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ANNEX 2

ANNEX

to the

Commission implementing Regulation

amending Commission Regulations: (EU) No 321/2013, No 1299/2014, No 1300/2014, No 1301/2014, No 1302/2014, No 1304/2014 and Commission Implementing Regulation (EU) 2019/777

ANNEX II

The Annex to Regulation (EU) No 1299/2014 is amended as follows:

(1) point 2.5 is replaced by the following:

"2.5 Relation to the safety management system

Necessary processes to manage safety and operations according to the requirements in the scope of this TSI, 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 Directive (EU) 2016/798.";

(2) the following point 2.6 is added:

"2.6 Relation to the codification of Combined Transport

(1) The provisions for structure gauge are laid down in point 4.2.3.1.

(2) The codification system used for the conveyance of intermodal loading units in combined transport can be based:

(a) on the characteristics of the line and the exact position of the obstacles;

(b) on the reference profile of the structure gauge of that line;

(c) on a combination of the methods referred to in points (a) and (b).";

(3) in point 4.1, point (6) is replaced by the following:

"(6) Where line speeds are stated in [km/h] as a category or performance parameter in this TSI, it shall be allowed to translate the speed to equivalent [mph] as in Appendix G, for Ireland and for the networks of the United Kingdom in respect of Northern Ireland.";

(4) point 4.2.1 is amended as follows:

(a) points (4) to (8) are replaced by the following:

"(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 as per traffic code targeted. Notwithstanding TEN-T requirements, the range of values indicated in the columns for 'line speed', 'usable length of platform' and 'train length' shall be applied, as long as reasonably practicable.

(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 and Appendix D1 of the Annex to Implementing Regulation (EU) 2019/773 (OPE TSI)*.

(6) Information defining minimum capability requirements for existing structures in relationship to different train types is given in Appendix E. For the networks of the United Kingdom in respect of Northern Ireland, 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

Performance parameters for passenger traffic infrastructure

– Route compatibility checks are subject to point 4.2.2.5 and Appendix D1 of the OPE TSI

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 dynamic checks of bridges, 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] .

([2]) Minimum required values of axle load to be used for static checks of infrastructure, 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] with regard of the specification referenced in Appendix T Index [2]). This axle load may be linked to limited speed.

([3]) To be used for static checks of infrastructure, 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] with regard of the specification referenced in Appendix T Index [2]). This axle load may be linked to limited speed.

Table 3				
Performance parameters for freight traffic infrastructure Route compatibility checks are subject to point 4.2.2.5 and Appendix D1 of the OPE TSI				
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 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]). This axle load may be linked to limited speed.

(8) For structures, axle load by itself is not sufficient to set out the requirements for infrastructure. Requirements are specified for new structures in points 4.2.7.1 and 4.2.7.2, for existing structures in point 4.2.7.4 and for track in point 4.2.6.

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* Commission Implementing Regulation (EU) 2019/773 of 16 May 2019 on the technical specification for interoperability relating to the operation and traffic management subsystem of the rail system within the European Union and repealing Decision 2012/757/EU (OJ L 139I, 27.5.2019, p. 5).";

(b) point (11) is replaced by the following:

"(11) (not used)";

(5) in point 4.2.3.1, points (1), (2) and (3) are replaced by the following:

"(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. Those gauges are set out in the specification referenced in Appendix T Index [3].

(2) The lower part of the structure gauge shall be GI2 as set out in the specification referenced in Appendix T Index [3]. Where tracks are equipped with rail brakes, structure gauge GI1 as set out in the same specification 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].";

(6) in point 4.2.3.2, point (3) is replaced by the following:

"(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].";

(7) in point 4.2.3.4, point (2) is replaced by the following:

"(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] 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, infrastructure manager may 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.";

(8) in point 4.2.4.5(4), the first paragraph is replaced by the following:

"The following wheelsets, as defined in the specification referenced in Appendix T, Index [6], shall be modelled passing over the designed track conditions (simulated by calculation in accordance with the specification referenced in Appendix T, Index [5]):

(a) S 1002 with SR1.

(b) S 1002 with SR2.

(c) GV 1/40 with SR1.

(d) GV 1/40 with SR2.";

(9) in point 4.2.4.6, point (1) is replaced by the following:

"(1) The railhead profile shall be selected from the range set out in one of the specifications referenced in Appendix T, Index [7] and Index [8], or shall be in accordance with point (2).";

(10) in point 4.2.6.1, points (b) and (c) are replaced by the following:

"(b) maximum vertical wheel forces. Maximum wheel forces for defined test conditions are set out in the specification referenced in Appendix T, Index [9].

(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].";

(11) in point 4.2.6.3, points (a) and (b) are replaced by the following:

"(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];

(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].";

(12) point 4.2.7 is replaced by the following:

"4.2.7 Structures resistance to traffic loads

The requirements of the specifications referenced in Appendix T, Index [10] and Index [11] specified in this point of the TSI 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];

(b) in addition, for continuous bridges, Load Model SW/0, as set out in the specification referenced in Appendix T, Index [10].

(2) The load models shall be multiplied by the factor alpha (α) as set out in the specification referenced in Appendix T, Index [10].

(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].

(2) For bridges for speeds over 200 km/h where the specification referenced in Appendix T, Index [10] 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] .

(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.

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].

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].

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].

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].

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) The equivalent vertical loading shall be multiplied by the factor alpha (α) as set out in the specification referenced in Appendix T, Index [10]. 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].

4.2.7.4. Resistance of existing bridges and earthworks to traffic loads

(1) Bridges and earthworks shall be brought to a specified level of interoperability in accordance with the TSI category of the line referred to 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 TSI (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 the United Kingdom (Northern Ireland), 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 notified for that purpose) and consequently references to Appendix E are replaced by references to Appendix F.";

(13) in point 4.2.8.1, point (1) is replaced by the following:

"(1) The immediate action limits for isolated defects in alignment are set out in the specification referenced in Appendix T, Index [12]. Isolated defects shall not exceed the limits of wavelength range D1.";

(14) in point 4.2.8.2, point (1) is replaced by the following:

"(1) The immediate action limits for isolated defects in longitudinal level are set out in the specification referenced in Appendix T, Index [12]. Isolated defects shall not exceed the limits of wavelength range D1.";

(15) point 4.2.8.3 is amended as follows:

(a) points (1) and (2) are replaced by the following:

"(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].

(2) The track twist limit is a function of the measurement base applied in accordance with the specification referenced in Appendix T, Index [12].";

(b) point (6) is replaced by the following:

"(6) Instead of point (2), for the 1668 mm track gauge system, the track twist limit is a function of the measurement base applied in accordance with the specification referenced in Appendix T, Index [12].";

(16) in point 4.2.9.2, point (3) is replaced by the following:

"(3) For platforms where only passenger trains that are explicitly listed as excluded from the scope of the Annex to Commission Regulation (EU) No 1302/2014*

(LOC&PAS TSI) in its point 1.1 are intended to stop in normal service, different provisions for the nominal platform height might apply.

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* Commission Regulation (EU) No 1302/2014 of 18 November 2014 concerning a technical specification for interoperability relating to the 'rolling stock — locomotives and passenger rolling stock' subsystem of the rail system in the European Union (OJ L 356, 12.12.2014, p. 228).";

(17) in point 4.2.9.3, point (1) is replaced by the following:

"(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], 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.";

(18) point 4.2.10.1 is replaced by the following:

"4.2.10.1 Maximum pressure variations in tunnels

(1) Any new tunnel or underground structure falling in the categories described in the specification referenced in Appendix T, Index [14], has to provide that maximum pressure variation, caused by the passage of a train running at the maximum allowed speed in the tunnel, do not exceed 10 kPa during the time taken for the train to pass through the tunnel.

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

(3) Assessment of existing tunnel or underground structure in the scope of this TSI intended to be operated at speeds greater than or equal to 200 km/h has to be performed in accordance with the specification referenced in Appendix T, Index [14].";

(19) point 4.2.12.4 is amended as follows:

(a) point (2) is replaced by the following:

"(2) Fixed equipment for the supply of water intended for human consumption shall be supplied with drinking water meeting the requirements of Directive (EU) 2020/2184 of the European Parliament and of the Council*.

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* Directive (EU) 2020/2184 of the European Parliament and of the Council of 16 December 2020 on the quality of water intended for human consumption (OJ L 435, 23.12.2020, p. 1).";

(b) the following point (3) is added:

"(3) The materials used for the supply of water intended for human consumption to the rolling stock (e.g. tank, pump, piping, water tap and sealing material and quality) shall comply with the requirements applicable to water intended for human consumption.";

(20) point 4.3.1 is amended as follows:

(a) in Table 15, row "Installations for servicing trains", third column, the text "4.2.11.4 Water refilling equipment" is deleted;

(b) Table 16 is amended as follows:

(i) the title is replaced by the following:

"Interfaces with the rolling stock subsystem, Regulation (EU) No 321/2013 ('WAG TSI')";

(ii) in the third column, the heading is replaced by the following:

"Reference WAG TSI";

(21) in point 5.3.3, point (2) is replaced by the following:

"(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.";

(22) in point 6.1.5.1, points (a), (b) and (c) are replaced by the following:

"(a) Rail hardness shall be tested for position RS in accordance with the specification referenced in Appendix T, Index [7].

(b) Tensile strength shall be tested in accordance with the specification referenced in Appendix T, Index [7].

(c) Fatigue test shall be done in accordance with the specification referenced in Appendix T, Index [7].";

(23) in point 6.1.5.2, point (1) is replaced by the following:

"(1) (not used)";

(24) in point 6.2.4.1, point (1) is replaced by the following:

"(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].";

(25) in point 6.2.4.2, points (1) and (2) are replaced by the following:

"(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 specification referenced in Appendix T, Index [3]. 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] is approached by less than 50 mm.";

(26) in point 6.2.4.4, the following point (3) is added:

"(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.";

(27) point 6.2.4.6 is replaced by the following:

"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].";

(28) point 6.2.4.10 is replaced by the following:

"6.2.4.10 Assessment procedure of existing structures

(1) Assessment of existing structures against the requirements of points 4.2.7.4(3)(b) and (c) shall be done by one of the following methods:

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

(c) check the traffic loads specified for the structures or for the design 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) mentioned 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 either of the following items:

– 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.";

(29) in point 6.2.4.11, point (1) is replaced by the following:

"(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].";

(30) point 6.2.4.12 is replaced by the following:

" 6.2.4.12. Assessment of maximum pressure variations in tunnels

(1) The assessment of the maximum pressure variation in the tunnel (10 kPa criterion) shall be done in accordance with the specification referenced in Appendix T, Index [14] with trains complying with the LOC&PAS TSI and that are able to run at maximum line speed in the specific tunnel 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 TSI is fulfilled.

(3) The reference cross section areas are set out in the specification referenced in Appendix T, Index [14].

(31) point 6.3 is replaced by the following:

"6.3. (not used)";

(32) point 6.4 is replaced by the following:

"6.4 Assessment of maintenance file

(1) In accordance with Article 15(4) of Directive (EU) 2016/797, the applicant shall be responsible for compiling the technical file, containing the documentation requested for maintenance.

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

(33) in point 6.5.1(1), the introductory phrase is replaced by the following:

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

(34) in Chapter 7, the first paragraph is deleted;

(35) points 7.1 to 7.6 are replaced by the following:

"7.1. National implementation plan

Member States shall develop a national plan for the implementation of this TSI, targeting the coherence of the entire rail system of the Union. This plan shall include all projects regarding new, renewal and upgrading of infrastructure subsystem and shall ensure a gradual migration within a reasonable timescale onwards an interoperable target infrastructure subsystem fully compliant with this TSI.

7.2. Application of this TSI to a new infrastructure subsystem

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

(2) For the purpose of this TSI a 'new infrastructure subsystem' means an infrastructure subsystem placed into service after [Publications Office: please

insert the date of entry into force of this amending act] that 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) At least, the following situations 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 TSI to an existing infrastructure subsystem

7.3.1. Performance criteria of the subsystem

'Upgrading' is a major modification work of an existing infrastructure subsystem resulting in at least compliance with one additional traffic code or a change in the declared combination of traffic codes (referred to Table 2 and Table 3 in point 4.2.1) or fulfilling the descriptions that are included in point 7.2(3).

7.3.2. Application of the TSI

The conformity with this TSI is mandatory for a subsystem or part(s) of it which are upgraded or renewed. However, this TSI recognizes that due to the characteristics of the inherited railway system, compliance of existing infrastructure subsystem with this TSI may be achieved through a gradual improvement of interoperability, namely:

(1) For the upgraded infrastructure subsystem, the application of this TSI shall be compulsory, and applied to the upgraded subsystem within the geographical coverage of the upgrading. The geographical coverage of the upgrading shall be defined based on locations on tracks and shall result in the compliance of all basic parameters of the infrastructure subsystem associated with the tracks that are subject to the upgrading.

(2) In the event of a change other than an upgrading of the infrastructure subsystem, the application of this TSI for each basic parameter (referred to in point 4.2.2) affected by a change shall be compulsory when the change requires to carry out a new 'EC' verification procedure in accordance with Implementing Regulation (EU) 2019/250. Articles 6 and 7 of Implementing Regulation (EU) 2019/250 shall apply.

(3) In the event of a change other than an upgrading of the infrastructure subsystem and for those basic parameters that are not affected by a change, or when the change does not require carrying out a new 'EC' verification, the demonstration of the level of compliance with this TSI is voluntary.

(4) In case of upgrading or renewal of the infrastructure subsystem, the compliance with the requirements which are laid down for new lines is not required.

(5) 'Substitution in the framework of maintenance' means any replacement of components by parts of identical function and performance in the framework of maintenance.

(6) For a substitution in the framework of maintenance, 'EC' verification is not required.

(7) In the framework of a 'renewal', which is defined as a major substitution in Article 3(15) of Directive 2016/797, non TSI-compliant parts of subsystems shall be replaced with TSI-compliant ones.

(8) Other substitutions in the framework of maintenance shall be made in accordance with the requirements of this TSI, whenever reasonably and economically feasible.

Beside the gradual approach provided for in the first paragraph, the following exceptions are permitted for existing infrastructure subsystem, in case of upgrading or renewal:

(a) In the case of upgrading or renewal of the infrastructure subsystem, for parameters cant governed by point 4.2.4.2 of this TSI and cant deficiency governed by point 4.2.4.3 of this TSI it is permitted to deviate from the limiting values as set out in this TSI while respecting the exceptional limit values set out in subpoints 6.2 (table 5) and 6.3 (table 7 for non-tilting trains) of EN 13803:2017 for cant and cant deficiency respectively, and also applying specific restrictions and measures, as referred to in the notes inside those tables (e.g. "b" in table 5) and also in the text set out in subpoints 6.2 and 6.3 of EN 13803:2017 (e.g. notes 2 and 3 in both chapters). Applying this exception shall not prevent the access of vehicles authorised for the maximum values required in point 4.2.4.3 of this TSI.

(b) In the case of renewal of the infrastructure subsystem, the following conditions related to platform height and offset governed by points 4.2.9.2 and 4.2.9.3, shall apply:

- It shall be allowed to apply other nominal platform heights, if the compliance to the values set out by point 4.2.9.2 would require structural alterations to any load bearing element.
- It shall be allowed to apply other platform offset than the one defined in point 4.2.9.3(2) as long as the value for b_q is equal or greater than b_{qlim}.

7.3.3. Existing lines that are not subject to a renewal or upgrading project

Where an infrastructure manager wishes to demonstrate the level of compliance of an existing line with the basic parameters of this TSI, it shall apply the procedure described in Commission Recommendation 2014/881/EU*.

7.3.4 Route compatibility checks before the use of authorised vehicles

The route compatibility check procedure to be applied and the parameters of the infrastructure subsystem to be used are set out in point 4.2.2.5 and Appendix D1 of OPE TSI.

7.4 not used

7.5 not used

7.6. not used

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* Commission Recommendation 2014/881/EU of 18 November 2014 on the procedure for demonstrating the level of compliance of existing railway lines with

the basic parameters of the technical specifications for interoperability (OJ L 356, 12.12.2014, p. 520).";

(36) point 7.7.1.1. is replaced by the following:

"7.7.1.1. (not used)";

(37) point 7.7.6.7. is replaced by the following:

"7.7.6.7. Maximum unguided length of fixed obtuse crossings (4.2.5.3)

P cases

In Appendix J, for the nominal track gauge of 1524 mm:

(a) instead of point (J.1)(b), the minimum radius through obtuse crossing shall be 200 m; for radius between 200-220 m small radius shall be compensated with track gauge widening;

(b) instead of point (J.1)(c), the minimum check rail height shall be 39 mm.";

(38) the following point 7.7.8.2 is added:

"7.7.8.2 Immediate action limits of track gauge as an isolated defect (4.2.8.4)

P-case

Instead of point 4.2.8.4(1), the minimum track gauge for all speeds is 1430 mm.";

(39) in point 7.7.10.2(2), points (a) to (e) are replaced by the following:

" (a) S 1002 as defined in Annex C to EN 13715:2020 with SR1;

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

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

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

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

(40) in point 7.7.15.1 point (1) and point (3), 7.7.15.2, 7.7.15.7 point (1), 7.7.15.8, 7.7.16.2, 7.7.6.2, 7.7.6.3, 7.7.6.11, 13 "EN 15273-3:2013" is replaced by "EN 15273-3:2013+A1:2016";

(41) point 7.7.17 is replaced by the following:

"7.7.17. (not used)";

(42) in Appendix C.1, point (c), second indent, the second sub-indent is replaced by the following:

"– Wood: compliance with the specification referenced in Appendix T, Index [15]";

(43) in Appendix C.2, point (c) is replaced by the following:

"(c) Bearer

– Type

– Resistance to vertical loads:

  – Concrete: design bending moments

  – Wood: compliance with the specification referenced in Appendix T, Index [15]

– Steel: moment of inertia of cross section

– Resistance to longitudinal and lateral loads: geometry and weight

– Nominal track gauge";

(44) Appendix E is replaced by the following:

"**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. Those 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 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].

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].

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) D2-200 or LM71 with $\alpha = 1.0$(14)
P2	HSLM (8) D2-200	HSLM (8) D2-200

	or LM71 with $\alpha = 0.91$[14]	or LM71 with $\alpha = 0.91$[14]
P3a (> 160 km/h)	L≥4m D2-100 and L<4m D2-200[10][9][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[11][9][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[12][9] [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[13][9] [15]	L≥4m C2-100 and L<4m C2-160[9] [15]
P5	C2-120	B1-120
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 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 the LOC&PAS TSI. 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 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 Member State 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 2.6 m and the average mass per unit length over the length of the vehicle of up to 5.0 t/m.

(7) Taking into account the state of the 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.

(8) For P1 and P2 lines, compliance with HSLM in accordance with the specification referenced in Appendix T, Index [10] shall be stated (see procedure in point 6.2.4.10 of this TSI). If HSLM compliance cannot be shown, for the purpose of dynamic compatibility checks in accordance with the route compatibility check in Appendix D.1 to the TSI OPE (RINF parameter 1.1.1.1.2.4.4), 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 TSI). 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 to this TSI.

(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] 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 as in Appendix D.1 to the TSI OPE (RINF parameter 1.1.1.1.2.4.4). In case 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 to this TSI.

(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 speed) or EN line category C2 for speeds up to 160 km/h (local speed).

(11) The requirements for loco hauled passenger trains are valid for carriages and light freight wagons coaches satisfying EN line category C2 for speeds up to 160 km/h (local 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 speed) or EN line category B1 for speeds up to 160 km/h (local 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 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]. 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 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 earthworks *Freight traffic* (2)	
Traffic code	Freight trains including freight wagons, other vehicles and Locomotives
F1	D4
F2	D2
F3	C2
F4	B2
F1520	open point
F1600	open point

Notes:

(1) The published line categories of the section of line including earthworks 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 TSI. 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 Member State may indicate whether the requirements for locomotives and power heads apply.

(4) Taking into account the state of the 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.

Notes 3 and 4 are only informative.";

(45) Appendix F is amended as follows:

(a) the title is replaced by the following:

"Capability requirements for structures according to traffic code in the United Kingdom (Northern Ireland)";

(b) in Table 41, all notes are deleted;

(c) in Appendix G, the title is replaced by the following:

"Speed conversion to miles per hour for Ireland and United Kingdom (Northern Ireland)";

(46) Appendix I is replaced by the following:

"Appendix I

(not used)";

(47) Appendix K is replaced by the following:

"**Appendix K**

Basis of minimum requirements for structures for passenger coaches 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 coaches and multiple units.

Where checks on the dynamic response of rail bridges are required to specify 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], taking into account the values for passenger payload in standing areas given in Table 45.

Mass definitions for static compatibility are based upon the design mass under exceptional payload established in accordance with the specification referenced in Appendix T, Index [1], taking into account the specification referenced in Appendix T, Index [2].

Table 45	
Passenger payload in standing areas in kg/m^2 in accordance with the specification referenced in Appendix T, Index [1]	
Type of trains	*Normal payload* to specify Dynamic Compatibility
High speed and long distance trains	160
High speed and long distance trains Reservation Obligatory	0
Others (regional, commuter, suburban trains)	280
([1]) Normal payload of the specification referenced in Appendix T, Index [1] plus an additional 160 kg/m^2 for standing areas	

";

(48) Appendix N is replaced by the following:

"Appendix N

(not used)";

(49) in Appendix P, the second paragraph is replaced by the following:

"Calculations of structure gauge shall be done using the kinematic method in accordance with the requirements of the specification referenced in Appendix T, Index [3] with the kinematic reference profiles and associated rules defined in this Appendix.";

(50) Appendix Q is replaced by the following:

"Appendix Q

(not used)";

(51) in Appendix R, point (4) is replaced by the following:

"(4) (not used)";

(52) in Appendix S, Table 48, third column is amended as follows:

(a) the fourteenth row is replaced by the following:

"The result of the classification process set out in the specification referenced in Appendix T, Index [2] 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.";

(b) rows from the sixteenth to the twenty-first are replaced by the following:

"

Dimension between the crossing nose and check rail (see dimension No 2 on Figure 14).
Dimension between the running surface and the bottom of flangeway (see dimension No 6 on Figure 14).
Dimension between a running rail and an adjacent check or wing rail (see dimension No 5 on Figure 14).
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.
Dimension between the working face of the crossing wing rail and check rail opposite across the gauge (see dimension No 3 on Figure 14).
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).

";

(c) the twenty-third row is replaced by the following:

"The non SI unit for steel hardness defined in the specification referenced in Appendix T, Index [16].";

(d) the twenty-sixth row is replaced by the following:

"As defined in Article 3(2) of Directive 2012/34/EU of the European Parliament and of the Council of 21 November 2012 establishing a single European railway area (OJ L 343, 14.12.2012, p. 32).";

(e) the fifty-third row is replaced by the following:

"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].";

(53) Appendix T is replaced by the following:

"Appendix T

List of referenced standards

Table 49			
List of referenced standards			
Index	*TSI Parameter*	*TSI Point*	*Standard Point*
[1]	**EN 15663:2017+A1:2018** **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 15528:202** **1Railway applications – Line categories for managing the interface between load limits of vehicles and infrastructure**		
[2.1]	Mass definition of rolling stock	4.2.1(7), Table 2 Appendix K	6.4
[2.2]	Capability requirements for existing structures	Appendix E	Annex A

	in accordance with traffic code		
[2.3]	Line categories	Appendix E – note 9	
[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
[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	7.3.2	6.2 (Table 5) and 6.3 (table 7 for non-tilting trains) (see also e.g. notes 2

			and 3 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
[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 13674-4:2006+A1:2009** **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** **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	4.2.6.1(b) and (c) 4.2.6.3(b)	5.3.2.3

	Lateral track resistance		
[9.2]	Lateral track resistance	4.2.6.3(a)	5.3.2.2
[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 Equivalent vertical loading for new geotechnical structures, earthworks and earth pressure effects Capability requirements for existing structures in accordance with traffic code	4.2.7.1.1(1)(a) 4.2.7.2(1) Appendix E - – Load Model 71	6.3.2 (2)P ([1])
[10.3]	Resistance of new bridges to traffic loads Vertical loads Equivalent vertical loading for new geotechnical structures, earthworks and earth pressure effects Capability requirements for existing structures in accordance with traffic code	4.2.7.1.1(1)(b) 4.2.7.2 Appendix E – Load model SW/0	6.3.3 (3)P
[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
[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 Capability requirements for existing structures in accordance with traffic code	4.2.7.1.2(2) Appendix E – Load model HSLM	6.4.6.1.1 (3) to (6)
[10.8]	Centrifugal forces	4.2.7.1.3	6.5.1 (2), (4)P and (7)
[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
[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** **Railway applications – Aerodynamics – Part 5: Requirements and test procedures for aerodynamics in tunnels**		
[14.1]	Criterium for new tunnels	4.2.10.1(1)	6.1.3 Table 10
[14.2]	Criterium for existing tunnels	4.2.10.1(3)	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 13232-3:2003** **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 alpha.".