4.2.6.2 Longitudinal track resistance 4.2.7.1.5 Actions due to traction and braking (longitudinal loads)	4.2.4.3.2 Brake performance
Minimum curve radius	4.2.3.4 Minimum radius of horizontal curve	4.2.2.1 Mechanical interface
Vertical curve	4.2.3.5 Minimum radius of vertical curve	4.2.3.1 Gauging

4.3.2. Interfaces with the energy subsystem

Table 17

Interfaces with the energy subsystem

Interface	Reference in INF NTSN	Reference in ENE NTSN
Gauge	4.2.3.1 Structure gauge	4.2.10 Pantographs gauge

4.3.3. Interfaces with the control command and signalling subsystem

Table 18

Interfaces with the control command and signalling subsystem

Interface	Reference in INF NTSN	Reference in CCS NTSN
Structure gauge set for CCS installations. Visibility of track-side CCS objects.	4.2.3.1 Structure gauge	4.2.5.2 Eurobalise communication (space for installation) 4.2.5.3 Euroloop communication (space for installation) 4.2.10 Train detection systems (space for installation) 4.2.15 Visibility of track-side control-command and signalling objects

4.3.4. Interfaces with the operation and traffic management subsystem

Table 19

Interfaces with the operation and traffic management subsystem

Interface	Reference in INF NTSN	Reference in OPE NTSN
Ride stability	4.2.11.2 Equivalent conicity in service	4.2.3.4.4 Operational quality
Use of eddy current brakes	4.2.6.2 Longitudinal track resistance	4.2.2.6.2 Braking performance
Crosswinds	4.2.10.2 Effect of crosswinds	4.2.3.6.3 Contingency arrangements
Operating rules	4.4 Operating rules	4.2.1.2.2.2 Modifications to information contained in the route book 4.2.3.6 Degraded operation
Staff competences	4.6 Professional competences	4.2.11 General requirements

4.4. OPERATING RULES

(1) Operating rules are developed within the procedures described in the infrastructure manager's safety management system. These rules take into account the documentation related to operation which forms a part of the technical file as required in regulation 17(2)(a) of and Schedule 4 to the Railways (Interoperability) Regulations 2011.

(2) In certain situations involving pre-planned works, it may be necessary to temporarily suspend the specifications of the infrastructure subsystem and its interoperability constituents defined in sections 4 and 5 of this NTSN.

4.5. MAINTENANCE RULES

(1) Maintenance rules are developed within the procedures described in the infrastructure manager's safety management system.

(2) The maintenance file shall be prepared before placing a line into service as the part of the technical file accompanying the declaration of verification

(3) The maintenance plan shall be drawn up for the subsystem to ensure that the requirements set out in this NTSN are maintained during its lifetime.

4.5.1. Maintenance file

A maintenance file shall contain at least:

(a) a set of values for immediate action limits,

(b) the measures taken (for example speed restriction, repair time) when prescribed limits are not met,

related to track geometric quality and limits on isolated defects.

4.5.2. Maintenance plan

The infrastructure manager shall have a maintenance plan containing the items listed in point 4.5.1 together with at least the following:

(a) a set of values for intervention limits and alert limits,

(b) a statement about the methods, professional competences of staff and personal protective safety equipment necessary to be used,

(c) the rules to be applied for the protection of people working on or near the track,

(d) the means used to check that in-service values are respected,

(e) the measures taken, for speed greater than 250 km/h, to mitigate the risk of ballast pick up.

4.6. PROFESSIONAL QUALIFICATIONS

The professional qualifications of staff required for operation and maintenance of the infrastructure subsystem are not set out in this NTSN but are described in the infrastructure manager's safety management system.

4.7. HEALTH AND SAFETY CONDITIONS

(1) The health and safety conditions of staff required for the operation and maintenance of the infrastructure subsystem shall be compliant with the relevant national legislation.

(2) The issue is covered by the procedures described in the infrastructure manager's safety management system.

5. INTEROPERABILITY CONSTITUENTS

5.1. BASIS ON WHICH INTEROPERABILITY CONSTITUENTS HAVE BEEN SELECTED

(1) The requirements of point 5.3 are based on a traditional design of ballasted track with Vignole (flat-bottom) rail on concrete or wooden sleepers and fastening providing resistance to longitudinal slip by bearing on the rail foot.

(2) Components and subassemblies used for the construction of other designs of track are not considered to be interoperability constituents.

5.2. LIST OF CONSTITUENTS

(1) For the purposes of this technical specification for interoperability, only the following elements, whether individual components or subassemblies of the track are declared to be 'interoperability constituents':

(a) the rail (5.3.1),

(b) the rail fastening systems (5.3.2),

(c) track sleepers (5.3.3).

(2) The following points describe the specifications applicable to each of these constituents.

(3) Rails, fastenings and sleepers used for short length of track for specific purposes, for example in switches and crossings, at expansion devices, transition slabs and special structures, are not considered to be interoperability constituents.

5.3. CONSTITUENTS PERFORMANCES AND SPECIFICATIONS

5.3.1. The rail

The specifications of the 'rail' interoperability constituent concern the following parameters:

(a) railhead profile,

(b) rail steel.

5.3.1.1. Railhead profile

The rail head profile shall fulfil the requirements of point 4.2.4.6 ‘Railhead profile for plain line’.

5.3.1.2. Rail steel

(1) The rail steel is relevant to the requirements of point 4.2.6 ‘Track resistance to applied loads’.

(2) The rail steel shall meet the following requirements:

(a) The rail hardness shall be at least 200 HBW.

(b) The tensile strength shall be at least 680 MPa.

(c) Minimum number of cycles at fatigue test without failure shall be at least 5×10^6.

5.3.2. The rail fastening systems

(1) The rail fastening system is relevant to the requirements of point 4.2.6.1 for ‘Track resistance to vertical loads’, point 4.2.6.2 for ‘Longitudinal track resistance’ and point 4.2.6.3 for ‘Lateral track resistance’.

(2) The rail fastening system shall comply in laboratory test conditions with the following requirements:

(a) the longitudinal force required to cause the rail to begin to slip (i.e. move in an inelastic way) through a single rail fastening assembly shall be at least 7 kN and for speeds of more than 250 km/h shall be at least 9 kN,

(b) the rail fastening shall resist application of 3,000,000 cycles of the typical load applied in a sharp curve, such that the change in performance of the fastening system shall not exceed:

— 20 % in terms of clamping force,

— 25 % in terms of vertical stiffness,

— a reduction of more than 20 % in terms of longitudinal restraint.

The typical load shall be appropriate to:

— the maximum axle load the rail fastening system is designed to accommodate,

— the combination of rail, rail inclination, rail pad and type of sleepers with which the fastening system may be used.

5.3.3. Track sleepers

(1) Track sleepers shall be designed such that when they are used with a specified rail and rail fastening system they will have properties that are consistent with the requirements of point 4.2.4.1 for 'Nominal track gauge', point 4.2.4.7 for 'Rail inclination' and point 4.2.6 for 'Track resistance to applied loads'.

(2) For the nominal track gauge system of 1435 mm, the design track gauge for track sleepers in straight alignments and in horizontal curves with radius greater than 300 m shall be 1437 mm.

6. ASSESSMENT OF CONFORMITY OF INTEROPERABILITY CONSTITUENTS AND UK VERIFICATION OF THE SUBSYSTEMS

Modules for the procedures for assessment of conformity and suitability for use and UK verification are defined in Article 3 of this NTSN.

6.1. INTEROPERABILITY CONSTITUENTS

6.1.1. Conformity assessment procedures

(1) The conformity assessment procedure of interoperability constituents as defined in section 5 of this NTSN shall be carried out by application of the relevant modules.

(2) Serviceable interoperability constituents that are suitable for reuse are not subject to the conformity assessment procedures.

6.1.2. Application of modules as set out in the Modules NTSN

(1) The following modules for conformity assessment of interoperability constituents are used:

(a) CA 'Internal production control'

(b) CB 'UK type examination'

(c) CC 'Conformity to type based on internal production control'

(d) CD ‘Conformity to type based on quality management system of the production process’

(e) CF ‘Conformity to type based on product verification’

(f) CH ‘Conformity based on full quality management system’

(2) The modules for conformity assessment of interoperability constituents shall be chosen from those shown in Table 20.

Table 20

Modules for conformity assessment to be applied for interoperability constituents

Procedures	**Rail**	**Rail fastening system**	**Track sleepers**
		CA or CH	
Placed on the UK market	CB + CC or CB + CD or CB + CF or CH		

(3) In the case of products placed on the UK market before the 12 December 2014, the type is considered to have been approved and therefore UK type examination (module CB) is not necessary, provided that the manufacturer demonstrates that tests and verification of interoperability constituents have been considered successful for previous applications under comparable conditions and are in conformity with the requirements of the INF TSI 1299/2014/EU. In this case these assessments shall remain valid in the new application. If it is not possible to demonstrate that the solution is positively proven in the past, the procedure for interoperability constituents placed on the GB market after publication of this NTSN applies.

(4) The conformity assessment of interoperability constituents shall cover the phases and characteristics as indicated in Table 36 of Appendix A to this NTSN.

6.1.3. Innovative solutions for interoperability constituents

If an innovative solution is proposed for an interoperability constituent, the procedure described in Summary subsection 7 ‘Exemptions from this NTSN’ shall apply.

6.1.4. UK declaration of conformity for interoperability constituents

6.1.4.1. Interoperability constituents subject to other requirements

(1) Regulation 25(4) of the Railways (Interoperability) Regulations 2011 states that if an interoperability constituent is subject to other requirements in any enactment or rule of law, a person may only draw up a UK declaration of conformity or suitability for use if satisfied that the interoperability constituent meets those other requirements and the person must state in the declaration that the interoperability constituent meets those other requirements;

(2) in accordance with point 3(e) of Schedule 8 to the Railways (Interoperability) Regulations 2011, the UK declaration of conformity or suitability for use shall include a list of restrictions or conditions of use.

6.1.4.2. UK declaration of conformity for rails

No statement setting out the conditions of use is required.

6.1.4.3. UK declaration of conformity for rail fastening systems

The UK declaration of conformity shall be accompanied by statement setting out:

(a) the combination of rail, rail inclination, rail pad and type of sleepers with which the fastening system may be used

(b) the maximum axle load the rail fastening system is designed to accommodate.

6.1.4.4. UK declaration of conformity for track sleepers

The UK declaration of conformity shall be accompanied by statement setting out:

(a) the combination of rail, rail inclination and type of rail fastening system with which the sleeper may be used,

(b) the nominal and design track gauge,

(c) the combinations of axle load and train speed the track sleeper is designed to accommodate.

6.1.5. Particular assessment procedures for interoperability constituents

6.1.5.1. Assessment of rails

Assessment of rail steel shall be done according to the following requirements:

(a) Rail hardness shall be tested for position RS in accordance with the specification referenced in Appendix T, Index [7.2].

(b) Tensile strength shall be tested in accordance with the specification referenced in Appendix T, Index [7.3].

(c) Fatigue test shall be done in accordance with the specification referenced in Appendix T, Index [7.4].

6.1.5.2. Assessment of sleepers

(1) Not used.

(2) For polyvalent gauge and multiple gauge track sleepers it is allowed not to assess the design track gauge for the nominal track gauge of 1 435 mm.

6.2. INFRASTRUCTURE SUBSYSTEM

6.2.1. General provisions

(1) At the request of the applicant, the approved body carries out the UK verification of the infrastructure subsystem in accordance with Schedule 4 to the Railways (Interoperability) Regulations 2011 and in accordance with the provisions of the relevant modules.

(2) If the applicant demonstrates that tests or assessments of an infrastructure subsystem or parts of the subsystem are the same as have been successful for previous applications of a design, the approved body shall consider the results of these tests and assessments for the UK verification.

(3) The UK verification of the infrastructure subsystem shall cover the phases and characteristics indicated in Table 37 in Appendix B to this NTSN.

(4) Performance parameters as set out in point 4.2.1 of this NTSN are not subject to the UK verification of the subsystem.

(5) Particular assessment procedures for specific basic parameters of infrastructure subsystem are set out in point 6.2.4.

(6) The applicant shall draw up the UK declaration of verification for the infrastructure subsystem in accordance with regulations 16 and 17 and Schedule 5 to the Railways (Interoperability) Regulations 2011.

6.2.2. Application of modules

For the UK verification procedure of the infrastructure subsystem, the applicant may choose either:

(a) Module SG: UK verification based on unit verification, or

(b) Module SH1: UK verification based on full quality management system plus design examination.

6.2.2.1. Application of module SG

In the case where UK verification is most effectively undertaken by using information collected by the infrastructure manager, contracting entity or the main contractors involved (for example data obtained using track recording vehicle or other measuring devices), the approved body shall take this information into account to assess conformity.

6.2.2.2. Application of module SH1

The SH1 module may be chosen only where the activities contributing to the proposed subsystem to be verified (design, manufacturing, assembling, installation) are subject to a quality management system for design, production, final product inspection and testing, approved and surveyed by an approved body.

6.2.3. Innovative solutions

If an innovative solution is proposed for the infrastructure subsystem, the procedure described in Summary subsection 7 ‘Exemptions from this NTSN’ shall apply.

6.2.4. Particular assessment procedures for infrastructure subsystem

6.2.4.1. Assessment of Structure gauge

(1) Assessment of structure gauge as a design review shall be done against characteristic cross sections using the results of calculations made by infrastructure manager or the contracting entity on the basis of the specification referenced in Appendix T, Index [3.3].

(2) Characteristic cross sections are:

(a) track without Cant,

(b) track with maximum Cant,

(c) track with a civil engineering structure over the line

(d) any other location where the designed installation limit gauge is approached by less than 100 mm or the installation nominal gauge or uniform gauge is approached by less than 50 mm.

(3) After assembly before putting into service clearances shall be verified at locations where the designed installation limit gauge is approached by less than 100 mm or the installation nominal gauge or uniform gauge is approached by less than 50 mm.

Note: There is a UK specific case relevant to point 6.2.4.1 (see point 7.7.17.9).

6.2.4.2. Assessment of distance between track centres

(1) A design review for assessment of the distance between track centres shall be done using the results of calculations made by the Infrastructure Manager or the contracting entity on the basis of . The nominal distance between track centres shall be checked at the line layout where distances are given in parallel to the horizontal plane. The limit installation distance between track centres shall be checked with the radius and relevant Cant.

(2) After assembly before putting into service, distance between track centres shall be verified at critical locations where the limit installation distance between track centres as defined in accordance with the specification referenced in Appendix T, Index [3.4] is approached by less than 50 mm.

Note: There is a UK specific case relevant to point 6.2.4.2 (see point 7.7.17.10).

6.2.4.3. Assessment of nominal track gauge

(1) Assessment of the nominal track gauge at design review shall be done by checking the self-declaration of the applicant.

(2) Assessment of the nominal track gauge at assembly before putting into service shall be done by checking the interoperability constituent sleeper's certificate. For non-certified interoperability constituents assessment of the nominal track gauge shall be done by checking the self-declaration of the applicant.

6.2.4.4. Assessment of track layout

(1) At design review the curvature, Cant, Cant deficiency and abrupt change of Cant deficiency shall be assessed against the local design speed.

(2) Assessment of switches and crossings layout is not required.

(3) At assembly before putting into service, for the review of the minimum horizontal curve the measurement values provided by the applicant or infrastructure manager shall be assessed. Rules for acceptance of works defined by the infrastructure manager shall be taken into account.

6.2.4.5. Assessment of Cant deficiency for trains designed to travel with higher Cant deficiency

Point 4.2.4.3(2) states that 'It is permissible for trains specifically designed to travel with higher Cant deficiency (for example multiple units with lower axle loads; vehicles with special equipment for the negotiation of curves) to run with higher Cant deficiency values, subject to a demonstration that this can be achieved safely'. This demonstration is outside the scope of this NTSN and thus not subject to an approved body verification of the infrastructure subsystem. The demonstration shall be undertaken by the RU, if necessary in cooperation with the IM.

6.2.4.6. Assessment of design values for equivalent conicity

Assessment of design values for equivalent conicity shall be done using the results of calculations made by the infrastructure manager or the contracting entity on the basis of the specification referenced in Appendix T, Index [5.2].

6.2.4.7. Assessment of railhead profile

(1) The design profile of new rails shall be checked against point 4.2.4.6.

(2) Reused serviceable rails shall not be subject to the requirements for railhead profile as set out in point 4.2.4.6.

6.2.4.8. Assessment of switches and crossings

Assessment of switches and crossings related to points 4.2.5.1 to 4.2.5.3 shall be done by checking that a self-declaration of the infrastructure manager or contracting entity exists.

6.2.4.9. Assessment of new structures, geotechnical structures, earthworks and earth pressure effects

(1) Assessment of new structures shall be done by checking the traffic loads and the track twist limit used for design against the minimum requirements of points 4.2.7.1 and 4.2.7.3. The approved body is not required to review the design nor carry out any calculations. When reviewing the value of factor alpha used in the design according to point 4.2.7.1 it is only necessary to check that the value of factor alpha satisfies Table 11.

(2) Assessment of new geotechnical structures, earthworks and earth pressure effects shall be done by checking the vertical loads used for design according to requirements of point 4.2.7.2. When reviewing the value of factor alpha used in the design according to point 4.2.7.2 it is only necessary to check that the value of factor alpha satisfies Table 11. The approved body is not required to review the design nor carry out any calculations.

6.2.4.10. Assessment procedure of existing structures

(1) The assessment of existing structures against the requirements of point 4.2.7.4 (3) (b) and (c) shall be done by one of the following methods (a), (b) or (c) and additionally method (d) for dynamic loading using the HSLM or additionally (e) for alternative dynamic loading:

(a) A check that the values of EN line categories, in combination with the allowed speed published, or intended to be published, for the lines containing the structures, are in line with the requirements of Appendix E,

(b) A check that the values of EN line categories, in combination with the allowed speed specified for the structures or for the assessment or design, or for bridges the alternative requirements specified with LM71 and factor alpha (α) for P1 and P2), are in line with the requirements of Appendix E,

(c) A check the traffic loads specified for the assessment or the design of existing structures against the minimum requirements of points 4.2.7.1.1, 4.2.7.1.2 and 4.2.7.2. When reviewing the value of factor alpha (α) in accordance with points 4.2.7.1.1 and 4.2.7.2, it is only necessary to check that the value of factor alpha (α) is in line with the value of factor alpha (α) set out in Table 11.

(d) Where the requirement for an existing bridge is specified by reference to the design load model HSLM in Appendix E, the assessment of the existing bridge shall be done by one of the following methods:

— checking the specification of the design of the existing bridge,

— checking the specification of the dynamic appraisal,

— checking the published load carrying capacity of the existing bridge in the register of infrastructure (RINF) for the parameter 1.1.1.1.2.4.2 (Compliance of structures with the High Speed Load Model (HSLM))

(e) Where the requirement for an existing bridge is specified by reference to alternative dynamic loading requirements (Appendix E note 8), the assessment of the existing bridge shall be done by checking the specification of the dynamic appraisal for these alternative loading requirements against the requirements in Appendix E note 8.

(2) It is not required to review the design nor carry out any calculations.

(3) For existing structures assessment point 4.2.7.4(4) applies respectively.

6.2.4.11. Assessment of platform offset

(1) Assessment of the distance between the track centre and the platform edge as a design review shall be done using the results of calculations made by the Infrastructure Manager or the contracting entity on the basis of the specification referenced in Appendix T, Index [3.5].

(2) After assembly before putting into service clearances shall be verified. The offset is checked at the ends of the platform and every 30 m in straight track and every 10 m in curved track.

Note: There is a UK specific case relevant to point 6.2.4.11 (see point 7.7.17.11).

6.2.4.12. Assessment of maximum pressure variations in tunnels and underground structures

(1) Assessment of the maximum pressure variation in the tunnel or underground structure (10 kPa criterion) shall be done in accordance with the specification referenced in Appendix T, Index [14.3] with the trains complying with the LOC & PAS NTSN and that are able to run at the design speed in the specific tunnel or underground structure to be assessed.

(2) The input parameters to be used during the assessment shall be such that the reference characteristic pressure signature of the trains set out in the LOC & PAS NTSN is fulfilled.

(3) The reference cross section areas are set out in the specification referenced in Appendix T, Index [14.4] and taken as 10 m^2 for the GB mainline railway.

(4) The assessment may take into account construction features which reduce the pressure variation if any, as well as the tunnel length.

(5) The pressure variations due to atmospheric or geographical conditions can be neglected.

6.2.4.13. Assessment of effect of crosswinds

This demonstration of the safety is outside the scope of this NTSN and thus not subject to an approved body verification. The demonstration shall be undertaken by the infrastructure manager, if necessary in cooperation with the railway undertaking.

6.2.4.14. Assessment of fixed installations for servicing trains

This NTSN does not cover assessment of fixed installations for servicing trains. Those responsible for such installations should have regard to any requirements contained in any other enactment or rule of law in relation to such assessments.

6.2.4.15. Assessment of compatibility with braking systems

The assessment of the requirements laid down in point 4.2.6.2.2(2) is not required.

6.2.5. Technical solutions giving presumption of conformity at design stage

Presumption of conformity at design stage for technical solutions may be assessed prior and independent from a specific project.

6.2.5.1. Assessment of track resistance for plain line

(1) The demonstration of conformity of the track to the requirements of point 4.2.6 may be done by reference to an existing track design which meets the operating conditions intended for the subsystem concerned.

(2) A track design shall be defined by the technical characteristics as set out in Appendix C.1 to this NTSN and by its operating conditions as set out in Appendix D.1 to this NTSN.

(3) A track design is considered to be existing, if both of the following conditions are met:

(a) the track design has been in normal operation for at least one year and

(b) the total tonnage over the track was at least 20 million gross tons for the period of normal operation.

(4) The operating conditions for an existing track design refer to conditions which have been applied in normal operation.

(5) The assessment to confirm an existing track design shall be performed by checking that the technical characteristics as set out in Appendix C.1 to this NTSN and conditions of use as set out in Appendix D.1 to this NTSN are specified and that the reference to the previous use of the track design is available.

(6) When a previously assessed existing track design is used in a project, the approved body shall only assess that the conditions of use are respected.

(7) For new track designs that are based on existing track designs, a new assessment can be performed by verifying the differences and evaluating their impact on the track resistance. This assessment may be supported for example by computer simulation or by laboratory or in situ testing.

(8) A track design is considered to be new, if at least one of the technical characteristics set out in Appendix C to this NTSN or one of conditions of use set out in Appendix D to this NTSN is changed.

6.2.5.2. Assessment for switches and crossing

(1) The provisions as set out in point 6.2.5.1 are applicable for the assessment of track resistance for switches and crossings. Appendix C.2 sets out the technical characteristics of switches and crossings design and Appendix D.2 sets out the conditions of use of switches and crossings design.

(2) Assessment of design geometry of switches and crossings shall be done according to point 6.2.4.8 of this NTSN.

(3) Assessment of maximum unguided length of fixed obtuse crossings shall be done according to point 6.2.4.8 of this NTSN.

6.3. UK VERIFICATION WHEN SPEED IS USED AS A MIGRATION CRITERION

(1) Point 7.5 allows a line to be put into service at a lower speed than the ultimate intended speed. This point sets out requirements for UK verification in this case.

(2) Some limiting values set out in section 4 depend on the intended speed of the route. Conformity should be assessed at the intended ultimate speed;

however it is permissible to assess speed dependant characteristics at the lower speed at the time of placing in service.

(3) The conformity of the other characteristics for the ultimate intended speed of the route remains valid.

(4) To declare the interoperability at this ultimate intended speed, it is only necessary to assess the conformity of the characteristics temporarily not respected, when they are brought up to the required level.

6.4. ASSESSMENT OF MAINTENANCE FILE

(1) In accordance with Schedule 4 of the Railways (Interoperability Regulations 2011, the applicant shall be responsible for compiling the technical file, containing the documentation requested for maintenance.

(2) The Approved Body shall verify only that the documentation requested for maintenance, as set out in point 4.5.1, is provided. The Approved Body is not required to verify the information contained in the documentation provided.

6.5. SUBSYSTEMS CONTAINING INTEROPERABILITY CONSTITUENTS NOT HOLDING AN UK DECLARATION

The circumstances in which it is permissible to rely on an EC declaration of conformity rather than a UK declaration of conformity to place an interoperability constituent on the UK market and any relevant additional assessment requirements are set out in Part 3 and regulation 47A of the Railways (Interoperability) Regulations 2011 and in the NTSN concerning the further assessment of interoperability constituents which hold an EC declaration of conformity or suitability for use.

6.5.1. Conditions

(1) Until the list of interoperability constituents listed in Chapter 5 of this NTSN are revised, an approved body is allowed to issue a UK certificate of verification for a subsystem even if some of the interoperability constituents incorporated within the subsystem are not covered by the relevant EC or UK declarations of conformity and/or suitability for use according to this NTSN (or relevant TSIs), if the following criteria are complied with:

(a) the conformity of the subsystem has been checked against the requirements of section 4 and in relation to sections 6.2 to 7 (except point 7.7 ‘Specific Cases’) of this NTSN by the approved body.

Furthermore, the conformity of the ICs to section 5 and 6.1 does not apply, and

(b) the interoperability constituents, which are not covered by the relevant EC or UK declaration of conformity and/or suitability for use, have been used in a subsystem already approved and put in service in at least one of the Member States of the EU or the UK before the 1 January 2015.

(2) UK declarations of conformity and/or suitability for use shall not be drawn up for the interoperability constituents assessed in this manner.

6.5.2. Documentation

(1) The UK certificate of verification of the subsystem shall indicate clearly which interoperability constituents have been assessed by the approved body as part of the subsystem verification.

(2) The UK declaration of verification of the subsystem shall indicate clearly:

(a) Which interoperability constituents have been assessed as part of the subsystem;

(b) Confirmation that the subsystem contains the interoperability constituents identical to those verified as part of the subsystem;

(c) For those interoperability constituents, the reason(s) why the manufacturer did not provide an EC or UK Declaration of conformity and/or suitability for use before its incorporation into the subsystem, including the application of national technical rules or national technical rules notified under Article 17 of Directive 2008/57/EC[3].

6.5.3. Maintenance of the subsystems certified according to 6.5.1.

(1) During and after the transition period and until the subsystem is upgraded or renewed (taking into account the decision of the Competent Authority on application of the NTSNs), the interoperability constituents which do not hold an EC or UK Declaration of conformity and/or suitability for use and are of the same type are allowed to be used as maintenance related replacements

3 Directive 2008/57/EC of the European Parliament and of the Council of on the interoperability of the rail system within the Community. Implemented by the Railways (Interoperability) Regulations 2011. The EU legislation is EU derived domestic legislation under section 2 of the European Union (Withdrawal) Act 2018, and it has been amended under that Act by the Railways (Interoperability) (Amendment) (EU Exit) Regulations 2019 SI (2019/345) to make amendments to EU legislation as a result of the UK's exit from the EU.

(spare parts) for the subsystem, under the responsibility of the body responsible for maintenance.

(2) In any case the body responsible for maintenance must ensure that the components for maintenance related replacements are suitable for their applications, are used within their area of use and enable interoperability to be achieved within the rail system while at the same time meeting the essential requirements. Such components must be traceable and certified in accordance with any national or international rule or any code of practice widely acknowledged in the railway domain.

6.6. SUBSYSTEM CONTAINING SERVICEABLE INTEROPERABILITY CONSTITUENTS THAT ARE SUITABLE FOR REUSE

6.6.1. Conditions

(1) An approved body is allowed to issue a UK certificate of verification for a subsystem even if some of the interoperability constituents incorporated within the subsystem are serviceable interoperability constituents that are suitable for reuse, if the following criteria are complied with:

(a) the conformity of the subsystem has been checked against the requirements of section 4 and in relation to sections 6.2 to 7 (except point 7.7 'Specific Cases') of this NTSN by the approved body. Furthermore the conformity of the ICs to 6.1 does not apply, and

(b) the interoperability constituents are not covered by the relevant EC or UK declaration of conformity and/or suitability for use.

(2) UK declarations of conformity and/or suitability for use shall not be drawn up for the interoperability constituents assessed in this manner.

6.6.2. Documentation

(1) The UK certificate of verification of the subsystem shall indicate clearly which interoperability constituents have been assessed by the approved body as part of the subsystem verification.

(2) The UK declaration of verification of the subsystem shall indicate clearly:

(a) Which interoperability constituents are serviceable interoperability constituents that are suitable for reuse;

(b) Confirmation that the subsystem contains the interoperability constituents identical to those verified as part of the subsystem.

6.6.3. Use of serviceable interoperability constituents in maintenance

(1) Serviceable interoperability constituents that are suitable for reuse are allowed to be used as maintenance related replacements (spare parts) for the subsystem, under the responsibility of the body responsible for maintenance.

(2) In any case the body responsible for maintenance must ensure that the components for maintenance related replacements are suitable for their applications, are used within their area of use, and enable interoperability to be achieved within the rail system while at the same time meeting the essential requirements. Such components must be traceable and certified in accordance with any national or international rule, or any code of practice widely acknowledged in the railway domain.

7. IMPLEMENTATION OF THE INFRASTRUCTURE NTSN

As referred to in Article 2, the UK has published an implementation plan.

7.1. APPLICATION OF THIS NTSN TO RAILWAY LINES

Sections 4 to 6 and any specific provisions in points 7.2 to 7.6 here below apply in full to the lines within the geographical scope of this NTSN, which will be placed in service as interoperable lines after this NTSN is published.

7.2. APPLICATION OF THIS NTSN TO A NEW INFRASTRUCTURE SUBSYSTEM

(1) For a new infrastructure subsystem, the application of this NTSN shall be compulsory.

(2) A ‘new infrastructure subsystem’ means an infrastructure subsystem placed into service after this NTSN enters into force which creates a route or a part of a route where none currently exists.

Any other infrastructure subsystems shall be considered as ‘existing infrastructure subsystems’.

(3) The following cases are considered as upgrading and not as the placing into service of a new infrastructure subsystem :

(a) the realignment of part of an existing route,

(b) the creation of a bypass,

(c) the addition of one or more tracks on an existing route, regardless of the distance between the original tracks and the additional tracks.

7.3. APPLICATION OF THIS NTSN TO AN EXISTING INFRASTRUCTURE SUBSYSTEM

7.3.1. Upgrading of a line

(1) In accordance with regulation 2 of the Railways (Interoperability) Regulations 2011, “upgrading” means any major modification work on a subsystem or part of it which results in a change in the technical file accompanying the “EC” or “UK” declaration of verification, if that technical file exists, and which improves the overall performance of the subsystem.

(2) The infrastructure subsystem of a line is considered to be upgraded in the context of this NTSN when at least the performance parameters axle load or gauge, as defined in point 4.2.1 are improved in order to meet the requirements of another traffic code.

(3) In accordance with regulation 2 of the Railways (Interoperability) Regulations 2011, “renewal” means any major substitution work on a subsystem or part of it which does not change the overall performance of the subsystem.

(4) For this purpose, major substitution should be interpreted as a project undertaken to systematically replace elements of a line or a section of a line. Renewal differs from a substitution in the framework of maintenance, referred to in point 7.3.3 below, since it gives the opportunity to achieve an NTSN compliant line. A renewal is the same case as upgrading, but without a change in performance parameters.

(5) The scope of the upgrading or renewal of the infrastructure subsystem may cover the entire subsystem on a given line or only certain parts of the subsystem. According to regulation 13 of the Railways (Interoperability) Regulations 2011, at the request of the applicant, the Competent Authority shall examine the project and decide whether a new authorisation for placing in service is needed.

(6) Where a new authorisation is required, parts of the infrastructure subsystem falling under the scope of the upgrading or renewal shall comply with this NTSN and shall be subject to the procedure established in regulation 17 of and Schedule 4 to the Railways (Interoperability) Regulations 2011, unless a permission for non-application of NTSN is granted according to regulation 14 of the Railways (Interoperability) Regulations 2011.

(7) Where a new authorisation for placing in service is not required, compliance with this NTSN is recommended.

7.3.2. *This provision has been left intentionally blank*

7.3.3. Substitution in the framework of maintenance

(1) Where the parts of a subsystem on a line are maintained, the formal verification and authorisation for placing into service is not required in accordance with this NTSN. However, maintenance replacements should be, as far as it is reasonably practicable, undertaken in accordance with the requirements of this NTSN.

(2) The objective should be that maintenance replacements progressively contribute the development of an interoperable line.

(3) In order to bring progressively an important part of the infrastructure subsystem in a process towards interoperability, the following group of basic parameters should be adapted together:

(a) Line layout,

(b) Track parameters,

(c) Switches and crossings,

(d) Track resistance to applied loads,

(e) Bridges, resistance to traffic loads

(f) Geotechnical structures and earthworks resistance to traffic loads,

(g) Platforms.

(4) In such cases, it is noted that each of the above elements taken separately cannot ensure compliance of the whole subsystem. The conformity of a subsystem can only be stated when all the elements are compliant with the NTSN.

7.3.4. *This provision has been intentionally left blank*

7.3.5. Route compatibility checks before the use of authorised vehicles

The route compatibility check is carried out in accordance with point 4.2.2.5 of the OPE NTSN.

7.4. NOT USED

7.5. SPEED AS AN IMPLEMENTATION CRITERION

(1) It is permissible to bring a line into service as an interoperable line at a lower speed than its intended ultimate line speed. However, when it is the case the line should not be constructed in a way that inhibits future adoption of the intended ultimate line speed.

(2) For example the distance between track centres shall be suitable for the intended ultimate line speed but the Cant will need to be appropriate to the speed at the time the line is brought into service.

(3) Requirements for assessment of conformity in this case are set out in section 6.3.

7.6. *This provision has been left intentionally blank*

7.7. UK SPECIFIC CASES

The following UK specific cases may be applied on particular networks. The UK specific cases are classified as:

(a) '**P' cases**: permanent cases;

(b) **'T' cases**: temporary cases (note that there are no T cases for the UK).

All UK specific cases and their relevant dates shall be re-examined in the course of future revisions of the NTSN with a view to limiting their technical and geographical scope based on an assessment of their impact on safety, interoperability, cross border services, and the practical and economic impacts of retaining or eliminating them.

UK Specific cases shall be limited to the route or network where they are strictly necessary and taken account of through route compatibility procedures.

7.7.1. This provision has been left intentionally blank

7.7.2. This provision has been left intentionally blank

7.7.3. *This provision has been left intentionally blank*

7.7.4. *This provision has been left intentionally blank*

7.7.5. *This provision has been left intentionally blank*

7.7.6. *This provision has been left intentionally blank*

7.7.7. *This provision has been left intentionally blank*

7.7.8. *This provision has been left intentionally blank*

7.7.9. *This provision has been left intentionally blank*

7.7.10. *This provision has been left intentionally blank*

7.7.11. *This provision has been left intentionally blank*

7.7.12. *This provision has been left intentionally blank*

7.7.13. *This provision has been left intentionally blank*

7.7.14. *This provision has been left intentionally blank*

7.7.15. *This provision has been left intentionally blank*

7.7.16. *This provision has been left intentionally blank*

7.7.17. Particular features on the network for Great Britain

7.7.17.1. NTSN categories of line (4.2.1)

P cases

(1) Where line speeds are stated in kilometres per hour [km/h] as a category or performance parameter in this NTSN, it shall be allowed to translate the speed to equivalent miles per hour [mph] as in Appendix G, for the United Kingdom national network in Great Britain.

(2) Instead of the column ‘Gauge’ in Table 2 and Table 3 of point 4.2.1(7), for the gauge of all lines except new, dedicated high speed lines of traffic code P1, it shall be allowed to use national technical rules.

7.7.17.2. Structure gauge (4.2.3.1)

P cases

Instead of point 4.2.3.1, for national gauges selected according to point 7.7.17.1(2), the structure gauge shall be set according to national technical rules.

7.7.17.3. Distance between track centres (4.2.3.2)

P cases

(1) Instead of point 4.2.3.2, the nominal distance between track centres shall be 3 400 mm on straight track and curved track with a radius of 400 m or greater.

(2) Where topographical constraints prevent a nominal distance of 3 400 mm between track centres being achieved, it is permissible to reduce the distance between track centres provided special measures are put in place to ensure a safe passing clearance between trains.

(3) Reduction in the distance between track centres shall be in accordance with national technical rules.

7.7.17.3.bis Equivalent conicity (4.2.4.5)

P cases

(a) Instead of point 4.2.4.5.(3) design values of track gauge, rail head profile and rail inclination for plain line shall be selected to ensure that the equivalent conicity limits set out in Table 32 are not exceeded

Table 32

Equivalent conicity design limit values

	Wheel profile	
Speed range [km/h]	**S1002, GV1/40**	**EPS**
v ≤ 60	Assessment not required	
60 < v ≤ 200	0,25	0,30
200 < v ≤ 280	0,20	0,20
v > 280	0,10	0,15

(b) Instead of point 4.2.4.5. (4) the following wheelsets shall be modelled passing over the designed track conditions (simulated by calculation according to EN 15302:2021):

(a) S 1002 as defined in Annex C of EN 13715:2020 with SR1.

(b) S 1002 as defined in Annex C of EN 13715:2020 with SR2.

(c) GV 1/40 as defined in Annex B of EN 13715:2020 with SR1.

(d) GV 1/40 as defined in Annex B of EN 13715:2020 with SR2.

(e) EPS as defined in Annex D of EN 13715:2020 with SR1.

For SR1 and SR2 the following values apply:

(f) For the 1 435 mm track gauge system SR1 = 1 420 mm and SR2 = 1 426 mm.

7.7.17.4. Maximum unguided length of fixed obtuse crossings (4.2.5.3)

P cases

Instead of point 4.2.5.3, the design value of the maximum unguided length of fixed obtuse crossing shall be in accordance with national technical rules.

7.7.17.5. The immediate action limits for switches and crossings (4.2.8.6)

P cases

Instead of point 4.2.8.6(1)(b), for the 'CEN56 Vertical' design of switches and crossings, a minimum value of fixed nose protection for common crossings of 1 388 mm is allowed (measured 14 mm below the running surface, and on the theoretical

reference line, at an appropriate distance back from the actual (RP) of the nose as indicated in Figure 2).

7.7.17.6. Platform height (4.2.9.2)

P cases

Instead of point 4.2.9.2, for platform height, national technical rules shall be allowed.

7.7.17.7. Platform offset (4.2.9.3)

P cases

Instead of point 4.2.9.3, for platform offset, national technical rules shall be allowed.

7.7.17.8. Equivalent conicity in service (4.2.11.2)

P cases

Instead of point 4.2.11.2.(2) the infrastructure manager shall measure the track gauge and the railhead profiles at the site in question at a distance of approximate 10 m. The mean equivalent conicity over 100 m shall be calculated by modelling with the wheelsets (a) – (e) mentioned in paragraph 7.7.17.3(2) of this NTSN in order to check for compliance, for the purpose of the joint investigation, with the limit equivalent conicity for the track specified in Table 14.

7.7.17.9. Assessment of structure gauge (6.2.4.1)

P cases

Instead of point 6.2.4.1, it shall be allowed to assess structure gauge in accordance with national technical rules.

7.7.17.10. Assessment of distance between track centres (6.2.4.2)

P cases

Instead of point 6.2.4.2, it shall be allowed to assess distance between track centres in accordance with national technical rules.

7.7.17.11. Assessment of platform offset (6.2.4.11)

Instead of point 6.2.4.11, it shall be allowed to assess platform offset in accordance with national technical rules.

7.7.18. *This provision has been left intentionally blank.*

7.7.19. *This provision has been left intentionally blank.*

7.7.20. Particular features of the High Speed Two (HS2) infrastructure

Points 7.7.20.1 to 7.7.20.9 apply to HS2 infrastructure only.

7.7.20.1. NTSN Categories of Line (4.2.1)

P Cases

In point 4.2.1.(7), Table 2, the maximum line speed for traffic code P1 is 360 km/h.

7.7.20.2. Requirements for Basic Parameters (4.2.2.2)

P Cases

In point 4.2.2.2(2), instead of the values of basic parameters specified being only valid up to a maximum line speed of 350 km/h, they shall be only valid up to a maximum line speed of 360 km/h for HS2 infrastructure.

7.7.20.3. Distance between track centres (4.2.3.2)

P Cases

Instead of point 4.2.3.2(2), for HS2 infrastructure, the nominal horizontal distance between track centres for new lines shall be specified for the design and shall not be smaller than the values from Table 32A; it considers margins for aerodynamic effects.

Table 32A

Minimum nominal horizontal distance between track centres

Maximum allowed speed [km/h]	Minimum nominal horizontal distance between track centres [m]
160 < v ≤ 200	3,80
200 < v ≤ 250	4,00
250 < v ≤ 300	4,20
300 < v ≤ 350	4,50
350 < v ≤ 360	4,70

7.7.20.4. Compatibility with braking systems (4.2.6.2.2)

P Cases

For the HS2 infrastructure, point 4.2.6.2.2 shall not apply.

7.7.20.5. Allowance for dynamic effects of vertical loads (4.2.7.1.2)

P Cases

In point 4.2.7.1.2, the following sub-points (4) and (5) shall be added for HS2 infrastructure:

(4) The allowances for dynamic effects in BS EN 1991-2:2003/AC:2020 Cl.6.4.4 to Cl6.4.6 are valid for Maximum Permitted Vehicle Speeds up to 360 km/h and the limit of applicability in BS EN 1991-2:2003/AC:2010 Cl.6.4.3(5) shall be disregarded.

(5) For a bridge for speed over 200 km/h, instead of (2), a dynamic analysis shall be carried out. The bridge shall additionally be designed for HSLM defined in EN1991-2:2003/AC:2010 Cl 6.4.6.1.1 (3) to (6) and the individual train loading defined in 4.2.7.1.2 (3).

7.7.20.6. Design track twist due to rail traffic actions (4.2.7.1.6)

P Cases

For the HS2 infrastructure, the maximum total design track twist due to rail traffic actions shall not exceed the values set out in point A2.4.4.2.2(2) of EN 1990:2002/A1:2005 for design speeds up to 300 km/h and a value of 1.2mm over a 3m length for design speeds over 300 km/ h.

7.7.20.7. Resistance of new structures over or adjacent to tracks (4.2.7.3)

P Cases

For the HS2 infrastructure, the aerodynamic actions from passing trains shall be calculated in accordance with point 6.1.3 of BS EN 14067-4:2013+a1:2018 with an air density of 1.25kg/m^3.

7.7.20.8. Platform height (4.2.9.2)

P Cases

Instead of point 4.2.9.2, the nominal platform height shall be compliant with the relevant national technical rules.

7.7.20.9. Platform offset (4.2.9.3)

P Cases

Instead of point 4.2.9.3, the platform offset of HS2 platform shall be compliant with the relevant national technical rules.

Appendix A Assessment of interoperability constituents

The characteristics of the interoperability constituents to be assessed by the approved body or the manufacturer in accordance with the selected module, in the different phases of design, development and production, are marked by 'X' in Table 36. Where no assessment is required, this is marked by 'n.a.' in the table.

There are no particular assessment procedures required for interoperability constituents of the infrastructure subsystem.

Table 36

Assessment of interoperability constituents for the UK declaration of conformity

Characteristics to be assessed	**Assessment in the following phase**			
	Design and development phase			**Production phase Manufacturing process + product test**
	Design review	**Review of manufacturing process**	**Type test**	**Product quality**
5.3.1 The rail				
5.3.1.1 Railhead profile	X	n.a.	X	X
5.3.1.2 Rail steel	X	X	X	X
5.3.2 The rail fastening systems	n.a.	n.a.	X	X
5.3.3 Track sleepers	X	X	n.a.	X

Appendix B Assessment of the infrastructure subsystem

The characteristics of the subsystem to be assessed in the different phases of design, construction and operation are marked by 'X' in Table 37.

Where no assessment by an approved body is required, this is marked by 'n.a.' in the table. This does not prevent the need for other assessments to be performed in the framework of other phases.

Definition of assessment phases:

(1) **'Design review'**: it includes checking of correctness of values/parameters against applicable NTSN requirements related to the final design.

(2) **'Assembly before putting into service'**: checking on site that the actual product or subsystem complies with the relevant design parameters just before putting it into operation.

Column 3 gives references to point 6.2.4 'Particular assessment procedures for subsystem' and to point 6.2.5 'Technical solutions giving presumption of conformity at design stage'.

Table 37

Assessment of the infrastructure subsystem for the UK verification of conformity

Characteristics to be assessed	**New line or upgrading/renewal project**		**Particular assessment procedures**
	Design review	**Assembly before putting into service**	
	1	**2**	**3**
Structure gauge (4.2.3.1)	X	X	6.2.4.1
Distance between track centres (4.2.3.2)	X	X	6.2.4.2
Maximum gradients (4.2.3.3)	X	n.a.	
Minimum radius of horizontal curve (4.2.3.4)	X	X	6.2.4.4
Minimum radius of vertical curve (4.2.3.5)	X	n.a.	6.2.4.4
Nominal track gauge (4.2.4.1)	X	X	6.2.4.3
Cant (4.2.4.2)	X	X	6.2.4.4
Cant deficiency (4.2.4.3)	X	n.a.	6.2.4.4 6.2.4.5
Abrupt change of Cant deficiency (4.2.4.4)	X	n.a.	6.2.4.4
Assessment of design values for equivalent conicity (4.2.4.5)	X	n.a.	6.2.4.6
Railhead profile for plain line (4.2.4.6)	X	n.a.	6.2.4.7
Rail inclination (4.2.4.7)	X	n.a.	

Characteristics to be assessed	New line or upgrading/renewal project		Particular assessment procedures
	Design review	Assembly before putting into service	
	1	2	3
Design geometry of switches and crossings (4.2.5.1)	X	n.a.	6.2.4.8
Use of swing nose crossings (4.2.5.2)	X	n.a.	6.2.4.8
Maximum unguided length of fixed obtuse crossings (4.2.5.3)	X	n.a.	6.2.4.8
Track resistance to vertical loads (4.2.6.1)	X	n.a.	6.2.5
Longitudinal track resistance (4.2.6.2)	X	n.a.	6.2.5 6.2.14.15’
Lateral track resistance (4.2.6.3)	X	n.a.	6.2.5
Resistance of new bridges to traffic loads (4.2.7.1)	X	n.a.	6.2.4.9
Equivalent vertical loading for new geotechnical structures, earthworks and earth pressure effects (4.2.7.2)	X	n.a.	6.2.4.9
Resistance of new structures over or adjacent to tracks (4.2.7.3)	X	n.a.	6.2.4.9
Resistance of existing structures (bridges, geotechnical structures and earthworks) to traffic loads (4.2.7.4)	X	n.a.	6.2.4.10
The immediate action limit for alignment (4.2.8.1)	n.a.	n.a.	
The immediate action limit for longitudinal level (4.2.8.2)	n.a.	n.a.	
The immediate action limit for track twist (4.2.8.3)	n.a.	n.a.	
The immediate action limit of track gauge as an isolated defect (4.2.8.4)	n.a.	n.a.	
The immediate action limit for Cant (4.2.8.5)	n.a	n.a.	

Characteristics to be assessed	New line or upgrading/renewal project		Particular assessment procedures
	Design review	Assembly before putting into service	
	1	2	3
The immediate action limit for switches and crossings (4.2.8.6)	n.a.	n.a.	
Usable length of platforms (4.2.9.1)	X	n.a.	
Platform height (4.2.9.2)	X	X	
Platform offset (4.2.9.3)	X	X	6.2.4.11
Track layout along platforms (4.2.9.4)	X	n.a.	
Maximum pressure variation in tunnels and underground structures (4.2.10.1)	X	n.a.	6.2.4.12
Effect of crosswinds (4.2.10.2)	n.a.	n.a.	6.2.4.13
Location markers (4.2.11.1)	n.a.	n.a.	
Equivalent conicity in service (4.2.11.2)	n.a.	n.a.	
Toilet discharge (4.2.12.2)	n.a.	n.a	6.2.4.14
Train external cleaning facilities (4.2.12.3)	n.a.	n.a.	6.2.4.14
Water restocking (4.2.12.4)	n.a.	n.a.	6.2.4.14
Refuelling (4.2.12.5)	n.a.	n.a.	6.2.4.14
Electric shore supply (4.2.12.6)	n.a.	n.a	6.2.4.14
Application of Interoperability Constituents	n.a.	X	

Appendix C Technical characteristics of track design and switches and crossings design

C.1 Technical characteristics of track design

Track design shall be at least defined by the technical characteristics as follows:

(a) Rail

— Profile(s) & grades

— Continuous welded rail or length of rails (for jointed track sections)

(b) Fastening system

— Type

— Pad stiffness

— Clamping force

— Longitudinal restraint

(c) Sleeper

— Type

— Resistance to vertical loads:

— Concrete: design bending moments

— Wood: compliance with the specification referenced in Appendix T, Index [15.1]

— Steel: moment of inertia of cross section

— Resistance to longitudinal and lateral loads: geometry and weight

— Nominal and design track gauge

(d) Rail inclination

(e) Ballast cross sections (ballast shoulder — ballast thickness)

(f) Ballast type (grading = granulometrie)

(g) Sleeper spacing

(h) Special devices: for example, sleeper anchors, third/fourth rail, …

C.2 Technical characteristics of switches and crossings design

Switches and crossings design shall be at least defined by the technical characteristics as follows:

(a) Rail

— Profile(s) & grades (switch rail, stock rail)

— Continuous welded rail or length of rails (for jointed track sections)

(b) Fastening system

- Type
- Pad stiffness
- Clamping force
- Longitudinal restraint

(c) Bearer

- Type
- Resistance to vertical loads:
  - Concrete: design bending moments
  - Wood: compliance with the specification referenced in Appendix T, Index [15.1]
  - Steel: moment of inertia of cross section
- Resistance to longitudinal and lateral loads: geometry and weight
- Nominal track gauge

(d) Rail inclination

(e) Ballast cross sections (ballast shoulder — ballast thickness)

(f) Ballast type (grading = granulometrie)

(g) Type of crossing (fixed or movable point)

(h) Type of locking (switch pannel, movable point of crossing)

(i) Special devices: for example sleeper anchors, third/fourth rail, …

(j) Generic switches and crossings drawing indicating

- Geometrical diagram (triangle) describing the length of the turnout and the tangents at the end of the turnout
- Main geometrical characteristics like the main radii in switch, closure and crossing panel, crossing angle
- Sleeper spacing

Appendix D Conditions of use of track design and switches and crossings design

D.1 Conditions of use of track design

Conditions of use of track design are defined to be as follows:

(a) Maximum axle load [t]

(b) Maximum line speed [km/h]

(c) Minimum horizontal curve radius [m]

(d) Maximum Cant [mm]

(e) Maximum Cant deficiency [mm]

D.2 Conditions of use of switches and crossings design

Conditions of use of switches and crossings design are defined to be as follows:

(a) Maximum axle load [t]

(b) Maximum line speed [km/h] on through route and diverging track of switches

(c) Rules for curved turnouts based on generic designs, giving minimum curvatures (for through route and diverging track of switches)

Appendix E Capability requirements for existing structures in accordance with traffic code

The minimum capability requirements for existing bridges in accordance with point 4.2.7.4(2) are set out in Table 38A and Table 39A in accordance with the traffic codes given in Table 2 and Table 3. These capability requirements are set out using the vertical loading only defined by the EN line category with a corresponding speed or by LM71 with the factor alpha. Additional dynamic capability requirements are expressed by the dynamic load model HSLM. The EN line category and associated speed shall be considered as a single combined quantity.

The minimum capability requirements for existing geotechnical structures and earthworks in accordance with point 4.2.7.4 (2) are set out in Table 38B and Table 39B in accordance with the traffic codes given in Table 2 and Table 3.EN line categories are a function of axle load and geometrical aspects relating to the spacing of axles and are set out in the specification referenced in Appendix T, Index [2.2] .

For continuous bridges, the case with most onerous effects between Load Model 71 (LM71) and Load Model SW/0 shall be taken into account. LM71, Load Model SW/0 and Load Model HSLM are set out in the specification referenced in Appendix T, Index [10.2], Index [10.3] and Index [10.7] respectively.

Table 38A

Loading capability requirements for bridges and additional requirements due to dynamic effects [(1)] — Passenger traffic

Traffic code	**Traffic with loco hauled trains: Passenger trains including Carriages (Coaches, Vans and Car Carriers) and Light Freight Wagons and Locomotives and Power Heads[(2)(3)(5)(6)(4)]**	**Traffic with Electric or Diesel Multiple Units, Power Units and Railcars [(2)(5)(4)]**
P1	n.a.[(7)]	HSLM [(8)] and D2-200 or HSLM [(8)] and LM71 with α = 1.0[(14)]
P2	HSLM [(8)] and D2-200 or HSLM [(8)] and LM71 with α = 0.91[(14)]	HSLM [(8)] and D2-200 or HSLM [(8)] and LM71 with α = 0.91[(14)]
P3a (> 160 km/h)	L ≥4m D2-100 and L <4m D2-200[(9)(10)(15)]	L ≥4m C2-100 and L <4m C2-200 [(9)(15)]
P3b (≤ 160 km/h)	L ≥4m D2-100 and L <4m D2-160[(9)(11)(15)]	L ≥4m D2-100 and L <4m D2-160 [(9)(15)]
P4a (> 160 km/h)	L ≥4m D2-100 and L <4m D2-200[(9)(12)(15)]	L ≥4m C2-100 and L <4m C2-200 [(9)(15)]
P4b (≤ 160 km/h)	L ≥4m D2-100 and L <4m D2-160[(9)(13)(15)]	L ≥4m C2-100 and L <4m C2-160 [(9)(15)]
P5	C2-120	B1-120

Traffic code	Traffic with loco hauled trains: Passenger trains including Carriages (Coaches, Vans and Car Carriers) and Light Freight Wagons and Locomotives and Power Heads[(2)(3)(5)(6)(4)]	Traffic with Electric or Diesel Multiple Units, Power Units and Railcars [(2)(5)(4)]
P6	a12	
P1520	Open point	
P1600	Open point	

Table 39A

Loading capability requirements for bridges expressed by EN Line Category – Associated Speed [(1)] — Freight traffic

Traffic code	Freight trains including freight wagons, other vehicles and locomotives [(2)]
F1	D4 – 120
F2	D2 – 120
F3	C2 – 100
F4	B2 – 100
F1520	Open point
F1600	Open point

Notes:

(1) The indicated speed value in the tables represents the maximum requirement for the line and may be lower in accordance with the requirements in point 4.2.1(12). When checking individual structures on the line, it is acceptable to take account the local allowed speeds as also indicated in the notes 2 and 3 of Table 2 and in the note 1 of Table 3.

(2) Passenger Carriages (including Coaches, Vans, Car Carriers), Other Vehicles, Locomotives, Power Heads, Diesel and Electric Multiple Units, Power Units and Railcars are defined in the LOC & PAS NTSN. Light Freight Wagons are defined as vans except that they are allowed to be conveyed in formations which are not intended to convey passengers.

(3) The requirements for structures set out using EN line categories or load model LM71 (and additionally for continuous bridges load model SW/0) are compatible with up to two adjacent coupled locomotives and/or power heads. The requirements for structures are compatible with a maximum speed of 120 km/h for three or more adjacent coupled locomotives and/or power heads (or a train of locomotives and/or power heads) subject to the locomotives and/or power heads satisfying the corresponding limits for freight wagons.

(4) For traffic codes P2, P3 and P4 the requirements for both traffic with loco hauled trains and traffic with multiple units shall apply. For traffic code P5 the Competent Authority may indicate whether the requirements for locomotives and power heads apply.

(5) The requirements for structures are compatible with carriages, light freight wagons and electric or diesel multiple units with an average mass per unit length over the length of each vehicle of 2.45 t/m for EN line category A, 2.75 t/m for EN line category B1, 3.1 t/m for EN line category C2 and 3.5 t/m for EN line category D2 (not for P5)

(6) The requirements for structures are compatible with 4 axle locomotive and power heads with a spacing of the axles in a bogie of at least 2.6m and the average mass per unit length over the length of the vehicle of up to 5.0 t/m.

() Taking into account the state of art of operation there is no need to define harmonized requirements to deliver an adequate level of interoperability for this type of vehicles for the traffic code P1.

(8) For P1 and P2 lines, compliance with HSLM in accordance with the specification referenced in Appendix T, Index [10.7] shall be stated (see procedure in point 6.2.4.10 of this NTSN). If HSLM compliance cannot be shown, for the purpose of dynamic compatibility checks set out in accordance with the route compatibility check in the OPE NTSN, the dynamic loading, to which the compatibility with existing bridges should be checked, shall be provided in the documents with the procedure(s) as in RINF parameter 1.1.1.1.2.4.4 (see also procedure in point 6.2.4.10 of this NTSN). When a dynamic analysis has to be undertaken with models based on individual trains, the characteristic value of the loading shall be in accordance with the design mass under normal payload in accordance with Appendix K of this NTSN.

(9) For avoiding excessive dynamic effects including resonance, currently it is not possible to specify harmonized minimum bridge properties to obviate the need for a dynamic appraisal. The dynamic loading from vehicles satisfying the bridge static loading requirements (specified as either a Line Category in accordance with the specification referenced in Appendix T Index [2.3] or in terms of load model LM71) can in a number of cases exceed these normal bridge static loading requirements (when these static loadings are enhanced by normal industry allowances for dynamic factors for bridge recalculation or bridge design). This risk to compatibility between vehicles and bridges is managed by the dynamic compatibility checks undertaken to meet the requirement for a compatibility check set out in the OPE NTSN. When a dynamic analysis has to be undertaken with load models based on individual trains, the characteristic value of the loading for passengers or luggage carrying vehicles shall be in accordance with the design mass under normal payload in accordance with Appendix K to this NTSN.

(10) The requirements for loco hauled passenger trains are valid for carriages and light freight wagons satisfying EN line category A for speeds up to 200 km/h (local allowed speed) or EN line category C2 for speeds up to 160 km/h (local allowed speed).

(11) The requirements for loco hauled passenger trains are valid for carriages and light freight wagons satisfying EN line category C2 for speeds up to 160 km/h (local allowed speed).

(12) The requirements for loco hauled passenger trains are valid for carriages and light freight wagons satisfying line EN category A for speeds up to 200 km/h (local allowed speed) or EN line category B1 for speeds up to 160 km/h (local allowed speed).

(13) The requirements for loco hauled passenger trains are valid for carriages and light freight wagons satisfying EN line category B1 for speeds up to 160 km/h (local allowed speed).

(14) The requirements set out using EN line categories or load model LM71 can be fulfilled either via EN line category with the corresponding speed or with LM71 with the factor alpha in accordance with the specification referenced in Appendix T, Index [10.2] and Index [10.4]. The decision between the two available options, not necessarily the most onerous, is to be made exclusively by the applicant. EN line category with the corresponding speed is based on static loading multiplied by a dynamic amplification factor.

(15) Where the minimum capability requirements for a traffic code given in Table 38A are given for example in the form L>=4m D2-100* and L<4m D2-200** the relevant criteria in accordance with the loaded length L of the bridge element being considered shall be satisfied. EN line category with the corresponding speed is based on static loading multiplied by a dynamic amplification factor.

*For local allowable speeds up to 100km/h the minimum required loading capability is D2 at the local allowable speed. For local allowable speeds exceeding 100km/h the minimum required loading capability is D2 at 100km/h.

** For local allowable speeds up to 200km/h the minimum required loading capability is D2 at the local allowable speed.

Table 38B

Loading capability requirements for geotechnical structures and earthworks [(1) (2)]

Passenger traffic

Traffic code	**Traffic with loco hauled trains: Passenger trains including Carriages (Coaches, Vans and Car Carriers) and Light Freight Wagons and Locomotives and Power Heads**[(3)]	**Traffic with Electric or Diesel Multiple Units, Power Units and Railcars** [(3)]
P1	n.a.[(4)]	D2
P2	D2	D2
P3a (> 160 km/h)	D2	C2
P3b (≤ 160 km/h)	D2	D2
P4a (> 160 km/h)	D2	C2
P4b (≤ 160 km/h)	D2	C2
P5	C2	B1
P6	a12	
P1520	Open point	
P1600	Open point	

Table 39B

Loading capability requirements for geotechnical structures and earthworks

Freight traffic [(2)]

Traffic code	**Freight trains including freight wagons, other vehicles and locomotives** [(2)]
F1	D4
F2	D2

Traffic code	Freight trains including freight wagons, other vehicles and locomotives (2)
F3	C2
F4	B2
F1520	Open point
F1600	Open point

Notes:

(1) The published line categories of the section of line including earthworks shall take account of the local allowed speeds.

(2) Passenger Carriages (including Coaches, Vans, Car Carriers), Other Vehicles, Locomotives, Power Heads, Diesel and Electric Multiple Units, Power Units and Railcars are defined in point 2.2 of the LOC & PAS NTSN. Light Freight Wagons are defined as vans except that they are allowed to be conveyed in formations which are not intended to convey passengers.

(3) For traffic codes P2, P3 and P4 the requirements for both traffic with loco hauled trains and traffic with multiple units shall apply. For traffic code P5 the Competent Authority may indicate whether the requirements for locomotives and power heads apply.

(4) Taking into account the state of art of operation there is no need to define harmonized requirements to deliver an adequate level of interoperability for this type of vehicles for P1 traffic codes.

Appendix F Capability requirements for existing structures according to traffic codes in Great Britain

The minimum capability requirements for existing bridges and geotechnical structures and earthworks in accordance with clause 4.2.7.4 points (2) and (4) are set out in Table 40 and Table 41 in accordance with the traffic codes given in Table 2 and Table 3. These capability requirements are set out using the vertical loading only defined by a combined quantity comprising of the Route Availability number and a corresponding maximum speed. The Route Availability number and associated speed shall be considered as a single combined quantity.

The Route Availability number is a function of axle load and geometrical aspects relating to the spacing of axles. Route Availability numbers are defined in the national technical rules notified for this purpose.

Table 40

Loading capability requirements and additional requirements due to dynamic effects ([1]) ([5])

Passenger traffic

Route Availability number —Associated Speed [miles per hour]

Traffic code	**Passenger Carriages (including Coaches, Vans and Car Carriers) and Light Freight Wagons ([2]) ([3]) ([6])**	**Locomotives and Power Heads ([2]) ([4])**	**Electric or Diesel Multiple Units, Power Units and Railcars ([2]) ([3]) ([6])**
P1	n.a. ([11]) ([12])	n.a. ([11]) ([12])	Open point ([12])
P2	n.a. ([11]) ([12])	n.a. ([11]) ([12])	Open point ([12])
P3a (> 100mph) ([10])	RA1 – 125 RA2 – 90	RA7 – 125 ([7]) RA8 – 110 ([7]) RA8 – 100 ([8]) RA5 – 125 ([9])	Open point ([12])
P3b (≤ 100mph) ([10])	RA1 – 100 RA2 – 90	RA8 – 100 ([8]) RA5 – 100 ([9])	RA3 – 100
P4a (> 100mph) ([10])	RA1 – 125 RA2 – 90	RA7 – 125 ([7]) RA7 – 100 ([8]) RA4 – 125 ([9])	Open point ([12])
P4b (≤ 100mph) ([10])	RA1 – 100 RA2 – 90	RA7 – 100 ([8]) RA4 – 100 ([9])	RA3 – 100
P5	RA1 – 75	RA5 – 75 ([8]) ([10]) RA4 – 75 ([9]) ([10])	RA3 – 75
P6	RA1		
P1600	Open point		

Table 41

Loading capability requirements (1) (5)

Freight traffic

Route Availability number — Associated Speed [miles per hour]

Traffic code	Freight wagons and other vehicles	Locomotives (2) (4) (8)
F1	RA8 – 75	RA7 – 75
F2	RA7 – 75	RA7 – 75
F3	RA5 – 60	RA7 – 60
F4	RA4 – 60	RA5 – 60
F1600	Open point	

(1) The indicated speed value in the table represents the maximum requirement for the line and may be lower in accordance with the requirements in point 4.2.1(12). When checking individual structures on the line, it is acceptable to take account of the type of vehicle, the local allowed speed, Table 2 note 2, Table 2 note 3 and Table 3 note 1.

(2) Passenger Carriages (including Coaches, Vans, Car Carriers), Other Vehicles, Locomotives, Power Heads, Diesel and Electric Multiple Units, Power Units and Railcars are defined in the LOC & PAS NTSN. Light Freight Wagons are defined as vans except that they are allowed to be conveyed in formations which are not intended to convey passengers.

(3) The requirements for structures set out using RA numbers are compatible with Passenger Coaches, Vans, Car Carriers, Light Freight Wagons and vehicles in Diesel and Electric Multiple Units and Power Units with a length of; 18 m to 27,5 m for conventional and articulated vehicles and with a length of 9 m to 14 m for regular single axles.

(4) The requirements for structures are compatible with up to two adjacent coupled locomotives and/or power heads. The requirements for structures are compatible with a maximum speed of 75 mph for up to five adjacent coupled locomotives and/or power heads (or a train of locomotives and/or power heads) subject to the locomotives and/or power heads satisfying the corresponding limits for freight wagons.

(5) When checking the compatibility of individual trains and structures, the basis of the compatibility check shall be in accordance with Appendix K except where modified by the national technical rules notified for this purpose.

(6) The requirements for structures are compatible with an average mass per unit length over the length of each coach/vehicle of 3,0 t/m

(7) Only 4 axle vehicles allowed. The spacing of the axles in a bogie shall be at least 2,6 m. The average mass per unit length over the length of the vehicle shall not exceed 4,6 t/m.

(8) 4 or 6 axle vehicles allowed.

(9) Powerhead, only 4 axle vehicles allowed. Also includes locomotives where difference in length between locomotive and the hauled vehicles is less than 15 % of the length of the hauled vehicles for speeds over 90 mph.

(10) For traffic codes P3 and P4 the requirements for both traffic with loco hauled trains and traffic with Multiple Units shall apply. For traffic code P5 the Competent Authority may indicate whether the requirements for locomotives and power heads apply.

(11) Taking into account the state of art of operation there is no need to define harmonized requirements to deliver an adequate level of interoperability for these types of vehicles for P1 and P2 traffic codes.

(12) For avoiding excessive dynamic effects including resonance, currently it is not possible to specify harmonised minimum bridge properties to obviate the need for a dynamic appraisal. The dynamic loading from vehicles satisfying the bridge static loading requirements specified as either a RA number in accordance with the national technical rule or in

terms of load models LM71 and SW/0 if the option to use these load models in 6.2.4.10(c) is utilised can in a number of cases exceed these normal bridge static loading requirements (when these static loadings are enhanced by normal industry allowances for dynamic factors for bridge recalculation or bridge design). This risk to compatibility between vehicles and bridges is managed by the dynamic compatibility checks in the national procedures for this purpose. When a dynamic analysis has to be undertaken with models based on individual trains, the characteristic value of the loading shall be in accordance with the design mass under normal payload in accordance with Appendix K or the national procedures for this purpose.

Appendix G Speed conversion to miles per hour for Great Britain

Table 42

Speed conversion from [km/h] to [mph]

Speed [km/h]	Speed [mph]
2	1
3	1
5	3
10	5
15	10
20	10
30	20
40	25
50	30
60	40
80	50
100	60
120	75
140	90

Speed [km/h]	Speed [mph]
150	95
160	100
170	105
180	110
190	120
200	125
220	135
225	140
230	145
250	155
280	175
300	190
320	200
350	220

Appendix H *This Appendix has been left intentionally blank.*

Appendix I Not Used

Appendix J Safety assurance over fixed obtuse crossings

The fixed obtuse crossings should be designed in order not to have a too long unguided length. In obtuse crossing check rails cannot be constructed to assure guidance over the whole length. This unguided length can be accepted up to a certain limit, defined by a reference situation defining:

(a) Minimum crossing angle: tangent 1 in 9 ($tg\alpha = 0{,}11$, $\alpha = 6°20'$)

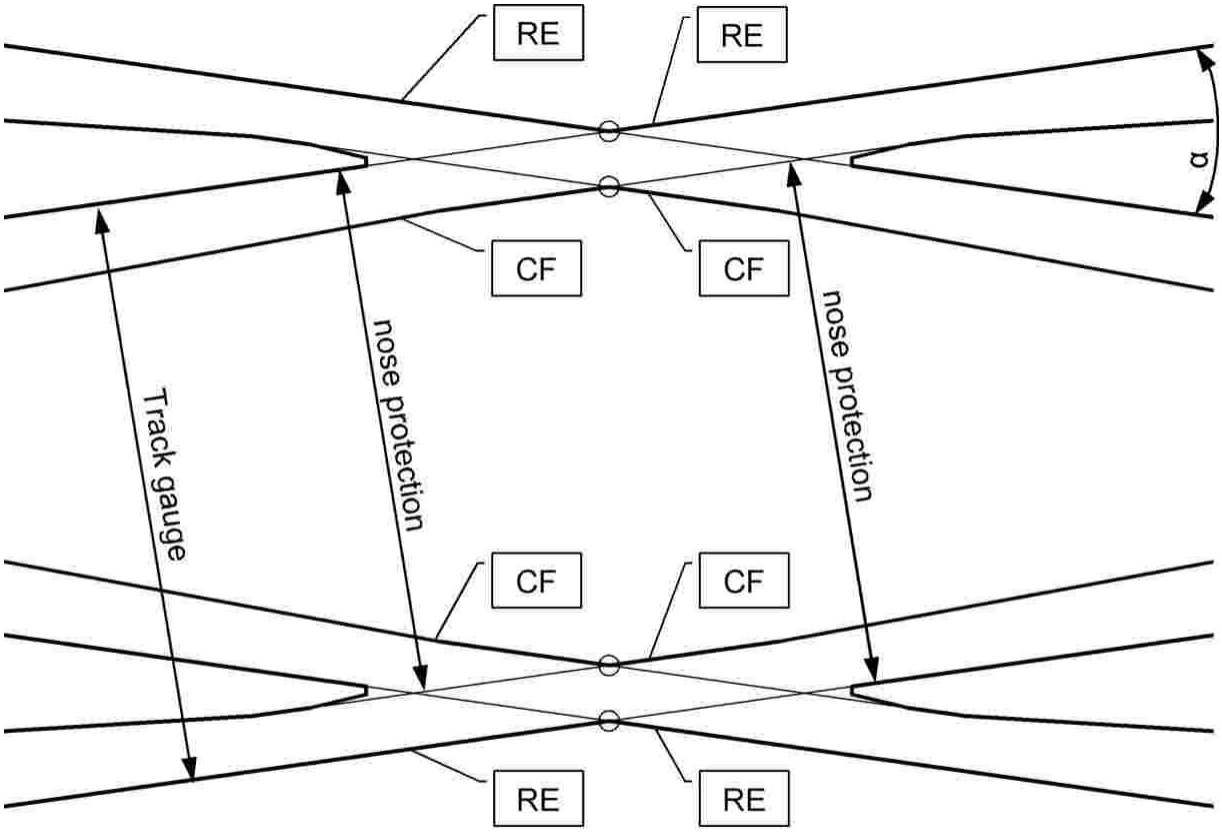
(b) Minimum radius through obtuse crossing: 450 m

(c) Minimum height of check rail: 45 mm

(d) Nose shape as defined in the figure below

Figure 6

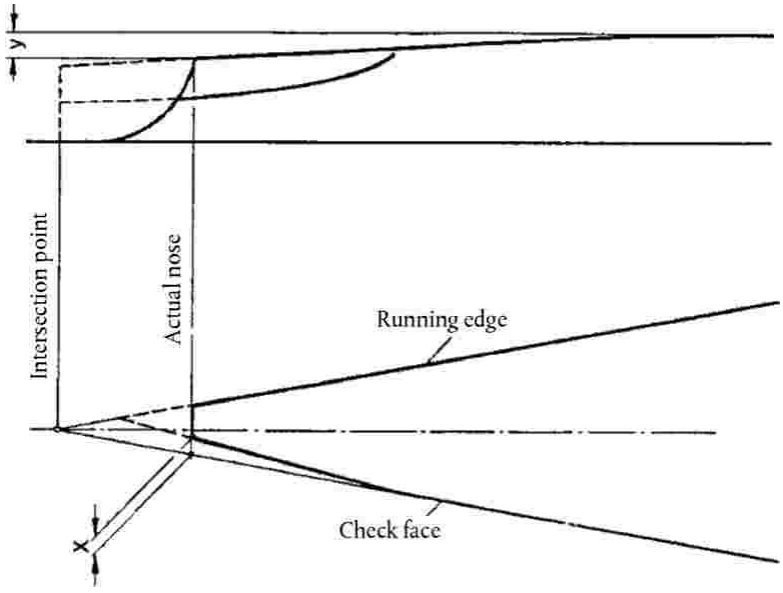
Obtuse crossing



RE = running edge
CF = check face (guiding edge)

Figure 7

Point retraction X on check face



X = 3 mm (over a length of 150 mm).

Y = 8 mm (over a length of 200 to 500 mm approximately)

(J.1) If one or more of the above requirements is not respected, the design shall be checked, verifying either the equivalence of the unguided length or acceptance of the interference between wheel and nose when they get in contact.

The design shall be checked for wheels with diameter between 630 mm and 840 mm. For wheel diameters between 330 mm and 630 mm specific demonstrations are required.

(J.2) The following graphs allow simple verification of unguided length for specific situation with different crossing angles, height of check rail and different crossing curvature.

The graphs consider the following maximum track tolerances:

(a) Track gauge between 1 433 mm and 1 439 mm inclusive

(b) Nose protection between 1 393 mm and 1 398 mm inclusive

(c) Free wheel passage ≤ 1 356 mm

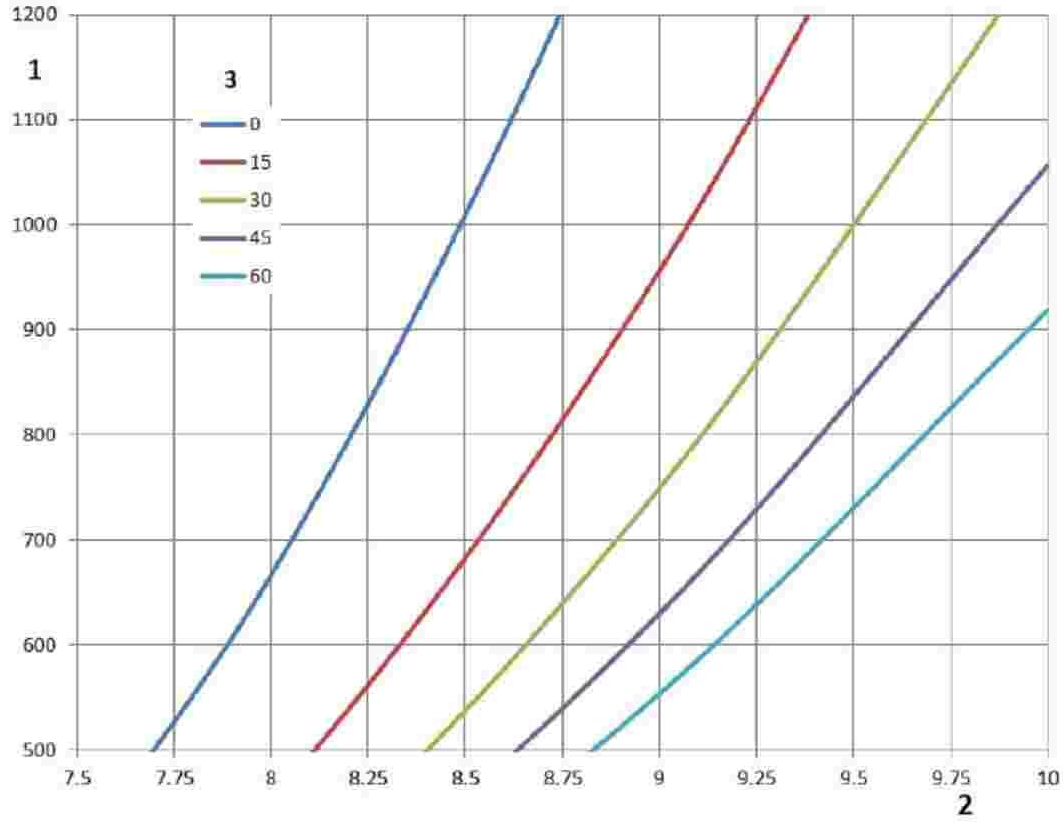
Figure 8 allows to specify the minimum wheel diameter that can run on curved obtuse crossings with a radius of 450 m, Figure 9 allows it for straight obtuse crossings.

For other situations specific calculations can be performed.

(J.3) For track gauge systems other than 1 435 mm, specific calculations shall be performed.

Figure 8

Minimum wheel diameter against crossing angle for 450 m radius of obtuse crossing



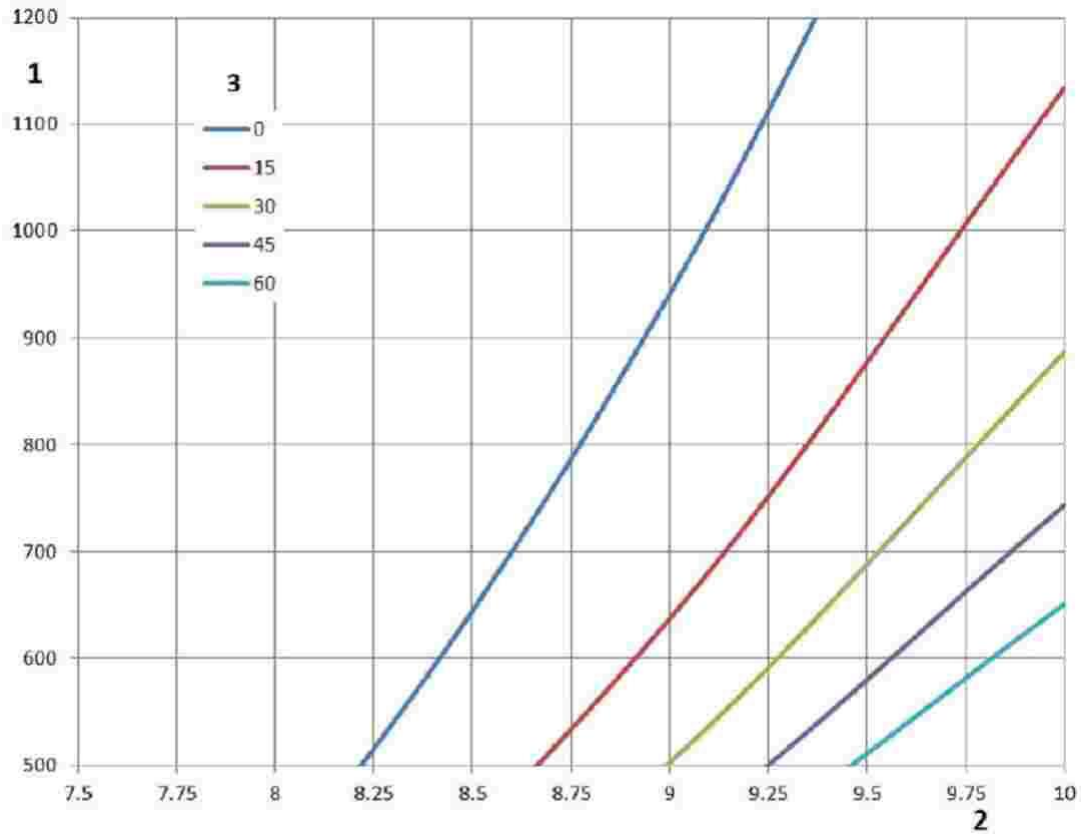
1 Minimum wheel diameter [mm]

2 N for crossing angle tangent 1 in N

3 Height of check rail [mm] (Z3)

Figure 9

Minimum wheel diameter against crossing angle for straight obtuse crossing



1 Minimum wheel diameter [mm]

2 N for crossing angle tangent 1 in N

3 Height of check rail [mm] (Z3)

Appendix K Basis of minimum requirements for structures for passenger carriages and multiple units

The following mass definitions for passenger carriages and multiple units form the basis of the minimum dynamic requirements for structures and checking the compatibility of structures with passenger carriages and multiple units.

Where a dynamic appraisal is required to determine the load carrying capacity of the bridge, the load capacity of the bridge shall be specified and expressed in terms of the design mass under normal payload in accordance with the specification referenced in Appendix T, Index [1.1] taking into account the values for passenger payload in standing areas given in Table 45.

Mass definitions for static compatibility checks are based upon the design mass under exceptional payload established in accordance with the specification referenced in Appendix T Index [1.1], taking into account the national technical rule.

Table 45

Passenger payload in standing areas in kg/m² in accordance with the specification referenced in Appendix T Index [1]

Type of trains	**Normal payload**	
High speed and long distance trains (Appendix T, Index 1.3])	160 ([1])	
High speed and long distance trains Reservation Obligatory (Appendix T, Index 1.3])	0	
Others (regional, commuter, suburban trains) (Appendix T, Index 1.4])	280	

Notes

(1) Normal payload of the specification referenced in Appendix T, Index [1.3] plus an additional 160 kg/m2 for standing areas

Appendix L *Deleted*

Appendix M *This Appendix has been left intentionally blank.*

Appendix N *This Appendix has been left intentionally blank.*

Appendix O *This Appendix has been left intentionally blank.*

Appendix P *This Appendix has been left intentionally blank.*

Appendix Q Not used.

Appendix R List of open points

(1) Immediate action limits for isolated defects in alignment for speeds of more than 300 km/h (4.2.8.1).

(2) Immediate action limits for isolated defects in longitudinal level for speeds of more than 300 km/h (4.2.8.2).

(3) The minimum allowed value of distance between track centres for the uniform structure gauge IRL3 is an open point (7.7.18.2).

(4) EN Line Category — Associated Speed [km/h] for Traffic codes P1520 (all vehicles), P1600 (all vehicles), F1520 (all vehicles) and F1600 (all vehicles) in Appendix E, Tables 38A, 39A, 38B and 39B.

(5) Route Availability Number — Associated Speed [miles/h] for Traffic codes P1 (multiple units), P2 (multiple units), P3a (multiple units), P4a (multiple units), P1600 (all vehicles) and F1600 (all vehicles) in Appendix F, Tables 40 and 41.

(6) This provision has been left intentionally blank

(7) The requirements for mitigating the risk for ballast pick up for speed greater than 250 km/h.

Appendix S Glossary

Table 48

Terms

Defined term	NTSN point	Definition
Actual point (RP)	4.2.8.6	Physical end of a crossing vee. See Figure 2, which shows the relationship between the actual point (RP) and the intersection point (IP).
Alert limit	4.5.2	Refers to the value which, if exceeded, requires that the track geometry condition is analysed and considered in the regularly planned maintenance operations.
Axle load	4.2.1, 4.2.6.1	Sum of the static vertical wheel forces exerted on the track through a wheelset or a pair of independent wheels divided by acceleration of gravity.
Braking systems independent of wheel-rail adhesion conditions	4.2.6.2.2	"Braking systems independent of wheel – rail adhesion conditions" refers to all brake systems of the rolling stock capable to develop a brake force applied to the rails independently of the wheel – rail adhesion conditions (e.g. magnetic braking systems and eddy current braking systems)
Cant	4.2.4.2 4.2.8.5	Difference in height, relative to the horizontal, of the two rails of one track at a particular location, measured at the centrelines of the heads of the rails.
Cant deficiency	4.2.4.3	Difference between the applied Cant and a higher equilibrium Cant.
Common crossing	4.2.8.6	Arrangement ensuring intersection of two opposite running edges of turnouts or diamond crossings and having one crossing vee and two wing rails.
Crosswind	4.2.10.2	Strong wind blowing laterally to a line which may adversely affect the safety of trains running.
Design value	4.2.3.4, 4.2.4.2, 4.2.4.5, 4.2.5.1, 4.2.5.3	Theoretical value without manufacturing, construction or maintenance tolerances.

Defined term	NTSN point	Definition
Design track gauge	5.3.3	A single value which is obtained when all the components of the track conform precisely to their design dimensions or their median design dimension when there is a range.
Distance between track centres	4.2.3.2	The distance between points of the centre lines of the two tracks under consideration, measured parallel to the running surface of the reference track namely the less Canted track.
Dynamic lateral force	4.2.6.3	The sum of dynamic forces exerted by a wheelset on the track in lateral direction.
EN Line Category	4.2.7.4, Appendix E	The result of the classification process set out in the specification referenced in Appendix T, Index [2.4] and referred to in that standard as “Line Category”. It represents the ability of the infrastructure to withstand the vertical loads imposed by vehicles on the line or section of line for regular (“normal”) service.
Equivalent conicity	4.2.4.5, 4.2.11.2	The tangent of the cone angle of a wheelset with coned wheels whose lateral movement has the same kinematic wavelength as the given wheelset on straight track and large-radius curves.
Fixed nose protection	4.2.5.3, Appendix J	Dimension between the crossing nose and check rail (see dimension No 2 on Figure 14).
Flangeway depth	4.2.8.6	Dimension between the running surface and the bottom of flangeway (see dimension No 6 on Figure 14).
Flangeway width	4.2.8.6	Dimension between a running rail and an adjacent check or wing rail (see dimension No 5 on Figure 14).
Free wheel passage at check rail/wing rail entry	4.2.8.6	Dimension between the working face of the crossing check rail or wing rail and the gauge face of the running rail opposite across the gauge measured at entry to check rail or wing rail respectively. (see dimensions No 4 on Figure 14). The entry to the check rail or wing rail is the point at which the wheel is allowed to contact the check rail or wing rail.

Defined term	NTSN point	Definition
Free wheel passage at crossing nose	4.2.8.6	Dimension between the working face of the crossing wing rail and check rail opposite across the gauge (see dimension No 3 on Figure 14).
Free wheel passage in switches	4.2.8.6.	Dimension from the gauge face of one switch rail to the back edge of the opposite switch rail (see dimension No 1 on Figure 14).
Gauge	4.2.1, 4.2.3.1	Set of rules including a reference contour and its associated calculation rules allowing definition of the outer dimensions of the vehicle and the space to be cleared by the infrastructure.
Geotechnical structure	4.2.7.2, 4.2.7.4	A structure that includes ground or a structural member that relies on the ground resistance. Note: Earthworks is a subset of geotechnical structure.
HBW	5.3.1.2	The non SI unit for steel hardness defined in the specification referenced in Appendix T, Index [16.1].
Height of check rail	4.2.8.6, Appendix J	Height of the check rail above the running surface (see dimension 7 on Figure 14 below).
Immediate Action Limit	4.2.8, 4.5	The value which, if exceeded, requires taking measures to reduce the risk of derailment to an acceptable level.
Infrastructure Manager	4.2.5.1, 4.2.8.3, 4.2.8.6, 4.2.11.2 4.4, 4.5.2, 4.6, 4.7, 6.2.2.1, 6.2.4, 6.4	Any body or undertaking that is responsible in particular for establishing and maintaining railway infrastructure. This may also include the management of infrastructure control and safety systems. The functions of the infrastructure manager on a network or part of a network may be allocated to different bodies or undertakings.
In service value	4.2.8.5, 4.2.11.2	Value measured at any time after the infrastructure has been placed into service.
Intersection point (IP)	4.2.8.6	Theoretical intersection point of the running edges at the centre of the crossing (see figure 2).
Intervention Limit	4.5.2	The value, which, if exceeded, requires corrective maintenance in order that the immediate action limit shall not be reached before the next inspection;
Isolated defect	4.2.8	A discrete track geometry fault.

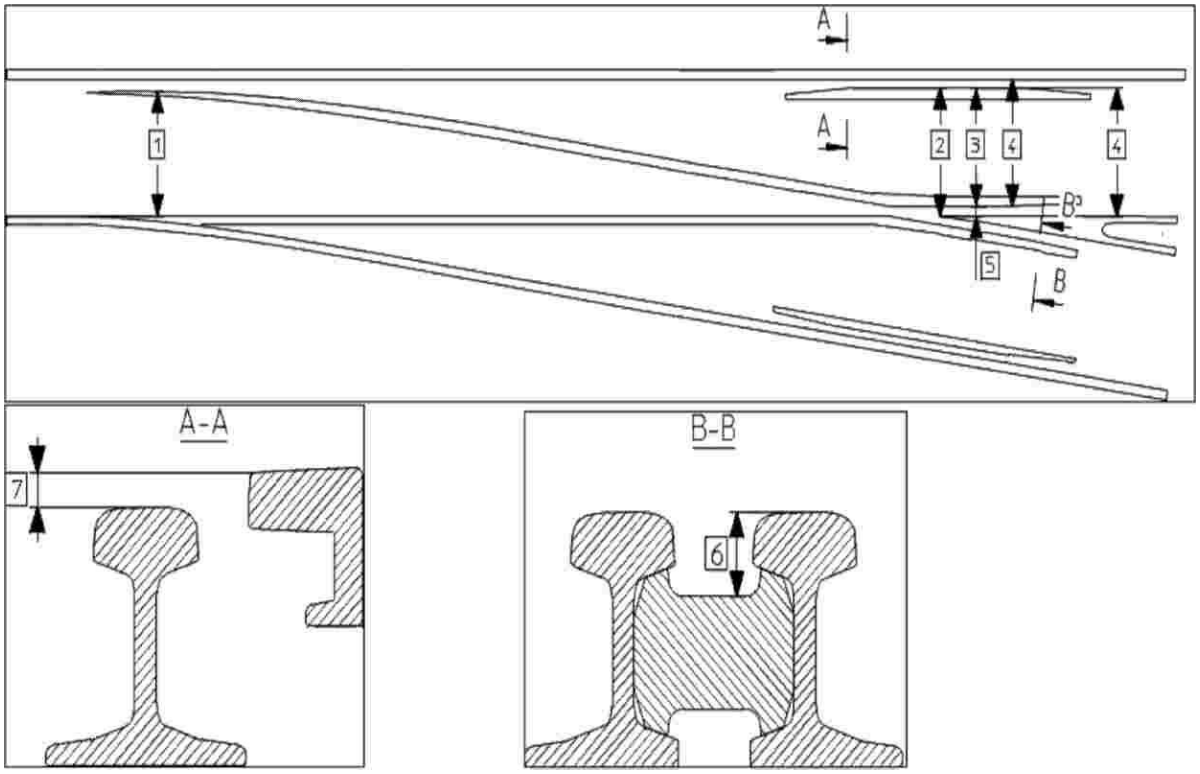
Defined term	NTSN point	Definition
Line speed	4.2.1	Maximum speed for which a line has been designed.
Maintenance file	4.5.1	Elements of the technical file relating to conditions and limits of use and instructions for maintenance.
Maintenance plan	4.5.2	A series of documents setting out the infrastructure maintenance procedures adopted by an Infrastructure Manager.
Multi-rail track	4.2.2.2	Track with more than two rails, where at least two pairs of respective rails are designed to be operated as separate single tracks, with or without different track gauges.
Nominal track gauge	4.2.4.1	A single value which identifies the track gauge but may differ from the design track gauge.
Normal service	4.2.2.2 4.2.9	The railway operating to a planned timetable service.
Passive provision	4.2.9	Provision for the future construction of a physical extension to a structure (for example: increased platform length).
Performance Parameter	4.2.1	Parameter describing an NTSN Category of Line used as the basis for the design of infrastructure subsystem elements and as the indication of the performance level of a line.
Plain line	4.2.4.5 4.2.4.6 4.2.4.7	Section of track without switches and crossings.
Point retraction	4.2.8.6	The reference line in a fixed common crossing can deviate from the theoretical reference line. From a certain distance to the crossing point, the reference line of the vee can, depending on the design, be retracted from this theoretical line away from the wheel flange in order to avoid contact between both elements. This situation is described in Figure 2.
Rail inclination	4.2.4.5 4.2.4.7	An angle defining the inclination of the head of a rail when installed in the track relative to the plane of the rails (running surface), equal to the angle between the axis of symmetry of the rail (or of an equivalent

Defined term	NTSN point	Definition
		symmetrical rail having the same rail head profile) and the perpendicular to the plane of the rails.
Rail pad	5.3.2	A resilient layer fitted between a rail and the supporting sleeper or baseplate.
Reverse curve	4.2.3.4	Two abutting curves of opposite flexure or hand
Structure gauge	4.2.3.1	Defines the space in relation to the reference track that shall be cleared of all objects or structures and of the traffic on the adjacent tracks, in order to allow safe operation on the reference track. It is defined on the basis of the reference contour by application of the associated rules.
Swing nose	4.2.5.2	Within the domain of “common crossing with movable point”, the term “swing nose” identifies the part of the crossing which forms the vee and that it is moved to form a continuous running edge for either the main or the branch line.
Switch	4.2.8.6	A unit of track comprising two fixed rails (stock rails) and two movable rails (switch rails) used to direct vehicles from one track to another track.
Switches and crossings	4.2.4.5, 4.2.4.7, 4.2.5, 4.2.6, 4.2.8.6, 5.2, 6.2.4.4, 6.2.4.8, 6.2.5.2, 7.3.3, Appendix C and D,	Track constructed from sets of switches and individual crossings and the rails connecting them.
Through route	Appendix D	In the context of switches and crossings a route which perpetuate the general alignment of the track.
Track design	4.2.6, 6.2.5, Appendix C and D	The track design consists of cross-section defining basic dimensions and track components (for example rail, rail fastenings, sleepers, ballast) used together with operating conditions with an impact on forces related to 4.2.6, such as axle load, speed and radius of horizontal curvature.

Defined term	NTSN point	Definition
Track gauge	4.2.4.1, 4.2.4.5, 4.2.8.4, 5.3.3, 6.1.5.2, 6.2.4.3, Appendix H	The smallest distance between lines perpendicular to the running surface intersecting each rail head profile in a range from 0 to 14 mm below the running surface.
Track twist	4.2.7.1.6 4.2.8.3, 6.2.4.9,	Track twist is defined as the algebraic difference between two cross levels taken at a defined distance apart, usually expressed as a gradient between the two points at which the cross level is measured.
Train length	4.2.1	The length of a train, which can run on a certain line in normal operation.
Unguided length of an obtuse crossing	4.2.5.3, Appendix J	Portion of obtuse crossing where there is no guidance of the wheel described as “unguided length” in the specification referenced in Appendix T, Index [17.1].
Usable length of a platform	4.2.1, 4.2.9.1	The maximum continuous length of that part of platform in front of which a train is intended to remain stationary in normal operating conditions for passengers to board and alight from the train, making appropriate allowance for stopping tolerances. Normal operating conditions means that railway is operating in a non-degraded mode (e.g. rail adhesion is normal, signals are working, everything is working as planned).

Figure 14

Geometry of switches and crossings



(1) 1 Free wheel passage in switches

(2) Fixed nose protection

(3) Free wheel passage at crossing nose

(4) Free wheel passage at check rail/wing rail entry

(5) Flangeway width

(6) Flangeway depth

(7) Height of check rail

Appendix T Technical specifications referenced in this NTSN

Table 49

Referenced standards

Index	Characteristic to be assessed	NTSN point	Mandatory standard point
[1]	**EN 15663:2017+A2:2024** **Railway applications – Vehicle reference masses**		
[1.1]	Mass definition of rolling stock	4.2.1 (7) Table 2 Appendix K	4.5
[1.2]	Mass definition of rolling stock	4.2.1 (7) Table 3	4.5 and 7.4
[1.3]	Passenger payload for high speed and long distance trains	Appendix K, Table 45	Table 7
[1.4]	Passenger payload for other trains	Appendix K, Table 45	Table 8
[2]	**EN 15528:2021** **Railway applications – Line categories for managing the interface between load limits of vehicles and infrastructure**		
[2.1]	Mass definition of rolling stock	*This provision has been left intentionally blank*	6.4
[2.2]	Capability requirements for existing structures in accordance with traffic code	Appendix E	Annex A
[2.3]	Line categories	Appendix E, – Table 38A (note [9])	Annex A
[2.4]	Definition of line category	Appendix S	5
[3]	**EN 15273-3: 2013+A1:2016** **Railway applications – Gauges – Part 3: structure gauges**		
[3.1]	Structure gauge	4.2.3.1 (1)	Annex C and in Annex D, point D.4.8
[3.2]	Structure gauge	4.2.3.1 (2)	Annex C

Index	Characteristic to be assessed	NTSN point	Mandatory standard point
[3.3]	Structure gauge Assessment	4.2.3.1 (3) 6.2.4.1	5, 7, 10 Annex C and in Annex D, point D.4.8
[3.4]	Distance between track centres Assessment	4.2.3.2 (3) 6.2.4.2	9
[3.5]	Platform offset Assessment	4.2.9.3(1) 6.2.4.11(1)	13
[3.6]	Calculation of the structure gauge for the lower parts for the 1668 mm track gauge	Appendix P	5, 7 and 10
[4]	**EN 13803: 2017** **Railway applications – Track – Track alignment design parameters – Track gauges 1435mm and wider**		
[4.1]	Minimum radius of horizontal curve Definition of reference vehicle	4.2.3.4 (2)	Tables N.1 and N.2 N.2
[4.2]	Upgrading or renewal of the infrastructure, for parameters Cant and Cant deficiency	*This provision has been left intentionally blank*	6.2 (Table 5) and 6.3 (table 7 for non-tilting trains) (see also corresponding notes in both chapters).
[5]	**EN 15302: 2021** **Railway applications – Method for determining the equivalent conicity**		
[5.1]	Equivalent conicity	4.2.4.5 (4)	6, 8, 9, 12
[5.2]	Assessment	6.2.4.6	6, 8, 9, 12
[6]	**EN 13715: 2020** **Railway applications – Wheelsets and bogies – Wheels – Tread profile**		
[6.1]	Equivalent conicity	4.2.4.5 (4) (a) and (b)	Annex C

Index	Characteristic to be assessed	NTSN point	Mandatory standard point
[6.2]	Equivalent conicity	4.2.4.5 (4) (c) and (d)	Annex B
[7]	**EN 13674-1: 2011+A1:2017** **Railway applications – Track – Rail – Part 1: Vignole railway rails 46 kg/m and above**		
[7.1]	Railhead profile for plain line	4.2.4.6 (1)	Annex A
[7.2]	Assessment of rails	6.1.5.1 (a)	9.1.8
[7.3]	Assessment of rails	6.1.5.1 (b)	9.1.9
[7.4]	Assessment of rails	6.1.5.1 (c)	8.1 and 8.4
[8]	**EN 13674-4: 2019** **Railway applications – Track – Rail – Part 4: Vignole railway rails from 27 kg/m to, but excluding 46 kg/m**		
[8.1]	Railhead profile for plain line	4.2.4.6 (1)	Annex A
[9]	**EN 14363: 2016+A2:2022** **Railway applications – Testing and Simulation for the acceptance of running characteristics of railway vehicles – Running Behaviour and stationary tests**		
[9.1]	Track resistance to vertical loads Lateral track resistance	4.2.6.1 (b) and (c) 4.2.6.3 (b)	7.5.3
[9.2]	Lateral track resistance	4.2.6.3 (a)	7.5.2 and Table 4
[10]	**EN 1991-2: 2003/AC:2010** **Eurocode 1 : Actions on structures – Part 2 : Traffic loads on bridges**		
[10.1]	Structures resistance to traffic loads	4.2.7	
[10.2]	Resistance of new bridges to traffic loads Vertical loads	4.2.7.1.1 (1)(a)	6.3.2 (2)P [(1)]
	Equivalent vertical loading for new geotechnical structures, earthworks and earth pressure effects	4.2.7.2(1)	

Index	Characteristic to be assessed	NTSN point	Mandatory standard point
	Capability requirements for existing structures in accordance with traffic code	Appendix E – Load Model 71	
[10.3]	Resistance of new bridges to traffic loads Vertical loads	4.2.7.1.1 (1)(b)	6.3.3 (3)P
	Capability requirements for existing structures in accordance with traffic code	Appendix E – Load model SW/0	
[10.4]	Resistance of new bridges to traffic loads Vertical loads	4.2.7.1.1 (2)	6.3.2(3)P and 6.3.3 (5)P
	Equivalent vertical loading for new geotechnical structures, earthworks and earth pressure effects	4.2.7.2(2)	6.3.2 (3)P
[10.5]	Allowance for dynamic effects of vertical loads	4.2.7.1.2 (1)	6.4.3 (1)P and 6.4.5.2 (2)
[10.6]	Allowance for dynamic effects of vertical loads	4.2.7.1.2 (2)	6.4.4
[10.7]	Allowance for dynamic effects of vertical loads	4.2.7.1.2 (2)	6.4.6.1.1 (3) to (6)
	Capability requirements for existing structures in accordance with traffic code	Appendix E – Load model HSLM	
[10.8]	Centrifugal forces	4.2.7.1.3	6.5.1 (2), (4)P, (7) and (8)
[10.9]	Nosing forces	4.2.7.1.4	6.5.2
[10.10]	Actions due to traction and braking (longitudinal loads)	4.2.7.1.5	6.5.3 (2)P, (4), (5), (6).and (7)P
[10.11]	Resistance of new structures over or adjacent to tracks	4.2.7.3	6.6.2 to 6.6.6

Index	Characteristic to be assessed	NTSN point	Mandatory standard point
[11]	**Annex A2 to EN 1990:2002 issued as EN 1990:2002/A1:2005** **Eurocode – Basis of structural design**		
[11.1]	Structures resistance to traffic loads	4.2.7	
[11.2]	Design track twist due to rail traffic actions	4.2.7.1.6	A2.4.4.2.2(3)P
[12]	**EN 13848-5: 2017** **Railway applications – Track – Track geometry quality – Part 5: Geometric quality levels – Plain line, switches and crossings**		
[12.1]	The immediate action limit for alignment	4.2.8.1 (1)	7.5 Limits of wavelength range D1 set out in table 5
[12.2]	The immediate action limit for longitudinal level	4.2.8.2 (1)	7.3 Limits of wavelength range D1 set out in table 4
[12.3]	The immediate action limit for track twist	4.2.8.3 (2)	7.6
[12.4]	The immediate action limit for track twist - 1668 mm track gauge system	4.2.8.3 (6)	Annex C
[13]	**EN 13848-1: 2019** **Railway applications – Track – Track geometry quality – Part 1: Characterization of track geometry**		
[13.1]	The immediate action limit for track twist	4.2.8.3 (1)	6.5
[14]	**EN 14067-5:2021/AC:2023** **Railway applications – Aerodynamics – Part 5: Requirements and test procedures for aerodynamics in tunnels**		
[14.1]	Criteria for new tunnels	*This provision has been left intentionally blank*	6.1.3 Table 10

Index	Characteristic to be assessed	NTSN point	Mandatory standard point
[14.2]	Criteria for existing tunnels	*This provision has been left intentionally blank*	6.1.4
[14.3]	Assessment procedure	6.2.4.12(1)	6.1, 7.4
[14.4]	Reference cross section	6.2.4.12(3)	6.1.2.1
[15]	**EN 13145: 2001** **Railway applications – Track – Wood sleepers and bearers**		
[15.1]	Resistance to vertical loads	Appendix C.1, point (c), Appendix C.2 point (c)	
[16]	**EN ISO 6506-1: 2014** **Metallic materials – Brinell hardness test. Test method.**		
[16.1]	Definition of steel hardness	Appendix S	
[17]	**EN 13232-3: 2023** **Railway applications – Track – Switches and crossings – Part 3: Requirements for wheel/rail interaction**		
[17.1]	Definition of the 'unguided length of an obtuse crossing'	Appendix S	4.2.5

(1) If agreed by the NSA, it is permitted to design geotechnical structures, earthworks and calculate earth pressure effects using line loads or point loads, where their load effects correspond to the Load Model 71 with factor α.

Table 50

Not used