

COMMISSION IMPLEMENTING REGULATION (EU) 2023/1694**of 10 August 2023****amending Regulations (EU) No 321/2013, (EU) No 1299/2014, (EU) No 1300/2014, (EU) No 1301/2014, (EU) No 1302/2014, (EU) No 1304/2014 and Implementing Regulation (EU) 2019/777****(Text with EEA relevance)**

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Directive (EU) 2016/797 of the European Parliament and of the Council of 11 May 2016 on the interoperability of the rail system within the European Union ⁽¹⁾, and in particular Article 5(11) thereof,

Whereas:

- (1) Having regard to the role railways are called on to play in a decarbonised transport system, as envisaged by the European Green Deal and the Sustainable and Smart Mobility Strategy, and in the light of developments in that field, a revision of the current Technical Specifications for Interoperability (TSIs) is required, in the framework of the Digital Rail and Green Freight package.
- (2) Pursuant to Article 3(5), points (b) and (f) of Commission Delegated Decision (EU) 2017/1474 ⁽²⁾ TSIs are to be reviewed in order to take into account the developments of the Union railway system and related research and innovation activities, and update references to standards. This TSI revision shall set the scene for the next TSI revision taking into account the outcomes of Europe's Rail Joint Undertaking and in particular the System Pillar achievements.
- (3) Delegated Decision (EU) 2017/1474 sets out specific objectives for the drafting, adoption and review of TSIs of the rail system within the Union.
- (4) On 24 January 2020, in accordance with Article 19(1) of Regulation (EU) No 2016/796 of the European Parliament and of the Council ⁽³⁾, the Commission requested the European Union Agency for Railways (the 'Agency') to prepare recommendations implementing a selection of the specific objectives set out in Delegated Decision (EU) 2017/1474.
- (5) On 30 June 2022, the Agency issued Recommendation ERA 1175-1218 as regards the TSIs of the Union rail system covering Articles 3 to 11 of Delegated Decision (EU) 2017/1474.

⁽¹⁾ OJ L 138, 26.5.2016, p. 44.

⁽²⁾ Commission Delegated Decision (EU) 2017/1474 of 8 June 2017 supplementing Directive (EU) 2016/797 of the European Parliament and of the Council with regard to specific objectives for the drafting, adoption and review of technical specifications for interoperability (OJ L 210, 15.8.2017, p. 5).

⁽³⁾ Regulation (EU) No 2016/796 of the European Parliament and of the Council of 11 May 2016 on the European Union Agency for Railways and repealing Regulation (EC) No 881/2004 (OJ L 138, 26.5.2016, p. 1).

- (6) It is appropriate for combined transport to be regulated through TSIs. Changes should accordingly be made, inter alia, to the Commission Implementing Regulation (EU) 2019/773 ⁽⁴⁾ (OPE TSI) and TSIs set out in the Annexes to Commission Regulation (EU) No 1299/2014 ⁽⁵⁾ (TSI INF) and Commission Regulation (EU) No 321/2013 ⁽⁶⁾ (TSI WAG) and in the content of the Annex to Commission Implementing Regulation (EU) 2019/777 ⁽⁷⁾ (RINF). This should enable a more harmonised application of the codification system and foster the development of combined transport; for that purpose ERA will further develop an Acceptable Mean Of Compliance in accordance with Article 2(33) of Directive (EU) 2016/797.
- (7) The Union-wide authorization of passenger coaches will be a major step in fostering interoperability of the European railway network. In pursuit of that objective, the Annex to Commission Regulation (EU) No 1302/2014 ⁽⁸⁾ (TSI LOC&PAS) should be amended, in particular by harmonizing requirements and testing methods in terms of the topic of electromagnetic compatibility and compatibility with train detection systems.
- (8) The TSIs LOC&PAS and INF should be amended with a view to harmonizing the specifications applicable to rolling stock and fixed installations, notably by closing open points as regards requirements on traffic loads and load carrying capacity of infrastructure, requirements for operations with more than two pantographs at the same time, and facilitating the retrofitting of trains with Energy Measuring Systems.
- (9) Furthermore, TSI LOC&PAS should be amended to clarify the definition of special vehicles including on-track machines, infrastructure inspection vehicles, emergency vehicles, environment vehicles and road-rail vehicles and clarify the applicability of the TSIs to those vehicles.
- (10) The Annex to Commission Regulation (EU) No 1304/2014 ⁽⁹⁾ (TSI NOI) should be amended to introduce a methodology to assess the acoustic performance of composite brake blocks at constituent level.
- (11) To enhance the level of rail safety and reliability, the TSIs WAG and LOC&PAS should be amended to incorporate a derailment detection function.
- (12) TSI WAG paves the way to the further digital automatic coupling (DAC) development, migration and implementation; its deployment will be a major step in modernising the European railway freight business.
- (13) Given that no specific new competence is required for the assessment of conformity of interoperability constituents or the verification of subsystems, there should be no change as regards the notified bodies for the purposes of Commission Regulations (EU) 321/2013, (EU) 1299/2014, (EU) 1300/2014 ⁽¹⁰⁾, (EU) 1301/2014 ⁽¹¹⁾, (EU) 1302/2014 and (EU) 1304/2014.

⁽⁴⁾ 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)

⁽⁵⁾ Commission Regulation (EU) No 1299/2014 of 18 November 2014 on the technical specifications for interoperability relating to the 'infrastructure' subsystem of the rail system in the European Union (OJ L 356, 12.12.2014, p. 1).

⁽⁶⁾ Commission Regulation (EU) No 321/2013 of 13 March 2013 concerning the technical specification for interoperability relating to the subsystem 'rolling stock — freight wagons' of the rail system in the European Union and repealing Decision 2006/861/EC (OJ L 104, 12.4.2013, p. 1).

⁽⁷⁾ 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 (OJ L 139, 27.5.2019, p. 312).

⁽⁸⁾ 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).

⁽⁹⁾ Commission Regulation (EU) No 1304/2014 of 26 November 2014 on the technical specification for interoperability relating to the subsystem 'rolling stock — noise' amending Decision 2008/232/EC and repealing Decision 2011/229/EU (OJ L 356, 12.12.2014, p. 421).

⁽¹⁰⁾ Commission Regulation (EU) No 1300/2014 of 18 November 2014 on the technical specifications for interoperability relating to accessibility of the Union's rail system for persons with disabilities and persons with reduced mobility (OJ L 356, 12.12.2014, p. 110).

⁽¹¹⁾ Commission Regulation (EU) No 1301/2014 of 18 November 2014 on the technical specifications for interoperability relating to the 'energy' subsystem of the rail system in the Union (OJ L 356, 12.12.2014, p. 179).

- (14) It should be clarified when to apply the TSIs INF and the Annex to Regulation (EU) No 1301/2014 (TSI ENE) in case of upgrade or renewal of existing subsystems and fixed installations, in order to ensure a gradual transition to a fully interoperable European railway system, in accordance with Article 4 of Directive (EU) 2016/797.
- (15) The Annex to Regulation (EU) No 1300/2014 (TSI PRM) should be amended to better define the basic parameters which facilitate access to railway services for persons with reduced mobility, including the introduction of the concept of interoperable wheelchair transportable by train. Further clarifications are required concerning ticket vending machines and provision of travel information in aural, visual and tactile form.
- (16) References to standards require regular updates. In order to facilitate future updates, all details about standards should be gathered in dedicated appendices to each TSI, which can then be amended without amending the TSI core text. Such approach enables the applicants to use modern IT tools which perform better for requirements capture. All TSIs on Fixed Installations and Rolling Stock should be amended accordingly.
- (17) The railway infrastructure parameters registered in the Register of Infrastructure (RINF) should also evolve, in particular by amending the tables listing such parameters consistently with other amendments included in this Regulation and Commission Implementing Regulations (EU) 2023/1695 ⁽¹²⁾ and (EU) 2023/1693 ⁽¹³⁾, by making the infrastructure manager the data provider replacing the national registration entity which may keep a coordination role, and by identifying future developments.
- (18) Therefore the following Regulations should be amended accordingly:
- (1) Regulation (EU) No 321/2013 (TSI WAG);
 - (2) Regulation (EU) No 1299/2014 (TSI INF);
 - (3) Regulation (EU) No 1300/2014 (TSI PRM);
 - (4) Regulation (EU) No 1301/2014 (TSI ENE);
 - (5) Regulation (EU) No 1302/2014 (TSI LOC&PAS);
 - (6) Regulation (EU) No 1304/2014 (TSI NOI);
 - (7) Implementing Regulation (EU) 2019/777 (RINF).
- (19) The measures provided for in this Regulation are in accordance with the opinion of the Railway Safety and Interoperability Committee

HAS ADOPTED THIS REGULATION:

Article 1

Regulation (EU) No 321/2013 is amended as follows:

- (1) Article 4 is replaced as follows:

'Article 4

Not used.'

- (2) Article 9a is deleted;
- (3) the Annex is amended in accordance with Annex I to this Regulation.

⁽¹²⁾ Commission Implementing Regulation (EU) 2023/1695 of 10 August 2023 on the technical specification for interoperability relating to the control-command and signalling subsystems of the rail system in the European Union and repealing Regulation (EU) 2016/919 (see page 380 of this Official Journal).

⁽¹³⁾ Commission Implementing Regulation (EU) 2023/1693 of 10 August 2023 amending Implementing Regulation (EU) 2019/773 on the technical specification for interoperability relating to the operation and traffic management subsystem of the rail system within the European Union (see page 1 of this Official Journal).

Article 2

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

(1) Article 6 is replaced as follows:

'Article 6

Projects at an advanced stage of development

Article 7(2) of Directive (EU) 2016/797 applies.;

(2) the Annex is amended in accordance with Annex II to this Regulation.

Article 3

Regulation (EU) No 1300/2014 is amended as follows:

(1) Article 2 is modified as follows:

(a) in paragraphs 1 and 5 'Directive 2008/57/EC' is replaced by 'Directive (EU) 2016/797';

(b) paragraph 2 is replaced as follows:

'2. The TSI shall apply to the network of the Union rail system as described in Annex I of Directive (EU) 2016/797 with the exclusion of cases referred to in Article 1(3) and (4) of Directive (EU) 2016/797.;

(2) Article 4 is modified as follows:

(a) in paragraph 1 'Article 17(2) of Directive 2008/57/EC' is replaced by 'Article 13(1) of Directive (EU) 2016/797';

(b) in paragraph 2 point (c), 'Article 17, paragraph 3, of Directive 2008/57/EC' is replaced by 'Article 37 of Directive (EU) 2016/797';

(3) in Article 5, 'Article 9(3) of Directive 2008/57/EC' is replaced by 'Article 7(2) of Directive (EU) 2016/797';

(4) in Article 6 paragraph 5, 'Directive 2008/57/EC' is replaced by 'Directive (EU) 2016/797';

(5) In Article 7 paragraph 3, 'Article 6 of Directive 2008/57/EC' is replaced by 'Article 5 of Directive (EU) 2016/797';

(6) Article 8 is modified as follows:

(a) in paragraphs 6, 'Directive 2008/57/EC' is replaced by 'Directive (EU) 2016/797';

(b) in paragraphs 7, 'Article 6 of Directive 2008/57/EC' is replaced by 'Article 5 of Directive (EU) 2016/797';

(7) in Article 9 paragraph 4, 'Directive 2008/57/EC' is replaced by 'Directive (EU) 2016/797';

(8) the Annex is amended in accordance with Annex III to this Regulation.

Article 4

Regulation (EU) No 1301/2014 is amended as follows:

(1) the paragraph in Article 6 is replaced as follows:

'Article 7(2) of Directive (EU) 2016/797 applies.;

(2) Article 9 is amended as follows:

(1) in paragraphs 1 and 3 'Article 20 of Directive 2008/57/EC' is replaced by 'Article 18 of Directive (EU) 2016/797';

(2) in paragraph 2 'Article 29 of Directive 2008/57/EC' is replaced by 'Article 51 of Directive (EU) 2016/797';

(3) the Annex is amended in accordance with Annex IV to this Regulation.

Article 5

Regulation (EU) No 1302/2014 is amended as follows:

- (1) in Article 2(1), point (d), the term ‘mobile railway infrastructure construction and maintenance equipment’ is replaced by: ‘special vehicles, such as on-track machines (OTMs)’;
- (2) Article 8 is deleted;
- (3) Article 11 is amended as follows:
 - (a) in paragraph 1, the second subparagraph is amended as follows:
 - (i) the introductory phrase is replaced by the following:
‘They shall however continue to apply to.’;
 - (ii) point (c) is deleted;
 - (b) paragraphs 2 and 3 are deleted;
- (4) the Annex is amended in accordance with Annex V to this Regulation.

Article 6

The Annex to Regulation (EU) No 1304/2014 is replaced by the text in Annex VI to this Regulation.

Article 7

Implementing Regulation (EU) 2019/777 is amended as follows:

- (1) in Article 1, paragraph 2 is replaced as follows:
 - ‘2. Each Member State shall instruct its Infrastructure Managers to include the values of the parameters of its railway network in an electronic application which shall comply with the common specifications of this Regulation.’;
- (2) Article 2 is modified as follows:
 - (a) in paragraphs 4 and 5 ‘Member State’ is replaced by ‘infrastructure manager’;
 - (b) paragraph 6 is replaced as follows:
 - ‘6. The Agency shall set up a group composed of representatives of the infrastructure managers which shall coordinate, monitor and support the implementation of this Regulation into the RINF Application. This group shall also support the future development of this Regulation. National registration entities designated under Article 5 shall have the right to participate in line with their tasks and scope of activities. As appropriate, the Agency shall invite experts and representative bodies.’;
- (3) Articles 4 and 5 are replaced as follows:

‘Article 4

Data submission and update

1. Infrastructure managers shall directly submit data to the RINF Application, as soon as such data becomes available. The infrastructure managers shall ensure the accuracy, completeness, consistency and timeliness of the submitted data.
2. Infrastructure managers shall make available in RINF all information relating to new infrastructures to be placed in service, upgraded or renewed before their placing in service.

Article 5

National Registration Entity

Member State may designate a national registration entity to act as point of contact between the Agency and the infrastructure managers in the view of assisting and coordinating the infrastructure managers of their territory provided that this does not put at risk the availability of data in accordance with Article 4.’;

(4) Article 6 is replaced as follows:

'Article 6

Future developments

1. The Agency shall update the RINF application by 15 December 2024 in order to:
 - (a) Allow for a partial update of data corresponding to the modified parameter(s), in order to allow infrastructure managers to update the relevant modified information as soon as it becomes available;
 - (b) Further adapt the routing calculation on the network with a micro level description;
 - (c) Provide dedicated notification to railway undertakings regarding changes in the RINF Application in relation to the network(s) for which they have registered to be informed of and provide a system acknowledgement to the IM;
 - (d) Provide the definition, modelling and implementation of validity dates in order to fulfil the use cases;
 - (e) Align locations for infrastructure description with locations used in the Union for information exchange in telematics applications.
 - (f) Integrate infrastructure description related to the nature of the infrastructure which is available to railway undertakings (part of the network statement (*)) and to the technical characteristics of the rail service facilities (**).
2. Further developments of the RINF application may create a data system feeding into all electronic information flows in respect of the Union rail network.

(*) 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).

(**) Commission Implementing Regulation (EU) 2017/2177 of 22 November 2017 on access to service facilities and rail-related services (OJ L 307, 23.11.2017, p. 1) (C/2017/7692).;

(5) a new Article 7a is added:

'Article 7a

ERA vocabulary

“ERA Vocabulary” means a Technical Document issued by the Agency pursuant to Article 4(8) of Directive (EU) 2016/797, establishing human and machine readable data definitions and presentations and linked quality and accuracy requirements for each data element (ontology) of the rail system.

The Agency shall ensure the ERA vocabulary is maintained to reflect regulatory and technical developments affecting the rail system.’;

(6) the Annex is amended in accordance with Annex VII to this Regulation.

Article 8

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 10 August 2023.

For the Commission
The President
Ursula VON DER LEYEN

ANNEX I

The Annex to Regulation (EU) No 321/2013 is amended as follows:

- (1) point 1 is replaced by the following:

1. INTRODUCTION

A Technical Specification for Interoperability (TSI) is a specification that covers a subsystem (or part of it) as defined in Article 2(11) of Directive (EU) 2016/797 in order:

- to ensure the interoperability of the rail system, and
- to meet the essential requirements.;

- (2) point 1.2 is replaced by the following:

1.2. Geographical scope

This Regulation applies to the Union rail system.;

- (3) in point 1.3., the introductory phrase and point (a) are replaced by the following:

'In accordance with Article 4(3) of Directive (EU) 2016/797, this TSI:

- (a) covers the 'rolling stock-freight wagons' subsystem.;

- (4) in point 2.1, second paragraph, point (a) is replaced by the following:

'(a) special vehicles.;

- (5) Chapter 3 is amended as follows:

- (a) the introductory paragraph is replaced by the following:

'Article 3(1) of Directive (EU) 2016/797 provides that the rail system, its subsystems and their interoperability constituents are to meet the relevant essential requirements. The essential requirements are set out in general terms in Annex III to that Directive. Table 1 of this Annex indicates the basic parameters specified in this TSI and their correspondence to the essential requirements as explained in Annex III to Directive (EU) 2016/797.;

- (b) in Table 1, the following row 4.2.3.5.3 is inserted:

'4.2.3.5.3	Derailment detection and prevention function	1.1.1 1.1.2				2.4.3'
------------	--	----------------	--	--	--	--------

- (6) point 4.1 is replaced by the following:

4.1. Introduction

The rail system, to which Directive (EU) 2016/797 applies and of which freight wagons form a part, is an integrated system whose consistency shall be verified. This consistency shall be checked in particular with regard to the specifications of the rolling stock subsystem and the compatibility with the network (Section 4.2), its interfaces in relation to the other subsystems of the rail system in which it is integrated (Sections 4.2 and 4.3), as well as the initial operating and maintenance rules (Sections 4.4 and 4.5) as requested by Article 15(4) of Directive (EU) 2016/797.

The technical file, as set out in Article 15(4) of Directive (EU) 2016/797 and in point 2.4 of Annex IV to that Directive, shall contain in particular design related values concerning the compatibility with the network.;

- (7) in point 4.2.1, the third paragraph is deleted;

(8) point 4.2.2.2 is amended as follows:

(a) the first paragraph is replaced by the following:

‘The structure of a unit body, any equipment attachments and lifting and jacking points shall be designed such that no cracks, no significant permanent deformation or ruptures occur under the load cases defined in the specification referenced in Appendix D Index [1].’;

(b) the fourth paragraph is replaced by the following:

‘The lifting and jacking positions shall be marked on the unit. The marking shall comply with the specification referenced in Appendix D Index [2].’;

(9) in point 4.2.2.3, the following paragraph is added:

‘Units intended to be used for combined transport and requiring a wagon compatibility code shall be equipped with devices for securing the Intermodal Loading Unit.’;

(10) point 4.2.3.1 is amended as follows:

(a) the second and third paragraphs are replaced by the following:

‘The compliance of a unit with the intended reference profile including the reference profile for the lower part shall be established by one of the methods set out in the specification referenced in Appendix D Index [4].

The kinematic method, as described in the specification referenced in Appendix D Index [4] shall be used to establish conformity, if any, between the reference profile established for the unit and the respective target reference profiles G1, GA, GB and GC including those used for the lower part G11 and G12.’;

(b) the following paragraph is added:

‘Units intended to be used for combined transport shall be codified in accordance with the requirements of Appendix H and the specification referenced in Appendix D.2, index [B].’;

(11) in point 4.2.3.2, the second paragraph is replaced by the following:

‘The permissible payload a unit may carry, for axle loads up to and including 25 t, shall be determined by application of the specification referenced in Appendix D Index [5].’;

(12) point 4.2.3.3 is replaced by the following:

‘4.2.3.3. Compatibility with train detection systems

If the unit is intended to be compatible with one or more of the following train detection systems, this compatibility shall be established in accordance with the provisions of the technical document referenced in Appendix D.2 Index [A]:

(a) train detection systems based on track circuits (the electrical resistance of the wheelset can be assessed at IC level or at vehicle level);

(b) train detection systems based on axle counters;

(c) train detection systems based on loop equipment.

The related specific cases are defined in section 7.7 of the CCS TSI.’;

(13) in point 4.2.3.4, the second and third paragraphs are replaced by the following:

‘If the unit is intended to be capable of being monitored by line side equipment on the 1 435 mm track gauge network the unit shall be compliant with the specification referenced in Appendix D Index [6] in order to ensure sufficient visibility.

For units intended to be operated on the networks with track gauges of 1 524 mm, 1 600 mm, 1 668 mm, the corresponding values in Table 2 referring to the parameters of the specification referenced in Appendix D Index [6] shall be applied.’;

(14) in point 4.2.3.5.2, second paragraph, the first indent is replaced by the following:

‘— following the procedures set out in the specification referenced in Appendix D Index [7], or’;

(15) the following point 4.2.3.5.3 is inserted:

4.2.3.5.3. Derailment detection and prevention function

The derailment detection and prevention function is intended to prevent derailments or to mitigate the consequences of a derailment of the unit.

If a unit is fitted with the derailment detection and prevention function, the requirements below shall be met.

4.2.3.5.3.1. General requirements

The function shall be able to detect either a derailment or conditions which are a precursor to derailment of the unit in accordance with one of the three sets of requirements set out in points 4.2.3.5.3.2, 4.2.3.5.3.3 and 4.2.3.5.3.4 below.

It is allowed to combine those requirements as follows:

4.2.3.5.3.2 and 4.2.3.5.3.3

4.2.3.5.3.2 and 4.2.3.5.3.4

4.2.3.5.3.2 Derailment prevention function (DPF)

The DPF shall send a signal to the driver's cab of the locomotive hauling the train once a precursor to derailment is detected in the unit.

The signal enabling the DPF to be available at train level and its transmission between the unit, the locomotive and the other coupled unit(s) in a train shall be documented in the technical file.

4.2.3.5.3.3. Derailment detection function (DDF)

The DDF shall send a signal to the driver's cab of the locomotive hauling the train once the derailment is detected in the unit.

The signal enabling the DDF to be available at train level and its transmission between the unit, the locomotive and the other coupled unit(s) in a train shall be documented in the technical file.

4.2.3.5.3.4. Derailment detection and actuation function (DDAF)

The DDAF shall automatically activate a brake application when the derailment is detected without possibility of overriding by the driver.

The risk of false derailment detections shall be limited to an acceptable level.

Therefore, the DDAF shall be subject to a risk assessment in accordance with Implementing Regulation (EU) No 402/2013.

It shall be possible to deactivate the DDAF directly on the unit when the unit is stopped. That deactivation will release and isolate the DDAF from the brake system.

The DDAF shall indicate its status (activated/deactivated) and that status shall be visible from both sides of the unit. If this is not physically feasible, the DDAF shall indicate its status from at least one side and the other side of the wagon shall be marked in accordance with the specification referenced in Appendix D Index [2].’;

(16) in point 4.2.3.6.1, the first paragraph is replaced by the following:

‘The integrity of the structure of a bogie frame, all attached equipment and body to bogie connection shall be demonstrated based on methods as set out in the specification referenced in Appendix D Index [9]’;

(17) in point 4.2.3.6.2, Table 3 is replaced by the following:

Table 3

Limits of use of the geometric dimensions of wheelsets

Designation		Wheel diam. D [mm]	Minimum value [mm]	Maximum value [mm]
1 435 mm	Front-to-front dimension (S_R) $S_R = A_R + S_{d,left} + S_{d,right}$	$330 \leq D \leq 760$	1 415	1 426
		$760 < D \leq 840$	1 412	1 426
		$D > 840$	1 410	1 426
	Back-to-back distance (A_R)	$330 \leq D \leq 760$	1 359	1 363
		$760 < D \leq 840$	1 358	1 363
		$D > 840$	1 357	1 363
1 524 mm	Front-to-front dimension (S_R) $S_R = A_R + S_{d,left} + S_{d,right}$	$400 \leq D < 840$	1 492	1 514
		$D \geq 840$	1 487	1 514
	Back-to-back distance (A_R)	$400 \leq D < 840$	1 444	1 448
		$D \geq 840$	1 442	1 448
1 600 mm	Front-to-front dimension (S_R) $S_R = A_R + S_{d,left} + S_{d,right}$	$690 \leq D \leq 1\,016$	1 573	1 592
	Back-to-back distance (A_R)	$690 \leq D \leq 1\,016$	1 521	1 526
1 668 mm	Front-to-front dimension (S_R) $S_R = A_R + S_{d,left} + S_{d,right}$	$330 \leq D < 840$	1 648 ⁽¹⁾	1 659
		$840 \leq D \leq 1\,250$	1 648 ⁽¹⁾	1 659
	Back-to-back distance (A_R)	$330 \leq D < 840$	1 592	1 596
		$840 \leq D \leq 1\,250$	1 590	1 596

⁽¹⁾ Two-axle wagons with axle load up to 22,5 t the value shall be taken as 1 651 mm.'

(18) in point 4.2.4.3.2.1, the second and third paragraphs are replaced by the following:

'The brake performance of a unit shall be calculated in accordance with one of the specifications referenced in Appendix D, either Index [16], Index [37], Index [58] or Index [17].

The calculation shall be validated by tests. Brake performance calculation in accordance with the specification referenced in Appendix D Index [17] shall be validated as set out in the same specification or in the specification referenced in Appendix D, Index [58].';

(19) point 4.2.4.3.2.2 is amended as follows:

(a) the second paragraph is replaced by the following:

'If the unit is equipped with a parking brake, the following requirements shall be met:

— the immobilisation shall remain until intentionally released,

- where it is not possible to identify the state of the parking brake directly, an indicator showing the state shall be provided on both sides on the outside of the vehicle,
 - the minimum parking brake force, considering no wind, shall be determined by calculations as defined in the specification referenced in Appendix D Index [16].;
- (b) the following paragraph is added:
- ‘Where relevant, the calculations shall determine:
- the minimum parking brake force for an unloaded wagon,
 - the maximum parking brake force for a fully loaded wagon,
 - the breakover loading mass, i.e. the minimum loading condition for the maximum parking brake force,
 - the parking brake of a unit shall be designed considering a wheel/rail (steel/steel) adhesion factor not higher than 0,12.’;
- (20) in point 4.2.5, the eighth paragraph is replaced by the following:
- ‘The unit shall meet the requirements of this TSI without degradation for snow, ice and hail conditions as defined in the specification referenced in Appendix D Index [18], which correspond to the nominal range.’;
- (21) in point 4.2.6.2.1, the second paragraph is replaced by the following:
- ‘Units shall be bonded in accordance with the provisions as described in the specification referenced in Appendix D Index [27].’;
- (22) in point 4.2.6.2.2, the second paragraph is replaced by the following:
- ‘The unit shall be designed so that direct contact is prevented following the provisions set out in the specification referenced in Appendix D Index [27].’;
- (23) in point 4.2.6.3, the second sentence is replaced by the following:
- ‘The dimensions and clearance of these attachment devices shall be as described in the specification referenced in Appendix D Index [28].’;
- (24) in point 4.3.1, Table 5 is amended as follows:
- (a) the heading of the first column is replaced by the following:
‘Reference in TSI WAG’
 - (b) the heading of the second column is replaced by the following:
‘Reference in TSI INF’;
 - (c) the last row is deleted;
- (25) in point 4.3.2, Table 6 is amended as follows:
- (a) the heading of the first column is replaced by the following:
‘Reference in TSI WAG’
 - (b) the heading of the second column is replaced by the following:
‘Reference in TSI OPE’;
 - (c) the last row is deleted;
- (26) in point 4.3.3, Table 7, is amended as follows:
- (a) the heading of the first column is replaced by the following:
‘Reference in TSI WAG’;

(b) the second column is replaced by the following:

Reference in TSI CCS
— 4.2.10: Compatibility with trackside train detection systems: vehicle design
— 4.2.11: Electromagnetic compatibility between rolling stock and Control-Command and Signalling trackside equipment
— 4.2.10: Compatibility with trackside train detection systems: vehicle design
— 4.2.11: Electromagnetic compatibility between rolling stock and Control-Command and Signalling trackside equipment
— 4.2.10: Compatibility with trackside train detection systems: vehicle design'

(27) in point 4.4, in the last paragraph, the following sentence is deleted:

'The Notified Body shall verify only that the documentation on operation is provided.'

(28) in point 4.5, in the third paragraph, the following sentence is deleted:

'The Notified Body shall verify only that the documentation on maintenance is provided.'

(29) in point 4.5.1, the introductory phrase is replaced by the following:

'The general documentation comprises:';

(30) in point 4.5.2, the third sentence of the introductory paragraph is replaced by the following:

'The maintenance design justification file comprises:';

(31) point 4.8, the first paragraph, is amended as follows:

(a) the twentieth indent is deleted;

(b) the following indents are added:

- 'Minimum brake force and, where relevant, maximum brake force and breakover loading mass for the parking brake (if applicable)
- Number of axles where the parking brake is applied
- Presence of one or more of the following functions: DDF, DPF, DDAF.
- Description of the signal informing of a derailment or a precursor to a derailment and its transmission for units fitted with DDF or DPF.;

(32) point 6.1.2.1 is replaced by the following:

6.1.2.1 Running gear

The demonstration of conformity for running dynamic behaviour is set out in the specification referenced in Appendix D Index [8].

Units equipped with an established running gear as described in that specification are presumed to be in conformity with the relevant requirement provided that the running gears are operated within their established area of use.

The minimum axle load and maximum axle load during operation of a wagon equipped with an established running gear shall be compliant with the loading conditions between tare and loaded specified for the established running gear, as in the specification referenced in Appendix D Index [8].

In case the minimum axle load is not achieved by the mass of the vehicle in tare condition, conditions for use can be applied to the wagon requiring to operate it always with a minimum payload or a ballast (for example with an empty loading device), to be compliant with the parameters of the specification referenced in Appendix D Index [8].

In such case, the parameter 'Mass of wagon in tare conditions' used for dispensation of on track tests can be substituted by 'Minimum axle load'. This shall be reported in the Technical File as a condition for use.

The assessment of the bogie frame strength shall be based on the specification referenced in Appendix D Index [9].;

(33) point 6.1.2.2 is replaced by the following:

6.1.2.2. Wheelset

The demonstration of conformity for the mechanical behaviour of the wheelset assembly shall be carried out in accordance with the specification referenced in Appendix D Index [10], which defines limit values for the axial assembly force and the associated verification test.;

(34) in point 6.1.2.3(a), the first, second and third paragraphs are replaced by the following:

'Forged and rolled wheels: The mechanical characteristics shall be proven following the procedure described in the specification referenced in Appendix D Index [11].

If the wheel is intended to be used with brake blocks acting on the wheel running surface, the wheel shall be thermo mechanically proven by taking into account the maximum braking energy foreseen. A type test, as described in the specification referenced in Appendix D Index [11], shall be performed in order to check that the lateral displacement of the rim during braking and the residual stress are within the specified tolerance limits.

The decision criteria of residual stresses for forged and rolled wheels are set out in the same specification.;

(35) in point 6.1.2.4, the first and second paragraphs are replaced by the following:

'In addition to the requirement for the assembly above, the demonstration of conformity of the mechanical resistance and fatigue characteristics of the axle shall be based on the specification referenced in Appendix D, Index [12].

That specification includes the decision criteria for the permissible stress. A verification procedure shall exist to ensure at the production phase that no defects may adversely affect safety due to any change in the mechanical characteristics of the axles. The tensile strength of the material in the axle, the resistance to impact, the surface integrity, the material characteristics and the material cleanliness shall be verified. The verification procedure shall specify the batch sampling used for each characteristic to be verified.;

(36) in point 6.2.2.1, the first paragraph is replaced by the following:

'The demonstration of conformity shall be in accordance with one of the specifications referenced in Appendix D, either Index [3] or Index [1].;

(37) point 6.2.2.2 is replaced by the following:

6.2.2.2. Safety against derailment running on twisted track

The demonstration of conformity shall be carried out in accordance with the specification referenced in Appendix D Index [7].;

(38) point 6.2.2.3 is amended as follows:

(a) the first paragraph is replaced by the following:

'The demonstration of conformity shall be carried out in accordance with the specification referenced in Appendix D Index [7].;

(b) in the second paragraph, the introductory phrase is replaced by the following:

'For units operated on the 1 668 mm track gauge network, the evaluation of the estimated value for the guiding force normalized to the radius $R_m = 350$ m in accordance with that specification, shall be calculated in accordance with the following formula:;

(c) the fifth paragraph is replaced by the following:

‘The combination of the highest equivalent conicity and speed for which the unit meets the stability criterion in the specification referenced in Appendix D Index [7] shall be recorded in the report.’;

(39) in point 6.2.2.4, the first paragraph is replaced by the following:

‘The demonstration of conformity for mechanical resistance and fatigue characteristics of the rolling bearing shall be in accordance with the specification referenced in Appendix D Index [13].’;

(40) point 6.2.2.5 is replaced by the following:

‘6.2.2.5. Running gear for manual change of wheelsets

Changeover between 1 435 mm and 1 668 mm track gauges

The technical solutions described in the specification referenced in Appendix D Index [14] for axle units and for bogie units are deemed to be compliant with the requirements in point 4.2.3.6.7.

Changeover between 1 435 mm and 1 524 mm track gauges

The technical solution described in the specification referenced in Appendix D Index [15] is deemed to be compliant with the requirements in point 4.2.3.6.7.’;

(41) in point 6.2.2.8.1, the first sentence is replaced by the following:

‘Barriers shall be tested in accordance with the specification referenced in Appendix D Index [19].’;

(42) point 6.2.2.8.2 is amended as follows:

(a) the first and second paragraphs are replaced by the following:

‘Testing of the materials ignitability and flame spread properties shall be performed in accordance with the specification referenced in Appendix D Index [20] for which the limit value shall be $CFE \geq 18 \text{ kW/m}^2$.

For rubber parts of bogies, the testing shall be performed in accordance with the specification referenced in Appendix D Index [23] for which the limit value shall be $MARHE \leq 90 \text{ kW/m}^2$ under the test conditions set out in the specification referenced in Appendix D Index [22].’;

(b) in the third paragraph, the sixth indent is replaced by the following:

‘– materials that meet the requirements of category C-s3, d2 or higher in accordance with the specification referenced in Appendix D Index [21].’;

(43) point 6.2.2.8.3 is replaced by the following:

‘6.2.2.8.3 Cables

The electrical cables shall be selected and installed in accordance with the specification referenced in Appendix D Indexes [24] and [25].’;

(44) point 6.2.2.8.4 is replaced by the following:

‘6.2.2.8.4 Flammable liquids

The measures taken shall be in accordance with the specification referenced in Appendix D Index [26].’;

(45) point 7.1 is replaced by the following:

‘7.1 Authorisation for placing on the market

(1) This TSI is applicable to the subsystem ‘rolling stock — freight wagons’ within the scope set out in its points 1.1, 1.2 and 2.1, which are placed on the market after the date of application of this TSI, except where point 7.1.1 ‘Application to ongoing projects’ applies.

- (2) This TSI is also applicable on a voluntary basis to:
- units referred to in point 2.1(a) in running mode, in case they correspond to a ‘unit’ as defined in this TSI, and
 - units as defined in point 2.1(c), in case they are in empty configuration.

In case the applicant chooses to apply this TSI, the corresponding EC declaration of verification shall be recognised as such by Member States.

- (3) Compliance with this Annex in its version applicable before 28 September 2023 is deemed equivalent to compliance with this TSI, except for changes listed in Appendix A.;

(46) point 7.1.1 is replaced by the following:

7.1.1. Application to ongoing projects

- (1) The application of this TSI applicable from 28 September 2023 is not mandatory for projects that, on that date, are in phase A or phase B as defined in points 7.2.3.1.1 and 7.2.3.1.2 of the ‘previous TSI’ (i.e. this Regulation, as amended by Commission Implementing Regulation (EU) 2020/387 (*)).
- (2) Without prejudice to Appendix A, Table A.2, the application of the requirements of Chapters 4, 5, 6 to projects referred in point (1) is possible on a voluntary basis.
- (3) If the applicant chooses not to apply this TSI version to an ongoing project, the version of this TSI applicable at the beginning of phase A as referred to in point (1) remains applicable.

(*) Commission Implementing Regulation (EU) 2020/387 of 9 March 2020 amending Regulations (EU) No 321/2013, (EU) No 1302/2014 and (EU) 2016/919 as regards the extension of the area of use and transition phases (OJ L 73, 10.3.2020, p. 6-18).;

(47) point 7.1.2, the third paragraph, is amended as follows:

- (a) the following points (d1) and (d2) are inserted after point (d):

‘(d1) If the unit has electronic equipment on board emitting interference current via the rail, the ‘influencing unit’ (as defined in the technical document referenced in Appendix D.2 Index [A]) of which the unit is planned to be part shall be compliant with specific cases for track circuits notified under Article 13 of CCS TSI by applying the harmonised vehicle test methods and vehicle impedance referred in the technical document referenced in Appendix D.2 Index [A]. Compliance of the unit can be demonstrated based on the technical document referred in Article 13 of CCS TSI and is checked by the Notified Body as part of EC verification.

(d2) If the unit has electrical or electronic equipment on board emitting interference electromagnetic fields:

- close to the wheel sensor of an axle counter, or
- induced by the return current via the rail if applicable.

The ‘influencing unit’ (as defined in the technical document referenced in Appendix D.2 Index [A]) of which the unit is planned to be part shall be compliant with specific cases for axle counters notified under Article 13 of CCS TSI. Compliance of the unit shall be demonstrated by applying the harmonised vehicle test methods referred in the technical document referenced in appendix D.2 index [A] or alternatively based on the technical document referred in Article 13 of CCS TSI. It is checked by the Notified Body as part of EC verification.’;

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

‘(e) The unit must be equipped with the manual coupling system in accordance with the prescriptions set out in Appendix C, Section 1, including the fulfilment of Section 8 or with any semi-automatic or automatic coupling system.’;

(c) point (g) is replaced by the following:

‘(g) The unit must be marked with all applicable markings in accordance with the specification referenced in Appendix D Index [2].’;

(d) point (h) is replaced by the following:

‘(h) The minimum and, where relevant maximum parking brake force, the number of wheelsets (N) and the number of wheelsets on which the parking brake is applied (n) shall be marked as set out in Figure 1:

Figure 1

Marking of the parking brake force



(48) in point 7.2.1, the fifth paragraph is replaced by the following:

‘Non-certified ICs: Components which correspond to an IC in Chapter 5 but are not holding a certificate of conformity and which are produced before the expiry of the transitional period referred to in Article 8’;

(49) in point 7.2.2, the heading is replaced by the following:

7.2.2. Changes to a unit in operation or to an existing unit type’;

(50) in point 7.2.2.1, the second paragraph, the first sentence is replaced by the following:

‘This point 7.2.2 applies in case of any change(s) to a unit in operation or to an existing unit type, including renewal or upgrade.’;

(51) point 7.2.2.2 is amended as follows:

(a) the second paragraph is replaced by the following:

‘Without prejudice to point 7.2.2.3, compliance with the requirements of this TSI or Commission Regulation (EU) No 1304/2014 (*) (‘TSI NOI’) (see point 7.2 of TSI NOI) shall only be needed for the basic parameters in this TSI which may be affected by the change(s).

(*) Commission Regulation (EU) No 1304/2014 of 26 November 2014 on the technical specification for interoperability relating to the subsystem ‘rolling stock — noise’ amending Decision 2008/232/EC and repealing Decision 2011/229/EU (OJ L 356, 12.12.2014, p. 421).’;

(b) in Table 11a, the following row 4.2.3.5.3 is inserted:

‘4.2.3.5.3 Derailment detection and prevention function	Presence and type of derailment detection and prevention function(s)	Fitting/removing of prevention/detection function	N/A’
---	--	---	------

- (c) the twelfth and thirteenth paragraphs are replaced by the following:

‘In order to establish the EC type or design examination certificate, the notified body selected by the entity managing the change may refer to:

- the original EC type or design examination certificate for parts of the design that are unchanged or those that are changed but do not affect the conformity of the subsystem, as far as it is still valid,
- additional EC type or design examination certificate (amending the original certificate) for modified parts of the design that affect the conformity of the subsystem with the TSIs referred to in the certification framework defined in point 7.2.3.1.1.

In case the validity period of the EC type or design examination certificate for the original type is limited to 10 years (due to the application of the former Phase A/B concept), the validity period of the EC type or design examination certificate for the modified type, type variant or type version shall be limited to 14 years after the date of appointment of a notified body by the applicant for the initial rolling stock type (beginning of phase A of the original EC type or design examination certificate).;

- (52) in point 7.2.2.3, the heading and the first paragraph are replaced by the following:

‘7.2.2.3. Particular rules for units in operation not covered by an EC declaration of verification with a first authorisation for placing in service before 1 January 2015

The following rules apply, in addition to point 7.2.2.2, to units in operation with a first authorisation for placing in service before 1 January 2015, where the scope of the change has an impact on basic parameters not covered by the EC declaration.’;

- (53) point 7.2.2.4 is amended as follows:

- (a) the heading is replaced by the following:

‘7.2.2.4. Rules for the extension of the area of use for units in operation having an authorisation in accordance with Directive 2008/57/EC or in operation before 19 July 2010’;

- (b) in point (4), point (a) is replaced by the following:

‘(a) specific cases relating to any part of the extended area of use, listed in this TSI, TSI NOI and CCS TSI’;

- (54) point 7.2.3.1 is replaced by the following:

‘7.2.3.1. Rolling stock subsystem

This point concerns a rolling stock type (unit type in the context of this TSI), as defined in Article 2(26) of Directive (EU) 2016/797, which is subject to an EC type or design verification procedure in accordance with section 6.2 of this TSI. It also applies to the EC type or design verification procedure in accordance with the TSI NOI, which refers to this TSI for its scope of application to freight units.

The TSI assessment basis for an EC type or design examination is defined in columns ‘Design review’ and ‘Type test’ of Appendix F of this TSI and of Appendix C of the TSI NOI.’;

- (55) points 7.2.3.1.1 and 7.2.3.1.2 are replaced by the following:

‘7.2.3.1.1. Definitions

- (1) Initial assessment framework

The initial assessment framework is the set of TSIs (this TSI and the TSI NOI) applicable at the beginning of the design phase when the notified body is contracted by the applicant.

(2) Certification framework

The certification framework is the set of TSIs (this TSI and the TSI NOI) applicable at the time of issuing the EC type or design examination certificate. It is the initial assessment framework amended with the revisions of TSIs that came into force during the design phase.

(3) Design phase

The design phase is the period starting once a notified body, which is responsible for EC verification, is contracted by the applicant and ending when the EC type or design examination certificate is issued.

A design phase can cover a type and one or several type variant(s) and type version(s). For all type variant(s) and type version(s), the design phase is considered as starting at the same time as for the main type.

(4) Production phase

The production phase is the period during which units may be placed on the market on the basis of an EC declaration of verification referring to a valid EC type or design examination certificate.

(5) Unit in operation

A unit is in operation when it is registered with 'Valid' registration code '00', in the National Vehicle Register in accordance with Decision 2007/756/EC or in the European Vehicle Register in accordance with Implementing Decision (EU) 2018/1614 and maintained in a safe state of running in accordance with Implementing Regulation (EU) 2019/779.

7.2.3.1.2. Rules related to the EC type or design examination certificate

(1) The notified body shall issue the EC type or design examination certificate referring to the certification framework.

(2) When a revision of this TSI or of the TSI NOI comes into force during the design phase, the notified body shall issue the EC type or design examination certificate in accordance with the following rules:

— For changes in the TSIs that are not referenced in Appendix A, conformity with the initial assessment framework leads to conformity to the certification framework. The Notified Body shall issue the EC type or design examination certificate referring to the certification framework without additional assessment.

— For changes in the TSIs that are referenced in Appendix A, their application is mandatory in accordance with the transition regime laid down in that Appendix. During the transition period, the Notified Body may issue the EC type or design examination certificate referring to the certification framework without additional assessment. The Notified Body shall list in the EC type or design examination certificate all the points assessed in accordance with the initial assessment framework.

(3) When several revisions of this TSI or of the TSI NOI come into force during the design phase, point (2) shall apply to all revisions successively

(4) It is always permissible (but not mandatory) to use a most recent version of any TSI, either totally or for particular sections, unless explicitly otherwise specified in the revision of those TSIs; in case of application limited to particular sections, the applicant has to justify and document that applicable requirements remain consistent, and that has to be approved by the notified body.;

(56) the following point 7.2.3.1.3 is inserted:

7.2.3.1.3. Validity of the EC type or design examination certificate

- (1) When a revision of this TSI or of the TSI NOI comes into force, the EC type or design examination certificate for the subsystem remains valid unless it is required to be revised in accordance with the specific transition regime of a TSI change.
- (2) Only the changes to the TSIs with a specific transition regime can apply to units in production phase or to units in operation.;

(57) point 7.2.3.2 is replaced by the following:

7.2.3.2. Interoperability constituents

- (1) This point concerns interoperability constituents which are subject to type examination or design examination or to suitability for use.
- (2) The type or design examination or suitability for use remains valid even if a revision of this TSI or of the TSI NOI comes into force, unless explicitly otherwise specified in the revision of those TSIs.

During this time, new constituents of the same type are permitted to be placed on the market without a new type assessment.;

(58) in point 7.3.1, the first paragraph is replaced by the following:

‘The specific cases, as listed in point 7.3.2, are classified as:

- “P” cases: “permanent” cases.
- “T0”: “temporary” cases of indefinite duration, where the target system shall be reached by a date still to be determined.
- “T2” cases: “temporary” cases, where the target system shall be reached by 31 December 2035.;

(59) point 7.3.2.2 is amended as follows:

(a) ‘EN 15437-1:2009’ is replaced by ‘EN 15437-1:2009+A1:2022’

(b) in point (a) the first sentence is replaced by the following:

‘(“T2”) Units intended to operate on the Swedish railway network shall be compliant with the target and prohibitive zones as set out in Table 12.’

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

‘(b) Specific case France (“T0”)

This specific case is applicable to all units intended to operate on the French railway network.

Points 5.1 and 5.2 of standard EN 15437-1:2009+A1:2022 apply with the following specificities. The notations are the ones used in picture 3 of the standard.

$$W_{TA} = 70 \text{ mm}$$

$$Y_{TA} = 1\,092,5 \text{ mm}$$

$$L_{TA} = V_{\max} \times 0,56 \text{ (} V_{\max} \text{ being the maximal line speed at the level of the Hot Axle Box Detector (HABD), expressed in km/h).}$$

Units mutually recognised in accordance with point 7.1.2 and units equipped with on-board axle bearing condition monitoring equipment are exempted from this specific case. The exemption of units in accordance with point 7.1.2 is not applicable when using other conformity assessment methods in accordance with point 6.1.2.4a.;

- (60) in point 7.3.2.4, the heading ‘Specific case UK for Great Britain’ and the following two paragraphs are deleted;
- (61) point 7.3.2.5 is replaced by the following:

7.3.2.5 Brake safety requirements (point 4.2.4.2)

Specific case Finland

For freight wagon intended to operate only on 1 524 mm network, the safety requirement defined in point 4.2.4.2 is deemed fulfilled if the unit complies with conditions defined in point 9 of Appendix C with the following modifications:

- (1) (point 9(d) of Appendix C) the braking performance shall be determined on the basis of the minimum distance of 1 200 m between signals on the Finnish network. The minimum percentage of braked weight is 55 % for 100 km/h and 85 % for 120 km/h;
 - (2) (point 9(l) of Appendix C) if the brake system requires an interoperability constituent ‘friction element for wheel tread brakes’, the interoperability constituent shall comply with the requirements of point 6.1.2.5 or be made of cast iron.’;
- (62) point 7.3.2.7 is deleted;
- (63) point 7.6 is deleted;
- (64) Appendix A is replaced by the following:

‘Appendix A

Changes of requirements and transition regimes

For other TSI points than these listed in Table A.1 and Table A.2, compliance with the ‘previous TSI’ (i.e. this Regulation, as amended by Commission Implementing Regulation (EU) 2020/387 (*) imply compliance with this TSI applicable from 28 September 2023.

Changes with a generic transition regime of 7 years:

For TSI points listed in Table A.1, compliance with the previous TSI does not imply compliance with the version of this TSI applicable from 28 September 2023.

Projects already in design phase on 28 September 2023 shall comply with the requirement of this TSI from 28 September 2030.

Projects in production phase and units in operation are not affected by the TSI requirements listed in Table A.1

Table A.1

transition regime of 7 years

TSI point(s)	TSI point(s) in previous TSI	Explanation of the TSI change
4.2.2.3 Second paragraph	New requirement	Inclusion of a requirement on the securing devices
4.2.3.5.3 Derailment detection and prevention function	No point	Inclusion of requirements for the derailment detection and prevention function
4.2.4.3.2.1 Service brake	4.2.4.3.2.1 Service brake	Evolution of the specification referenced in Appendix D.1, Indexes [16] and [17]
4.2.4.3.2.2 Parking brake	4.2.4.3.2.2 Parking brake	Evolution of the specification referenced in Appendix D.1 Index [17]

4.2.4.3.2.2 Parking brake	4.2.4.3.2.2 Parking brake	Change in the calculation of the parking brake parameters
6.2.2.8.1 Testing of barriers	6.2.2.8.1 Testing of barriers	Evolution of the specification referenced in Appendix D.1 Index [19]
7.1.2 (h) Marking of the parking brake	7.1.2 (h) Marking of the parking brake	Change in the required marking
Point 9 of Appendix C	Point 9 of Appendix C	Evolution of the specification referenced in Appendix D.1, Indexes [38], [39], [46], [48], [49], [58]
Points referring to Appendix H and Appendix D.2 index [B]	New requirement	Inclusion of requirements on the codification of units intended to be used in combined transport
Points referring to Appendix D.2 index [A] except to point 3.2.2	Points referring to ERA/ERTMS/033281 V4 except to point 3.2.2	ERA/ERTMS/033281 V5 replaces ERA/ERTMS/033281 V4, main changes concern frequency management for interference current limits and closure of open points

Changes with a specific transition regime:

For TSI points listed in Table A.2, compliance with the previous TSI does not imply compliance with this TSI applicable from 28 September 2023.

Projects already in design phase on 28 September 2023, projects in production phase, and units in operation shall comply with the requirement of this TSI in accordance with the respective transition regime set out in Table A.2 starting from 28 September 2023.

Table A.2

Specific transition regime

TSI point(s)	TSI points(s) in previous TSI	Explanation on TSI change	Transition regime			
			Design phase not started	Design phase started	Production phase	units in operation
Points referring to point 3.2.2 Appendix D.2 Index [A]	Points referring to point 3.2.2 of ERA/ERTMS/033281 V4	ERA/ERTMS/033281 V5 replaces ERA/ERTMS/033281 V4	Transition regime is defined in Table B1 in Appendix B to the CCS TSI			

(*) Commission Implementing Regulation (EU) 2020/387 of 9 March 2020 amending Regulation (EU) No 321/2013 concerning the technical specification for interoperability relating to the subsystem 'rolling stock — freight wagons' of the rail system (OJ L 73 10.3.2020, p. 6).;

(65) Appendix C is amended as follows:

- (a) in the section 'Additional optional conditions', 'C.18' is replaced by 'C.20';
- (b) point 1 is replaced by the following:

1. Manual coupling system

The manual coupling system shall comply with the following requirements:

- The screw coupling system excluding the draw hook, and the draw hook itself, shall respectively comply with the requirements related to freight wagons defined in Appendix D Index [31]
- The wagon shall comply with the requirements related to freight wagons defined in Appendix D Index [59]
- The buffer shall comply with the requirements related to freight wagons defined in Appendix D Index [32]

Where a combined automatic and screw coupler is fitted, it is permissible for the auto coupler head to infringe the space for shunting staff on the left hand side when it is stowed and the screw coupler is in use. In this case the marking defined in the specification referenced in Appendix D Index [2] is mandatory.

In order to provide this full compatibility, it is permitted to have a different value of the distance between buffer centrelines, 1 790 mm (Finland) and 1 850 mm (Portugal and Spain) taking into account the specification referenced in Appendix D Index [32];

- (c) point 2 is replaced by the following:

2. UIC footsteps and handrails

The unit shall be equipped with footsteps and handrails in accordance with the specification referenced in Appendix D Index [28] and with clearances in accordance with the same specification;

- (d) point 3 is replaced by the following:

3. Ability to be hump shunted

In addition to the requirements of point 4.2.2.2 the unit shall be assessed in accordance with the specification referenced in Appendix D Index [1] and classified in Category F I in accordance with the same specification with the following exception: for units designed to carry motor vehicles or combined transport units without long stroke shock absorbers the Category F-II may be used. The requirements concerning the buffing tests in the same specification apply.;

- (e) in point 7, the following points (c) and (d) are added:

'(c) If the unit has electronic equipment on board emitting interference current via the rail, the 'influencing unit' (as defined in the technical document referenced in Appendix D.2 Index [A]) of which the unit is planned to be part shall be compliant with specific cases for track circuits notified under Article 13 of CCS TSI by applying the harmonised vehicle test methods and vehicle impedance referred in the technical document referenced in Appendix D.2 Index [A]. Compliance of the unit can be demonstrated based on the technical document referred in Article 13 of CCS TSI and is checked by the Notified Body as part of EC verification.

- (d) If the unit has electrical or electronic equipment on board emitting interference electromagnetic fields:

- close to the wheel sensor of an axle counter, or
- induced by the return current via the rail if applicable.

The 'influencing unit' (as defined in the technical document referenced in Appendix D.2 Index [A]) of which the unit is planned to be part shall be compliant with specific cases for axle counters notified under Article 13 of CCS TSI by applying the harmonised vehicle test methods referred in the technical document referenced in Appendix D.2 Index [A]. Compliance of the unit can be demonstrated based on the technical document referred in Article 13 of CCS TSI and is checked by the Notified Body as part of EC verification.;

(f) point 8 is replaced by the following:

'8. Tests concerning longitudinal compressive forces

The verification of safe running under longitudinal compressive forces shall be in accordance with the specification referenced in Appendix D Index [33].;

(g) point 9 is amended as follows:

(i) point (c) is replaced by the following:

'Every unit shall be fitted with a brake system having at least brake modes G and P. The brake modes G and P shall be assessed in accordance with the specification referenced in Appendix D Index [36].;

(ii) in point (e), the second sentence is replaced by the following:

'The brake application time of the P brake mode in accordance with the specification referenced in Appendix D Index [36] are also valid for further brake modes.;

(iii) in point (f), the second sentence is replaced by the following:

'Details for standardised air reservoirs are set out in the specifications referenced in Appendix D Index [40] and Index [41].;

(iv) in point (h), the first sentence is replaced by the following:

'The distributor and distributor isolating device shall be in accordance with the specification referenced in Appendix D Index [34].;

(v) point (i) is amended as follows:

— point (i) is replaced by the following:

'(i) The interface of the brake pipe shall be in accordance with the specification referenced in Appendix D Index [42].;

— point (iv) is replaced by the following:

'(iv) The end cocks shall be in accordance with the specification referenced in Appendix D Index [43].;

(vi) points (j) and (k) are replaced by the following:

'(j) The brake mode switching device shall be in accordance with the specification referenced in Appendix D Index [44].

(k) Brake block holders shall be in accordance with the specification referenced in Appendix D Index [45].;

(vii) point (l) is replaced by the following:

'If the brake system requires a 'friction element for wheel tread brakes' interoperability constituent, the interoperability constituent shall, in addition to the requirements of point 6.1.2.5, comply with the specification referenced in Appendix D Index [46] or Index [47].;

(viii) in point (m), the first and second sentences are replaced by the following:

'Slack adjusters shall be in accordance with the specification referenced in Appendix D Index [48]. The assessment of conformity shall be carried out in accordance with the same specification';

(ix) point (n) is replaced by the following:

(n) If the unit is equipped with a wheel slide protection system (WSP) it shall be in accordance with the specification referenced in Appendix D Index [49].

Table C.3

Minimum braking performance for brake modes G and P

Braking mode	Command Equipment	Unit type	Load status	Requirement for running speed at 100 km/h		Requirement for running speed at 120 km/h	
				Maximum braking distance	Minimum braking distance	Maximum braking distance	Minimum braking distance
Braking mode 'P'	Change-over ⁽¹⁾	'S1' ⁽²⁾	Empty	$S_{max} = 700 \text{ m}$ $\lambda_{min} = 65 \%$ $a_{min} = 0,60 \text{ m/s}^2$	$S_{min} = 390 \text{ m}$ $\lambda_{max} = 125 \%$, (130 %) ⁽³⁾ $a_{max} = 1,15 \text{ m/s}^2$	$S_{max} = 700 \text{ m}$ $\lambda_{min} = 100 \%$ $a_{min} = 0,88 \text{ m/s}^2$	$S_{min} = 580 \text{ m}$ $\lambda_{max} = 125 \%$, (130 %) ⁽³⁾ $a_{max} = 1,08 \text{ m/s}^2$
			Inter-mediate	$S_{max} = 810 \text{ m}$ $\lambda_{min} = 55 \%$ $a_{min} = 0,51 \text{ m/s}^2$	$S_{min} = 390 \text{ m}$ $\lambda_{max} = 125 \%$ $a_{max} = 1,15 \text{ m/s}^2$		
			Loaded	$S_{max} = 700 \text{ m}$ $\lambda_{min} = 65 \%$ $a_{min} = 0,60 \text{ m/s}^2$	$S_{min} = \text{Max} [(S = 480 \text{ m}, \lambda_{max} = 100 \%, a_{max} = 0,91 \text{ m/s}^2) (S \text{ obtained with a mean retardation force of } 16,5 \text{ kN per axle})] \text{ } ^{(4)}$		
	Variable load Relay ⁽⁵⁾	'SS', 'S2'	Empty	$S_{max} = 480 \text{ m}$ $\lambda_{min} = 100 \%$ ⁽⁶⁾ $a_{min} = 0,91 \text{ m/s}^2$ ⁽⁶⁾	$S_{min} = 390 \text{ m}$ $\lambda_{max} = 125 \%$, (130 %) ⁽¹⁾ $a_{max} = 1,15 \text{ m/s}^2$	$S_{max} = 700 \text{ m}$ $\lambda_{min} = 100 \%$ $a_{min} = 0,88 \text{ m/s}^2$	$S_{min} = 580 \text{ m}$ $\lambda_{max} = 125 \%$, (130 %) ⁽¹⁾ $a_{max} = 1,08 \text{ m/s}^2$
			'S2' ⁽⁷⁾	Loaded	$S_{max} = 700 \text{ m}$ $\lambda_{min} = 65 \%$ $a_{min} = 0,60 \text{ m/s}^2$	$S_{min} = \text{Max} [(S = 480 \text{ m}, \lambda_{max} = 100 \%, a_{max} = 0,91 \text{ m/s}^2) (S \text{ obtained with a mean retardation force of } 16,5 \text{ kN per axle})] \text{ } ^{(8)}$	

		'SS' ⁽⁹⁾	Loaded (18 t per axle for brake blocks)			$S_{\max}^{(10)} = \text{Max} [S = 700 \text{ m}, \lambda_{\max} = 100 \%, a_{\max} = 0,88 \text{ m/s}^2] (S \text{ obtained with a mean retardation force of } 16 \text{ kN per axle})^{(11)}$
Braking mode 'G'					There shall be no separate assessment of the braking performance of units in position G. A unit's braked weight in position G is the result of the braked weight in position P (see the specifications referenced in Appendix D, either Index [17] or Index [58])	

⁽¹⁾ Changeover in accordance with the specification referenced in Appendix D Index [38].

⁽²⁾ An 'S1' unit is a unit with empty/load device. The maximum load per axle is 22,5 t.

⁽³⁾ Only for two stage load brake (changeover command) and P10 (cast iron blocks with 10 ‰ phosphor)- or LL-brake blocks.

⁽⁴⁾ The maximum mean retardation force allowed (for running speed at 100 km/h) is $18 \times 0,91 = 16,5 \text{ kN/axle}$. This value comes from the maximum braking energy input permitted on a clasp braked wheel with a nominal new diameter in the range of [920 mm; 1 000 mm] during braking (the brake weight shall be limited to 18 tonnes/axle).

⁽⁵⁾ Variable load relay in accordance with the specification referenced in Appendix D Index [35] in combination with a variable load sensing device in accordance with the specification referenced in Appendix D Index [39].

⁽⁶⁾ $a = \left(\frac{(\text{Speed (km/h)})}{3,6} \right)^2 / (2 \times (S - ((Te) \times (\text{Speed (km/h)}) / 3,6)))$, with $Te = 2 \text{ sec}$. Distance calculation in accordance with the specification referenced in Appendix D Index [16].

⁽⁷⁾ An 'S2' unit is a unit with a variable load relay. The maximum load per axle is 22,5 t.

⁽⁸⁾ The automatic-load controlled equipment of wagons worked under s conditions can provide a maximum braked weight of $\lambda = 100\%$, up to load limit equal to 67 % of the maximum permissible wagon weight.

For standard wheelset with using the max axle load

Max 1 000 mm; minimal worn 840 mm, max axle load 22,5t,

Max axle load for $\lambda=100$: 15 t

Max 840 mm; minimal worn 760 mm,

max axle load 20 t, Max axle load for $\lambda=100$: 13 t

Max 760 mm; minimal worn 680 mm,

max axle load 18 t, Max axle load for $\lambda=100$: 12 t

Max 680 mm; minimal worn 620 mm

Max axle load 16 t, Max axle load for $\lambda=100$: 10,5 t

-
- (⁹) An 'SS' unit shall be equipped with a variable load relay. The maximum load per axle is 22,5 t.
- (¹⁰) λ must not exceed 125 %, considering for braking only on wheels (brake blocks), the maximum mean retardation force allowed of 16 kN/axle (for running speed at 120 km/h).
- (¹¹) The requirement by a running speed of 120 km/h is to fulfil $\lambda = 100$ % up to the SS load limit, with following derogation: the mean retardation force for tread brake with wheel diameter [new max 1 000mm, worn min. 840 mm] shall be limited to 16 kN/wheelset. This limit is caused by the maximum admissible braking energy corresponding to 20 t axle load with $\lambda = 90$ % and 18 t braked weight per wheelset.
If a braked weight percentage of more than 100 % is required with an axle load of more than 18 t, it is necessary to realize another type of brake system (for example disc brakes) to limit the thermal load on the wheel.'
-

(x) the following point (o) is added:

'(o) For wagons with composite brake blocks and a nominal wheel diameter of max 1 000 mm, minimal worn 840 mm and a braked weight per wheelset of more than 15,25 t (14,5 t plus 5%), a relay valve type E in accordance with the specification referenced in Appendix D Index [35] shall be used. For wagons with a nominal wheel diameter smaller than 920 mm, this brake weight limit value shall be adapted in line with the energy input into the wheel rim.'

(h) point 12 is replaced by the following:

12. Welding

Welding shall be carried out in accordance with the specifications referenced in Appendix D Indexes [50] to [54];

(i) in point 14, the second paragraph, the introductory phrase is replaced by the following:

'With regard to the use of wheel tread brake systems, this condition is deemed to be met if the 'friction element for wheel tread brakes' interoperability constituent is, in addition to the requirements of point 6.1.2.5, compliant with the specification referenced in Appendix D, either Index [46] or Index [47], and if the wheel:'

(j) points 15 to 18 are replaced by the following:

15. Specific product properties concerning the wheel

The wheels shall be in accordance with the specification referenced in Appendix D Index [55]. The thermal mechanical type test required in point 6.1.2.3 shall be carried out in accordance with the specification referenced in Appendix D Index [11] when the complete brake system is acting directly on the wheel tread.

16. Tow hooks

Units shall be provided with tow hooks, each one being fixed to the side of the unit underframe in accordance with the specification referenced in Appendix D Index [56].

Alternative technical solutions are allowed as far as conditions listed in the same specification are respected. If the alternative solution is a cable eye bracket, it shall in addition have a minimum diameter of 85 mm.

17. Protective devices on protruding parts

To ensure the safety of staff, protruding (e.g. angular or pointed) parts of the unit located up to 2 m above rail level or above passageways, working surfaces or tow hooks which are liable to cause accidents, shall be fitted with protective devices as described in the specification referenced in Appendix D Index [56].

18. Label holders and attachment devices for rear-end signal

All units shall be equipped with a label holder in accordance with the specification referenced in Appendix D Index [57] and at both ends with attachment devices as set out in point 4.2.6.3.;

(k) point 20 is replaced by the following:

‘20. Running dynamic behaviour

The combination of maximum operating speed and maximum admissible cant deficiency shall be in accordance with the specification referenced in Appendix D Index [7].

Units equipped with established running gear as specified in point 6.1.2.1 are presumed to be in conformity with this requirement.’;

(66) Appendix D is replaced by the following:

‘Appendix D

D.1 Standards or normative documents

Index	Characteristics to be assessed	TSI point	Mandatory standard point
[1]	EN 12663-2:2010 Railway applications - Structural requirements of railway vehicle bodies - Part 2: Freight wagons		
[1.1]	Strength of unit	4.2.2.2	5
[1.2]	Strength of unit – demonstration of conformity	6.2.2.1	6, 7
[1.3]	Ability to be hump shunted	Appendix C, point 3	8
[1.4]	Classification	Appendix C, point 3	5.1
[1.5]	Requirements concerning the buffing tests	Appendix C, point 3	8.2.5.1
[2]	EN 15877-1:2012+A1:2018 Railway applications - Marking on railway vehicles - Part 1: Freight wagons		
[2.1]	Lifting and jacking position marking	4.2.2.2	4.5.14
[2.2]	Marking of DDAF	4.2.3.5.3.4	4.5.59
[2.3]	Applicable markings	7.1.2 (g)	all points except 4.5.25(b)
[2.4]	Marking for combined automatic and screw coupler	Appendix C, point 1	Figure 75
[3]	EN 12663-1:2010+A1:2014 Railway applications - Structural requirements of railway vehicle bodies - Part 1: Locomotives and passenger rolling stock (and alternative method for freight wagons)		
[3.1]	Strength of unit – demonstration of conformity	6.2.2.1	9.2, 9.3
[3.2]	Strength of unit - fatigue strength	6.2.2.1	5.6
[4]	EN 15273-2:2013+A1 :2016 Railway applications - Gauges - Part 2: Rolling stock gauge		
[4.1]	Gauging	4.2.3.1	5, annexes A to J, L, M, P

[5]	EN 15528:2021 Railway applications - Line categories for managing the interface between load limits of vehicles and infrastructure		
[5.1]	Compatibility with load carrying capacity of lines	4.2.3.2	6.1, 6.2
[6]	EN 15437-1:2009+A1:2022 Railway applications – Axle box condition monitoring – Interface and design requirements - Part 1: Track side equipment and rolling stock axle box		
[6.1]	Axle bearing condition monitoring	4.2.3.4	5.1, 5.2
[7]	EN 14363:2016+A2:2022 Railway applications - Testing and Simulation for the acceptance of running characteristics of railway vehicles - Running Behaviour and stationary tests		
[7.1]	Safety against derailment running on twisted track	6.2.2.2	4, 5, 6.1
[7.2]	Running dynamic behaviour	4.2.3.5.2	4, 5, 7
[7.3]	Running dynamic behaviour - On-track tests	6.2.2.3	4, 5, 7
[7.4]	Application to units operated on the 1 668 mm track gauge network	6.2.2.3	7.6.3.2.6 (2)
[7.5]	Running dynamic behaviour	C.20	Table H.1
[8]	EN 16235:2013 Railway application - Testing for the acceptance of running characteristics of railway vehicles - Freight wagons - Conditions for dispensation of freight wagons with defined characteristics from on-track tests in accordance with EN 14363		
[8.1]	Running dynamic behaviour	6.1.2.1	5
[8.2]	Established running gear	6.1.2.1	6
[8.3]	Minimum axle load for established running gears	6.1.2.1	Table 7, 8, 10, 13, 16 and 19, in chapter 6
[9]	EN 13749:2021 Railway applications - Wheelsets and bogies - Method of specifying the structural requirements of bogie frames		
[9.1]	Structural design of bogie frame	4.2.3.6.1	6.2
[9.2]	Assessment of the bogie frame strength	6.1.2.1	6.2
[10]	EN 13260:2020 Railway applications - Wheelsets and bogies - Wheelsets - Product requirements		
[10.1]	Characteristics of wheelsets	6.1.2.2	4.2.1

[11]	EN 13979-1:2020 Railway applications - Wheelsets and bogies - Monobloc wheels - Technical approval procedure - Part 1: Forged and rolled wheels		
[11.1]	Mechanical characteristics of wheels	6.1.2.3	8
[11.2]	Thermomechanical behaviour and criteria for residual stress	6.1.2.3	7
[11.3]	Specific product properties concerning the wheel	Appendix C, point 15	7
[11.4]	Specific product properties concerning the wheel - Thermomechanical type test	Appendix C, point 15	Table A.1
[12]	EN 13103-1:2017+A1:2022 Railway applications - Wheelsets and bogies - Part 1: Design method for axles with external journals		
[12.1]	Method of verification	6.1.2.4	5, 6, 7
[12.2]	Decision criteria for permissible stress	6.1.2.4	8
[13]	EN 12082:2017+A1:2021 Railway applications – Axle boxes - Performance testing		
[13.1]	Mechanical resistance and fatigue characteristics of the rolling bearing	6.2.2.4	7
[14]	UIC 430-1:2012 Conditions with which wagons must comply in order to be accepted for transit between standard gauge railways and the Spanish and Portuguese broad gauge railways		
[14.1]	Changeover between 1 435 mm and 1 668 mm track gauges, for axle units	6.2.2.5	Figures 9 and 10 of Annex B.4, and Figure 18 of Annex H
[14.2]	Changeover between 1 435 mm and 1 668 mm track gauges, for bogie units	6.2.2.5	Figure 18 of Annex H and Figures 19 and 20 of Annex I
[15]	UIC 430-3:1995 Goods wagons - Conditions to be satisfied by goods wagons to make them acceptable for running on both standard-gauge networks and the network of the Finnish state railways		
[15.1]	Changeover between 1 435 mm and 1 524 mm track gauges	6.2.2.5	Annex 7
[16]	EN 14531-1:2015+A1 :2018 Railway applications - Methods for calculation of stopping distances, slowing distances and immobilization braking - Part 1: General algorithms utilizing mean value calculation for train sets or single vehicles		
[16.1]	Service brake	4.2.4.3.2.1	4
[16.2]	Parking brake	4.2.4.3.2.2	5

[16.3]	Distance calculation	Appendix C, point 9, Table C.3	4
[17]	UIC 544-1:2014 Brakes - Braking performance		
[17.1]	Service brake - calculation	4.2.4.3.2.1	1 to 3 and 5 to 8
[17.2]	Service brake - validation	4.2.4.3.2.1	Appendix B
[17.3]	Assessment of braking mode G	C.9 - Table C.3	1 to 3 and 5 to 8
[18]	EN 50125-1:2014 Railway applications - Environmental conditions for equipment -Part 1: Rolling stock and on-board equipment		
[18.1]	Environmental conditions	4.2.5	4.7
[19]	EN 1363-1:2020 Fire resistance tests - Part 1: General Requirements		
[19.1]	Barriers	6.2.2.8.1	4 to 12
[20]	ISO 5658- 2:2006/Am1:2011 Reaction to fire tests — Spread of flame — Part 2: Lateral spread on building and transport products in vertical configuration		
[20.1]	Testing of the materials ignitability and flame spread properties	6.2.2.8.2	5 to 13
[21]	EN 13501-1:2018 Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests		
[21.1]	Material properties	6.2.2.8.2	8
[22]	EN 45545-2:2020 Railway applications - Fire protection on railway vehicles -Part 2: Requirements for fire behaviour of materials and components		
[22.1]	Test conditions	6.2.2.8.2	Ref T03.02 of Table 6
[23]	ISO 5660-1:2015+Amd1:2019 Reaction-to-fire tests — Heat release, smoke production and mass loss rate —Part 1: Heat release rate (cone calorimeter method) and smoke production rate (dynamic measurement)		
[23.1]	Testing of rubber parts of bogies	6.2.2.8.2	5 to 13
[24]	EN 50355:2013 Railway applications - Railway rolling stock cables having special fire performance -Guide to use		
[24.1]	Cables	6.2.2.8.3	1, 4 to 9
[25]	EN 50343:2014/A1:2017 Railway applications -Rolling stock -Rules for installation of cabling		
[25.1]	Cables	6.2.2.8.3	1, 4 to 7

[26]	EN 45545-7:2013 Railway applications -Fire protection on railway vehicles -Part 7: Fire safety requirements for flammable liquid and flammable gas installations		
[26.1]	Flammable liquids	6.2.2.8.4	4 to 9
[27]	EN 50153:2014+A2:2020 Railway applications -Rolling stock -Protective provisions relating to electrical hazards		
[27.1]	Protective measures against indirect contact (protective bonding)	4.2.6.2.1	6.4
[27.2]	Protective measures against direct contact	4.2.6.2.2	5
[28]	EN 16116-2:2021 Railway applications - Design requirements for steps, handrails and associated access for staff -Part 2: Freight wagons		
[28.1]	Attachment devices for rear-end signal	4.2.6.3	Figure 10
[28.2]	UIC footsteps and handrails Clearances	Appendix C, point 2	4, 5 6.2
[29]	EN 15153-1:2020 Railway applications -External visible and audible warning devices for trains -Part 1: Head, marker and tail lamps		
[29.1]	Rear-end signal - colour of tail lamps	Appendix E, point 1	5.5.3
[29.2]	Rear-end signal - lighting intensity of tail lamps	Appendix E, point 1	Table 8
[30]	EN 12899-1:2007 Fixed, vertical road traffic signs - Part 1: Fixed signs		
[30.1]	Reflective plates	Appendix E, point 2	Class Ref. 2
[31]	EN 15566:2022 Railway applications - Railway rolling stock - Draw gear and screw coupling		
[31.1]	Manual coupling system	Appendix C, point 1	4, 5, 6, 7 (except 4.3 and the dimension 'a' in Annex B Figure B.1 which shall be treated as informative).
[32]	EN 15551:2022 Railway applications - Railway rolling stock - Buffers		
[32.1]	Buffers	Appendix C, point 1	4 (except 4.3), 5, 6 (except 6.2.2.3 and E.4), and 7

[33]	EN 15839:2012+A1:2015 Railway applications - Testing for the acceptance of running characteristics of railway vehicles - Freight wagons - Testing of running safety under longitudinal compressive forces		
[33.1]	Tests concerning longitudinal compressive forces	Appendix C, point 8	All
[34]	EN 15355:2019 Railway applications - Braking - Distributor valves and distributor-isolating devices		
[34.1]	Distributor and distributor isolating device	Appendix C, point 9(h)	5, 6
[35]	EN 15611:2020+A1:2022 Railway applications - Braking - Relay valves		
[35.1]	Variable load relay	Appendix C, point 9, Table C.3	5, 6, 7, 10
[35.2]	Type of relay valve	Appendix C, point 9(o)	5, 6, 7, 10
[36]	UIC 540:2016 Brakes - Air brakes for freight trains and passenger trains		
[36.1]	UIC brake	Appendix C, points 9(c) and (e)	2
[37]	EN 14531-2:2015 Railway applications - Methods for calculation of stopping and slowing distances and immobilization braking - Part 2: Step by step calculations for train sets or single vehicles		
[37.1]	Service brake	4.2.4.3.2.1	4 & 5
[38]	EN 15624:2021 Railway applications - Braking - Empty-loaded changeover devices		
[38.1]	Changeover specification	Appendix C, point 9, Table C.3	4, 5, 8
[39]	EN 15625:2021 Railway applications - Braking - Automatic variable load sensing devices		
[39.1]	Variable load sensing devices	Appendix C, point 9, Table C.3	5, 6, 9
[40]	EN 286-3:1994 Simple unfired pressure vessels designed to contain air or nitrogen – Part 3: Steel pressure vessels designed for air braking equipment and auxiliary pneumatic equipment for railway rolling stock		
[40.1]	Air reservoirs - steel	Appendix C, point 9(f)	4, 5, 6, 7

[41]	EN 286-4:1994 Simple unfired pressure vessels designed to contain air or nitrogen – Part 4: Aluminium alloy pressure vessels designed for air braking equipment and auxiliary pneumatic equipment for railway rolling stock		
[41.1]	Air reservoirs - aluminium	Appendix C, point 9(f)	4, 5, 6, 7
[42]	EN 15807:2021 Railway applications - Pneumatic half couplings		
[42.1]	Interface of the brake pipe	Appendix C, point 9 (i)	5, 6, 9
[43]	EN 14601:2005+A1:2010+A2 :2021 Railway applications - Straight and angled end cocks for brake pipe and main reservoir pipe		
[43.1]	End cocks	Appendix C, point 9(i)	4, 5, 7, 9
[44]	UIC 541-1:2013 Brakes - Regulations concerning the design of brake components		
[44.1]	Brake mode switching device	Appendix C, point 9(j)	Appendix E
[45]	UIC 542:2015 Brake parts – Interchangeability		
[45.1]	Brake block holders	Appendix C, point 9 (k)	1 to 5
[46]	UIC 541-4:2020 Composite brake blocks - General conditions for certification and use		
[46.1]	Friction element for wheel tread brakes	Appendix C, point 9(l)	1, 2
[47]	EN 16452:2015+A1:2019 Railway applications - Braking - Brake blocks		
[47.1]	Friction element for wheel tread brakes	Appendix C, point 9(l)	4 to 11
[48]	EN 16241:2014+A1 :2016 Railway applications - Slack adjuster		
[48.1]	Slack adjusters Assessment of conformity	Appendix C, point 9(m)	4, 5, 6.2 6.3.2 to 6.3.5
[49]	EN 15595:2018+AC :2021 Railway applications - Braking - Wheel slide protection		
[49.1]	Wheel slide protection system	Appendix C, point 9 (n)	5 to 9, 11

[50]	EN 15085-1:2007+A1:2013 Railway applications -Welding of railway vehicles and components -Part 1: General		
[50.1]	Welding	Appendix C, point 12	4
[51]	EN 15085-2:2020 Railway applications - Welding of railway vehicles and components - Part 2: Requirements for welding manufacturer		
[51.1]	Welding	Appendix C, point 12	4, 5, 6, 7
[52]	EN 15085-3:2022 Railway applications - Welding of railway vehicles and components - Part 3: Design requirements		
[52.1]	Welding	Appendix C, point 12	4, 5, 6, 7
[53]	EN 15085-4:2007 Railway applications - Welding of railway vehicles and components - Part 4: Production requirements		
[53.1]	Welding	Appendix C, point 12	4, 5, 6
[54]	EN 15085-5:2007 Railway applications - Welding of railway vehicles and components - Part 5: Inspection, testing and documentation		
[54.1]	Welding	Appendix C, point 12	4 to 10
[55]	EN 13262:2020 Railway applications - Wheelsets and bogies - Wheels - Product requirements		
[55.1]	Specific product properties concerning the wheel	Appendix C, point 15	4, 5 and 6
[56]	UIC 535-2:2006 Standardisation and positioning on wagons of steps, end platforms, gangways, handrails, tow hooks, automatic coupler (AC), draw-only automatic coupler and brake valve controls on the UIC member RUs and OSJD member RUs		
[56.1]	Tow hooks Conditions for alternative solutions	Appendix C, point 16	1.4 1.4.2 to 1.4.9
[56.2]	Protective devices on protruding parts	Appendix C, point 17	1.3
[57]	IRS 50575:2020, Ed1 Railway applications -Wagons – Label-holders and hazard identification panels: interchangeability		
[57.1]	Label holders and attachment devices for rear end signal	Appendix C, point 18	2

[58]	EN 16834:2019 Railway applications - Braking – Brake performance		
[58.1]	Service brake	4.2.4.3.2.1	Annex D
[58.2]	Validation of brake performance calculated with Index [17]	4.2.4.3.2.1	6, 8, 9, 10, 12
[58.3]	Assessment of braking mode G	Appendix C, point 9, Table C.3	6, 8, 9, 12
[59]	EN 16839:2022 Railway applications - Rolling stock - Head stock layout		
[59.1]	Head stock layout	Appendix C, point 1	4 except 4.3, 5 except 5.5.2.3 and 5.5.2.4, 6, 7, 8

D.2 Technical documents (available on ERA website)

Index	Characteristics to be assessed	TSI point	Mandatory technical document point
[A]	Interfaces between Control-Command and Signalling Trackside and other Subsystems Appendix A of CCS TSI, index [77] ERA/ERTMS/033281 V5.0		
[A.1]	train detection system based on track circuits	4.2.3.3(a)	axle distances (3.1.2.1, 3.1.2.3, 3.1.2.4, 3.1.2.5), vehicle axle load (3.1.7.1), impedance between wheels (3.1.9), use of composite brake blocks (3.1.6), if the rolling stock is equipped: use of shunt assisted devices (3.1.8), if the rolling stock has electrical or electronic equipment on board creating interference current in the rail: conducted interference (3.2.2).
[A.2]	train detection system based on axle counters	4.2.3.3(b)	axle distances (3.1.2.1, 3.1.2.2, 3.1.2.4, 3.1.2.5), wheel geometry (3.1.3.1-3.1.3.4), metal/inductive components-free space between wheels (3.1.3.5), wheel material (3.1.3.6), if the rolling stock has electrical or electronic equipment on board creating interference electromagnetic fields close to the wheel sensor: electromagnetic fields (3.2.1).
[A.3]	train detection system based on loop equipment	4.2.3.3(c)	vehicle metal construction (3.1.7.2).
[A.4]	Influencing unit	7.1.2 (d1)	Point 3.2

[A.5]	Vehicle impedance	7.1.2 (d1)	Point 3.2.2
[A.6]	Harmonised test method	7.1.2 (d1)	Point 3.2.1
[A.7]	Influencing unit	Appendix C, point 7	Point 3.2
[A.8]	Vehicle impedance	Appendix C, point 7	Point 3.2.2
[A.9]	Harmonised test method	Appendix C, point 7	Point 3.2.1
[B]	ERA Technical Document on codification of combined transport ERA/TD/CT version 1.1 (released on 2023-03-21)		
[B.1]	Codification of units intended to be used in combined transport	4.2.3.1 Appendix H	2.2
[C]	ERA Technical Document on the list of fully UIC approved composite brake blocks for international transport ERA/TD/2009-02/INT, version 15.0'		

(67) Appendix E is amended as follows:

(a) in point 1, the first and second paragraphs are replaced by the following:

‘The colour of tail lamps shall be in accordance with the specification referenced in Appendix D Index [29].

The tail lamp shall be designed to display a lighting intensity in accordance with the specification referenced in Appendix D Index [29].’;

(b) in point 2, the fourth sentence is replaced by the following:

‘The plate shall be retro-reflective in accordance with the specification referenced in Appendix D Index [30].’;

(68) Appendix F is amended as follows:

A new line is added after ‘Running dynamic behaviour’ as follows:

‘Derailment detection and prevention function	4.2.3.5.3	x	x	n.a.	-’
---	-----------	---	---	------	----

(69) Appendix G is replaced by the following:

‘Appendix G

List of composite brake blocks exempted of a declaration of conformity as referred in Article 8b

This Appendix is referenced in Appendix D.2, index [C].’

(70) the following Appendix H is added:

‘Appendix H

Codification of units intended to be used in combined transport

The codification of units intended to be used in combined transport shall be in accordance with the specification referenced in Appendix D.2, index [B].

The following requirements are applicable to units intended to be used in combined transport and requiring a Wagon Compatibility Code.

H.1 Wagon Compatibility Code

- (1) The Wagon Compatibility Code (WCC) specifies the type of Intermodal Loading Unit that can be loaded on the unit.
- (2) The WCC shall be determined for all units and assessed by a Notified Body.

H.2 Wagon Correction Digit

- (1) The Wagon Correction Digit (WCD) is the result of a comparison between the geometric characteristics of the unit under assessment and the characteristics of the reference wagons defined in point H.3.
- (2) This comparison shall be performed for all units and assessed by a Notified Body. The result of the assessment shall be included in the report of the Notified Body.

- (3) On the basis of the assessment:

For units having equivalent or more favourable geometric characteristics than the reference wagon, the WCD may be calculated if requested by the applicant.

For units having less favourable geometric characteristics than the reference wagon, the calculation of the WCD is not required by this TSI.

H.3 Characteristics of the reference wagons

The combined transport 'P' profiles are calculated on the basis of the characteristics of the reference recess wagon defined as:

- Distance between bogie pivots (a) 11 200 mm
- Bogie wheelbase (p) 1 800 mm
- Height of semi-trailer (ST) loading plane 330mm
- Maximum overhang (na) 2 000 mm
- Load tolerance 10mm
- Dissymmetry 1°
- Height of ST + wagon roll centre (Hc) 1 000 mm
- q+w play 11.5mm
- Play in side bearers (j) 12mm
- Half-distance between side bearers (bG) 850mm
- ST + wagon flexibility (s) 0.3

The combined transport 'C' and ISO profiles are calculated on the basis of the characteristics of the reference wagon defined as:

- Distance between bogie pivots (a) 13 500 mm
 - Bogie wheelbase (p) 1 800 mm
 - Height of swap body loading plane 1 175 mm
 - Maximum overhang (na) 2 000 mm
 - Load tolerance 10mm
 - Dissymmetry 1°
 - Height of wagon roll centre (Hc) 500mm
 - q+w play 11.5mm
 - Play in side bearers (j) 12mm
 - Half-distance between side bearers (bG) 850mm
 - Wagon flexibility (s) 0.15'
-

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 shall be in accordance with the specification referenced in Appendix T, index [A]. It can be based on:
- (a) the characteristics of the line and the exact position of the obstacles;
 - (b) the reference profile of the structure gauge of that line;
 - (c) 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 D.1 of the Annex of the Commission Implementing Regulation (EU) 2019/773 (*) (‘TSI OPE’).
- (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

Infrastructure performance parameters for passenger traffic*(route compatibility checks are subject to point 4.2.2.5 and Appendix D.1 of TSI OPE)*

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]).

⁽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] 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 checks of infrastructure used for 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] with regard of the specification referenced in Appendix T Index [2]). 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 and Appendix D.1 of TSI OPE)*

Traffic code	Structure gauge	Axle load [t]	Line speed [km/h]	Train length [m]
F1	GC	22,5 ⁽¹⁾	100-120	740-1 050
F2	GB	22,5 ⁽¹⁾	100-120	600-1 050
F3	GA	20 ⁽¹⁾	60-100	500-1 050
F4	G1	18 ⁽¹⁾	n.a.	n.a.
F1520	S	25 ⁽¹⁾	50-120	1 050
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.

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

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

- for new structures in points 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.

(*) 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 139 I, 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, which 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 ϕ (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 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 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 1 668 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) point 4.2.9.2 is amended as follows:
- (a) point (3) is replaced by the following:
 - ‘(3) For platforms where only passenger trains that are explicitly listed as excluded from the scope of Commission Regulation (EU) No 1302/2014 (‘TSI LOC&PAS’) (*) in its point 1.1 are intended to stop in normal service, different provisions for the nominal platform height might apply.
- (*) 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).;
- (b) the following sentence is added at the end of point (4):
- ‘These values shall be considered with a tolerance of -10/+20 mm.’;

(17) point 4.2.9.3 is amended as follows:

(a) 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.’;

(b) the following sentence is added at the end of point (3):

‘These values shall be considered with a tolerance of -10/+10 mm.’;

(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 TSI LOC&PAS.

(3) In the case of upgrading or renewal of the infrastructure subsystem, existing tunnel or underground structure intended to be operated at speeds greater than or equal to 200 km/h 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. The assessment has to be performed in accordance with the specification referenced in Appendix T, Index [14], or in point 6.2.4.12(1) when it is not possible to apply a simplified conformity assessment.’;

(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 (*).

(*). 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) Table 15 is amended as follows:

(i) the title is replaced by the following:

‘Interfaces with the subsystem “Rolling stock – locomotives and passenger rolling stock”’;

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

‘Reference in TSI INF’;

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

‘Reference in TSI LOC&PAS’;

- (iv) 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 subsystem "Rolling stock – freight wagons";
 - (ii) in the second column, the heading is replaced by the following:
'Reference in TSI INF';
 - (iii) in the third column, the heading is replaced by the following:
'Reference in TSI WAG';
- (21) In point 4.3.2, Table 17 is amended as follows:
- (i) in the second column, the heading is replaced by the following:
'Reference in TSI INF';
 - (ii) in the third column, the heading is replaced by the following:
'Reference in TSI ENE';
- (22) In point 4.3.3, Table 18 is amended as follows:
- (i) in the second column, the heading is replaced by the following:
'Reference in TSI INF';
 - (ii) in the third column, the heading is replaced by the following:
'Reference in TSI CCS';
- (23) In point 4.3.4, Table 19 is amended as follows:
- (i) in the second column, the heading is replaced by the following:
'Reference in TSI INF';
 - (ii) in the third column, the heading is replaced by the following:
'Reference in TSI OPE';
 - (iii) row 'Staff competences' is replaced by:

Staff competences	4.6 Professional competences	4.2.1.1 General requirements
-------------------	------------------------------	------------------------------

- (24) in point 5.3.3, point (2) is replaced by the following:
'(2) For the nominal track gauge system of 1 435 mm, the design track gauge for track sleepers in straight alignments and in horizontal curves with radius greater than 300 m shall be 1 437 mm.';
- (25) 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].';
- (26) in point 6.1.5.2, point (1) is replaced by the following:
'(1) (not used)';
- (27) 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].';

(28) 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.;

(29) 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.;

(30) 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].;

(31) point 6.2.4.10 is replaced by the following:

'6.2.4.10. Assessment procedure of existing structures

- (1) The 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) 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 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) A check that 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) 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 either 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.;

(32) 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].;’

(33) 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 TSI LOC&PAS 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 TSI LOC&PAS is fulfilled.

(3) The reference cross section areas are set out in the specification referenced in Appendix T, Index [14].;’

(34) point 6.3 is replaced by the following:

‘6.3. **(not used)**’;

(35) 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 of the European Parliament and of the Council (*), 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.

(*) Directive (EU) 2016/797 of the European Parliament and of the Council of 11 May 2016 on the interoperability of the rail system within the European Union (OJ L 138, 26.5.2016, p. 44).;’

(36) 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:’;

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

(38) 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) A 'new infrastructure subsystem' means an infrastructure subsystem placed into service after 28 September 2023 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 TSI to an existing infrastructure subsystem

7.3.1. Performance criteria of the subsystem

In addition to the cases referred to in point 7.2.(3), '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).

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. 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:

- (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 metric references and shall result in the compliance of all basic parameters of the infrastructure subsystem associated with the tracks that are subject to the upgrading of the infrastructure subsystem.

The addition of one or more rails supporting a further track gauge is also considered as upgrade when the performance criteria of the subsystem is triggered as described in point 7.3.1.

- (2) In the event of a change other than an upgrading of the infrastructure subsystem, the application of this TSI for each basic parameters (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 (*). Provisions defined in 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 the change, or when the change does not require 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) In case of 'major substitution', as defined in Article 2(15) of Directive (EU) 2016/797 of the European Parliament and of the Council, in the framework of a 'renewal', non TSI-compliant elements of the subsystem or part(s) of it shall systematically be replaced with TSI-compliant ones.

- (6) 'Substitution in the framework of maintenance' means any replacement of components by parts of identical function and performance in the framework of maintenance, as defined in Article 2(17) of Directive (EU) 2016/797. It shall be made in accordance with the requirements of this TSI, whenever reasonably and economically feasible and it does not require an 'EC' verification.
- (7) 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 not 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 and applying specific restrictions and measures set out in the specification referenced in Appendix T, index [4]. 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 event of a change other than an upgrading 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 $b_{q\text{lim}}$.

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 D.1 of TSI OPE.

7.4. **not used**

7.5. **not used**

7.6. **not used**

(*) Commission Implementing Regulation (EU) 2019/250 of 12 February 2019 on the templates for 'EC' declarations and certificates for railway interoperability constituents and subsystems, on the model of declaration of conformity to an authorised railway vehicle type and on the 'EC' verification procedures for subsystems in accordance with Directive (EU) 2016/797 of the European Parliament and of the Council and repealing Commission Regulation (EU) No 201/2011 (OJ L 42, 13.2.2019, p. 9).

(**) 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).;

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

'7.7.1.1. **(not used)**;

(40) 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 1 524 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.;

(41) 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 1 430 mm.;

(42) point 7.7.10.2(2) is amended as follows:

(a) ‘EN 15302:2008+A1:2010’ is replaced by ‘EN 15302:2021’

(b) 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.;

(43) 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, 7.7.6.13, 7.7.13.1, 7.7.13.2, 7.7.13.6, 7.7.13.7, ‘EN 15273-3:2013’ is replaced by ‘EN 15273-3:2013+A1:2016’;

(44) point 7.7.17 is replaced by the following:

‘7.7.17. (not used);

(45) 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];’

(46) 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;

(47) 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. 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].

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⁾ and D2-200 or HSLM ⁽⁸⁾ and LM71 with $\alpha = 1.0$ ⁽¹⁴⁾
P2	HSLM ⁽⁸⁾ and D2-200 Or HSLM ⁽⁸⁾ and LM71 with $\alpha = 0.91$ ⁽¹⁴⁾	HSLM ⁽⁸⁾ and D2-200 Or HSLM ⁽⁸⁾ and LM71 with $\alpha = 0.91$ ⁽¹⁴⁾
P3a (> 160 km/h)	L \geq 4m D2-100 and L<4m D2-200 ⁽⁹⁾⁽¹⁰⁾⁽¹⁵⁾	L \geq 4m C2-100 and L<4m C2-200 ⁽⁹⁾⁽¹⁵⁾
P3b (\leq 160 km/h)	L \geq 4m D2-100 and L<4m D2-160 ⁽⁹⁾⁽¹¹⁾⁽¹⁵⁾	L \geq 4m D2-100 and L<4m D2-160 ⁽⁹⁾⁽¹⁵⁾
P4a (> 160 km/h)	L \geq 4m D2-100 and L<4m D2-200 ⁽⁹⁾⁽¹²⁾⁽¹⁵⁾	L \geq 4m C2-100 and L<4m C2-200 ⁽⁹⁾⁽¹⁵⁾
P4b (\leq 160 km/h)	L \geq 4m D2-100 and L<4m D2-160 ⁽⁹⁾⁽¹³⁾⁽¹⁵⁾	L \geq 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 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 TSI LOC&PAS. 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 these types 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] 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 set out 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 set out 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 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 of 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 set out in Appendix D.1 to the TSI OPE (RINF parameter 1.1.1.1.2.4.4). 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 of 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 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]. 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 $L \geq 4\text{m D2-100}$ (*) and $L < 4\text{m D2-200}$ (**), 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.

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
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 TSI LOC&PAS. 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.

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

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

(48) 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);

(49) Appendix I is replaced by the following:

‘Appendix I

(not used);

(50) Appendix K is replaced by the following:

'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 carrying 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/m² in accordance with the specification referenced in Appendix T, Index [1]

Type of train	Normal payload to specify Dynamic Compatibility
High speed and long distance trains	160 ⁽¹⁾
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/m² for standing areas'

(51) Appendix N is replaced by the following:

'Appendix N

(not used);

(52) Appendix P is amended as follows:

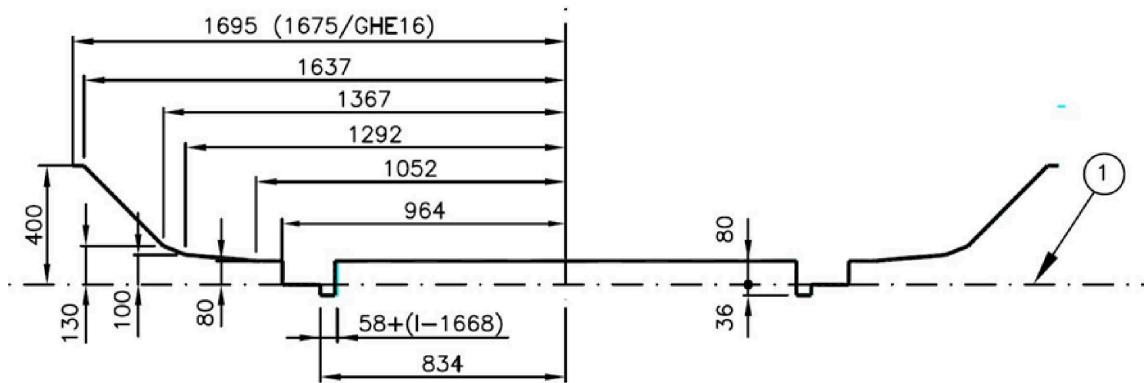
(a) the second paragraph is replaced by the following:

'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.';

(b) In point P.1.2, the figure 13 is replaced by the following ones:

'Reference profile of lower parts of kinematic gauge GEI2 for vehicles which may pass over rail brakes in a non-active position (l = track gauge)

(Dimensions in millimeters)



(1) Running surface.'

(53) Appendix Q is replaced by the following:

'Appendix Q

(not used)';

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

'(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';

(55) 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].';

(56) in Appendix S, a new line is inserted in alphabetical order as follows:

'Geotechnical structures/Geotechnische Strukturen/ Structures géotechniques	4.2.7.2, 4.2.7.4	A structure that includes ground or structural member that relies on the ground resistance. Note: Earthworks is a subset for geotechnical structure'
--	---------------------	---

(57) Appendix T is replaced by the following:

'Appendix T

Technical specifications referenced in this TSI

Table 49

Referenced standards

Index	Characteristics to be assessed	TSI point	Mandatory 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 15528:2021 Railway 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 in accordance with traffic code	Appendix E	Annex A
[2.3]	Line categories	Appendix E, Table 38A (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 1 668 mm track gauge	Appendix P	5, 7 and 10
[4]	EN 13803:2017 Railway applications – Track – Track alignment design parameters – Track gauges 1 435 mm 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 corresponding notes in both chapters).
[5]	EN 15302:2021 Railway applications - Wheel-rail contact geometry parameters - Definitions and methods for evaluation		
[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+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)	
	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)	
[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 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 - 1 668 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]	Criterion for new tunnels	4.2.10.1(1)	6.1.3 Table 10

[14.2]	Criterion 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 α .

Table 50

Technical Documents (available on ERA website)

Index	Characteristics to be assessed	TSI Point	Mandatory technical document point
[A]	ERA Technical Document on codification of combined transport ERA/TD/2023-01/CCT version 1.1 (realased on 2023-03-21)		
[A.1]	Codification of lines	2.6	2.1'

ANNEX III

The Annex to Regulation (EU) No 1300/2014 is amended as follows:

- (1) point 2.1.2 is replaced by the following:

‘2.1.2. Scope related to rolling stock subsystem

This TSI applies to rolling stock which is in the scope of the Annex to Regulation (EU) No 1302/2014 (LOC&PAS TSI) and which is intended to carry passengers.

This TSI does not apply to rolling stock intended for other purposes than the carriage of persons. Persons accompanying a freight train or riding on other rail vehicles than those intended for passengers shall be subject to conditions set up by the railway undertaking and published on its website.;

- (2) in point 2.3, the following definition is added:

“Interoperable wheelchair transportable by train” An interoperable wheelchair transportable by train is a wheelchair the characteristics of which permit the full usage of all features of rolling stock designed for wheelchair users. The characteristics of an interoperable wheelchair transportable by train are within the limits specified in Appendix M.;

- (3) Chapter 3 is amended as follows:

- (a) the first paragraph is replaced by the following:

‘The following tables indicate the essential requirements, as set out in Annex III to Directive (EU) 2016/797 of the European Parliament and of the Council (*), that are met by the specifications set out in Chapter 4 of this TSI for the scope of this TSI.

(*) Directive (EU) 2016/797 of the European Parliament and of the Council of 11 May 2016 on the interoperability of the rail system within the European Union (OJ L 138, 26.5.2016, p. 44).;

- (b) in Table 1, in the first row of the heading, ‘Directive 2008/57/EC’ is replaced by ‘Directive (EU) 2016/797’;

- (c) in Table 2, in the first row of the heading, ‘Directive 2008/57/EC’ is replaced by ‘Directive (EU) 2016/797’;

- (4) in point 4.1(1), ‘Directive 2008/57/EC’ is replaced by ‘Directive (EU) 2016/797’;

- (5) in point 4.1(3), the second sentence is replaced by the following:

‘The operational requirements and responsibilities are set out in Commission Implementing Regulation (EU) 2019/773 (*) (OPE TSI) and in point 4.4 of this TSI.

(*) 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).;

- (6) in point 4.2.1, Table 3 is replaced by the following:

‘Table 3

Categories of basic parameters

Basic Parameter	Technical details provided	Functional requirement only
Parking facilities for persons with disabilities and persons with reduced mobility		Complete point 4.2.1.1
Obstacle-free route	Location of the routes Width of the obstacle-free route Threshold Double handrails Type of lift Height of braille signs	Detailed characteristics

Doors and entrances	4.2.1.3(2): Door width 4.2.1.3(4): Height of door operating device	4.2.1.3(1) 4.2.1.3(3)
Floor surfaces	4.2.1.4(2): Floor irregularities	4.2.1.4(1): Slip resistance
Highlighting of transparent obstacles		Complete point 4.2.1.5
Toilets and baby nappy changing facilities		Complete point 4.2.1.6
Furniture and free-standing devices		Complete point 4.2.1.7
Ticketing, Information desks and Customer Assistance points	4.2.1.8(5): Passageway for ticket control machines	4.2.1.8(1) to (4) 4.2.1.8(6)
Lighting	4.2.1.9(3): Lighting on platforms	4.2.1.9(1), 4.2.1.9(2), 4.2.1.9(4): Lighting in other locations
Visual information: signposting, pictograms, printed or dynamic information	Detail of information to be provided Location of information	Detailed characteristics of visual information
Spoken information	Complete point 4.2.1.11	
Platform width and edge of platform	4.2.1.12(2) to (5) 4.2.1.12(6) to (9): Presence of the items	4.2.1.12 (1) 4.2.1.12(6) to (9): Characteristics of contrast and of visual and tactile markings
End of platform	4.2.1.13: Presence of the items	4.2.1.13: Characteristics of contrast and of visual and tactile markings'
Boarding aids stored on platforms	Complete point 4.2.1.14	
Passenger track level crossing at stations	Complete point 4.2.1.15	

(7) in point 4.2.1.2, point (2) is replaced by the following:

'(2) All obstacle-free routes, footbridges and subways, shall have a free width of a minimum of 160 cm, except in areas that are specified in points 4.2.1.2.2(3a) (ramps), 4.2.1.3(2) (doors), 4.2.1.12(3) (platforms) and 4.2.1.15 (2) (level crossings).';

(8) in point 4.2.1.2.1, point (1) is deleted;

(9) point 4.2.1.2.2. is replaced by the following:

4.2.1.2.2. Vertical circulation

(1) Where an obstacle-free route includes a change in level, there shall be a step-free route providing an alternative to stairs for mobility impaired people.

(2) Steps and stairs on the obstacle-free routes shall have a minimum width of 160 cm measured between the handrails

(2a) As a minimum, the first and last steps of a flight of stairs shall be indicated by a contrasting band. This requirement shall apply from a single step.

(2b) As a minimum, tactile warning surface indicators shall be installed before the first descending step of staircases of three steps or more.

- (3) Ramps shall be installed for persons with disabilities and persons with reduced mobility unable to use stairs where lifts are not provided. They shall have a moderate gradient. A steep gradient is allowed for ramps on short distances only.
 - (3a) When they are used as a complement to stairs, ramps may have a width of 120 cm measured at floor surface.
 - (4) Stairs of three steps or more and ramps shall be provided with handrails on both sides and at two levels.
 - (5) Lifts shall be provided where ramps are not available and shall be at least of type 2 in accordance with the specification referenced in Appendix A, Index [1]. Type 1 lifts are allowed in the case of stations being renewed or upgraded only.
 - (6) Escalators and moving walks shall be designed in accordance with the specification referenced in Appendix A, Index [2].
 - (7) Level track crossings can form part of an obstacle-free route when they comply with the requirements of point 4.2.1.15.;
- (10) point 4.2.1.2.3 is replaced by the following:

4.2.1.2.3. Route identification

- (1) Obstacle-free routes shall be clearly identified by visual information as detailed in point 4.2.1.10.
 - (2) Information on the obstacle-free route shall be given to visually impaired people by a walking surface that has tactile and contrasting indicators as a minimum. This point does not apply to obstacle free routes to and from car parks.
 - (2a) If more than one facility of a certain type of public area are provided, the route to at least one of them shall be indicated by tactile and contrasting walking surface indicators.
 - (2b) Tactile walking surface indicators can be omitted when the route is indicated unambiguously by built or natural elements, such as edges and surfaces that can be followed tactually and visually.
 - (3) Technical solutions using remotely controlled audible devices or telephone applications are permitted to be used in addition or as an alternative. When they are intended to be used as an alternative, they shall be treated as innovative solutions.
 - (4) If there are handrails or walls within reach along the obstacle-free route to the platform, they shall have brief information (for example platform-number or direction-information). The information shall be in Braille or prismatic-letters or numbers. The information shall be located on the handrail, or on the wall at a height between 145 cm and 165 cm.;
- (11) in point 4.2.1.6, point (2) is replaced by the following:
- ‘(2) If baby nappy changing facilities are provided at a station, then a minimum of one baby nappy changing facility shall be accessible to both men and women wheelchair users.’;
- (12) point 4.2.1.8 is amended as follows:
- (a) point (1) is replaced by the following:

‘(1) Where manual ticket sales counters, information desks and customer assistance points are provided, a minimum of one desk shall be accessible to a wheelchair user and to people of small stature and a minimum of one desk shall be fitted with an induction loop system for hearing assistance.’;
 - (b) point (4) is replaced by the following:

‘(4) Where ticket vending machines are provided at a station, a minimum of one of those machines shall have an interface that is reachable by a wheelchair user and people of small stature. This requirement applies to each ticket vendor providing vending machines in the station.’;
- (13) in point 4.2.1.9, point (3) is replaced by the following:
- ‘(3) The platforms shall be illuminated in accordance with the specification referenced in Appendix A, Index [3] and Index [4].’;

(14) point 4.2.1.10 is replaced by the following:

‘4.2.1.10. Visual information: signposting, pictograms, printed or dynamic information

- (1) The following information shall be provided:
 - Safety Information and Safety Instructions.
 - Warning, prohibition and mandatory actions signs.
 - Information concerning the departure of trains.
 - Identification of station facilities, where provided, and access routes to those facilities.
- (2) The fonts, symbols and pictograms used for visual information shall contrast with their background.
- (3) Signposting shall be provided at all points where passengers need to make a route taking decision and at intervals on the route. Signage, symbols and pictograms shall be applied consistently over the whole route.
- (4) The information concerning the departure of trains (including destination, intermediate stops, platform number and time) shall be available and suitable for reading from a height of 160 cm at least in one location in the station.
- (5) The typeface used for texts shall be easily readable.
- (6) All safety, warning, mandatory action and prohibition signs shall include pictograms.
- (7) Tactile information signage shall be fitted in:
 - toilets, for functional information and call for aid if appropriate,
 - lifts in accordance with the specification referenced in Appendix A, Index [1].
- (8) Time information presented in digits shall be in the 24 h system.
- (9) The following specific graphic symbols and pictograms shall be fitted with the wheelchair symbol in accordance with Appendix N:
 - directional information for wheelchair specific routes;
 - indication of the wheelchair accessible toilets and other amenities if provided;
 - if there is train configuration information on the platform, indication of the wheelchair boarding location.

The symbols are permitted to be combined with other symbols (for example: lift, toilet, etc.).
- (10) Where inductive loops are fitted, those shall be indicated by a sign as described in Appendix N.
- (11) In wheelchair accessible toilets, where hinged handrails are provided, a graphic symbol showing the rail in both the stowed and deployed position shall be provided.
- (12) There shall be no more than five pictograms, in addition to a directional arrow, indicating a single direction placed adjacent to each other at a single location.
- (13) Displays shall be sized to show individual station names (which may be abbreviated) or words of messages. Each station name, or words of messages, shall be displayed for a minimum of 2 seconds. The term ‘display’ shall be understood as any support of dynamic information.
- (14) If a scrolling display is used (either horizontal or vertical), each complete word shall be displayed for a minimum of 2 seconds and the horizontal scrolling speed shall not exceed 6 characters per second.
- (15) Displays shall be designed for a maximum viewing distance in accordance with the following formula:
Reading distance in mm divided by 250 = character height (for example: 10 000 mm/250 = 40 mm);

(15) in point 4.2.1.12, point (5) is deleted;

(16) in point 4.2.1.15, point (1) is replaced by the following:

‘(1) Level track crossings are permitted to be used as part of a step-free route or of an obstacle-free route.’;

(17) in point 4.2.2.1.1.(1), the first and second indents are replaced by the following:

- the back of another seat facing in the opposite direction which is fitted at its aisle side with a handhold or a vertical handrail or other items that can be used for personal stability,
- a handrail or a partition provided at the aisle side of the seat.’;

(18) point 4.2.2.1.2.1 is amended as follows:

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

‘(2) The priority seats and vehicles containing them shall be identified by signs complying with Appendix N. It shall be stated that other passengers shall make such seats available to those who are eligible to use them when required. That identification is not required for units intended to be operated exclusively within a seat reservation system: that shall be reported in the technical documentation referred to in point 4.2.12 of the LOC&PAS TSI.’;

(b) points (7) and (8) are replaced by the following:

‘(7) Each priority seat and the space available to its user shall comply with the specification referenced in Appendix A, Index [16].

(8) The whole useful sitting surface of the priority seat shall be a minimum of 450 mm wide (see specification referenced in Appendix A, Index [16]).’;

(19) in point 4.2.2.1.2.2, point (1) is replaced by the following:

‘(1) Where uni-directional priority seats are provided, the clearance in front of each seat shall comply with the specification referenced in Appendix A, Index [16].’;

(20) point 4.2.2.1.2.3. is replaced by the following:

‘4.2.2.1.2.3. Facing seats arrangement

(1) Where facing priority seats are provided, the distance between the front edges of the seat cushions shall be a minimum of 600 mm (See the specification referenced in Appendix A, Index [16]). Such distance shall be maintained even if one of the facing seats is not a priority seat.

(2) Where facing priority seats are equipped with a table, there shall be a minimum clear horizontal distance between the front edge of the seat cushion and the leading edge of the table of at least 230 mm (See the specification referenced in Appendix A, Index [16]). When one of the facing seats is not a priority seat, its distance to the table can be reduced provided that the distance between the front edges of the seat cushions remains 600 mm. Sidewall mounted tables the length of which does not extend over the centre line of the window seat do not need to be considered for conformity with this point.’;

(21) point 4.2.2.2 is amended as follows:

(a) point (4) is replaced by the following:

‘(4) The minimum distance in the longitudinal plane between the back of the wheelchair space and the next surface shall be in accordance with the specification referenced in Appendix A, Index [16].’;

(b) points (8) and (9) are replaced by the following:

‘(8) There shall be no equipment such as bicycle hooks or ski racks in the wheelchair space or directly in front of it.

(9) At least one seat shall be available either side-by-side with or face-to-face to each of the wheelchair spaces for a companion to travel with the wheelchair user. That seat shall offer the same level of comfort as the other passenger seats and may also be situated on the opposing side of the aisle.’;

(c) point (12) is replaced by the following:

‘(12) The call for aid device shall be placed within the comfortable reach range of the person using the wheelchair as shown in the specification referenced in Appendix A, Index [9].’;

(d) point (14) is replaced by the following:

‘(14) The interface of the call for aid device shall be as set out in point 5.3.2.6.’;

(22) point 4.2.2.3.2. is replaced by the following:

4.2.2.3.2. Exterior doors

- (1) All exterior passenger doorways shall have a minimum clear useable width of 800 mm when open.
- (2) On trains with a design speed lower than 250 km/h, wheelchair access doors offering a level access as defined in point 2.3 shall have a minimum clear useable width of 1 000 mm when open.
- (3) All exterior passenger doorways shall be marked on the outside in a way that gives a contrast to the vehicle body-side surrounding them.
- (4) The designated wheelchair exterior accessible doorways shall be the closest doorways to the designated wheelchair spaces.
- (5) The doors to be used for wheelchair access shall be clearly labelled with a sign in accordance with Appendix N.
- (6) From the inside of the vehicle the position of external doorways shall clearly be marked by use of contrasted adjacent flooring.
- (7) Audible and visible signals shall be given to persons inside and outside the train when doors are operated or about to operate.
- (8) The door operating signals are the following:
 - (a) when a door is released for opening, a door opening signal shall be given; it shall last a minimum of 5 seconds unless the door is operated, in which case it may cease after 3 seconds;
 - (b) when a door is automatically or remotely opened by the driver or other member of the train crew, a door opening signal shall be given; it shall last a minimum of 3 seconds from the moment that the door starts to open;
 - (c) when a door, that is automatically or remotely closed, is about to operate, a door closing signal shall be given; it shall start a minimum of 2 seconds before the door starts to close and shall continue until the door is closed;
 - (d) when a door is closed locally (by a passenger or crew), a door closing signal shall be given; it shall start following the operation of the control device and shall continue until the door is closed.

The audible and visible door closing signal can be omitted when a door is closing for reasons other than departure if alternative means are in place to mitigate the risk of injury to the passengers and the train crew. The provision of audible and visible door closing signals or of the alternative means shall be equally accepted in all Member States.
- (9) The audible door opening signal for persons outside the train can be omitted when a door finding signal is provided. A door finding signal shall sound continuously whilst the door is released or available to be opened, or both.
- (10) The sound source for door signals shall be in the area local to the control device.

If there is no control device, the sound source for door signals shall be located adjacent to the doorway.

If a separate sound source is used for the door closing signal, it can be either local to the control device or adjacent to the doorway.

If an external door finding signal is provided, its sound source shall be located in the area local to the control device, and the sound source for the door closing signal shall be located in the area adjacent to the doorway.
- (11) The visible signals shall be visible from inside and outside the train and shall be located such that they minimise the opportunity for them to be obscured by passengers located in the vestibule. Visible signals shall be in accordance with the specification referenced in Appendix A, Index [19].
- (12) Passenger doors audible signals shall be in accordance with the specification in Appendix G.
- (13) The method of door activation shall be by train crew, semi-automatic (for instance, passenger pushbutton operation) or automatic.
- (14) The door control shall be located either next to or on the door leaf.

(15) The centre of exterior door opening control, operable from the platform, shall be not less than 800 mm and not more than 1 200 mm measured vertically above platforms, for all platforms for which the train is designed. If the train is designed for a single platform height, the centre of exterior door opening control shall be not less than 800 mm and not more than 1 100 mm measured vertically above that platform height.

(16) The centre of internal door opening control for the exterior door shall be not less than 800 mm and not more than 1 100 mm measured vertically above the vehicle floor level.;

(23) point 4.2.2.4. is replaced by the following:

4.2.2.4. Lighting

Minimum values of average illuminance in the passenger areas shall be in accordance with the specification referenced in Appendix A, Index [6]. Requirements relative to the uniformity of those values are not applicable for conformity with this TSI.;

(24) point 4.2.2.6. is replaced by the following:

4.2.2.6. Clearways

(1) From the vehicle entrance, the following sections of the clearway shall be in accordance with the specification referenced in Appendix A, Index [17]:

- through the vehicles,
- between connecting vehicles of a single trainset,
- to and from wheelchair accessible doors, wheelchair spaces and wheelchair accessible areas including sleeping accommodation and universal toilets if provided.

(2) The minimum height requirement does not need to be verified in:

- all areas of double-deck vehicles,
- gangways and door areas of single deck vehicles.

In those areas, reduced headroom is accepted as a consequence of structural constraints (gauge, physical space).

(3) A turning space, with a minimum diameter of 1 500 mm, shall be provided adjacent to the wheelchair space and in other locations where wheelchairs are supposed to turn 180°. The wheelchair space may be part of the turning circle.

(4) If a change in direction is required for a wheelchair user, the clearway width of both corridors or corridor and door shall be in accordance with the specification referenced in Appendix A, Index [17].;

(25) in point 4.2.2.7.1, points (2) and (3) are replaced by the following:

‘(2) Visual information referred to in point (1) shall contrast with its background.

(3) The typeface used for texts referred to in point (1) shall be easily readable.;

(26) in point 4.2.2.7.2., point (2) is replaced by the following:

‘(2) There shall be no more than five pictograms, in addition to a directional arrow, indicating a single direction placed adjacent to each other at a single location.;

(27) point 4.2.2.7.3. is replaced by the following:

4.2.2.7.3. Dynamic visual information

(1) The final destination or route shall be displayed on the outside of the train on the platform side adjacent to at least one of the passenger access doors on at least alternate vehicles of the train.

(2) Where trains operate in a system in which dynamic visual information is given on the station platform every 50 m or less, and destination or route information is also provided on the front of the train, it is not mandatory to provide information on the sides of vehicles.

(3) The final destination or route of the train shall be displayed inside each vehicle.

- (4) The next stop of the train shall be displayed such that it can be read from at least 51 % of passenger seats inside each vehicle including 51 % of the priority seats, and from all wheelchair spaces.
- (5) The dynamic visual information system shall have the capability to display the next stop of the train at least two minutes before arrival at the station concerned. If the next station is less than two minutes planned journey time away, the system shall have the capability to display the next station immediately following departure from the previous station.
- (6) The requirement in point (4) does not apply to compartment carriages where the compartments have a maximum of 8 seats and are served by an adjacent corridor. However, that information shall be visible to a person standing in a corridor outside a compartment and to a passenger occupying a wheelchair space.
- (7) The dynamic visual information system may display information about the next stop on the same support as the final destination.
- (8) If the system is automated, it shall be possible to suppress or correct incorrect or misleading information.
- (9) Internal and external displays shall comply with the requirements of points (10) to (13). In those points, the term 'display' shall be understood as any support of dynamic information.
- (10) Each station name (which may be abbreviated), or words of messages, shall be displayed for a minimum of 2 seconds.
- (11) If a scrolling display is used (either horizontal or vertical), each complete word shall be displayed for a minimum of 2 seconds and the horizontal scrolling speed shall not exceed an average of 6 characters per second.
- (12) On external displays the minimum character height shall be 70 mm on front displays and 35 mm on side displays.
- (13) Internal displays shall be designed for a maximum viewing distance in accordance with the formula in Table 5a.

Table 5a

Maximum viewing distance of the internal displays for rolling stock

Reading distance	Character height
< 8 750 mm	(reading distance/250) mm
8 750 to 10 000 mm	35 mm
> 10 000 mm	(reading distance/285) mm'

(28) point 4.2.2.8 is amended as follows:

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

'(2) As a minimum, the first and the last steps shall be indicated by a contrasting band extending the full width of the steps on both the front and the top surfaces of the step nosing with a depth of:

- 45 mm to 55 mm on the front surface,
- 45 mm to 75 mm on the top surface.;

(b) in point (7), Table 6, the text in the second row is replaced by the following:

'Paths between a wheelchair accessible exterior door, the wheelchair space, a wheelchair accessible sleeping accommodation and the universal toilet.;

(29) in point 4.2.2.9, point (5) is replaced by the following:

'(5) The handrails referred to in point (4) shall be:

- vertical handrails that shall extend from 700 mm to 1 200 mm above the threshold of the first step for all external doorways;
- additional handrails at a height of between 800 mm and 900 mm above the first useable step and parallel with the line of the step nosing for doorways with more than two entrance steps.;

(30) in point 4.2.2.10, point (9) is replaced by the following:

‘(9) The call for aid devices described in points (7) and (8) shall be located on different vertical surfaces of the sleeping accommodation.’;

(31) in point 4.2.2.11.1, point (3) is replaced by the following:

‘(3) The technical documentation referred to in point 4.2.12 of the LOC&PAS TSI shall include information about:

- the height and offset of the theoretical platform resulting in a vertical gap (δ_{v+}) of 230 mm and in a horizontal gap (δ_h) of 200 mm from the point situated in the central position of the nose of the rolling stock’s lowest step on a straight level track,
- the height and offset of the theoretical platform resulting in a vertical gap (δ_{v-}) of 160 mm and in a horizontal gap (δ_h) of 200 mm from the point situated in the central position of the nose of the rolling stock’s lowest step on a straight level track.’;

(32) in point 4.2.2.11.2, point (7) is replaced by the following:

‘(7) Access to the vestibule shall be achieved with a maximum of 4 steps of which one may be external.’;

(33) in point 4.2.2.12.1, the point (3) is replaced by ‘Not used.’;

(34) point 4.2.2.12.3 is replaced by the following:

4.2.2.12.3. On-board lift

- (1) An on-board lift is a device integrated in the doorway area of a vehicle that shall be able to overcome the maximum height difference between the vehicle floor and the station platform where operated.
- (2) When the lift is in the stowed position, the doorway shall have a minimum useable width in accordance with point 4.2.2.3.2.
- (3) On-board lifts shall comply with the requirements of point 5.3.2.10.’;

(35) in point 4.3.2, Table 11 is replaced by the following:

‘Table 11

Interface with the rolling stock subsystem

This TSI		TSI LOC&PAS	
Parameter	Point	Parameter	Point
Rolling Stock subsystem	4.2.2	Passenger related items	4.2.5
Rolling Stock intended to be operated exclusively within a seat reservation system	4.2.2.1.2.1	General documentation	4.2.12.2
Height and offset of theoretical platforms	4.2.2.11.1	General documentation	4.2.12.2
Movable step and bridging plate	4.2.2.12.1	Door-traction interlock	4.2.5.5.7’

(36) in point 4.4, second paragraph, the following sentence is added:

‘The following operating rules apply to the operation of the whole infrastructure and rolling stock subsystems.’;

(37) point 4.4.1 is amended as follows:

(a) the first indent is replaced by the following:

– General

The infrastructure manager, station manager or railway undertaking shall have a written policy to ensure that all persons with disabilities and persons with reduced mobility can access the passenger infrastructure at all operational times in accordance with the technical requirements of this TSI. Furthermore, the policy shall be compatible with a policy of any railway undertaking that may wish to use the facilities, (refer to point 4.4.2) as appropriate. The policy shall be implemented through the provision of adequate information to staff, procedures and training. The infrastructure policy shall include, but not be limited to, operating rules for the following situations:;

(b) the twenty fifth indent is replaced by the following:

‘Conditions on which assistance to persons with disabilities and persons with reduced mobility is provided are defined in Regulation (EU) 2021/782 of the European Parliament and of the Council (*).

(*) Regulation (EU) 2021/782 of the European Parliament and of the Council of 29 April 2021 on rail passengers’ rights and obligations (recast) (OJ L 172, 17.5.2021, p. 1).;

(38) point 4.4.2. is replaced by the following:

‘4.4.2 **Rolling Stock subsystem**

In light of the essential requirements in Chapter 3, the operating rules specific to the rolling stock subsystem related to accessibility for persons with disabilities and persons with reduced mobility are as follows:

4.4.2.1. **General**

The railway undertaking shall have a written policy to ensure accessibility to passenger rolling stock at all operational times in accordance with the technical requirements of this TSI. Furthermore, the policy shall be compatible with the infrastructure manager or station manager policy (refer to point 4.4.1) as appropriate. The policy shall be implemented through the provision of adequate information to staff, procedures and training. The rolling stock policy shall include, but not be limited to, operating rules for the following situations:

4.4.2.2. **Access and Reservation of Priority Seats**

Two possible conditions exist in connection with seats classified as ‘priority’: (i) unreserved and (ii) reserved (refer to point 4.2.2.1.2.1(2)). In case (i), the operating rules will be directed to other passengers (i.e. provision of signage) requesting them to ensure that priority is given to all persons with disabilities and persons with reduced mobility that are defined as being eligible to use such seats and that occupied priority seats are given-up as appropriate. In case (ii), operating rules shall be implemented by the railway undertaking to ensure that the ticketing reservation system is equitable with regards to persons with disabilities and persons with reduced mobility. Such rules will ensure that priority seating is initially only available for reservation by persons with disabilities and persons with reduced mobility until a given cut-off period prior to departure. After that point in time, priority seats will be made available to the entire passenger population, including persons with disabilities and persons with reduced mobility.

4.4.2.3. **Carriage of Assistance Dogs**

Operating rules shall be made to ensure that persons with disabilities and persons with reduced mobility with an assistance dog shall not be charged extra.

4.4.2.4. **Access and Reservation of Wheelchair Spaces**

The priority seating access and reservation rules also apply to wheelchair spaces, with only wheelchair users having priority. Additionally, operating rules shall provide for (i) unreserved or (ii) reserved accompanying persons (non-PRM) seating adjacent or facing the wheelchair space.

4.4.2.5. **Access and Reservation of Universal Sleeping Compartments**

The priority seating reservation rules also apply to universal sleeping compartments (refer to point 4.2.2.10). However, operational rules shall prevent non-reserved occupation of universal sleeping compartments (i.e. advanced booking will always be necessary).

4.4.2.6. **Train crew — exterior doors activation**

Operational rules shall be implemented regarding the procedure for external door activation by train crew to ensure safety of all passengers including persons with disabilities and persons with reduced mobility (refer to point 4.2.2.3.2).

4.4.2.7. **Call for aid device in wheelchair space, universal toilets or wheelchair accessible sleeping accommodation**

Operational rules shall be implemented to ensure appropriate response and action from the staff in the event of activation of the call for aid device (refer to points 4.2.2.2, 4.2.2.5 and 4.2.2.10). Response and action need not be the same according to the origin of the call for aid.

4.4.2.8. **Lighting**

Where every passenger seat is equipped with an individual light, it is permitted to reduce the lighting level in the unit according to the type of operation (e.g. night service, passenger comfort). The requirements of the specification referenced in Appendix A, Index [6], shall be met.

4.4.2.9. **Audible safety instructions in case of emergency**

Operational rules shall be implemented regarding the transmission of audible safety instructions to passengers in the event of an emergency (refer to point 4.2.2.7.4). Those rules shall include the nature of the instructions and of their transmission.

4.4.2.10. **Visual and audible information — Control of advertisements**

Details of the route or network on which the train operates shall be available (the railway undertaking shall decide the manner in which this information is provided).

Advertisements shall not be combined with routing information.

Note: General information about public transport services shall not be considered as advertisements for the purposes of this point.

4.4.2.11. **Automatic Information Systems — Manual Correction of incorrect or misleading information**

Operational rules shall be implemented for the validation and ability to correct erroneous automatic information by the train crew (refer to point 4.2.2.7).

4.4.2.12. **Rules for announcement of the final destination and the next stop**

Operational rules shall be implemented to ensure that the next stop is announced no later than 2 minutes prior to the event and that the dynamic information displays revert to show the final destination as soon as the train has stopped (refer to point 4.2.2.7).

4.4.2.13. **Rules on train composition to make wheelchair boarding aid devices usable according to the arrangement of the platforms.**

Operational rules shall be implemented to take account of train composition variations such that the safe operational zones for wheelchair boarding aids can be determined with respect to the stopping point of trains.

4.4.2.14. **Safety of Manual and Powered Wheelchair Boarding Aids**

Operational rules shall be implemented concerning the operation of boarding aids by train and station staff. In the case of manual devices, procedures shall ensure that minimum physical effort is required from staff. In the case of powered devices, procedures shall ensure emergency fail-safe-operation in the event of loss of power. An operational rule shall be implemented concerning the use by train or station staff of the moveable safety barrier fitted to wheelchair lifts.

Operational rules shall be implemented to ensure that train and station staff is able to safely operate boarding ramps, with respect to deployment, securing, raising, lowering and stowing.

4.4.2.15. Assistance to board and alight the train

Operational rules shall be implemented to ensure that staff are aware that disabled persons and persons with reduced mobility may require assistance to board and alight the train, and shall provide such assistance if required.

Conditions on which assistance to persons with disabilities and persons with reduced mobility is provided are defined in Regulation (EU) 2021/782.

4.4.2.16. Platform — Wheelchair Boarding Aid Operational Zone

The railway undertaking and the infrastructure manager or station manager shall define together the area on the platform where the facility is likely to be used and shall demonstrate its validity. That area shall be compatible with the existing platforms where the train is likely to stop.

As a consequence, the stopping point of the train shall in some cases be adjusted in order to comply with this requirement.

Operational rules shall be implemented to take account of train composition variations (refer to point 4.2.1.12) so that the stopping point of trains can be determined with respect to the boarding aid operational zones.

4.4.2.17. Emergency method to deploy moveable steps

Operational rules shall be implemented for the emergency stowage or deployment of the bridging plate in the case of power failure.

4.4.2.18. Operating combinations of rolling stock compliant and non-compliant with this TSI

When forming a train from a mixture of compliant and non-compliant rolling stock, operational procedures shall be implemented to ensure that a minimum of two wheelchair spaces compliant with this TSI are provided on the train. If toilets are available on the train, it shall be ensured that wheelchair users have access to a universal toilet.

Under such rolling stock combinations, procedures shall be in place to ensure that visual and audible route information is available on all vehicles.

It is accepted that dynamic information systems, wheelchair space, universal toilet, wheelchair accessible sleeping accommodation and call for aid devices may not be fully functional when working in such formations.

4.4.2.19. Forming trains from individual vehicles compliant with this TSI

When vehicles that have been individually assessed in accordance with point 6.2.7 are formed into a train, operational procedures shall be in place to ensure that the complete train complies with point 4.2 of this TSI.

4.4.2.20. Providing services on-board trains

When a service is provided to passengers in a specific area of a train that cannot be accessed by wheelchair users, operational means shall be in place to ensure that:

- (a) free of charge assistance is available to assist wheelchair users reach the service; or
- (b) the service is delivered free of charge to wheelchair users at the wheelchair spaces, unless the nature of the service makes it impossible to provide it remotely.;

(39) point 4.4.3 is replaced by the following:

‘4.4.3. Provision of boarding aids and provision of assistance

The infrastructure manager or station manager and railway undertaking shall agree the provision and management of the boarding aids as well as the provision of assistance and alternative transport in line with Regulation (EU) 2021/782 in order to establish which party is responsible for the operation of boarding aids and alternative transport. The infrastructure manager (or station manager(s)) and railway undertaking shall ensure that the division of responsibilities they agree is the most viable overall solution.

Such agreements shall take into consideration the area of use of boarding aids referred to in points 5.3.1.2, 5.3.1.3, 5.3.2.9 and 5.3.2.10.

Such agreements shall define:

- (a) the station platforms where a boarding aid has to be operated by the infrastructure manager or the station manager and the rolling stock for which it will be used;
 - (b) the station platforms where a boarding aid has to be operated by the railway undertaking and the rolling stock for which it will be used;
 - (c) the rolling stock where a boarding aid has to be provided and operated by the railway undertaking and the station platform where it will be used;
 - (d) the rolling stock where a boarding aid has to be provided by the railway undertaking and operated by the infrastructure manager or station manager, and the station platforms where it will be used;
 - (e) for boarding aids located on the platforms, the location where they are most likely to be used, taking into account that a free space (no obstacles) of 150 cm is available from the edge of the boarding aid towards the direction where the wheelchair boards/lands at/to the platform level;
 - (f) the conditions for the provision of alternative transport where:
 - the platform cannot be reached through an obstacle-free route, or
 - assistance cannot be provided to deploy a boarding aid between the platform and the rolling stock.’
- (40) point 4.8 is deleted;
- (41) point 5.1 is deleted;
- (42) in point 5.3, introductory paragraph, ‘Directive 2008/57/EC’ is replaced by ‘Directive (EU) 2016/797’;
- (43) point 5.3.1.1. is deleted;
- (44) point 5.3.1.2 is amended as follows:
- (a) point (1) is replaced by the following:

‘(1) Ramps shall be designed and assessed for an area of use defined by the maximum vertical gap they can overcome within a maximum slope of 18 % (10.2°).’;
 - (b) point (5) is replaced by the following:

‘(5) The ramp surface shall be slip resistant and shall have a stable position with an effective clear width of a minimum of 760 mm.’;
- (45) in point 5.3.1.3, point (6) is replaced by the following:
- ‘(6) The bridging plate overriding the gap between the lift platform and the carriage floor shall have a stable position with a minimum width of 760 mm.’;
- (46) in point 5.3.2.2., the following points (7) to (9) are added:
- ‘(7) If both opened and closed door control devices are fitted one above the other, the top device shall always be the open control.
 - (8) Automatic and semi-automatic doors shall incorporate devices that prevent passengers becoming trapped during operation of the doors.
 - (9) The force required to open or close a manual door shall not exceed 60 N.’;
- (47) in point 5.3.2.6, point (1) is replaced by the following:
- ‘(1) be indicated by a sign having a yellow background contrasting with a black symbol (in accordance with the specification referenced in Appendix A, Index [10]). The symbol shall represent a bell or a telephone. The sign can be on the button or bezel or on a separate pictogram.’;
- (48) point 5.3.2.7 is deleted;
- (49) point 5.3.2.8 is amended as follows:
- (a) in point (2), ‘index 11’ is replaced by ‘index [11]’;
 - (b) in point (5), ‘index 11’ is replaced by ‘index [11]’;

(50) in point 5.3.2.9, point (1) is replaced by the following:

'(1) Ramps shall be designed and assessed for an area of use defined by the maximum vertical gap they can overcome within a maximum slope of 18 % (10.2°).';

(51) point 6.1.1 is replaced by the following:

'6.1.1. Conformity assessment

An EC declaration of conformity or suitability for use, in accordance with Article 9(2) and Article 10(1) of Directive (EU) 2016/797, shall be drawn up by the manufacturer or his authorised representative established in the Union before placing an interoperability constituent on the market.

The conformity assessment of an interoperability constituent shall be in accordance with the prescribed module(s) of that particular constituent specified in point 6.1.2 of this TSI.;

(52) in point 6.1.2, Table 15 is replaced by the following:

Table 15

Combination of modules for EC certification of conformity of interoperability constituents

Point of this Annex	Constituents to be assessed	Module						
		CA	CA1 or CA2 ⁽¹⁾	CB + CC	CB + CD	CB + CF	CH ⁽¹⁾	CH1
5.3.1.2 and 5.3.1.3	Platform ramps and platform lifts		X		X	X	X	X
5.3.2.1	Interface of door control device	X		X			X	
5.3.2.2, 5.3.2.3 and 5.3.2.4	Toilet modules		X	X	X		X	X
5.3.2.5	Baby nappy changing table	X		X			X	
5.3.2.6	Call for aid devices	X		X			X	
5.3.2.8 to 5.3.2.10	Boarding devices		X		X	X	X	X

⁽¹⁾ Modules CA1, CA2 or CH may be used only in the case of products manufactured in accordance with a design developed and already used to place products on the market before the application of relevant TSIs applicable to those products, provided that the manufacturer demonstrates to the notified body that design review and type examination were performed for previous applications under comparable conditions, and are in conformity with the requirements of this TSI; this demonstration shall be documented, and is considered as providing the same level of proof as module CB or design examination in accordance with module CH1.'

(53) point 6.2.1 is replaced by the following:

'6.2.1 EC verification (general)

The EC verification procedures to be applied to the subsystems are described in Article 15 of Directive (EU) 2016/797 and Annex IV to that Directive.

The EC verification procedure shall be performed in accordance with the prescribed modules(s) specified in point 6.2.2 of this TSI.

For the infrastructure subsystem, if the applicant demonstrates that tests or assessments of a subsystem or parts of a subsystem are the same or have been successful for previous applications of a design, the notified body shall consider the results of those tests and assessments for the EC verification.

For the infrastructure subsystem, the objective of inspection by a notified body is to ensure that the requirements of the TSI are fulfilled. The inspection is performed as a visual examination; in case of doubt, for the values verification, the notified body can ask the applicant to perform measurements. In case different methods are possible (e.g. for contrast), the measurement method shall be the one used by the applicant.

The approval process and the contents of the assessment shall be agreed between the applicant and a notified body in accordance with the requirements set out in this TSI.;

(54) the following point 6.2.3.3. is added:

‘6.2.3.3. Assessment of contrast for the rolling stock subsystem

Assessment of contrast for the rolling stock subsystem shall be performed in accordance with the specification referenced in Appendix A, Index [18].;

(55) points 6.2.5 and 6.2.6 are replaced by the following:

‘6.2.5. Assessment of maintenance

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 operation and maintenance.

The notified body shall verify only that the documentation requested for operation and maintenance, as defined in point 4.5 of this TSI, is provided. The notified body is not required to verify the information contained in the documentation provided.

6.2.6. Assessment of operational rules

In conformity with Articles 10 and 12 of Directive (EU) 2016/798, railway undertakings and infrastructure managers must demonstrate compliance with the operational requirements of this TSI within their safety management system when applying for any new or amended safety certificate or safety authorisation.;

(56) in point 6.2.7, the third paragraph is replaced by the following:

‘After such a unit has received the authorisation to be placed on the market, it is the responsibility of the railway undertaking to make sure, when forming the train with other compatible vehicles, that point 4.2 of this TSI is complied with at train level, in accordance with the rules defined in point 4.2.2.5 of the OPE TSI (train composition).;

(57) points 7.1.1 and 7.1.2 are replaced by the following:

‘7.1.1. New Infrastructure

This TSI is applicable to all new stations in its scope.

It is not mandatory to apply this TSI to new stations which have already been granted a building permit or which are subject to a contract for major construction works that is either already signed or in the final phase of a tendering procedure at the date of application of this TSI. However, an earlier version of this TSI must be applied within its defined scope. The consistence of applicable requirements of partial application of different versions of this TSI to particular sections of the station must be justified by the applicant certified by the notified body.

Where stations which were closed for a long time to passenger service are put in service again, this may be treated as renewal or upgrade in accordance with point 7.2.

In all cases of construction of a new station, the station manager or planning entity shall organise a consultation of the entities in charge of the management of the neighbourhood, in order to enable as far as possible the accessibility requirements to be met not only in the station, but also for the access to the station. In the case of multimodal stations, other transport authorities shall be consulted for access to and from the railway and to and from other modes of transport.

7.1.2. New Rolling Stock

(1) This TSI is applicable to all units of rolling stock in its scope which are placed on the market after 28 September 2023, except where point 7.1.1.2 ‘Application to ongoing projects’ of the LOC&PAS TSI applies.

- (2) Compliance with this Annex in its version applicable before 28 September 2023 is deemed equivalent to compliance with this TSI, except for the TSI changes listed in Appendix P.
- (3) The rules related to the EC type or design examination certificates for the rolling stock subsystem and the associated interoperability constituents shall be as specified in point 7.1.3 of the LOC&PAS TSI.;

(58) in point 7.2.1.1.1, the third paragraph is replaced by the following:

‘The specifications referenced in Appendix A, Indexes [21] and [22] shall apply for the formatting and exchange of accessibility data’;

(59) in point 7.2.1.1.3, the last sentence is deleted;

(60) point 7.2.3. is replaced by the following:

‘7.2.3. Application of this TSI to rolling stock in operation or to an existing rolling stock type.

- (1) The rules for managing changes to rolling stock in operation or to an existing rolling stock type shall be as specified in point 7.1.2 of the LOC&PAS TSI and in Appendix F to this TSI.
- (2) The rules for the extension of the area of use for existing rolling stock in operation before 19 July 2010 or having an authorisation in accordance with Directive 2008/57/EC shall be as specified in point 7.1.4 of the LOC&PAS TSI.;

(61) point 7.3.2.6 is amended as follows:

(a) in the section concerning the ‘Specific case Finland “P”’, second sentence, the expression ‘index 14’ is replaced by ‘Index [15]’;

(b) the section concerning the ‘Specific case Spain “P” for the 1 668 mm gauge network’ is replaced by the following:

‘Specific Case Spain “P”

For rolling stock intended to run on 1 435 mm track gauge, the values of bq_0 , δ_h , δ_{v+} and δ_{v-} shall be the ones defined in point 4.2.2.11.1, Table 7 and Table 8.

For rolling stock intended to run on 1 668 mm track gauge, the position of the first useable access step will fit to the dimensions given in Table 23 and Table 24 of this TSI, depending on the platform height and line structure gauge, as defined in point 7.7.15.1 of the Annex to Commission Regulation (EU) No 1299/2014 (*):

Table 23

Specific case for Spain — values of δ_h , δ_{v+} and δ_{v-} and bq_0 on a straight level track with 1 668 mm track gauge

On a straight level track

Step position		Line structure gauge			
		Gauge GEC16 or GEB16	Gauge GHE16		Three-rails track ⁽¹⁾
			Platform height 760 or 680 mm	Platform height 550 mm	
δ_h mm	1 435/1 668 mm variable track gauge vehicles	275	275	255	316,5
	1 668 mm track gauge vehicles	200	200	200	241,5
δ_{v+} mm		230			
δ_{v-} mm		160			
bq_0		1 725	1 725	1 705	1 766,5

Table 24

Specific case for Spain — values of δ_h , δ_{v+} and δ_{v-} and bq_0 on a track with a curve radius of 300 m with 1 668 mm track gauge

On a track with a curve radius of 300 m

Step position		Line structure gauge			
		Gauge GEC16 or GEB16	Gauge GHE16		Three-rails track ⁽¹⁾
			Platform height 760 or 680 mm	Platform height 550 mm	
δ_h mm	1 435/1 668 mm variable track gauge vehicles	365	365	345	406,5
	1 668 mm track gauge vehicles	290	290	290	331,5
δ_{v+} mm		230			
δ_{v-} mm		160			
bq_0		1 737,5	1 737,5	1 717,5	1 779

(1) These values shall be applied where the shared rail is located in the closest position to the platform. If the shared rail is in the farthest position from the platform, the position of the first useable step will fit to the appropriate dimensions depending on the line structure gauge and the platform height, as defined in the lines corresponding to the 1 668 mm track gauge case with two rails.

(*) Commission Regulation (EU) No 1299/2014 of 18 November 2014 on the technical specifications for interoperability relating to the 'infrastructure' subsystem of the rail system in the European Union (OJ L 356, 12.12.2014, p. 1).;

(c) the section concerning the 'Specific Case United Kingdom "P" for all rolling stock intended to stop, in normal operation at platforms of nominal 915 mm height' is replaced by the following:

'Specific Case United Kingdom "P" for all rolling stock intended to stop, in normal operation at platforms of nominal 915 mm height

Passenger access steps for the vehicle shall be designed to meet the requirements as set out in the National Technical Rules notified for this purpose.;

(62) the following points 7.3.2.7 and 7.3.2.8 are added:

7.3.2.7. Provision of boarding aids and provision of assistance (point 4.4.3)

Specific Case Spain 'P'

In the Spanish network, it is possible to operate trains with a design gauge narrower than the structure gauge considered for the installation of platforms (see Note). That situation might cause a wider horizontal gap between train and platform. Therefore, the railway undertaking and the infrastructure manager or station manager involved shall perform a shared risk management, in the following cases:

- for rolling stock intended to operate on 1 668 mm track gauge lines, when the nose of the access step is located outside the area defined in Table 23 for $\delta_h = 200$ mm and in Table 24 for $\delta_h = 290$ mm;
- for rolling stock intended to operate on 1 435 mm track gauge on three-rails lines, when the shared rail is in the farthest position from the platform.

Note: a vehicle gauge is narrower than a structure gauge if the semi-width of the reference kinematic profile of the vehicle gauge, measured at platform level, is smaller than the semi-width of the reference kinematic profile of the structure gauge.

7.3.2.8. Obstacle free route identification (point 4.2.1.2.3)

Specific Case France 'T'

Tactile and contrasted walking surface indicators may be omitted in small stations for the provision of information on the obstacle-free route when remotely controlled audible beacons are provided.;

(63) Appendix A is replaced by the following:

'Appendix A

Standards or Normative Documents Referred to in this TSI

Index	Characteristics to be assessed	TSI point	Mandatory standard point
[1]	EN 81-70:2021+A1:2022 Safety rules for the construction and installation of lifts - Particular applications for passenger and goods passenger lift - Part 70: Accessibility to lifts for persons including persons with disability		
[1.1]	Dimensions of the lifts	4.2.1.2.2 (5)	5.3.1, Table 3
[1.2]	Tactile signage	4.2.1.10 (7)	Table 4 points (c), (h), (j) and (k)
[2]	EN 115-1:2017 Safety of escalators and moving walks - Part 1: Construction and installation		
[2.1]	Design of escalators and moving walks	4.2.1.2.2 (6)	5.4.1.2.2, 5.4.1.2.3 5.2.2
[3]	EN 12464-2:2014 Light and lighting - Lighting of work places - Part 2: Outdoor work places		
[3.1]	Lighting on platforms	4.2.1.9 (3)	Table 5.12, except points 5.12.16 and 5.12.19
[4]	EN 12464-1:2021 Light and lighting - Lighting of work places - Part 1: Indoor work places		
[4.1]	Lighting on platforms	4.2.1.9 (3)	61.1.2
[5]	EN 60268-16:2020 Sound system equipment - Part 16: Objective rating of speech intelligibility by speech transmission index		
[5.1]	Speech transmission index, stations	4.2.1.11 (1)	Annex B
[5.2]	Speech transmission index, rolling stock	4.2.2.7.4 (5)	
[6]	EN 13272-1:2019 Railway applications -Electrical lighting for rolling stock in public transport systems-Part 1: Heavy rail		
[6.1]	Lighting in rolling stock	4.2.2.4 (1)	4.1.2
[6.2]	Reduction of lighting (operational rule)	4.4.2.7	4.1.6, 4.1.7

[7]	ISO 3864-1:2011 Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings		
[7.1]	Safety, warning, mandatory action and prohibition signs	4.2.2.7.2 (1)	6, 7, 8, 9, 10, 11
[8]	EN 15273-1:2013+A1:2016/AC:2017 Railway applications - Gauges - Part 1: General - Common rules for infrastructure and rolling stock		
[8.1]	Calculation of b_{q_0}	4.2.2.11.1 (2)	H.2.2
[9]	EN 16585-1:2017 Railway applications - Design for PRM use - Equipment and components onboard rolling stock - Part 1: Toilets		
[9.1]	Assessment of the Universal Toilet Module	6.1.3.1	Chapter 6
[9.2]	Comfortable reach range of a person using a wheelchair	4.2.2.2 (12)	Figure B.2
[10]	ISO 3864-4:2011 Graphical symbols — Safety colours and safety signs — Part 4: Colorimetric and photometric properties of safety sign materials		
[10.1]	Definition of colours	5.3.2.6 (1)	Chapter 4
[11]	EN 14752:2019+A1:2021 Railway applications - Bodyside entrance systems for rolling stock		
[11.1]	Boarding device mechanical strength	5.3.2.8 (2)	4.2.2
[11.2]	Obstacle detection	5.3.2.8 (5)	5.4
[12]	ISO 7000:2019 Graphical symbols for use on equipment — Registered symbols		
[12.1]	Symbol for sign which identify wheelchair accessible areas	point N.3 of Appendix N	Symbol 0100
[13]	ISO 7001:2007/Amd 4:2017 Graphical symbols — Public information symbols		
[13.1]	Symbol for sign which identify wheelchair accessible areas	Point N.3 of Appendix N	Symbol PIPF 006
[14]	ETSI EN 301 462:2000-03 Human Factors (HF); Symbols to identify telecommunications facilities for deaf and hard of hearing people		
[14.1]	Symbol for sign indicating inductive loops	Point N.3 of Appendix N	4.3.1.2
[15]	EN 15273-2:2013+A1:2016 Railway applications - Gauges - Part 2: Rolling stock gauge		
[15.1]	Specific case for Finland	7.3.2.6	Annex F

[16]	EN 16585-2:2017 Railway applications - Design for PRM use - Equipment and components on board rolling stock - Part 2: Elements for sitting, standing and moving		
[16.1]	Diagrams of priority seats	4.2.2.1.2.1 (7) 4.2.2.1.2.1 (8)	Annex A
[16.2]	Unidirectional seats	4.2.2.1.2.2 (1)	Figure A.2
[16.3]	Facing seats arrangement	4.2.2.1.2.3 (1) 4.2.2.1.2.3 (2)	Figures A.3 and A.4
[16.4]	Diagrams of wheelchair spaces	4.2.2.2 (4)	Figures B1, B2, B3
[16.5]	Diagrams of wheelchair spaces	Appendix F	Figure 5
[17]	EN 16585-3:2017 Railway applications - Design for PRM use - Equipment and components on board rolling stock - Part 3: Clearways and internal doors		
[17.1]	Clearway through the vehicles	4.2.2.6 (1)	Figure 2
[17.2]	Clearway between connecting vehicles of a single trainset,	4.2.2.6 (1)	Figure 3
[17.3]	Clearway to and from wheelchair accessible areas	4.2.2.6 (1)	Figure 5
[17.4]	Corridor widths for a change of direction	4.2.2.6 (4)	Table 3
[18]	EN 16584-1:2017 Railway applications - Design for PRM use - General requirements - Part 1: Contrast		
[18.1]	Assessment of contrast for the rolling stock subsystem	6.2.3.3	Annex A, point A.1
[19]	EN 16584-2:2017 Railway applications - Design for PRM use - General requirements – Part 2: Information		
[19.1]	Door visible signals	4.2.2.3.2 (11)	5.3.3.2 (g) and (h)
[20]	EN 17285:2020 Railway applications - Acoustics - Measuring of door audible warnings		
[20.1]	Measurement of interior door signals	App. G - G.4	5, 6, 7
[20.2]	Measurement of exterior door signals	App. G - G.4	5, 6, 7
[20.3]	Measurement of door finding signals	App. G – G.4	5, 7
[21]	CEN/TS 16614-1:2020 Public transport — Network and Timetable Exchange (NeTEx) — Part 1: Public transport network topology exchange format		
[21.1]	Formatting and exchange of accessibility data	7.2.1.1.1	All

[22]	EN 12896-1:2016 Public transport. Reference data model. Common concepts (Transmodel)		
[22.1]	Formatting and exchange of accessibility data	7.2.1.1.1	All'

(64) Appendix C is replaced by:

'Appendix C

(not used);

(65) in Appendix D, Table D.1 is amended as follows:

(a) row '5.3.1.1 Displays' is deleted;

(b) row '5.3.2.7 Displays' is deleted;

(66) in Appendix E, Tables E.1 and E.2 are replaced by the following:

'Table E.1

Assessment of the infrastructure subsystem (constructed and supplied as single entity)

1	2	3
Characteristics to be assessed	Design and development phase	Construction phase
	Design review and/or design examination	Inspection
Parking facilities for persons with disabilities and persons with reduced mobility	X	X
Obstacle-free routes	X	X
Route identification	X	X
Doors and entrances	X	X
Floor surfaces	X	X
Transparent obstacles	X	X
Toilets	X	X
Furniture and free-standing devices	X	X
Ticketing/Counter or vending machine/Information counter/Ticket control machine/Turnstiles/Customer Assistance points	X	X
Lighting	X	X
Visual information: signposting, pictograms, dynamic information	X	X
Spoken information	X	X
Platform width and edge of platform	X	X
End of platform	X	X
Level track crossing at stations	X	X

Table E.2

Assessment of the rolling stock subsystem (constructed and supplied as serial products)

1	2		3
Characteristics to be assessed	Design and development phase		Production phase
	Design review and/or design examination	Type Test	Routine Test
Seats			
General	X	X	
Priority Seats General	X		
Uni-directional seats	X	X	
Facing seats arrangement	X	X	
Wheelchair spaces	X	X	
Doors			
General	X	X	
Exterior doors	X	X	
Interior doors	X	X	
Lighting		X	
Toilets	X		
Clearways	X		
Customer Information			
General	X	X	
Signage, pictogram and tactile information	X	X	
Dynamic visual information	X	X	
Dynamic Audible information	X	X	
Height changes	X		
Handrails	X	X	
Wheelchair accessible sleeping accommodation	X	X	
Step position for vehicle access and egress			
General requirements	X		
Access/egress steps	X		X
Boarding aids	X	X	X

(67) Appendix F is replaced by the following:

Appendix F

Renewal or upgrade of rolling stock

Where parts of a rolling stock are renewed or upgraded, they shall comply with the requirements of this TSI; compliance with the content of this TSI is not mandatory in the following cases:

Structures

Compliance is not mandatory if the work would require structural alterations to door portals (interior or external), underframes, collision pillars, vehicle bodies, vehicle over-ride protection, or more generally if the work would necessitate re-validation of the vehicle structural integrity.

Seats

Compliance with point 4.2.2.1 with regard to seat back grab handles is only mandatory if the seat structures are renewed or upgraded within an entire vehicle.

Compliance with point 4.2.2.1.2 with regard to the dimensions of priority seats and their surroundings is only mandatory if the seating layout is altered within an entire train and this can be achieved without reducing the existing capacity of the train. In that case, the maximum number of priority seats shall be provided.

Compliance with requirements regarding headroom above priority seating is not mandatory if the limiting factor is a luggage rack that is not being structurally altered during the renewal or upgrading work.

Wheelchair spaces

The provision of wheelchair spaces is only required when the seating layout is altered within a complete train formation. However, if the entrance doorway, or clearways, cannot be modified to enable wheelchair access, a wheelchair space does not need to be provided if the seating layout is altered. Wheelchair spaces created in an existing rolling stock may be arranged in accordance with the specification referenced in Appendix A, Index [16].

The provision of call for aid devices at the wheelchair positions is not mandatory if the vehicle does not have an electrical communications system that can be adapted to include such a device.

The provision of a transfer seat is only mandatory when it does not require modifying the layout of an existing wheelchair space.

Exterior doors

Compliance with requirements to define the interior position of external doorways by contrast at floor level is only mandatory when the floor covering is renewed or upgraded.

Compliance with requirements to provide door opening and closing signals is only mandatory when the door control system is renewed or upgraded.

Full compliance with requirements regarding the position and illumination of door controls is only mandatory when the door control system is renewed or upgraded and when the controls can be re-positioned without alteration to the vehicle structure or door. However, in such an event, the renewed or upgraded controls shall be installed as close as possible to the compliant position.

Interior doors

Compliance with the requirements for door control operation operating forces and positioning is only mandatory if the door and door mechanism and/or control is being upgraded or renewed.

Lighting

Compliance with the requirement is not required if it can be established that there is insufficient capacity in the electrical system to support additional load, or that such lighting cannot locally be accommodated without structural alterations (doorways etc.).

Toilets

Provision of a fully compliant universal toilet is only mandatory when existing toilets are being completely renewed or upgraded and a wheelchair space is provided, and a compliant universal toilet can be accommodated without structural alteration to the vehicle body.

The provision of call for aid devices in the universal toilet is not mandatory if the vehicle does not have an electrical communications system that can be adapted to include such a device.

Clearways

Compliance with the requirements of point 4.2.2.6 is only mandatory if the seating layout is altered within an entire vehicle and a wheelchair space is being provided.

Compliance with the requirements for clearways between connecting vehicles is only mandatory if the gangway is being renewed or upgraded.

Information

Compliance with the requirements of point 4.2.2.7 in respect of route information is not mandatory at renewal or upgrade. However, where an automated route information system is installed as part of a renewal or upgrade programme, it shall comply with the requirements of that point.

Compliance with the other parts of point 4.2.2.7 shall be mandatory whenever signage or interior finishes are renewed or upgraded.

Height Changes

Compliance with the requirements of point 4.2.2.8 is not mandatory at renewal or upgrade. However, a contrasting warning band on step nosings shall be provided when tread surface materials are renewed or upgraded.

Handrails

Compliance with the requirements of point 4.2.2.9 is only mandatory where existing handrails are being renewed or upgraded.

Wheelchair accessible sleeping accommodation

Compliance with the requirement to provide wheelchair accessible sleeping accommodation is only mandatory when existing sleeping accommodation is being renewed or upgraded.

The provision of call for aid devices in the wheelchair accessible sleeping accommodation is not mandatory if the vehicle does not have an electrical communications system that can be adapted to include such a device.

Step positions, steps and boarding aids

Compliance with the requirements of points 4.2.2.11 and 4.2.2.12 is not mandatory at renewal or upgrade. However, if moveable steps or other integral boarding aids are fitted, they shall comply with the relevant provisions of those points.

However, if a wheelchair space in accordance with point 4.2.2.3 is created at renewal or upgrade, then it shall be mandatory to provide some form of boarding aid in accordance with point 4.4.3.;

(68) Appendix G is replaced by the following:

'Appendix G

Passenger external doors audible signals

G.1. Definitions

The following terms are used in this Appendix:

f_{signal} = frequency of excitation tone

L_S = sound pressure level measured as L_{AFmax} the maximum Sound Level with 'A' Frequency weighting and Fast Time weighting during the measurement period.

$L_{Smax} =$ maximum L_{AFmax}

$L_{Smin} =$ minimum L_{AFmax}

$L_N =$ surrounding noise level measured as follows:

a) frequency range energetic sum of three octave bands

$$L_N = \sum \left(10^{\frac{L_1}{10}} + 10^{\frac{L_2}{10}} + 10^{\frac{L_3}{10}} \right)$$

where:

$L_1 =$ $L_{oct.500}$ Hz

$L_2 =$ $L_{oct.1000}$ Hz

$L_3 =$ $L_{oct.2000}$ Hz

b) Sound Pressure level measured as an energy equivalent level of 20 s (L_{Aeq20})

G.2 Door opening and closing signals

G.2.1 Door opening signal

Characteristics	A slow pulse multi tone (up to 2 pulses per second) of 2 tones emitted sequential
Frequencies	<ul style="list-style-type: none"> - $f_{signal1} = 2200$ Hz +/- 100 Hz - $f_{signal2} = 1760$ Hz +/- 100 Hz
Sound pressure level	<ul style="list-style-type: none"> Adaptive device <ul style="list-style-type: none"> - $L_S \geq L_N + 5$ dB - $L_{Smax} = 70$ dB (+ 6/- 0) - Non adaptive device <ul style="list-style-type: none"> - $L_S = 70$ dB (+ 6/- 0)

G.2.2 Door closing signal

Characteristics	- A fast pulsed tone (6-10 pulses per second)
Frequency	- $f_{signal} = 1900$ Hz +/- 100 Hz
Sound pressure level	<ul style="list-style-type: none"> Adaptive device <ul style="list-style-type: none"> - $L_S \geq L_N + 5$ dB - $L_{Smax} = 70$ dB (+ 6/- 0) - Non adaptive device <ul style="list-style-type: none"> - $L_S = 70$ dB (+ 6/- 0)

G.3. Door finding signals

The door finding signal can be a single tone signal (in accordance with point G.3.1) or a dual tone signal (in accordance with point G.3.2). Both signal types shall be equally accepted in all Member States.

G.3.1 Single Tone Signal

Characteristics	Interval of tone (rectangle), none fade in and fade out — signal impulse duration = 5 ms ± 1 ms “on” (pure tone impulse) — signal time pattern of 3 to 5 pulses per second
Frequency	— $f_{\text{signal}} = 630 \text{ Hz} \pm 50 \text{ Hz}$
Sound pressure level	Adaptive device — $L_S \geq L_N + 5 \text{ dB}$ — $L_{S\text{min}} = 45 \text{ dB (+/- 2)}$ — $L_{S\text{max}} = 65 \text{ dB (+/- 2)}$ Non adaptive device — $L_S = 60 \text{ dB}$

G.3.2 Dual Tone Signal

Characteristics	Interval of tones (signal definition) — 100 ms sound pressure level fade in — 100 ms sound first tone 550 Hz ± 50 Hz — 100 ms sound pressure level fade out — 200 ms off — 100 ms sound pressure level fade in — 100 ms sound second tone 750 Hz ± 50 Hz — 100 ms sound pressure level fade out — 900 ms off — signal repetition time = 1 700 ms
Frequency	$f_{\text{signal1}} = 550 \text{ Hz} \pm 50 \text{ Hz}$ $f_{\text{signal2}} = 750 \text{ Hz} \pm 50 \text{ Hz}$
Sound pressure level	Adaptive device — $L_S \geq L_N + 5 \text{ dB}$ — $L_{S\text{min}} = 50 \text{ dB (+/- 2 dB)}$ — $L_{S\text{max}} = 70 \text{ dB (+/- 2 dB)}$ Non adaptive device — $L_S = 70 \text{ dB}$

G.4. Measuring Positions

The microphone position for the measurements of audible door signals shall be in accordance with the specification referenced in Appendix A, Index [20]. The specification shall also be used for the microphone position of the door finding signal despite the scope of the specification excluding the door finding signal.

Measurements to demonstrate compliance shall be carried out at three door locations on a train. The door shall be fully open for the close test and fully closed for the open test.;

(69) Appendixes H, I, J, K and L are deleted;

(70) Appendix M is replaced by the following:

Appendix M

Interoperable wheelchair transportable by train

M.1 SCOPE

This Appendix identifies the maximum engineering limits for an interoperable wheelchair transportable by train. Those limits are used for designing and assessing the rolling stock (architecture, structure, layout) and its components (access doors, internal doors, seats, toilets etc.). When the characteristics of a wheelchair exceed those limits, the conditions of use of the rolling stock might be degraded for the user (for instance no access to the wheelchair areas). Exceeding some limits may prevent the user to access the rolling stock. Those limits are defined by each railway undertaking as specified in the point 4.2.6.1 of the Annex to Regulation (EU) No 454/2011.

M.2 CHARACTERISTICS

The values considered as engineering limits are:

Basic Dimensions

- Width of 700 mm plus 50 mm min each side for hands when moving.
- Length of 1 200 mm plus 50 mm for feet.

Wheels

The smallest wheel shall accommodate a gap of dimensions 75 mm horizontal and 50 mm vertical.

Height

1 450 mm max including a 95th percentile male occupant

Turning circle

- 1 500 mm

Weight

- Fully laden weight of 300 kg for wheelchair and occupant (including any baggage) in the case of an electrical wheelchair for which no assistance is required for crossing a boarding aid.
- Fully laden weight of 200 kg for wheelchair and occupant (including any baggage) in the case of a manual wheelchair.

Obstacle height that can be overcome and ground clearance

- Obstacle height that can be overcome 50 mm (max)
- Ground clearance 60 mm (min) with a upward slope angle of 10° (17%) on top for going forward (under the foot rest)

Maximum safe slope on which the wheelchair will remain stable:

- Shall have dynamic stability in all directions at an angle of 6° (10%)
- Shall have static stability in all directions (including with brake applied) at an angle of 9° (16%);

(71) Appendix N is amended as follows:

(a) point N.3 is replaced by the following:

N.3 SYMBOLS TO USE ON SIGNS

International wheelchair sign

The sign which identifies wheelchair accessible areas shall include a symbol in accordance with one of the specifications referenced in Appendix A, Index [12] or Index [13].

Inductive loop sign

The sign indicating where inductive loops are fitted shall include a symbol in accordance with the specification referenced in Appendix A, Index [14].

Priority seating sign

The sign indicating where there are priority seats shall include symbols in accordance with Figure N1.

Figure N1

Symbols for priority seats

(b) the following point N.4 is added:

N.4 COLOUR OF SIGNS

The specific signage referred to in this Appendix shall be white on a dark blue background. Where signs are placed on a dark blue panel, it is allowed to invert the colours of the symbol and the background (i.e. dark blue symbol on a white background).;

(72) the following Appendix P is added:

Appendix P

Changes of requirements and transition regimes

For other TSI points than these listed in Table P.1 and Table P.2, compliance with the 'previous TSI' (i.e. this Regulation as amended by Commission Implementing Regulation (EU) 2019/772 (*)) imply compliance with this TSI applicable from 28 September 2023.

Changes with a generic transition regime of 7 years

For TSI points listed in Table P.1, compliance with the previous TSI does not imply compliance with the version of this TSI applicable from 28 September 2023.

Projects already in design phase on 28 September 2023, shall comply with the requirement of this TSI from 28 September 2030.

Projects in production phase and rolling stock in operation are not affected by the TSI requirements listed in Table P.1.

Table P.1

Transition regime of 7 years

TSI point(s)	TSI point(s) in the previous TSI	Explanation of the TSI change
4.2.2.1.1(1a)	No requirement	New requirement precisising the correct position of the handle
4.2.2.2(8)	4.2.2.2(8)	More precise wording of the requirement
4.2.2.3.2(8) When a door is closed locally (by a passenger or crew), a door closing signal shall be given; it shall start following the operation of the control device and shall continue until the door is closed	No requirement	New requirement

4.2.2.3.2(11)	No requirement	New requirement
4.2.2.11.1(3) The technical documentation referred to in point 4.2.12 of the LOC&PAS TSI shall include information about the height and offset of the theoretical platform resulting in a vertical gap (δv) of 160 mm and in a horizontal gap (δh) of 200 mm from the point situated in the central position of the nose of the rolling stock's lowest step on a straight level track.	No requirement	New requirement
5.3.2.6(1)	5.3.2.6(1)	Restriction of the possibilities given
5.3.2.8	5.3.2.8	New requirement in the specification referenced in Appendix A index [11]
6.2.3.3	No requirement	New requirement referring to a specific standard on contrast
7.3.2.6. Step position for vehicle access and egress) Specific Case Spain 'P'	7.3.2.6. Step position for vehicle access and egress) Specific Case Spain 'P' for the 1 668 mm gauge network	New requirement applicable to 1 668 mm track gauge vehicles
Appendix G – door opening and closing signals	Appendix G – door opening and closing signals	Change of measuring method

Changes with a specific transition regime:

For TSI points listed in Table P.2, compliance with the previous TSI does not imply compliance with this TSI applicable from 28 September 2023.

Projects already in design phase on 28 September 2023, projects in production phase, and rolling stock in operation shall comply with the requirement of this TSI in accordance with the respective transition regime set out in Table P.2 from 28 September 2023.

Table P.2

Specific transition regime

TSI point(s)	TSI points(s) in previous TSI	Explanation on TSI change	Transition regime			
			Design phase not started	Design phase started	Production phase	rolling stock in operation
Not applicable						

(*) Commission Implementing Regulation (EU) 2019/772 of 16 May 2019 amending Regulation (EU) No 1300/2014 as regards inventory of assets with a view to identifying barriers to accessibility, providing information to users and monitoring and evaluating progress on accessibility (OJ L 139I, 27.5.2019, p. 1).

ANNEX IV

The Annex to Regulation (EU) No 1301/2014 is amended as follows:

(1) in point 2.1(2), point (a) is replaced by the following:

‘(a) substations: connected on the primary side to the high-voltage grid, with transformation of the high-voltage to a voltage and/or conversion to a traction power supply system suitable for the trains. On the secondary side, substations are connected to the railway contact line system;’

(2) point 2.1.1 is replaced by the following:

‘2.1.1. Traction power supply

(1) The objective of the traction power supply system is to supply every train with power in order to meet the planned timetable.

(2) Basic parameters for traction power supply system are set out in point 4.2.’;

(3) in point 2.1.2, point (1) is replaced by the following:

‘(1) The objective is to ensure reliable and continuous power transfer from the traction power supply system to the rolling stock. The interaction between the overhead contact line and the pantograph is an important aspect of interoperability.’;

(4) in Chapter 3, the Table, rows 4.2.4 and 4.2.5 are replaced by the following:

4.2.4	Traction power supply performance	—	—	—	—	1.5 2.2.3	—
4.2.5	Current at standstill	—	—	—	—	1.5 2.2.3	—

(5) point 4.2.1 is replaced by the following:

‘4.2.1. **(not used)**’;

(6) point 4.2.2.1 is replaced by the following:

‘4.2.2.1. Traction power supply system:

(a) Voltage and frequency (4.2.3);

(b) Parameters relating to traction power supply system performance (4.2.4);

(c) Current at standstill (4.2.5);

(d) Regenerative braking (4.2.6);

(e) Electrical protection coordination arrangements (4.2.7);

(f) Harmonics and dynamic effects for AC traction power supply systems (4.2.8).’;

(7) point 4.2.3 is replaced by the following:

‘4.2.3. Voltage and frequency

The nominal voltage and nominal frequency of the traction power supply system shall be one of the four systems:

(a) AC 25 kV, 50 Hz;

(b) AC 15 kV, 16,7 Hz;

(c) DC 3 kV;

(d) DC 1,5 kV.

For new lines with speed greater than 250 km/h, implementation rules are specified in point 7.1.1.’;

- (8) point 4.2.4 is replaced by the following:

‘4.2.4. Traction power supply system performance

For newly built subsystems, or in the case the traction power supply system is changed (e.g. migration from DC to AC), the quality index for the subsystem shall comply with the specification referenced in Appendix E, Index [1] in order to enable trains to meet the design timetable.’;

- (9) point 4.2.5 is replaced by the following:

‘4.2.5. Current at standstill

The OCL shall be designed to sustain at least the values of current at standstill per pantograph, in accordance with the specification referenced in Appendix E, Index [2].’;

- (10) in point 4.2.6, point (1) is replaced by the following:

‘(1) The traction power supply systems shall be designed to allow the use of regenerative braking according to the specification referenced in Appendix E, Index [1].’;

- (11) point 4.2.7 is replaced by the following:

‘4.2.7. Electrical protection coordination arrangements

Electrical protection coordination design of the energy subsystem shall comply with the requirements detailed in the specification referenced in Appendix E, Index [1].’;

- (12) in point 4.2.8, point (2) is replaced by the following:

‘(2) In order to avoid instability and achieve electrical system compatibility, harmonic overvoltages shall be limited below critical values in accordance with the specification referenced in Appendix E, Index [1].’;

- (13) point 4.2.9 is amended as follows:

(a) in point (1), ‘7.2.3’ is replaced by ‘7.1.2’;

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

‘(2) The contact wire height and the lateral deviation of the contact wire under the action of a crosswind are factors which govern the interoperability of the rail network.’;

- (14) in point 4.2.9.1, points (1), (2) and (3) are replaced by the following:

‘(1) The permissible data for contact wire height is given in Table 4.2.9.1.

Table 4.2.9.1

Contact wire height

Description	$v \geq 250$ [km/h]	$v < 250$ [km/h]
Nominal contact wire height [mm]	Between 5 080 and 5 300	Between 5 000 and 5 750
Minimum design contact wire height [mm]	5 080	In accordance with the specification referenced in Appendix E, Index [3] depending on the chosen gauge
Maximum design contact wire height [mm]	5 300	6 200 ⁽¹⁾

⁽¹⁾ Taking into account tolerances and uplift in accordance with the specification referenced in Appendix E, Index [3], the maximum contact wire height shall not be greater than 6 500 mm.

(2) For the relation between the contact wire heights and pantograph working heights see the specification referenced in Appendix E, Index [3].

(3) At level crossings, the contact wire height shall be specified by national rules or in the absence of national rules, in accordance with the specification referenced in Appendix E, Index [4].’;

(15) point 4.2.9.2 is amended as follows:

(a) point (1) is replaced by the following:

‘(1) The maximum lateral deviation of the contact wire in relation to the track centre line under action of crosswind shall be in accordance with the specification referenced in Appendix E, Index [2].’;

(b) point (3) is replaced by the following:

‘(3) Track gauge system 1 520 mm:

For Member States applying the pantograph profile in accordance with point 4.2.8.2.9.2.3 of the LOC&PAS TSI the maximum lateral deviation of the contact wire in relation to the pantograph centre under action of a crosswind shall be 500 mm.’;

(16) point 4.2.10 is replaced by the following:

‘4.2.10. Pantograph gauge

(1) Track gauge system other than 1 520 mm:

The mechanical kinematic pantograph gauge shall be specified using the method given in the specification referenced in Appendix E, Index [2] to this TSI and the pantograph profiles defined in LOC&PAS TSI, clauses 4.2.8.2.9.2.1 and 4.2.8.2.9.2.2.

(2) Track gauge system 1 520 mm:

For Member States applying the pantograph profile in accordance with LOC&PAS TSI, clause 4.2.8.2.9.2.3, the static gauge available for pantograph is defined in Appendix D to this TSI.

(3) No part of the energy sub-system shall enter the pantograph gauge as stated in points (1) and (2), except for the contact wire and steady arm.’;

(17) in point 4.2.11, points (2) and (3) are replaced by the following:

‘(2) The ranges of F_m for each of the traction power supply systems are defined in the specification referenced in Appendix E, Index [2].

(3) The overhead contact lines shall be designed to be capable to sustain the upper design limit of F_m given in the specification referenced in Appendix E, Index [2].’;

(18) in point 4.2.12, points (2) and (3) are replaced by the following:

‘(2) S_0 is the simulated or measured uplift of the contact wire at a steady arm, with a minimum of two pantographs operating simultaneously with the upper limit of F_m at the OCL design speed. When the uplift of the steady arm is physically limited due to the overhead contact line design, it is permissible for the necessary space to be reduced to $1,5S_0$ (refer to the specification referenced in Appendix E, Index [3]).

(3) Maximum force (F_{max}) is usually within the range of F_m plus three standard deviations σ_{max} ; higher values may occur at particular locations and are given in the specification referenced in Appendix E, Index [3]. For rigid components such as section insulators in overhead contact line systems, the contact force can increase up to a maximum of 350 N.’;

(19) point 4.2.13 is replaced by the following:

‘4.2.13. Pantograph spacing for overhead contact line design

The overhead contact line shall be designed for trains with two pantographs operating simultaneously. The design spacing of the two pantograph heads, centre line to centre line, shall be equal or lower than values set out in the specification referenced in Appendix E, Index [2].’;

(20) in point 4.2.14, point (3) is replaced by the following:

‘(3) Permissible materials for contact wires are copper and copper-alloy. The contact wire shall comply with the requirements of the specification referenced in Appendix E, Index [5].’;

(21) point 4.2.15 is replaced by the following:

4.2.15. Phase separation sections

4.2.15.1. General

- (1) The design of phase separation sections shall ensure that trains can move from one section to an adjacent one without bridging the two phases. Power exchange between the OCL and the unit shall be brought to zero, by switching off the on-board circuit breaker or other equivalent means, before entering the phase separation section. Adequate means (except for the short separation section) shall be provided to allow a train that is stopped within the phase separation section to be restarted.
- (2) The overall length D of neutral sections is defined in the specification referenced in Appendix E, Index [2]. For the calculation of D clearances, the specification referenced in Appendix E, Index [3] and an uplift of S_0 shall be taken into account.

4.2.15.2. Lines with speed $v \geq 250$ km/h

Two types of design of phase separation sections may be adopted:

- (a) a phase separation design where all the pantographs of the longest TSI compliant trains are within the neutral section. The overall length of the neutral section shall be at least 402 m.

For detailed requirements see the specification referenced in Appendix E, Index [2];

- (b) a shorter phase separation with three insulated overlaps as shown in the specification referenced in Appendix E, Index [2]. The overall length of the neutral section is less than 142 m including clearances and tolerances.

4.2.15.3. Lines with speed $v < 250$ km/h

The design of separation sections shall normally adopt solutions as described in the specification referenced in Appendix E, Index [2]. Where an alternative solution is proposed, it shall be demonstrated that the alternative is at least as reliable.;

(22) point 4.2.16.1 is amended as follows:

- (a) in point (1), the first sentence is replaced by:

‘The design of system separation sections shall ensure that trains can move from one traction power supply system to an adjacent different traction power supply system without bridging the two systems.’;

- (b) point (3) is replaced by the following:

‘(3) The overall length D of neutral sections is defined in the specification referenced in Appendix E, Index [2]. For the calculation of D clearances, the specification referenced in Appendix E, Index [3] and an uplift of S_0 shall be taken into account.’;

(23) point 4.2.16.2 is amended as follows:

- (a) point (1) is replaced by the following:

‘(1) Power exchange between the OCL and the unit shall be brought to zero by switching off the on-board circuit breaker or other equivalent means, before entering the system separation section.’;

- (b) in point (2), points (b) and (c) are replaced by the following:

‘(b) provision shall be made in the energy subsystem to avoid bridging of both adjacent traction power supply systems should the opening of the on-board circuit breaker(s) fail;

(c) variation in contact wire height along the entire separation section shall fulfil requirements set in the specification referenced in Appendix E, Index [3].’;

(24) in point 4.2.16.3, point (2) is replaced by the following:

- (2) If a system separation section is traversed with pantographs lowered, it shall be designed so as to avoid the electrical connection of the two traction power supply systems by an unintentionally raised pantograph.’;

(25) in point 4.2.17, points (2) and (3) are replaced by the following:

- (2) The on-ground energy Data Collecting System (DCS) shall receive, store and export CEBD without corrupting it, in accordance with the specification referenced in Appendix E, Index [6].
- (3) The on-ground energy DCS shall support all the data exchange requirements as defined in point 4.2.8.2.8.4 of the LOC&PAS TSI and requirements set out in the specification referenced in Appendix E, Index [7].;

(26) point 4.2.18 is replaced by the following:

4.2.18. Protective provisions against electric shock

Electrical safety of the overhead contact line system and protection against electric shock shall be achieved by compliance with the specification referenced in Appendix E, Index [4] and, regarding AC voltage limits for the safety of persons and DC voltage limits, by compliance with the specification referenced in Appendix E, Index [4].;

(27) in point 4.3.2, the table is amended as follows:

(a) the second and third rows are replaced by the following:

'Traction power supply performance	4.2.4	Max current from OCL Power factor	4.2.8.2.4 4.2.8.2.6
Current at standstill	4.2.5	Maximum current at standstill	4.2.8.2.5'

(b) the sixth row is replaced by the following:

'Harmonics and dynamic effects for AC traction power supply systems	4.2.8	Harmonics and dynamic effects for AC systems	4.2.8.2.7'
---	-------	--	------------

(28) in point 4.3.4, points (2) and (3) are replaced by the following:

- (2) The information is transmitted between the ETCS trackside and the ETCS on-board sub-systems as well as between the ETCS on-board and the vehicle power system. The transmission interface is specified in the CCS TSI and the LOC & PAS TSI.
- (3) The relevant information to perform the switching off of the on-board circuit breaker, the change of maximum train current, the change of the traction power supply system and the pantograph management shall be transmitted via ETCS when the line is equipped with ETCS and those trackside functionalities are implemented.;

(29) in point 4.3.5, the table, the first row is replaced by the following:

'Traction power supply performance	4.2.4	Train composition Preparation of the Route Book	4.2.2.5 4.2.1.2.2.1'
------------------------------------	-------	--	-------------------------

(30) point 5.2.1.6 is replaced by the following:

5.2.1.6. Current at standstill

The overhead contact line shall be designed for the requirements set out in point 4.2.5.;

(31) point 6.1.4.1 is amended as follows:

(a) in point (1), point (d) is replaced by the following:

- (d) The design of an overhead contact line shall be assessed with a simulation tool validated in accordance with the specification referenced in Appendix E, Index [8] and by measurement in accordance with the specification referenced in Appendix E, Index [9].

For OCL with a design speed up to and including 100 km/h, simulation and measurement of the dynamic behaviour are not required.;

(b) point (3), point (f) is replaced by the following:

'(f) In order to be acceptable, the measured current collection quality shall be in accordance with point 4.2.12, for uplift, and either the mean contact force and standard deviation or percentage of arcing. The uplift of at least two steady arms shall be measured.';

(32) point 6.1.4.2 is replaced by the following:

'6.1.4.2. Assessment of current at standstill (DC systems only)

The conformity assessment for DC systems shall be carried out in accordance with the specification referenced in Appendix E, Index [2].';

(33) in point 6.1.5, the introductory phrase is replaced by the following:

'In accordance with Article 9(2) of Directive (EU) 2016/797, the EC declaration of conformity shall be accompanied by statement setting out the condition of use:';

(34) point 6.2.4.1 is replaced by the following:

'6.2.4.1. Assessment of voltage and frequency

(1) The applicant shall declare in the technical file which nominal voltage is chosen for the traction power supply only in the following cases:

- (a) a new energy subsystem is built;
- (b) the traction power supply system is changed (e.g. migration from DC to AC).

(2) The selected traction power supply system shall be assessed by a document review in the design phase. An assessment is required only in the following cases:

- (a) a new sub-systems is built;
- (b) the traction power supply system is changed (e.g. migration from DC to AC).';

(35) the following point 6.2.4.1a is inserted:

'6.2.4.1a. Assessment of traction power supply performance

(1) The applicant shall declare:

- (a) a quality index as defined in the point 4.2.4 for the subsystem;
- (b) that the output of the design study complies with the specification referenced in Appendix E, Index [1].

(2) The assessment shall be carried out by verifying only the existence of the declaration.';

(36) point 6.2.4.2 is replaced by the following:

'6.2.4.2. Assessment of regenerative braking

(1) The assessment for AC traction power supply fixed installations shall be demonstrated in accordance with the specification referenced in Appendix E, Index [1].

(2) The assessment for DC traction power supply shall be demonstrated by a design review.';

(37) points 6.2.4.3 and 6.2.4.4 are replaced by the following:

'6.2.4.3. Assessment of electrical protection coordination arrangements

The assessment shall be demonstrated for design and operation of substations in accordance with the specification referenced in Appendix E, Index [1].

6.2.4.4. Assessment of harmonics and dynamic effects for AC traction power supply systems

(1) A compatibility study shall be carried out in accordance with the specification referenced in Appendix E, Index [1].

(2) That study shall be carried out only in the case of introducing converters with active semi-conductors in the traction power supply system.

(3) The notified body shall assess if criteria of the specification referenced in Appendix E, Index [1] are fulfilled.';

(38) in point 6.2.4.5, point (2) is replaced by the following:

‘(2) Measurements of the interaction parameters shall be carried out in accordance with the specification referenced in Appendix E, Index [9].’;

(39) in point 6.3.1(1), the introductory phrase is replaced by the following:

‘Until the list of interoperability constituents listed in Chapter 5 of this TSI is 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:’;

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

(41) points 7.1 to 7.3 are replaced by the following:

7.1. National implementation plan

- (a) Member States shall develop a national plan for the implementation of this TSI, considering the coherence of the entire rail system of the Union. That plan shall include all projects regarding new, renewal and upgrading of energy subsystem and shall ensure a gradual migration within a reasonable timescale onwards an interoperable target energy subsystem fully compliant with this TSI.
- (b) Member States shall ensure that an on-ground energy data collecting system capable to exchange compiled energy billing data in accordance with point 4.2.17 of this TSI is implemented.

7.1.1. Implementation rules for voltage and frequency

New lines with speed greater than 250 km/h shall be supplied with one of the AC systems listed in point 4.2.3 (a) and (b).

7.1.2. Implementation rules for OCL geometry

7.1.2.1. Implementation rules for 1 435 mm track gauge system

The OCL shall be designed taking into account the following rules:

- (a) New energy subsystems with speed greater than 250 km/h shall accommodate both pantographs as specified in points 4.2.8.2.9.2.1 (1 600 mm) and 4.2.8.2.9.2.2 (1 950 mm) of the LOC & PAS TSI.
If this is not possible, the OCL shall be designed for use by at least a pantograph with the head geometry specified in point 4.2.8.2.9.2.1 (1 600 mm) of the LOC & PAS TSI.
- (b) Renewed or upgraded energy subsystems with speed greater than 250 km/h shall accommodate at least a pantograph with the head geometry specified in point 4.2.8.2.9.2.1 (1 600 mm) of the LOC & PAS TSI.
- (c) Other cases: the OCL shall be designed for use by at least one of the pantographs with the head geometry specified in points 4.2.8.2.9.2.1 (1 600 mm) or 4.2.8.2.9.2.2 (1 950 mm) of the LOC & PAS TSI.

7.1.2.2. Track gauge systems different than 1 435 mm

The OCL shall be designed for use by at least one of the pantographs with the head geometry specified in point 4.2.8.2.9.2 of the LOC & PAS TSI.

7.2. Application of this TSI to a new energy subsystem

- (1) For a new energy subsystem, the application of this TSI shall be compulsory.
- (2) A ‘new energy subsystem’ means an energy subsystem placed into service after 28 September 2023, which is created where no traction power supply and OCL previously existed.

Any other energy subsystem shall be considered as an ‘existing energy subsystem’.

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

7.3.1. Performance criteria of the subsystem

In addition to the cases referred to in point 7.2.(3), 'upgrading' is a major modification work of an existing energy subsystem resulting in an increase of the line speed of more than 30km/h.

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. Due to the characteristics of the inherited railway system, compliance of existing energy subsystem with this TSI may be achieved through a gradual improvement of interoperability:

- (1) For the upgraded energy 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 metric references and shall result in the compliance of all basic parameters of the energy subsystem associated with the tracks that are subject to the upgrading of the energy subsystem.

The addition of one or more rails supporting a further track gauge is also considered as upgrade when the performance criteria of the subsystem is triggered as described in point 7.3.1.

- (2) In the event of a change other than an upgrading of the energy subsystem, the application of this TSI for each of the basic parameters (referred to in point 4.2.2) affected by the change shall be compulsory when the change requires carrying out a new 'EC' verification procedure in accordance with Commission Implementing Regulation (EU) 2019/250 (*). Provisions defined in 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 energy subsystem and for those basic parameters that are not affected by the change, or when the change does not require a new 'EC' verification, the demonstration of the level of compliance with this TSI is voluntary.
- (4) In case of 'major substitution, as defined in Article 2(15) of Directive (EU) 2016/797 of the European Parliament and of the Council (**), in the framework of a 'renewal', non TSI-compliant elements of the subsystem or part(s) of it shall systematically be replaced with TSI-compliant ones.
- (5) 'Substitution in the framework of maintenance' means any replacement of components by parts of identical function and performance in the framework of maintenance, as defined in Article 2(17) of Directive (EU) 2016/797. It shall be made in accordance with the requirements of this TSI, whenever reasonably and economically feasible and it does not require an 'EC' verification.
- (6) For the existing energy subsystem, in the event of a change other than an upgrading, for the maximum lateral deviation of the OCL, it is permitted to deviate from the requirement in point 4.2.9.2. as long as the Infrastructure Manager has provided evidence that TSI compliant rolling stock with a TSI compliant pantograph (as described in point 7.1.2.1 of this TSI) has already operated under the same OCL design installed in the network without occurring any incident.

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 energy subsystem to be used are laid down in point 4.2.2.5 and Appendix D.1 of the TSI OPE.

- (*) Commission Implementing Regulation (EU) 2019/250 of 12 February 2019 on the templates for 'EC' declarations and certificates for railway interoperability constituents and subsystems, on the model of declaration of conformity to an authorised railway vehicle type and on the 'EC' verification procedures for subsystems in accordance with Directive (EU) 2016/797 of the European Parliament and of the Council and repealing Commission Regulation (EU) No 201/2011 (OJ L 42, 13.2.2019, p. 9).
- (**) Directive (EU) 2016/797 of the European Parliament and of the Council of 11 May 2016 on the interoperability of the rail system within the European Union (OJ L 138, 26.5.2016, p. 44).
- (***) 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).;

(42) point 7.4.1 is amended as follows:

- (a) point (1) is deleted;
- (b) First sentence of point (2) is replaced as follows:

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

(43) point 7.4.2.2.1 is replaced by the following:

'7.4.2.2.1. **(not used)**';

(44) point 7.4.2.6 is replaced by the following:

'7.4.2.6. **(not used)**';

(45) point 7.4.2.7.1 is replaced by the following:

'7.4.2.7.1. **(not used)**';

(46) point 7.4.2.8 is replaced by the following:

'7.4.2.8. **(not used)**';

(47) point 7.4.2.9 is replaced by the following:

'7.4.2.9. **(not used)**';

(48) in Appendix A, Table A.1, row 'Current at standstill — 5.2.1.6', fourth column, 'X' is replaced by 'X (only for DC systems)';

(49) in Appendix B, Table B.1, first column, the second and third rows are replaced by the following:

'Traction power supply performance — 4.2.4

DC systems only: Current at standstill — 4.2.5'

(50) Appendix C is replaced by the following:

'Appendix C

(not used)';

(51) Appendix D is amended as follows:

(a) the title is replaced by the following:

'Appendix D

Specification of the static pantograph gauge (track gauge system 1 520 mm);

(b) point D.1 is deleted;

(c) the title of point D.2 is deleted;

(52) Appendix E is replaced by the following:

'Appendix E

List of referenced standards

Index	Characteristics to be assessed	TSI Point	Mandatory standard Point
[1]	EN 50388-1:2022 Railway Applications - Fixed installations and rolling stock - Technical criteria for the coordination between electric traction power supply systems and rolling stock to achieve interoperability - Part 1: General		
[1.1]	Traction power supply performance	4.2.4	8.2
[1.2]	Regenerative braking	4.2.6	12.2.2
[1.3]	Electrical protection coordination arrangements	4.2.7	11.2 and 11.3 point 2 and 3
[1.4]	Harmonics and dynamic effects for AC traction power supply systems	4.2.8 (2)	10.3 – Table 6
[1.5]	Assessment of traction power supply performance	6.2.4.1a	8.4
[1.6]	Assessment of regenerative braking	6.2.4.2 (1)	15.6.2
[1.7]	Assessment of electrical protection coordination arrangements	6.2.4.3	15.5.1.2 and 15.5.2.1
[1.8]	Assessment of harmonics and dynamic effects for AC traction power supply systems	6.2.4.4 (1)	10.3
[1.9]	Assessment of harmonics and dynamic effects for AC traction power supply systems	6.2.4.4 (3)	10.3
[2]	EN 50367: 2020+A1:2022 Railway Applications - Fixed installations and rolling stock - Criteria to achieve technical compatibility between pantographs and overhead contact line		
[2.1]	Current at standstill	4.2.5	7.2, Table 5
[2.2]	Maximum lateral deviation	4.2.9.2 (1)	5.2.5
[2.3]	Mechanical kinematic pantograph gauge	4.2.10 (1)	5.2.2

[2.4]	Mean contact force	4.2.11 (2) and (3)	Table 6
[2.5]	Pantograph spacing for overhead contact line design	4.2.13	8.2.2, Table 9
[2.6]	Phase separation sections - General - length D of neutral section	4.2.15.1 (2)	4
[2.7]	Lines with speed $v \geq 250$ km/h	4.2.15.2 (a)	Annex A.1.2
[2.8]	Lines with speed $v \geq 250$ km/h	4.2.15.2 (b)	Annex A.1.4
[2.9]	Lines with speed $v < 250$ km/h	4.2.15.3	Annex A.1
[2.10]	System separation sections - General - length D of neutral section	4.2.16.1 (3)	4
[2.11]	Assessment of current at standstill (DC systems only)	6.1.4.2	Annex A.3
[3]	EN 50119:2020 Railway Applications - Fixed installations – Electric traction overhead contact lines		
[3.1]	Minimum design contact wire height	4.2.9.1 (1)	5.10.4
[3.2]	Maximum design contact wire height	4.2.9.1 (1) (note ⁽¹⁾)	figure 3
[3.3]	Relation with pantograph working height	4.2.9.1 (2)	figure 3
[3.4]	Dynamic behaviour and quality of current collection	4.2.12 (2)	5.10.2
[3.5]	Dynamic behaviour and quality of current collection	4.2.12 (3)	5.2.5.2, Table 4
[3.6]	Phase separation sections - calculation of D, clearances	4.2.15.1 (2)	5.1.3
[3.7]	System separation sections – General - calculation of D, clearances	4.2.16.1 (3)	5.1.3
[3.8]	System separation sections - pantographs raised	4.2.16.2 (2)	5.10.3
[4]	EN 50122-1:2022 Railway Applications - Fixed installations – Electrical safety, earthing and the return circuit – Part 1: Protective provisions against electric shock		
[4.1]	Contact wire height	4.2.9.1 (3)	5.2.5 and 5.2.7
[4.2]	Protective provisions against electric shock	4.2.18	5.1 and in public areas: — 5.2.1, 5.2.2, or — 5.3.1, 5.3.2, 5.3.3, 5.3.4
[4.3]	AC voltage limits	4.2.18	9.2.2.2, 9.2.2.4
[4.4]	DC voltage limits	4.2.18	9.3.2.2, 9.3.2.4

[5]	EN 50149:2012 Railway Applications - Fixed installations – Electric traction – Copper and copper alloy grooved contact wire		
[5.1]	Contact wire material	4.2.14 (3)	4.2 (excluding the reference to annex B of the standard), 4.3 and 4.6 to 4.8
[6]	EN 50463-3:2017 Railway Applications – Energy measurement on board trains – Part 3: Data handling		
[6.1]	On-ground energy data collecting system	4.2.17 (2)	4.12
[7]	EN 50463-4:2017 Railway Applications – Energy measurement on board trains – Part 4: Communication		
[7.1]	On-ground energy data collecting system	4.2.17 (3)	4.3.6 and 4.3.7
[8]	EN 50318:2018+A1:2022 Railway Applications – current collection systems – Validation of simulation of the dynamic interaction between pantograph and overhead contact line		
[8.1]	Assessment of dynamic behaviour and quality of current collection – Simulation tool	6.1.4.1 (1)	5, 6, 7, 8, 9, 10, 11
[9]	EN 50317:2012+A1:2022 Railway Applications – current collection systems – Requirements for and validation of measurements of the dynamic interaction between pantograph and overhead contact line		
[9.1]	Assessment of dynamic behaviour and quality of current collection - Measurement	6.1.4.1 (1)	5, 6, 7, 8, 9
[9.2]	Assessment of dynamic behaviour and quality of current collection (integration into a subsystem)	6.2.4.5 (2)	5, 6, 7, 8, 9'

(53) in Appendix G, Table G.1, the rows 'Mean useful voltage train' and 'Mean useful voltage zone' are deleted.

ANNEX V

The Annex to Regulation (EU) No 1302/2014 is amended as follows:

- (1) Unless indicated otherwise in points (2) to (165), the term ‘clause’ or ‘Clause’ is replaced by the term ‘point’;
- (2) point 1 is replaced by the following:

1. INTRODUCTION

A Technical Specification for Interoperability (TSI) is a specification that covers a subsystem, or part thereof, as defined in Article 2(11) of Directive (EU) 2016/797 of the European Parliament and of the Council (*).

(*) Directive (EU) 2016/797 of the European Parliament and of the Council of 11 May 2016 on the interoperability of the rail system within the European Union (OJ L 138, 26.5.2016, p. 44).;

- (3) point 1.2 is replaced by the following:

1.2. Geographical scope

This TSI applies to the Union rail system.;

- (4) point 1.3 is replaced by the following:

1.3. Content of the TSI

In accordance with Article 4(3) of Directive (EU) 2016/797, this TSI covers the ‘rolling stock - Locomotives and passenger rolling stock’ subsystem.;

- (5) point 2.1 is replaced as follows:

2.1. The rolling stock subsystem as part of the Union’s rail system

The Union’s rail system has been broken down into subsystems as set out in Annex II to Directive (EU) 2016/797.

The Locomotives and passenger rolling stock subsystem has interfaces with other subsystems of the Union rail system. Those interfaces are considered within the frame of an integrated system, compliant with all the relevant TSIs.

In addition to the rolling stock subsystem, other TSIs describe specific aspects of the railway system and concern several subsystems.

The requirements concerning the rolling stock subsystem expressed in the Commission Regulation (EU) No 1300/2014 (*) (‘TSI PRM’) and the Commission Regulation (EU) No 1304/2014 (**) (‘TSI NOI’) are not repeated in this TSI. They apply to “Locomotives and passenger rolling stock” subsystem in accordance with their respective scope and implementation rules.

(*) Commission Regulation (EU) No 1300/2014 of 18 November 2014 on the technical specifications for interoperability relating to accessibility of the Union’s rail system for persons with disabilities and persons with reduced mobility Text with EEA relevance (OJ L 356, 12.12.2014, p. 110).

(**) Commission Regulation (EU) No 1304/2014 of 26 November 2014 on the technical specification for interoperability relating to the subsystem ‘rolling stock — noise’ amending Decision 2008/232/EC and repealing Decision 2011/229/EU Text with EEA relevance (OJ L 356, 12.12.2014, p. 421).;

- (6) in point 2.2.1, point (g) is replaced by the following:

‘(g) “Multiple operation” is an operational formation consisting of more than one unit, including:

- trainsets designed in such a way that several of them (of the type under assessment) are capable of being coupled together to operate as a single train controlled from 1 driver’s cab;
- locomotives designed in such a way that several of them (of the type under assessment) are capable of being included in a single train controlled from one driver’s cab.;

(7) in point 2.2.2.(A)(2) the title is replaced by the following:

‘Self-propelling thermal or electric trainsets’;

(8) in point 2.2.2., points (B) and (C) are replaced by the following:

‘(B) Freight wagons, including low-deck vehicles designed for the entire network and vehicles designed to carry lorries.

Such vehicles are out of the scope of this TSI. They are covered by Commission Regulation (EU) No 321/2013 (*) (‘TSI WAG’).

(C) Special vehicles

Special vehicles, such as On-Track Machines (OTMs), are categorised in the EVR Commission Implementing Decision (EU) 2018/1614 (**). They can be grouped into the following subsets:

- (i) On track Machines (OTMs) are vehicles specially designed for construction and maintenance of the track and infrastructure.
- (ii) Infrastructure Inspection Vehicles (IIVs) are vehicles utilised to monitor the condition of the infrastructure.
- (iii) Environment vehicles are vehicles designed for clearance of the track from environmental conditions such as snow clearance machines.
- (iv) Emergency vehicles are vehicles designed for a specific emergency use such as evacuation, firefighting, and recovery of trains (including the breakdown cranes).
- (v) Road-Rail vehicles are self-propelled machines able to move on rails and on the ground.

Special vehicles can be used in one or more of the following modes: working mode, travelling mode and running mode, as self-propelled or as hauled vehicles.

(*) Commission Regulation (EU) No 321/2013 of 13 March 2013 concerning the technical specification for interoperability relating to the subsystem ‘rolling stock — freight wagons’ of the rail system in the European Union and repealing Decision 2006/861/EC (OJ L 104, 12.4.2013, p. 1).

(**) Commission Implementing Decision (EU) 2018/1614 of 25 October 2018 laying down specifications for the vehicle registers referred to in Article 47 of Directive (EU) 2016/797 of the European Parliament and of the Council and amending and repealing Commission Decision 2007/756/EC, C/2018/6929 (OJ L 268, 26.10.2018, p. 53).;

(9) letters (B) and (C) point 2.3.1 are replaced by the following:

‘(B) Freight wagons, including low-deck vehicles designed for the entire network and vehicles designed to carry lorries are not in the scope of this TSI but covered by the TSI WAG even when they are included in a passenger train (the train composition is in this case an operational issue).

Vehicles intended to carry road motor vehicles even where persons are on on-board the carried road motor vehicles are not in the scope of this TSI.

(C) Special vehicle

Special Vehicles are in the scope of this TSI and shall demonstrate compliance with the requirement of this TSI when in running mode and when:

- (1) running on its own rail wheels (in running mode self-propelled or hauled), and
- (2) designed and intended to be detected by a track-based train detection system for traffic management.

Specific requirements laid down in chapter 4 and Appendix C for OTMs are also applicable to Infrastructure Inspection Vehicles unless they are designed to be integrated into a fixed passenger train formation; in this case they shall be considered as non-passenger carrying vehicles as defined in point (A) (3).

Excluded from the scope of this TSI are road-rail vehicles.’;

(10) point 3.1 is replaced by the following:

‘3.1. Elements of the rolling stock subsystem corresponding to the essential requirements

The following table indicates the essential requirements, as set out and numbered in Annex III of Directive (EU) 2016/797, taken into account by the specifications set out in Chapter 4.

Rolling stock elements corresponding to essential requirements

Note: only those points in point 4.2, which contain requirements, are listed.

Ref. point	Element of the rolling stock sub-system	Safety	Reliability-Availability	Health	Environmental protection	Technical compatibility	Accessibility
4.2.2.2.2	Inner coupling	1.1.3 2.4.1					
4.2.2.2.3	End coupling	1.1.3 2.4.1					
4.2.2.2.4	Rescue coupling		2.4.2			2.5.3	
4.2.2.2.5	Staff access for coupling and uncoupling	1.1.5		2.5.1		2.5.3	
4.2.2.3	Gangways	1.1.5					
4.2.2.4	Strength of vehicle structure	1.1.3 2.4.1					
4.2.2.5	Passive safety	2.4.1					
4.2.2.6	Lifting and jacking					2.5.3	
4.2.2.7	Fixing of devices to carbody structure	1.1.3					
4.2.2.8	Staff and freight access doors	1.1.5 2.4.1					
4.2.2.9	Mechanical characteristics of glass	2.4.1					
4.2.2.10	Load conditions and weighted mass	1.1.3					
4.2.3.1	Gauging					2.4.3	
4.2.3.2.1	Axle load parameter					2.4.3	
4.2.3.2.2	Wheel load	1.1.3					
4.2.3.3.1	Rolling stock characteristics for compatibility with train detection systems	1.1.1				2.4.3 2.3.2	

4.2.3.3.2	Axle bearing condition monitoring	1.1.1	1.2				
4.2.3.4.1	Safety against derailment running on twisted track	1.1.1 1.1.2				2.4.3	
4.2.3.4.2	Running dynamic behaviour	1.1.1 1.1.2				2.4.3 2.3.2	
4.2.3.4.2.1	Limit values for running safety	1.1.1 1.1.2				2.4.3	
4.2.3.4.2.2	Track loading limit values					2.4.3	
4.2.3.4.3	Equivalent conicity	1.1.1 1.1.2				2.4.3	
4.2.3.4.3.1	Design values for new wheel profiles	1.1.1 1.1.2				2.4.3	
4.2.3.4.3.2	In-service values of wheelset equivalent conicity	1.1.2	1.2			2.4.3	
4.2.3.5.1	Structural design of bogie frame	1.1.1 1.1.2					
4.2.3.5.2.1	Mechanical and geometrical characteristics of wheelsets	1.1.1 1.1.2				2.4.3	
4.2.3.5.2.2	Mechanical and geometrical characteristics of wheels	1.1.1 1.1.2					
4.2.3.5.3	Automatic variable gauge systems	1.1.1 1.1.2, 1.1.3	1.2			1.5	
4.2.3.6	Minimum curve radius	1.1.1 1.1.2				2.4.3	
4.2.3.7	Life guards	1.1.1					
4.2.4.2.1	Braking — Functional requirements	1.1.1 2.4.1	2.4.2			1.5	

4.2.4.2.2	Braking — Safety requirements	1.1.1	1.2 2.4.2				
4.2.4.3	Type of brake system					2.4.3 2.3.2	
4.2.4.4.1	Emergency braking command	2.4.1				2.4.3 2.3.2	
4.2.4.4.2	Service braking command					2.4.3 2.3.2	
4.2.4.4.3	Direct braking command					2.4.3	
4.2.4.4.4	Dynamic braking command	1.1.3				2.3.2	
4.2.4.4.5	Parking braking command					2.4.3	
4.2.4.5.1	Braking performance -General requirements	1.1.1 2.4.1	2.4.2			1.5	
4.2.4.5.2	Emergency braking	1.1.2 2.4.1				2.4.3 2.3.2	
4.2.4.5.3	Service braking					2.4.3 2.3.2	
4.2.4.5.4	Calculations related to thermal capacity	2.4.1				2.4.3	
4.2.4.5.5	Parking brake	2.4.1				2.4.3	
4.2.4.6.1	Limit of wheel rail adhesion profile	2.4.1	1.2 2.4.2				
4.2.4.6.2	Wheel slide protection system	2.4.1	1.2 2.4.2				
4.2.4.7	Dynamic brake — Braking systems linked to traction system	2.4.1	1.2 2.4.2				

4.2.4.8.1.	Braking system independent of adhesion conditions – General	2.4.1	1.2 2.4.2				
4.2.4.8.2.	Magnetic track brake					2.4.3 2.3.2	
4.2.4.8.3	Eddy current track brake					2.4.3 2.3.2	
4.2.4.9	Brake state and fault indication	1.1.1	1.2 2.4.2				
4.2.4.10	Brake requirements for rescue purposes		2.4.2				
4.2.5.1	Sanitary systems				1.4.1		
4.2.5.2	Audible communication system	2.4.1					
4.2.5.3	Passenger alarm	2.4.1					
4.2.5.4	Communication devices for passengers	2.4.1					
4.2.5.5	Exterior doors: access to and egress from Rolling stock	2.4.1				2.3.2	
4.2.5.6	Exterior doors: system construction	1.1.3 2.4.1					
4.2.5.7	inter-unit doors	1.1.5					
4.2.5.8	Internal air quality			1.3.2			
4.2.5.9	body side windows	1.1.5					
4.2.6.1	Environmental conditions		2.4.2				

4.2.6.2.1	Slipstream effects on passengers on platform and on workers at track side	1.1.1		1.3.1			
4.2.6.2.2	Head pressure pulse					2.4.3	
4.2.6.2.3	Maximum pressure variations in tunnels					2.4.3	
4.2.6.2.4	Crosswind	1.1.1					
4.2.6.2.5	Aerodynamic effect on ballasted track	1.1.1				2.4.3	
4.2.7.1.1	Head lights					2.4.3 2.3.2	
4.2.7.1.2	Marker lights	1.1.1				2.4.3	
4.2.7.1.3	Tail lights	1.1.1				2.4.3	
4.2.7.1.4	Lamp controls					2.4.3	
4.2.7.2.1	Horn – General	1.1.1				2.4.3 2.6.3	
4.2.7.2.2	Warning horn sound pressure levels	1.1.1		1.3.1			
4.2.7.2.3	Protection					2.4.3	
4.2.7.2.4	Horn control	1.1.1				2.4.3	
4.2.8.1	Traction performance					2.4.3 2.6.3 2.3.2	
4.2.8.2 4.2.8.2.1 to 4.2.8.2.9	Power supply					1.5 2.4.3 2.3.2	
4.2.8.2.10	Electrical protection of the train	2.4.1					
4.2.8.4	Protection against electrical hazards	2.4.1					

4.2.9.1.1	Driver's cab – General	—	—	—	—	—	
4.2.9.1.2	Access and egress	1.1.5				2.4.3	
4.2.9.1.3	External visibility	1.1.1				2.4.3 2.3.2	
4.2.9.1.4	Interior layout	1.1.5					
4.2.9.1.5	Driver's seat			1.3.1			
4.2.9.1.6	Driver's desk- Ergonomics	1.1.5		1.3.1		2.3.2	
4.2.9.1.7	Climate control and air quality			1.3.1			
4.2.9.1.8	Internal lighting					2.6.3	
4.2.9.2.1	Windscreen — Mechanical characteristics	2.4.1					
4.2.9.2.2	Windscreen — Optical characteristics					2.4.3 2.3.2	
4.2.9.2.3	Windscreen – Equipment					2.4.3	
4.2.9.3.1	Driver's activity control function	1.1.1				2.6.3	
4.2.9.3.2	Speed indication	1.1.5					
4.2.9.3.3	Driver display unit and screens	1.1.5					
4.2.9.3.4	Controls and indicators	1.1.5					
4.2.9.3.5	Labelling					2.6.3	
4.2.9.3.6	Radio remote control function by staff for shunting operation	1.1.1				2.3.2	

4.2.9.3.7	Derailment detection and prevention signal processing	1.1.1 1.1.2					
4.2.9.3.7a	On-board derailment detection and prevention function	1.1.1 1.1.2					
4.2.9.3.8	Requirements for management of ETCS modes	1.1.1				1.5 2.3.2	
4.2.9.3.9	Traction status					2.3.2	
4.2.9.4	On-board tools and portable equipment	2.4.1				2.4.3 2.6.3	
4.2.9.5	Storage facility for staff personal effects	—	—	—	—	—	
4.2.9.6	Recording device					2.4.4 2.3.2	
4.2.10.2	Fire safety – Measures to prevent fire	1.1.4		1.3.2	1.4.2		
4.2.10.3	Measures to detect/control fire	1.1.4					
4.2.10.4	Requirements related to emergency situations	2.4.1				2.3.2	
4.2.10.5	Requirements related to evacuation	2.4.1					
4.2.11.2	Train exterior cleaning					1.5	
4.2.11.3	Connection to toilet discharge system					1.5	

4.2.11.5	Interface for water refilling					1.5	
4.2.11.6	Special requirements for stabling of trains					1.5	
4.2.11.7	Refuelling equipment					1.5	
4.2.11.8	Train interior cleaning – power supply					2.5.3	
4.2.12.2	General documentation					1.5	
4.2.12.3	Documentation related to maintenance	1.1.1				2.5.1 2.5.2 2.6.1 2.6.2	
4.2.12.4	Operating documentation	1.1.1				2.4.2 2.6.1 2.6.2	
4.2.12.5	Lifting diagram and instructions					2.5.3	
4.2.12.6	Rescue related descriptions		2.4.2			2.5.3	
4.2.13	Interface requirements with Automated Train Operation					1.5 2.3.2 2.4.3'	

(11) point 3.2 is replaced by the following:

‘3.2. Essential requirements not covered by this TSI

Some of the essential requirements classified as “general requirements” or “requirements specific to each subsystem” in Annex III to Directive (EU) 2016/797 that have an impact on the rolling stock subsystem are covered in a limited way by the scope of this TSI.’;

(12) in point 4.1.1, point (4) is replaced by the following:

‘(4) Some of the rolling stock characteristics that are mandated to be recorded in the “European register of authorised types of vehicles” (according to the relevant Commission Decision) are described in point 7.1.2 (see Table 17a). Additionally, those characteristics are required to be provided in the rolling stock technical documentation described in point 4.2.12.’;

(13) in point 4.1.3, point (3), the last two indents are replaced by:

‘- Special Vehicles (see point 2.2.2, letter C)’;

(14) point 4.2.1.2 is replaced by the following:

4.2.1.2. Open points

Open points in accordance with Article 4(6) of Directive (EU) 2016/797 are listed in Appendix I.;

(15) in point 4.2.2.2.3, point (b), point (b-2), points (1) and (2) are replaced by the following:

(1) The buffers and the screw coupling shall be installed according to the specification referenced in Appendix J-1, index [2].

(2) The dimensions and layout of brake pipes and hoses, couplings and cocks shall meet the requirements set out in the same specification.;

(16) In point 4.2.2.2.4, point(3)(a), the second indent is replaced by the following:

- Lateral location of brake pipes and cocks according to the specification referenced in Appendix J-1, index [2].;

(17) point 4.2.2.2.5 (2) is replaced as follows:

‘To comply with this requirement, units fitted with manual coupling systems of UIC type as per point 4.2.2.2.3(b) shall comply with the following requirements (the ‘Bern rectangle’):

— On units equipped with screw couplers and side buffers, the space for staff operation shall be in accordance to the specification referenced in Appendix J-1, index [2].

— Where a combined automatic and screw coupler is fitted it is permissible for the auto coupler head to infringe the Berne rectangle on the left-hand side when it is stowed and the screw coupler is in use.

There shall be a handrail under each buffer. The handrails shall withstand a force of 1,5 kN.;

(18) point 4.2.2.4, points (3), (4) and (5) are replaced by the following:

(3) The static and dynamic strength (fatigue) of vehicle bodies is relevant to ensure the safety required for the occupants and the structural integrity of the vehicles in train and in shunting operations. Therefore, the structure of each vehicle shall comply with the requirements of the specification referenced in Appendix J-1, index [1] where the rolling stock categories to be taken into account shall correspond to category L for locomotives and power head units and to categories PI or PII for all other types of vehicle within the scope of this TSI.

(4) Proof of the strength of the vehicle body may be demonstrated by calculations and/or by testing, according to the conditions set up in the specification referenced in Appendix J-1, index [1].

(5) In case of a unit designed for higher compressive force than those of the categories (required in point (3) as a minimum) in the specification referenced in Appendix J-1, index [1], this specification does not cover the proposed technical solution; it is then permissible to use for compressive force other normative documents that are publicly available.

In that case it shall be verified by the notified body that the alternative normative documents form part of a technically consistent set of rules applicable to the design, construction and testing of the vehicle structure.

The value of compressive force shall be recorded in the technical documentation defined in clause 4.2.12.;

(19) point 4.2.2.5. is replaced by the following:

4.2.2.5. Passive safety

(1) The requirements specified in this point apply to all units, except to units not intended to carry passengers or staff during operation and except to OTMs.

(2) For units designed to be operated on the 1 520 mm system, the requirements on passive safety described in this point are of voluntary application. If the Applicant chooses to apply the requirements on passive safety described in this point, this shall be recognised by Member States. Member States may also require application of those requirements.

- (3) For locomotives designed to be operated on the 1 524 mm system, the requirements on passive safety described in this point are of voluntary application. If the Applicant chooses to apply the requirements on passive safety described in this point, this shall be recognised by Member States.
- (4) Units which cannot operate up to the collision speeds specified under any of the collision scenarios below are exempted from the provisions related to that collision scenario.
- (5) Passive safety is aimed at complementing active safety when all other measures have failed. For this purpose, the mechanical structure of vehicles shall provide protection of the occupants in the event of a collision by providing means of:
- limiting deceleration;
 - maintaining survival space and structural integrity of the occupied areas;
 - reducing the risk of overriding;
 - reducing the risk of derailment;
 - limiting the consequences of hitting a track obstruction.

To meet these functional requirements, units shall comply with the detailed requirements specified in the specification referenced in Appendix J-1, index [3] related to crashworthiness design category C-I.

The following four reference collision scenarios shall be considered:

- scenario 1: A front end impact between two identical units,
- scenario 2: A front end impact with a freight wagon,
- scenario 3: An impact of the unit with a large road vehicle on a level crossing,
- scenario 4: An impact of the unit into a low obstacle (e.g. car on a level crossing, animal, rock, etc.).

- (6) The scenarios in point (5) are described in the specification referenced in Appendix J-1, index [3].
- (7) The requirements of the specification referenced in Appendix J-1, index [3] shall be applied in relation to the above given reference collision scenarios.
- (8) To limit the consequences of hitting a track obstruction, the leading ends of locomotives, power heads, driving coaches and trainsets shall be equipped with an obstacle deflector. The requirements with which obstacle deflectors shall comply are defined in the specification referenced in Appendix J-1, index [3].;

(20) in point 4.2.2.6, points (7), (8) and (9) are replaced by the following:

- ‘(7) The geometry of jacking/lifting points shall be compliant with the specification referenced in Appendix J-1, index [4].
- (8) Marking of lifting points shall be made by signs compliant with the specification referenced in Appendix J-1, index [5].
- (9) The structure shall be designed with consideration of the loads specified in the specification referenced in Appendix J-1, index [1]; proof of the strength of the vehicle body may be demonstrated by calculations or by testing, according to the conditions set up in the same specification.

Alternative normative documents that are publicly available may be used under the same conditions as defined in clause 4.2.2.4 above.’;

(21) in point 4.2.2.7.(3), ‘index 12’ is replaced by ‘index [1]’;

(22) point 4.2.2.10 is amended as follows:

(a) point (1) is replaced by the following:

‘(1) The following load conditions defined in the specification referenced in Appendix J-1, index [6], shall be determined:

- (i) design mass under exceptional payload;
- (ii) design mass under normal payload;
- (iii) design mass in working order;

- (iv) operational mass under normal payload;
- (v) operational mass in working order.;
- (b) in point (2), 'index 13' is replaced by 'index [6]';
- (23) point 4.2.3.1 is replaced by the following:

4.2.3.1. Gauging

- (1) This point concerns the rules for calculation and verification intended for sizing the rolling stock to run on one or several infrastructures without interference risk.

For units designed to be operated on other track gauge(s) than 1 520 mm system:

- (2) The applicant shall select the intended reference profile including the reference profile for the lower parts. This reference profile shall be recorded in the technical documentation defined in point 4.2.12.
- (3) The compliance of a unit with this intended reference profile shall be established by one of the methods set out in the specification referenced in Appendix J-1, index [7].
- (4) In case the unit is declared as compliant with one or several of the reference profiles G1, GA, GB, GC or DE3, including those related to the lower part GI1, GI2 or GI3, as set out in the specification referenced in Appendix J-1, index [7], compliance shall be established by the kinematic method as set out in the specification referenced in Appendix J-1, index [7].

The compliance to those reference profile(s) shall be recorded in the technical documentation defined in point 4.2.12.

- (5) For electric units, the pantograph gauge shall be verified by calculation according to the specification referenced in Appendix J-1, index [7] to ensure that the pantograph envelope complies with the mechanical kinematic pantograph gauge which in itself is determined according to Appendix D of Commission Regulation (EU) No. 1301/2014 (*) ('TSI ENE'), and depends on the choice made for the pantograph head geometry: the two permitted possibilities are defined in point 4.2.8.2.9.2.

The voltage of the power supply is considered in the infrastructure gauge in order to ensure the proper insulation distances between the pantograph and fixed installations.

- (6) The pantograph sway as specified in point 4.2.10 of TSI ENE and used for the mechanical kinematic gauge calculation shall be justified by calculations or measurements as set out in the specification referenced in Appendix J-1, index [7].

For units designed to be operated on track gauge of 1 520 mm system:

- (7) The static profile of the vehicle shall be within the 'T' uniform vehicle gauge; the reference profile for infrastructure is the 'S' gauge. This profile is specified in Appendix B .
- (8) For electric units the pantograph gauge shall be verified by calculation to ensure that the pantograph envelope complies with the mechanical static pantograph gauge which is defined in Appendix D of TSI ENE; the choice made for the pantograph head geometry shall be taken into account: the permitted possibilities are defined in point 4.2.8.2.9.2.

(*) Commission Regulation (EU) No 1301/2014 of 18 November 2014 on the technical specifications for interoperability relating to the 'energy' subsystem of the rail system in the Union (OJ L 356, 12.12.2014, p. 179).;

- (24) point 4.2.3.2.1 is replaced by the following:

4.2.3.2.1. Axle load parameter

- (1) The axle load in combination with the axle spacing, with the length of the unit and with the maximum allowed speed for the unit on the considered line is an interface parameter between the unit and the infrastructure.

For the infrastructure target system specified in point 4.2.1 of the Commission Regulation (EU) No 1299/2014 (*) ('TSI INF'), the axle load is a performance parameter and depends on the traffic code of the line.

- (2) The following characteristics to be used as an interface to the infrastructure shall be part of the general documentation produced when the unit is assessed and described in point 4.2.12.2:
- the mass per axle (for each axle) for all load conditions (as defined and required to be part of the documentation in point 4.2.2.10);
 - the position of the axles along the unit (axle spacing);
 - the length of the unit;
 - the maximum design speed (as required to be part of the documentation in point 4.2.8.1.2);
 - The EN line category as the result of a categorisation of the unit according to the specification referenced in Appendix J-1, index [10].
- (2a) For self-propelling thermal or electric passenger trains and for passenger coaches and other related cars, the EN line category shall always be documented, indicating the standard value of payload in standing areas in kg per m², as defined in the specification referenced in Appendix J-1, index [10].
- (2b) If a particular value of payload in standing areas is used to determine the load condition "design mass under exceptional payload", in accordance with points 4.2.2.10 (1) and (2), a second EN line category shall be documented using this particular value of payload in standing areas.
- (2c) For all of these units, any EN line category shall be documented indicating the payload used in standing areas, as described in the specification referenced in Appendix J-1, index [10].
- (3) Use of the axle load information at operational level for compatibility check between rolling stock and infrastructure (outside the scope of this TSI):
- The axle load of each individual axle of the unit to be used as interface parameter to the infrastructure must be defined by the railway undertaking as required in point 4.2.2.5 of the Commission Implementing Regulation (EU) 2019/773 (**) ('TSI OPE'), considering the expected load for the intended service (not defined when the unit is assessed). The axle load in load condition 'design mass under exceptional payload' represents the maximum possible value of the axle load mentioned above. The maximum load considered for the design of the brake system defined in point 4.2.4.5.2 has also to be considered.

(*) Commission Regulation (EU) No 1299/2014 of 18 November 2014 on the technical specifications for interoperability relating to the 'infrastructure' subsystem of the rail system in the European Union (OJ L 356, 12.12.2014, p. 1).

(**) 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 (OJ L 1391, 27.5.2019, p. 5).;

- (25) point 4.2.3.3.1 is replaced by the following:

4.2.3.3.1. 'Rolling Stock characteristics for the compatibility with train detection systems

- (1) The set of rolling stock characteristics for compatibility with train detection target systems are given in points 4.2.3.3.1.1, 4.2.3.3.1.2 and 4.2.3.3.1.3.
- Reference is made to points of the specification referenced in Appendix J-2, index [A] (also referenced in Appendix A, Table A.2, index 77 of TSI CCS (*)). The related specific cases are defined in point 7.7 of TSI CCS.
- (2) The set of characteristics the rolling stock is compatible with shall be recorded in the technical documentation described in point 4.2.12.

(*) Commission Implementing Regulation (EU) 2023/1695 of 10 August 2023 on the technical specification for interoperability relating to the control-command and signalling subsystems of the rail system in the European Union and repealing Regulation (EU) 2016/919 (JO L 222, 8.9.2023, p. 380).;

(26) point 4.2.3.3.1.1 is replaced by the following:

‘4.2.3.3.1.1. Rolling stock characteristics for compatibility with train detection system based on track circuits

The specification referenced in Appendix J-2 index [A] specifies the characteristics relative to:

(i) **Vehicle geometry**

- (1) The maximum distance between following axles;
- (2) The maximum distance between front/ rear end of train and first/last axle;
- (3) The minimum distance between first and last axle;

(ii) **Vehicle design**

- (4) The minimum axle load in all load conditions;
- (5) The electrical resistance between the running surfaces of the opposite wheels of a wheelset and the method to measure it;
- (6) For electric units equipped with a pantograph, the minimum vehicle impedance;
- (7) The use of shunting assisting devices;

(iii) **Isolating emissions**

- (8) The use of sanding equipment;
In case where an automatic sanding function is provided, it shall be possible for the driver to suspend its use on particular points of the track identified in operating rules as non-compatible with sanding;
- (9) The use of composite brake blocks;
- (10) If the vehicle is equipped, the requirements applicable to flange lubricators;

(iv) **EMC**

- (11) The requirements related to conducted interference.’;

(27) point 4.2.3.3.1.2 is replaced by the following:

‘4.2.3.3.1.2. Rolling stock characteristics for compatibility with train detection system based on axle counters

The specification referenced in Appendix J-2 index [A] specifies the characteristics relative to:

(i) **Vehicle geometry**

- (1) The maximum distance between following axles;
- (2) The minimum distance between following axles ;
- (3) At the end of a unit intended to be coupled, the minimum distance between front/ rear end of train and first/last axle (equal to half of the value specified)
- (4) The maximum distance between front/ rear end of train and first/last axle;

(ii) **Wheel geometry**

- (5) Wheel geometry;

(iii) **Vehicle design**

- (6) Metal and inductive-components-free space between wheels;
- (7) The characteristics of the wheel material;

(iv) **EMC**

- (8) The requirements related to electromagnetic fields;
- (9) The use of magnetic or eddy current track brakes.’;

(28) point 4.2.3.3.1.3 is replaced by the following:

‘4.2.3.3.1.3. Rolling stock characteristics for compatibility with loop equipment

The specification referenced in Appendix J-2 index [A] specifies the characteristics relative to:

Vehicle design

- (1) The vehicle metal construction.’;

- (29) in point 4.2.3.3.2.1, points (3) and (4) are replaced by the following:
- '(3) The detection system shall be located entirely on board the unit and diagnosis messages shall be made available on board.
 - (4) The diagnosis messages delivered shall be described and taken into account in the operating documentation described in point 4.2.12.4 and in the maintenance documentation described in point 4.2.12.3.;
- (30) in point 4.2.3.3.2.2, in points (1) and (2a), 'index 15' is replaced by 'index [8].';
- (31) in point 4.2.3.4.1, the second paragraph is replaced by the following:
- 'This conformity assessment procedure is applicable for axle loads in the range of those mentioned in the point 4.2.1 of TSI INF and in the specification referenced in Appendix J-1, index [9].';
- (32) point 4.2.3.4.2 is amended as follows:
- (a) point (a) is replaced by the following:
 - '(a) **Technical requirements**
 - (1) The unit shall run safely and produce an acceptable level of track loading when operated within the limits defined by the combination(s) of speed and cant deficiency under the conditions set out in the specification referenced in Appendix J-1, index [9].

This shall be assessed by verifying that limit values specified below in points 4.2.3.4.2.1 and 4.2.3.4.2.2 are respected; the conformity assessment procedure is described in point 6.2.3.4.
 - (2) The limit values and conformity assessment mentioned in point 3 are applicable for axle loads in the range of those mentioned in the point 4.2.1 of the TSI INF and in the specification referenced in Appendix J-1, index [9].

They are not applicable to vehicles designed for higher axle load, as harmonised track loading limit values are not defined; such cases may be covered by national rules or by the procedure for innovative solution described in article 10 and Chapter 6.
 - (3) The running dynamic behaviour test report (including limits of use and track loading parameters) shall be stated in the technical documentation described in point 4.2.12.

Track loading parameters (including the additional ones Y_{max} , B_{max} and the B_{qst} where relevant) to be recorded are defined in the specification referenced in Appendix J-1, index [9].';
 - (b) in point (b) (6) 2, the word 'contour' is replaced by 'profile';
 - (c) point (d) is inserted as follows:
 - '(d) **Additional requirements regarding interface with ETCS onboard**
 - (8) Requirements applicable to units with regards to their interface with ETCS onboard and related to train interface function 'status of the tilting system' when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B].';
- (33) in point 4.2.3.4.2.1 (1) 'index 17' is replaced by 'index [9].';
- (34) in point 4.2.3.4.2.2. (1) 'index 19' is replaced by 'index [9].';
- (35) in point 4.2.3.4.3.2, point (1) is replaced by the following:
- '(1) The combined equivalent conicities the vehicle is designed for, as verified by the demonstration of conformity of the running dynamic behaviour specified in point 6.2.3.4, shall be specified for in-service conditions in the maintenance documentation as set out in point 4.2.12.3.2, taking into account the contributions of wheel and rail profiles.';
- (36) in points 4.2.3.5.1 (1) and (3) 'index 20' is replaced by 'index [11].';
- (37) in point 4.2.3.5.1 (2) 'index 21' is replaced by 'index [1].';

(38) in point 4.2.3.5.2.1, point (3) is replaced by the following:

‘(3) The characteristics of the end of axle (interface between wheel and running gear) shall ensure the transmission of forces and torque.

The conformity assessment procedure shall be in accordance with point 6.2.3.7 (7).’;

(39) in point 4.2.3.5.2.1, in Table 1, ‘Back to back’ is replaced by ‘Back-to-back’;

(40) point 4.2.3.7 is replaced by the following:

‘4.2.3.7. Life guards

(1) This requirement applies to units fitted with a driving cab.

(2) The wheels shall be protected against damages caused by minor items on the rails by lifeguards in front of the wheels of the leading axle.

(3) Life guards shall comply with the requirements of the specification referenced in Appendix J-1, index [3].’;

(41) point 4.2.4.3 is replaced by the following:

‘4.2.4.3. Type of brake system

(1) Units designed and assessed to be operated in general operation (various formations of vehicles from different origins; train formation not defined at design phase) on other track gauge systems than the 1 520 mm system shall be fitted with a brake system with a brake pipe compatible with the UIC brake system. To this end, the specification referenced in Appendix J-1, index [12] specifies the principles to be applied.

This requirement is set to ensure technical compatibility of the brake function between vehicles of various origins in a train.

(2) There is no requirement on the type of brake system for units (trainsets or vehicles) assessed in fixed or predefined formation.

(3) Requirements applicable to units with regards to their interface with ETCS on-board and related to train interface function ‘brake pressure’ when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B].

(4) Requirements applicable to units with regards to their interface with ETCS on-board and related to train interface function ‘Special brake status Electro Pneumatic (EP) brake’ when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B].’;

(42) point 4.2.4.4.1 (3) is replaced by the following:

‘(3) Requirements applicable to units with regards to their interface with ETCS on-board and related to train interface function ‘emergency brake command’ when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B].’;

(43) in Point 4.2.4.4.2 the following point (5) is added:

‘(5) Requirements applicable to units with regards to their interface with ETCS on-board and related to train interface function ‘service brake command’ when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B].’;

(44) in point 4.2.4.4.4 the following points (4) and (5) are added after the note in point (3):

‘(4) Requirements applicable to units with regards to their interface with ETCS on-board and related to train interface function ‘Special brake inhibition area – Trackside orders: regenerative brake’ when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B]. The subsequent commands of regenerative brake inhibition by the unit can be automatic or manual through intervention of the driver. The rolling stock configuration on automatic or manual command shall be recorded in the technical documentation described in point 4.2.12.2.

(5) Requirements applicable to units with regards to their interface with ETCS on-board and related to train interface function ‘Special brake inhibit – STM Orders: regenerative brake’ when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B]. The subsequent commands of regenerative brake inhibition by the unit can be automatic or manual through intervention of the driver. The rolling stock configuration on automatic or manual command shall be recorded in the technical documentation described in point 4.2.12.2.’;

(45) in point 4.2.4.5.1, points (1) and (2) are replaced by the following:

‘(1) The unit (trainset or vehicle) braking performance (deceleration = $F(\text{speed})$ and equivalent response time) shall be determined by calculation as defined in the specification referenced in Appendix J-1, either index [13] or index [14], considering a level track.

Each calculation shall be performed for wheel diameters corresponding to new, half-worn and worn wheels, and shall include the calculation of the required wheel/rail adhesion level (see point 4.2.4.6.1).

(2) The friction coefficients used by friction brake equipment and considered in the calculation shall be justified (see the specification referenced in Appendix J-1, index [13]).’;

(46) point 4.2.4.5.2 is replaced as follows:

‘4.2.4.5.2. Emergency braking

Response time:

(1) For units assessed in fixed formation(s) or predefined formation(s), the equivalent response time and the delay time evaluated on the total emergency braking force developed in case of the emergency brake command shall be lower than the following values:

— Equivalent response time:

— 3 seconds for units of maximum design speed higher or equal to 250 km/h

— 5 seconds for other units

— Delay time: 2 seconds

‘Equivalent response time’ and ‘Delay time’ shall be evaluated based on the total brake force, or based on pressure in brake cylinders in case of pneumatic brake system, according to the definition of the specification referenced in Appendix J-1, index [13].

(2) For units designed and assessed for general operation, the response time shall be as specified for the UIC brake system (see also point 4.2.4.3: the brake system shall be compatible with the UIC brake system).

Calculation of the deceleration:

(3) For all units, the emergency braking performance calculation shall be performed in accordance with the specification referenced in Appendix J-1, either index [13] or index [14]; the deceleration profile and stopping distances at the following initial speeds (if lower than the maximum design speed of the unit) shall be determined: 30 km/h; 100 km/h; 120 km/h; 140 km/h; 160 km/h; 200 km/h; 230 km/h; 300 km/h; maximum design speed of the unit.

(4) For units designed and assessed for general operation, the brake weight percentage (λ) shall also be determined.

The specification referenced in Appendix J-1, index [65], specifies how other parameters (brake weight percentage (λ), braked mass) can be derived from the calculation of the deceleration or from the stopping distance of the unit.

(5) The emergency braking performance calculation shall be performed with a brake system in two different modes, and considering degraded conditions:

— Normal mode: no failure in the brake system and nominal value of the friction coefficients (corresponding to dry conditions) used by friction brake equipment. This calculation provides the braking performance normal mode.

— Degraded mode: corresponding to the failures of brake systems considered in point 4.2.4.2.2, hazard no. 3, and nominal value of the friction coefficients used by friction brake equipment. The degraded mode shall consider possible single failures; for this purpose, the emergency braking performance shall be determined for the case of single point(s) failure(s) leading to the longest stopping distance, and the associated single failure shall be clearly identified (component involved and failure mode, failure rate if available).

- Degraded conditions: in addition, the emergency braking performance calculation shall be performed with reduced values of the friction coefficient, with consideration of limit environmental (external influence) values for temperature and humidity (see the specification referenced in Appendix J-1, index [67] or index [68]).

Note: these different modes and conditions have to be considered particularly when advanced Control Command and Signalling systems (such as ETCS) are implemented, aiming at optimising the railway system.

- (6) The emergency braking performance calculation shall be performed for the three following load conditions:
- Minimum load: 'design mass in working order' (as described in point 4.2.2.10).
 - Normal load: 'design mass under normal payload' (as described in point 4.2.2.10)
 - Maximum braking load: load condition lower or equal to 'design mass under exceptional payload' (as described in point 4.2.2.10).

In case this load condition is lower than 'design mass under exceptional payload', it shall be justified and documented in the general documentation described in point 4.2.12.2.

- (7) Tests shall be performed to validate the emergency braking calculation, according to the conformity assessment procedure specified in point 6.2.3.8.
- (8) For each load condition, the lowest result (i.e. leading to longest stopping distance) of the 'emergency braking performance in normal mode' calculations at the design maximum speed (revised according to the results of tests required above) shall be recorded in the technical documentation defined in point 4.2.12.2.
- (9) Additionally, for units assessed in fixed or predefined formation of design maximum speed higher than or equal to 250 km/h, the stopping distance in case of 'emergency braking performance in normal mode' shall not exceed the following values for the load condition 'normal load':
- 5 360 m from the speed of 350 km/h (if \leq design maximum speed).
 - 3 650 m from the speed 300 km/h (if \leq design maximum speed).
 - 2 430 m from the speed 250 km/h.
 - 1 500 m from the speed 200 km/h.;

- (47) in point 4.2.4.5.3 points (1) and (2) are replaced by the following:

'(1) For all units, the maximum service braking performance calculation shall be performed in accordance with the specification referenced in Appendix J-1, either index [13] or index [14] with a brake system in normal mode, with nominal value of the friction coefficients used by friction brake equipment for the load condition 'design mass under normal payload' at the design maximum speed.

(2) Tests shall be performed to validate the maximum service braking calculation, according to the conformity assessment procedure specified in point 6.2.3.9.;

- (48) in point 4.2.4.5.5 point (3) 'index 29' is replaced by 'index [13]';

- (49) point 4.2.4.6.1 is replaced by the following:

4.2.4.6.1. Limit of wheel rail adhesion profile

- (1) The braking system of a unit shall be designed so that emergency brake performance (dynamic brake included if it contributes to the performance) and the service brake performance (without dynamic brake) do not assume a calculated wheel/rail adhesion for each wheelset in the speed range > 30 km/h and < 250 km/h higher than 0,15 with the following exceptions:
- for units assessed in fixed or predefined formation(s) having 7 axles or less, the calculated wheel/rail adhesion shall not be higher than 0,13,

- for units assessed in fixed or predefined formation(s) having 20 axles or more the calculated wheel/rail adhesion for the load case 'minimum load' is permitted to be higher than 0,15, but shall not be higher than 0,17.

Note: for the load case 'normal load', there is no exception; the limit value of 0,15 applies.

This minimum number of axles may be reduced to 16 axles if the test required in point 4.2.4.6.2 related to the efficiency of the WSP system is performed for the load case 'minimum load', and provides positive result.

In the speed range > 250 km/h and ≤ 350 km/h, the three limit values above shall decline linearly in order to be reduced by 0,05 at 350 km/h.

- (2) The above requirement shall also apply for a direct brake command described in point 4.2.4.4.3.
- (3) The design of a unit shall not assume wheel/rail adhesion higher than 0,12 when calculating the parking brake performance.
- (4) These limits of wheel rail adhesion shall be verified by calculation(s) with the smallest wheel diameter, and with the 3 load conditions considered in point 4.2.4.5.2.

All values of adhesion shall be rounded to two decimal places.;

- (50) point 4.2.4.6.2 is replaced by the following:

4.2.4.6.2. Wheel Slide Protection (WSP) system

- (1) A wheel slide protection system (WSP) is a system designed to make the best use of available adhesion by a controlled reduction and restoration of the brake force to prevent wheelsets from locking and uncontrolled sliding, thereby minimising the extension of stopping distances and possible wheel damage.

Requirements on the presence and use of a WSP system on the unit:

- (2) Units designed for maximum service speed higher than 150 km/h shall be fitted with a wheel slide protection system.
- (3) Units equipped with wheel tread brakes with a brake performance which assumes in the speed range > 30 km/h a calculated wheel/rail adhesion higher than 0.12 shall be fitted with a wheel slide protection system.
Units not equipped with wheel tread brakes with a brake performance which assumes in the speed range > 30 km/h a calculated wheel/rail adhesion higher than 0,11 shall be fitted with a wheel slide protection system.
- (4) The requirement on the wheel slide protection system above shall apply to the two brake modes: emergency brake and service brake.

It shall also apply to the dynamic brake system, which is part of the service brake, and can be part of the emergency brake (see point 4.2.4.7).

Requirements on the WSP system performance:

- (5) For units equipped with a dynamic braking system, a WSP system (if present according to the point above) shall control the dynamic brake force; when this WSP system is not available, the dynamic brake force shall be inhibited, or limited in order not to lead a wheel/rail adhesion demand higher than 0.15.
- (6) The wheel slide protection system shall be designed according to the specification referenced in Appendix J-1, index [15]; the conformity assessment procedure is specified in point 6.1.3.2.
- (7) Requirements on performance at unit level:

If a unit is equipped with a WSP, a test shall be done to verify the efficiency of the WSP system (maximum extension of the stopping distance compared to stopping distance on dry rail) when integrated in the unit; the conformity assessment procedure is specified in point 6.2.3.10.

The relevant components of the wheel slide protection system shall be considered in the safety analysis of the emergency brake function required in point 4.2.4.2.2.

- (8) Wheel rotation monitoring system (WRM):

Units of design maximum speed higher or equal to 250 km/h shall be equipped with a wheel rotation monitoring system to advise the driver that an axle has seized; the wheel rotation monitoring system shall be designed according to the specification referenced in Appendix J-1, index [15].;

- (51) point 4.2.4.7 is replaced by the following:

‘4.2.4.7. Dynamic brake — Braking system linked to traction system

Where the braking performance of the dynamic brake or of braking system linked to the traction system is included in the performance of the emergency braking in normal mode defined in point 4.2.4.5.2, the dynamic brake or the braking system linked to traction:

- (1) must be commanded by the main brake system control line (see point 4.2.4.2.1);
- (2) must be subject to a safety analysis covering the hazard ‘after activation of an emergency command, complete loss of the dynamic brake force’.

This safety analysis shall be considered in the safety analysis required by the safety requirement N° 3 set out in point 4.2.4.2.2 for the emergency brake function.

For electric units, in case the presence on-board the unit of the voltage delivered by the external power supply is a condition for the dynamic brake application, the safety analysis shall cover failures leading to absence on-board the unit of that voltage.

In case the hazard above is not controlled at the level of the rolling stock (failure of the external power supply system), the braking performance of the dynamic brake or of braking system linked to the traction system shall not be included in the performance of the emergency braking in normal mode defined in point 4.2.4.5.2.;

- (52) point 4.2.4.8.1 is replaced by the following:

‘4.2.4.8.1. General

- (1) Brake systems able to develop a brake force applied on the rail, independent of the wheel/rail adhesion condition, are a means of providing additional braking performance when the requested performance is higher than the performance corresponding to the limit of the available wheel rail adhesion (see point 4.2.4.6).
- (2) It is permissible to include the contribution of brakes independent of wheel/rail adhesion in the braking performance in normal mode defined in point 4.2.4.5 for the emergency brake; in such a case, the brake system independent of adhesion condition:
 - (a) Shall be commanded by the main brake system control line (see point 4.2.4.2.1).
 - (b) Shall be subject of a safety analysis covering the hazard ‘after activation of an emergency command, complete loss of the brake force independent of the wheel/rail adhesion’.

This safety analysis shall be considered in the safety analysis required by the safety requirement No 3 set out in point 4.2.4.2.2 for the emergency brake function.;

- (53) point 4.2.4.8.2 is replaced by the following:

‘4.2.4.8.2. Magnetic track brake

- (1) Requirements on magnetic brakes specified for compatibility with train detection system based on axle counters are referenced in point 4.2.3.3.1.2(9).
- (2) A magnetic track brake is allowed to be used as an emergency brake, as mentioned in the TSI INF, point 4.2.6.2.2.
- (3) The geometrical characteristics of the end elements of the magnet in contact with the rail shall be as specified for one of the types described in the specification referenced in Appendix J-1, index [16]. It is permissible to use geometries of end elements of the magnet that are not listed in Appendix J-1, index [16] provided that the compatibility with switches and crossings is demonstrated in accordance with the procedure referred to in Appendix K.

- (4) Magnetic track brake shall not be used at speed higher than 280 km/h.
 - (5) The braking performance of the unit specified in point 4.2.4.5.2 shall be determined with and without the use of magnetic track brakes.
 - (6) Requirements applicable to units with regards to their interface with ETCS on-board and related to train interface function 'Special brake inhibition area – Trackside orders: magnetic track brake' when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B]. The subsequent commands of inhibition of magnetic track brake by the unit can be automatic or manual through intervention of the driver. The rolling stock configuration on automatic or manual command shall be recorded in the technical documentation described in point 4.2.12.2.
 - (7) Requirements applicable to units with regards to their interface with ETCS on-board and related to train interface function 'Special brake inhibit – STM Orders: magnetic track brake' when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B]. The subsequent commands of inhibition of magnetic track brake by the unit can be automatic or manual through intervention of the driver. The rolling stock configuration on automatic or manual command shall be recorded in the technical documentation described in point 4.2.12.2.;
- (54) point 4.2.4.8.3 is replaced by the following:

4.2.4.8.3. Eddy current track brake

- (1) This point covers only eddy current track brake developing a brake force between the unit and the rail.
- (2) Requirements on eddy current track brake specified for compatibility with train detection system based on axle counters, track circuits, wheel detectors and vehicle detectors based on inductive loops are referenced in point 4.2.3.3.1.2(9).
- (3) If the eddy current track brake requires a displacement of its magnets when the brake is applied, the unobstructed movement of such magnets between the 'brake released' and 'brake applied' positions shall be demonstrated by calculation in accordance with the specification referenced in Appendix J-1, index [7].
- (4) The maximum distance between the eddy current track brake and the track corresponding to 'brake released' position will be recorded in the technical documentation described in point 4.2.12.
- (5) The eddy current track brake shall not operate below a fixed speed threshold.
- (6) The conditions for use of eddy current track brake for technical compatibility with the track are not harmonised (regarding in particular their effect on rail heating and vertical force) and are an open point.
- (7) The Register of Infrastructure indicates per track section if their use is allowed, and provides in such case their conditions for use:
 - The maximum distance between the eddy current track brake and the track corresponding to 'brake released' referred to in point (4) above,
 - Fixed speed threshold referred to in point (5) above,
 - Vertical force as a function of the train speed, for the case of full application of eddy current track brake (emergency braking) and limited application of eddy current brake (service braking),
 - Braking force as a function of the train speed, for the case of full application of eddy current track brake (emergency braking) and limited application of eddy current brake (service braking).
- (8) The braking performance of the unit specified in points 4.2.4.5.2 and 4.2.4.5.3 shall be determined with and without the use of eddy current track brakes.

- (9) Requirements applicable to units with regards to their interface with ETCS on-board and related to train interface function 'Special brake inhibition area – Trackside orders: Eddy current track brake' when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B]. The subsequent commands of inhibition of eddy current track brake by the unit can be automatic or manual through intervention of the driver. The rolling stock configuration on automatic or manual command shall be recorded in the technical documentation described in point 4.2.12.2.
- (10) Requirements applicable to units with regards to their interface with ETCS on-board and related to train interface function 'Special brake inhibit – STM Orders: eddy current track brake' when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B]. The subsequent commands of inhibition of eddy current track brake by the unit can be automatic or manual through intervention of the driver. The rolling stock configuration on automatic or manual command shall be recorded in the technical documentation described in point 4.2.12.2.;
- (55) point 4.2.4.9 is amended as follows:
- (a) point (1) is replaced by the following:
- '(1) Information available to train staff shall allow the identification of the status of the brake system. To that end, it shall be possible at certain phases during operation for the train staff to identify the status (applied or released or isolated) of the main (emergency and service) and parking brake systems, and the status of each part (including one or several actuators) of these systems that can be controlled and/or isolated independently.;
- (b) point (6) is replaced by the following:
- '(6) The function providing the information described above to the train staff is a function essential to safety, as it is used for the train staff to evaluate the braking performance of the train.
- Where local information is provided by indicators, the use of harmonised indicators ensures the required safety level.
- Where a centralised control system allowing the train staff to perform all checks from one location (i.e. inside the drivers cab) is provided, it shall be subject to a reliability study, considering the failure mode of components, redundancies, periodic checks and other provisions; based on this study, operating conditions of the centralised control system shall be defined and provided in the operating documentation described in point 4.2.12.4 .;
- (56) in point 4.2.4.10, points (4) and (5) are replaced by the following:
- '(4) The braking performance developed by the rescued train in this particular operating mode shall be evaluated by a calculation, but is not required to be the same as the braking performance described in point 4.2.4.5.2. The calculated braking performance and rescue operating conditions shall be part of the technical documentation described in point 4.2.12.
- (5) The requirement in 4.2.4.10 (4) does not apply to units which are operated in a train formation of less than 200 tons (load condition 'design mass in working order').;
- (57) point 4.2.5.1 is replaced by the following:
- 4.2.5.1. Sanitary systems**
- (1) The materials used for the on-board storage and distribution of water to sanitary systems (e.g. tank, pump, piping, water tap and sealing material and quality) shall comply with the requirements applicable to water intended for human consumption in accordance with Directive (EU) 2020/2184 of the European Parliament and of the Council (*).
- (2) Sanitary systems (toilets, washrooms, bar/restaurant facilities) shall prevent the release of sewage that may be detrimental to the health of people or to the environment. Released materials (i.e. treated water) shall be conformant to the following Directives (water with soap directly released from sink excluded):

- The bacterial content of sewage discharged from sanitary systems shall not at any time exceed the bacterial content value for Intestinal enterococci and Escherichia coli bacteria specified as 'good' for Inland waters in Directive 2006/7/EC of the European Parliament and of the Council (**) concerning the management of bathing water quality.
 - The treatment processes shall not introduce substances that are identified in Annex I of Directive 2006/11/EC of the European Parliament and of the Council (***) on pollution caused by certain dangerous substances discharged into the aquatic environment of the Union.
- (3) To limit the dispersion of released liquid on the trackside, discharge from any source shall take place downwards only, under the body frame of the vehicle in a distance not greater than 0,7 metres from the longitudinal centre line of the vehicle.
- (4) The following shall be provided in the technical documentation described in point 4.2.12:
- The presence and type of toilets in a unit,
 - The characteristics of the flushing medium, if it is not clean water,
 - The nature of the treatment system for released water and the standards against which conformity has been assessed.

(*) 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).

(**) Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC (OJ L 64, 4.3.2006, p. 37).

(***) Directive 2006/11/EC of the European Parliament and of the Council of 15 February 2006 on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community (OJ L 64, 4.3.2006, p. 52).';

(58) point 4.2.5.2 (5) is replaced by the following:

'(5) Provisions for passengers to contact train crew are prescribed in point 4.2.5.3 (passenger alarm) and in point 4.2.5.4 (communication devices for passengers).';

(59) in point 4.2.5.3.2 point (4a) is inserted as follows:

'(4a) In case of multiple activations, the driver's acknowledgement of the passenger alarm for the first activated passenger alarm device shall initiate the automatic acknowledgement for all further activated devices, until all activated devices have been reset.';

(60) point 4.2.5.4 is amended as follows:

(a) point (3) is replaced by the following:

'(3) The requirements to the location of the 'communication device' are the ones applicable for the passenger alarm as defined in point 4.2.5.3.';

(b) point (7) is added as follows:

'(7) The existence or not of communication devices shall be recorded in the technical documentation described in point 4.2.12.2.';

(61) in point 4.2.5.5.3, points (4) and (5) are replaced by the following:

'(4) The doors shall be kept closed and locked until they are released in accordance with point 4.2.5.5.6. In the event of loss of power to the door controls, the doors shall be kept locked by the locking mechanism.

Note: see point 4.2.2.3.2 of TSI PRM for alert signal when closing a door.

Door obstacle detection:

(5) External passenger access doors shall incorporate devices that detect if they close on an obstacle (e.g. a passenger). Where an obstacle is detected the doors shall automatically stop, and remain free for a limited period of time or reopen. The sensitivity of the system shall be such as to detect an obstacle according to the specification referenced in Appendix J-1, index [17], with a maximum force on the obstacle according to the specification referenced in Appendix J-1, index [17].';

- (62) in point 4.2.5.5.6, point (2) is replaced by the following:
- ‘(2) Requirements applicable to units with regards to their interface with ETCS on-board and related to the train interface function ‘Station platform’, when ETCS is installed, are defined in the specification referenced in Appendix J-2, index [B].’;
- (63) in point 4.2.5.5.9.(6) ‘index 33’ is replaced by ‘index [17]’;
- (64) in point 4.2.6.1.1 (1), ‘index 34’ is replaced by ‘index [18]’;
- (65) in point 4.2.6.1.2 (1), ‘index 35’ is replaced by ‘index [18]’;
- (66) in point 4.2.6.1.2.(4), the first two paragraphs of the first indent are replaced by the following:
- Obstacle deflector as defined in point 4.2.2.5: additionally, capability to remove snow in front of the train.
- Snow shall be considered as an obstacle to be removed by the obstacle deflector; the following requirements are defined in point 4.2.2.5 (by reference to the specification referenced in Appendix J-1, index [3]).’;
- (67) point 4.2.6.2, point (1) is replaced by the following:
- ‘(1) The requirements in this point apply to all rolling stock. For rolling stock operated on the 1 520 mm and 1 600 mm track gauge systems, in case of a maximum speed higher than the limits specified in points 4.2.6.2.1 to 4.2.6.2.5, the procedure for innovative solution shall apply.’;
- (68) in point 4.2.6.2.1, point (1), the introductory wording of point (2) and point (3) are replaced by the following:
- ‘(1) Units of maximum design speed $V_{tr,max} > 160$ km/h, running in the open air at a reference speed $V_{tr,ref}$ shall not cause the air speed to exceed, at each measurement point defined in the specification referenced in Appendix J-1 index [49], the value $U_{95\%,max}$ as indicated in that specification.
- (2) For units intended to be operated on the networks with track gauges of 1 524 mm and 1 668 mm, the corresponding values in Table 4 below referring to the parameters of the specification referenced in Appendix J-1, index [49] shall be applied:
- (3) The specification referenced in Appendix J-1, index [49] specifies:
- the reference train to be tested for fixed/predefined formations and units assessed for use in general operation;
- the formation to be tested for single units fitted with a driver cab.’;
- (69) in point 4.2.6.2.2, point (2) and the introductory wording of point (3) are replaced by the following:
- ‘(2) Units with a maximum design speed higher than 160 km/h running in the open air at their reference speed $V_{tr,ref}$ on 1 435 mm track gauge shall not cause the maximum peak-to-peak pressure to exceed the maximum permissible pressure change defined in specification referenced in Appendix J-1, index [49] assessed over the measurement positions defined in the same specification.
- (3) For units intended to be operated on the networks with track gauges of 1 524 mm and 1 668 mm, the corresponding values in Table 4a below referring to the parameters of the specification referenced in Appendix J-1, index [49] shall be applied.’;
- (70) point 4.2.6.2.3 is replaced by the following:
- ‘4.2.6.2.3. Maximum pressure variations in tunnels**
- (1) Units of maximum design speed higher than or equal to 200 km/h shall be aerodynamically designed so that for a given combination (reference case) of train speed and tunnel cross section in case of a solo run in a simple, non-inclined tube-like tunnel (without any shafts etc.) the requirements for the characteristic pressure variation shall be met as defined in Appendix J-1, index [50].
- (2) The reference train to be verified by a test is specified as follows for different types of rolling stock:
- (i) unit assessed in fixed or predefined formation: assessment shall be made according to the specification referenced to in Appendix J-1, Index [50];

- (ii) unit assessed for general operation (train formation not defined at design phase) and fitted with a driver's cab: assessment shall be made according to the specification referenced to in Appendix J-1, Index [50];
 - (iii) other units (coaches for general operation): assessment shall be made according to the specification referenced to in Appendix J-1, Index [50];
- (3) The conformity assessment procedure is described in point 6.2.3.15.;
- (71) point 4.2.6.2.4 is replaced by the following:
 - 4.2.6.2.4. Crosswind**
 - (1) This requirement applies to units of maximum design speed higher than 140 km/h.
 - (2) For units of maximum design speed lower than 250 km/h the characteristic wind curve (CWC) of the most sensitive vehicle shall be determined in accordance with the specification referenced in Appendix J-1, index [19].
 - (3) For units of maximum design speed equal or higher than 250 km/h the crosswind effect shall be determined and complying with the specification referenced in Appendix J-1, index [19].
 - (4) The resulting characteristic wind curve of the most sensitive vehicle of the unit under assessment shall be recorded in the technical documentation as per point 4.2.12.;
- (72) in point 4.2.7.1.1, points (4), (5) and (6) are replaced by the following:
 - (4) The colour of head lamps shall be in accordance with the values specified in the specification referenced in Appendix J-1, index [20].
 - (5) Headlamps shall provide 2 luminous intensity levels: 'dimmed headlamp' and 'full-beam headlamp'.
For each level, the luminous intensity of headlamps measured along the optical axis of the head lamp shall be in accordance with the values specified in the specification referenced in Appendix J-1, index [20].
 - (6) The installation of head lamps on the unit shall provide a means of alignment adjustment of their optical axis when installed on the unit according to the specification referenced in Appendix J-1, index [20].;
- (73) point 4.2.7.1.2 is amended as follows:
 - (a) point (6) is replaced by the following:
 - (6) The specification referenced in Appendix J-1, index [20] specifies the characteristics of:
 - (a) the colour of marker lamps;
 - (b) the spectral radiation distribution of light from the marker lamps;
 - (c) the luminous intensity of marker lamps.;
 - (b) point (7) is replaced as follows:
 - (7) The installation of marker lamps on the unit shall provide a means of alignment adjustment of their optical axis when installed on the unit according to the specification referenced in Appendix J-1, index [20].;
 - (c) point (8) is deleted;
- (74) in point 4.2.7.1.3, point (4) is replaced by the following:
 - (4) The specification referenced in Appendix J-1, index [20] specifies the characteristics of:
 - (a) the colour of tail lamps;
 - (b) the luminous intensity of tail lamps.;
- (75) point 4.2.7.1.4. is replaced by the following:
 - 4.2.7.1.4. Lamp controls**
 - (1) This point applies to units fitted with a driver's cab.

- (2) It shall be possible for the driver to control:
- the head, marker lamps of the unit from the normal driving position;
 - the tail lamps of the unit from the cab.

This control may use independent command or combination of commands.

- (3) On units intended to operate on one or more of the networks listed in point 7.3.2.8.a, it shall be possible for the driver to use the head lamps in automatic flashing/blinking mode and to inhibit the function. The characteristics of the flashing/blinking mode shall not be a condition for accessing a network.

- (4) The fitment of the controls to activate and to inhibit the flashing/blinking mode of head lamps shall be recorded in the technical documentation defined in point 4.2.12.2.;

(76) in point 4.2.7.2.1, point (4), 'clause 4.2.7.2.2.' is replaced by 'point 4.2.7.2.2.'.

(77) point 4.2.7.2.2 is replaced by the following:

4.2.7.2.2. Warning horn sound pressure levels

- (1) The C weighted sound pressure level produced by each horn sounded separately (or in a group if designed to sound simultaneously as a chord) when integrated on the unit shall be as defined in the specification referenced in Appendix J-1, index [21].

- (2) The conformity assessment procedure is specified in point 6.2.3.17.;

(78) point 4.2.8.1.2 is replaced by the following:

4.2.8.1.2. Requirements on performance

- (1) This point applies to units fitted with traction equipment.

- (2) Unit traction force profiles (force at wheel rim = $F(\text{speed})$) shall be determined by calculation; the unit running resistance shall be determined by a calculation for the load case 'design mass under normal payload', as defined in point 4.2.2.10.

- (3) Unit traction force profiles and running resistance shall be recorded in the technical documentation (see point 4.2.12.2).

- (4) The design maximum speed shall be defined from the data above for the load case 'design mass under normal payload' on a level track; design maximum speed higher than 60 km/h shall be a multiple of 5 km/h.

- (5) For units assessed in fixed or predefined formation, at the maximum service speed and on a level track, the unit shall still be capable of an acceleration of at least 0,05 m/s² for the load case 'design mass under normal payload'. This requirement may be verified by calculation or by testing (acceleration measurement) and applies for maximum design speed up to 350 km/h.

- (6) Requirements regarding the traction cut-off required in case of braking are defined in the point 4.2.4.

- (7) Requirements regarding availability of the traction function in case of fire on board are defined in the point 4.2.10.4.4.

- (8) Requirements applicable to units with regards to their interface with ETCS on-board and related to the train interface function 'traction cut off' when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B].

Additional requirements for units assessed in fixed or predefined formation of maximum design speed higher than or equal to 250 km/h:

- (9) The mean acceleration on a level track, for the load case 'design mass under normal payload', shall be of at least of:
- 0,40 m/s² from 0 to 40 km/h
 - 0,32 m/s² from 0 to 120 km/h
 - 0,17 m/s² from 0 to 160 km/h.

This requirement may be verified by calculation only or by testing (acceleration measurement) combined with calculation.

- (10) The design of the traction system shall assume a calculated wheel/rail adhesion not higher than:
- 0,30 at start up and very low speed
 - 0,275 at 100 km/h
 - 0,19 at 200 km/h
 - 0,10 at 300 km/h.
- (11) A single failure of power equipment affecting the traction capability shall not deprive the unit of more than 50 % of its traction force.;
- (79) in point 4.2.8.2.2, point (1) is replaced by the following:
- ‘(1) Electric units shall be able to operate within the range of at least one of the systems ‘voltage and frequency’ defined in TSI ENE, point 4.2.3 and in appendix J-1 index [69].’;
- (80) points 4.2.8.2.3 to 4.2.8.2.8.4 are replaced by the following:

4.2.8.2.3. Regenerative brake with energy to the overhead contact line

- (1) Electric units which return electrical energy to the overhead contact line in regenerative braking mode shall comply with the specification referenced in Appendix J-1, index [22].

4.2.8.2.4. Maximum power and current from the overhead contact line

- (1) Electric units including fixed and predefined formations with power higher than 2 MW shall be equipped with power or current limitation function. For units intended to be used in multiple operation the requirement shall apply when the single train - with the maximum number of units intended to be coupled - has a total power higher than 2 MW.
- (2) Electric units shall be equipped with automatic regulation as a function of voltage to limit the current or power to the ‘maximum current or power against voltage’ specified in the specification referenced in Appendix J-1, index [22].

A less restrictive limitation (lower value of coefficient ‘a’) may be used at operational level on a particular network or line if agreed by the Infrastructure Manager.

- (3) The maximum current assessed here above (rated current) shall be recorded in the technical documentation defined in point 4.2.12.2.
- (4) Requirements applicable to units with regards to their interface with ETCS on-board and related to the train interface function ‘change of allowed current consumption’ when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B]. When receiving the information on allowed current consumption:
- If the unit is equipped with power or current limitation function, the device automatically adapts the level of the power consumption.
 - If the unit is not equipped with power or current limitation function, the “allowed current consumption” shall be displayed on-board for the intervention of the driver.

The rolling stock configuration on automatic or manual command shall be recorded in the technical documentation described in point 4.2.12.2.

4.2.8.2.5. Maximum current at standstill

- (1) The maximum current per pantograph for AC and DC systems when a train is at standstill shall be as defined in the specification referenced in Appendix J-1, index [24].
- (2) For DC systems, the maximum current at standstill per pantograph shall be calculated and verified by measurement in accordance with point 6.1.3.7. For AC systems, the check for current at standstill is not necessary as the current is lower and not critical to causing heating of the contact wire.

- (3) For trains equipped with electric energy storage for traction purposes:
- The maximum current per pantograph at vehicle standstill in DC systems can be exceeded only for charging electric energy storage for traction, in allowed locations and under the specific conditions defined in the register of infrastructure. Only in that case, it shall be possible for a unit to enable the capacity to exceed the maximum current at standstill for DC systems.
 - The assessment method including the measurement conditions is an open point.
- (4) For DC systems, the measured value and measurement conditions regarding the material of the contact wire and, for trains equipped with electric energy storage for traction purposes, the documentation for the operation of electric energy storage shall be recorded in the technical documentation defined in point 4.2.12.2.

4.2.8.2.6. **Power factor**

- (1) The power factor design data of the train (including multiple operation of several units as defined in point 2.2) shall be subject to a calculation to verify acceptance criteria set out in the specification referenced in Appendix J-1, index [22].

4.2.8.2.7. **Harmonics and dynamic effects for AC systems**

- (1) An Electric unit shall comply with the requirements described in the specification referenced in Appendix J-1, index [22].
- (2) All hypothesis and data considered shall be recorded in the technical documentation (see point 4.2.12.2).

4.2.8.2.8. **On-board energy measurement system**

4.2.8.2.8.1. **General**

- (1) The on-board Energy Measurement System ('EMS') is the system for measurement of all active and reactive electric energy taken from or returned (during regenerative braking) to the Overhead Contact Line ('OCL') by the electric unit.
- (2) The EMS shall include at least the following functions: Energy Measurement Function ('EMF') as set out in point 4.2.8.2.8.2 and Data Handling System ('DHS') as set out in point 4.2.8.2.8.3.
- (3) A suitable communication system will send the Compiled Energy Billing Data sets ('CEBD') to an on-ground Data Collecting System ('DCS'). The interface protocols and transferred data format between EMS and DCS shall fulfil the requirements set out in point 4.2.8.2.8.4.
- (4) The on-board energy measurement system is suitable for billing purposes; the data sets defined in point 4.2.8.2.8.3(4) provided by this system shall be accepted for billing in all Member States.
- (5) The EMS rated current and voltage shall be matched to the electric unit rated current and voltage; it shall continue to function correctly when changing between several traction energy supply systems.
- (6) Data stored in the EMS shall be protected against loss of the power supply and the EMS shall be protected from non-authorised access.
- (7) An on-board location function providing location data originated from an external source to the DHS shall be provided in networks where such function is necessary for billing purposes. In any case, the EMS system shall be able to accommodate a compatible location function. If the location function is provided, it shall fulfil the requirements set out in specification referenced in Appendix J-1, index [55].
- (8) The fitment of an EMS, its on-board location function, the description of on-board to ground communication and the metrological control including the accuracy class of the EMF shall be recorded in the technical documentation described in point 4.2.12.2.

- (9) The maintenance documentation described in point 4.2.12.3 shall include any periodic verification procedure to ensure the required accuracy level of the EMS during its lifetime.

4.2.8.2.8.2. Energy Measurement Function (EMF)

- (1) The EMF shall ensure the measurement of the voltage and current, calculation of the energy and production of energy data.
- (2) The energy data produced by EMF shall have a time reference period of 5 minutes defined by the Universal Time Coordinated (UTC) clock time at the end of each time reference period; originating from the time stamp 00:00:00. It is permitted to use a shorter measuring period if the data can be aggregated on-board into 5 minutes time reference period.
- (3) The accuracy of EMF for active energy measurement shall comply with the specification referenced in Appendix J-1, index [56].
- (4) Each device containing one or more functions of EMF shall indicate: metrological control, and its accuracy class, according to the class designations specified in the specification referenced in Appendix J-1, index [56].
- (5) The conformity assessment of the accuracy is set out in point 6.2.3.19a.
- (6) In cases where:
- an EMS is intended to be installed on an existing vehicle, or
 - an existing EMS (or parts of it) is upgraded,
- and where existing components of a vehicle are used as part of the EMF, requirements (1) to (5) apply to current and voltage measurements considering the temperature influence factor at rated temperature only and may be verified only for the range of 20% to 120% of rated current. The technical documentation described in point 4.2.12.2 shall record:
- the characteristic of the compliance of components of the on-board energy measurement system with this limited set of requirements, and
 - the conditions for use of these components.

4.2.8.2.8.3. Data Handling System (DHS)

- (1) The DHS shall ensure the production of compiled energy billing data sets for energy billing purposes, by merging data from the EMF with time data and, when required, geographical position, and storing it ready to be sent to an on-ground DCS by a communication system.
- (2) The DHS shall compile the data without corrupting them and shall incorporate data storage with a memory capacity sufficient to store the compiled data of at least 60 days continuous operation. The time reference used shall be the same as in the EMF.
- (3) The DHS shall have a capability to be interrogated locally on-board for audit and data recovery purposes.
- (4) The DHS shall produce CEBD, by merging the following data for each time reference period:
- unique EMS Consumption Point Identification ('CPIId') as defined in the specification referenced in Appendix J-1, index [57],
 - end time of each period, defined as year, month, day, hour, minute and second,
 - location data at the end of each period,
 - consumed/regenerated active and reactive (if appropriate) energy in each period, in units of watt-hour (active energy) and var-hour (reactive energy) or their decimal-multiples.
- (5) The conformity assessment of compilation and handling of data produced by DHS is set out in point 6.2.3.19a.

4.2.8.2.8.4. Interface protocols and transferred data format between EMS and DCS

The data exchange between EMS and DCS shall fulfil the requirements specified in the specification referenced in Appendix J-1, index [58] with regards to the following characteristics:

- (1) The application services (service layer) of the EMS,
 - (2) The user access rights for these application services,
 - (3) The structure (data layer) for these application services, which shall comply with the defined XML schema,
 - (4) The message mechanism (message layer) for supporting these application services, which shall comply with the defined methods and the XML schema,
 - (5) The application protocols for supporting the message mechanism.
 - (6) The communication architectures: the EMS shall use at least one of them.;
- (81) in point 4.2.8.2.9.1.1, point (5) shall be modified as follows ‘4 190 mm and 5 700 mm above rail level for electric units designed to be operated on the 1 500 V DC system in accordance with the IRL gauge (track gauge system 1 600 mm).’;
- (82) in point 4.2.8.2.9.1.2, point (2) ‘index 46’ is replaced by ‘index [23].’;
- (83) in point 4.2.8.2.9.2, point (2) is replaced by the following:
- ‘(2) For electric units designed to be operated solely on the 1 520 mm system, at least one of the pantograph(s) to be installed shall have a head geometry type compliant with one of the three specifications given in the points 4.2.8.2.9.2.1, 2 and 3 below.’;
- (84) in point 4.2.8.2.9.2, point (5) ‘index 47’ is replaced by ‘index [24].’;
- (85) in point 4.2.8.2.9.2.1, point (1) ‘index 48’ is replaced by ‘index [24].’;
- (86) in point 4.2.8.2.9.2.2, point (1) ‘index 49’ is replaced by ‘index [24].’;
- (87) point 4.2.8.2.9.3a is replaced by the following:

‘4.2.8.2.9.3a. Pantograph current capacity (IC level)

- (1) Pantographs shall be designed for the rated current (as defined in point 4.2.8.2.4) to be transmitted to the Electric unit.
 - (2) An analysis shall demonstrate that the pantograph is able to carry the rated current; this analysis shall include the verification of the requirements of the specification referenced in Appendix J-1, index [23].
 - (3) Pantographs shall be designed for a current at standstill with a maximum as defined in point 4.2.8.2.5.’;
- (88) in point 4.2.8.2.9.4.2., point (3) ‘(see clause 6.1.3.8)’ is replaced by ‘(see point 6.1.3.8).’;
- (89) points 4.2.8.2.9.6 to 4.2.8.2.10 are replaced by the following:

‘4.2.8.2.9.6. Pantograph contact force and dynamic behaviour

- (1) The mean contact force F_m is the statistical mean value of the pantograph contact force and is formed by the static and aerodynamic components of the contact force with dynamic correction.
- (2) The factors which influence the mean contact force are the pantograph itself, its position in the train consist, its vertical extension, and the rolling stock on which the pantograph is mounted.
- (3) Rolling stock and pantographs fitted on rolling stock shall be designed to exert a mean contact force F_m on the contact wire in a range specified in point 4.2.11 of the TSI ENE, in order to ensure current collection quality without undue arcing and to limit wear and hazards to contact strips. Adjustment of the contact force is made when dynamic tests are performed.

- (3a) Rolling stock and pantographs fitted on rolling stock shall not exceed the limit values for uplift S_0 and either standard deviation σ_{\max} or percentage of arcing as defined in point 4.2.12 of the TSI ENE.
- (4) The verification at interoperability constituent level shall validate the dynamic behaviour of the pantograph itself, and its capability to collect current from a TSI compliant overhead contact line; the conformity assessment procedure specified in point 6.1.3.7.
- (5) The verification at rolling stock subsystem level (integration in a particular vehicle) shall allow to adjust the contact force, taking into account aerodynamic effects due to the rolling stock and the position of the pantograph in the unit or train fixed or predefined formation(s); the conformity assessment procedure specified in point 6.2.3.20.

4.2.8.2.9.7. Arrangement of pantographs (RST level)

- (1) It is permissible for more than one pantograph to be simultaneously in contact with the overhead contact line equipment.
- (2) The number of pantographs and their spacing shall be designed taking into consideration the requirements of current collection performance, as defined in point 4.2.8.2.9.6 above.
- (3) Where the spacing of 2 consecutive pantographs in fixed or predefined formations of the assessed unit is less than the spacing shown in point 4.2.13 of the TSI ENE for the selected OCL design distance type, or where more than 2 pantographs are simultaneously in contact with the overhead contact line equipment, it shall be demonstrated by testing that the dynamic behaviour as defined in point 4.2.8.2.9.6 above is met.
- (4) The distances between consecutive pantographs for which the rolling stock has been verified shall be recorded in the technical documentation (see point 4.2.12.2).

4.2.8.2.9.8. Running through phase or system separation sections (RST level)

- (1) Trains shall be designed to be able to move from one power supply system and from one phase section to an adjacent one (as described in points 4.2.15 and 4.2.16 of the TSI ENE) without bridging either system or phase separation sections.
- (2) Electric units designed for several power supply systems shall, when running through system separation sections, recognise automatically the voltage of the power supply system at the pantograph.
- (3) When running through phase or system separation sections, it shall be possible to bring the power exchange between the OCL and the unit to zero. The infrastructure register gives information on the permitted pantographs position: lowered or raised (with permitted pantograph arrangements) when running through systems or phase separation sections.
- (4) Electric units of maximum design speed higher than or equal to 250 km/h shall be able to receive from the ground the information related to the location of the separation section, and the subsequent commands to the control of the pantograph and main circuit breaker shall be triggered automatically by the unit, without intervention of the driver.
- (5) Requirements applicable to units with regards to their interface with ETCS on-board and related to the train interface functions 'Change of traction system, Powerless section with pantograph to be lowered – Trackside orders, Powerless section with main power switch to be switched off – Trackside orders,' when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B], for units of maximum design speed lower than 250 km/h, the subsequent commands are not required to be automatic. The rolling stock configuration on automatic or manual command shall be recorded in the technical documentation described in point 4.2.12.2.

- (6) Requirements applicable to units with regards to their interface with ETCS on-board and related to the train interface functions 'Main Power Switch – STM orders', 'Pantograph – STM orders' when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B]. For units of maximum design speed lower than 250 km/h, the subsequent commands are not required to be automatic. The rolling stock configuration on automatic or manual command shall be recorded in the technical documentation described in point 4.2.12.2.

4.2.8.2.9.9. **Insulation of pantograph from the vehicle (RST level)**

- (1) The pantographs shall be assembled on an electric unit in a way that ensures the current path from collector head to vehicle equipment is insulated. The insulation shall be adequate for all system voltages the unit is designed for.

4.2.8.2.9.10. **Pantograph lowering (RST level)**

- (1) Electric units shall be designed to lower the pantograph in a period (3 seconds) meeting the requirements of the specification referenced in Appendix J-1, index [23] and to the dynamic insulating distance according to the specification referenced in Appendix J-1, index [26] either by initiation by the driver or by a train control function (including CCS functions).
- (2) The pantograph shall lower to the stowed position in less than 10 seconds.
When lowering the pantograph, the main circuit breaker shall previously be opened automatically.
- (3) If an electric unit is equipped with an Automatic Dropping Device ('ADD') that lowers the pantograph in case of a collector head failure, the ADD shall meet the requirements of the specification referenced in Appendix J-1, index [23].
- (4) Electric units of maximum design speed higher than 160 km/h shall be equipped with an ADD.
- (5) Electric units that require more than one pantograph raised in operation and of maximum design speed higher than 120 km/h shall be equipped with an ADD.
- (6) Other electric units are permitted to be equipped with an ADD.

4.2.8.2.10. **Electrical protection of the train**

- (1) Electric units shall be protected against internal short – circuits (from inside the unit).
- (2) The location of the main circuit breaker shall be such as to protect the on-board high voltage circuits, including any high voltage connections between vehicles. The pantograph, the main circuit breaker, and the high voltage connection between them shall be located on the same vehicle.
- (3) Electric units shall protect themselves against short overvoltages, temporary overvoltages and maximum fault current. To meet this requirement, electrical protection coordination design of the unit shall comply with the requirements defined in the specification referenced in Appendix J-1, index [22].;
- (90) point 4.2.8.3 is replaced by 'Intentionally blank';
- (91) in point 4.2.8.4, point (1), 'index 54' is replaced by 'index [27]';
- (92) in point 4.2.9.1.4, point (5), '(see clause 4.2.9.1.5)' is replaced by '(see point 4.2.9.1.5)';
- (93) in point 4.2.9.1.5, point (2) is replaced by the following:
- '(2) It shall be possible for the driver to adjust the seat position in order to meet the reference position of eyes for external visibility, as defined in point 4.2.9.1.3.1.1.;

(94) in point 4.2.9.1.6 the following points (5) and (6) are added:

(5) Requirements applicable to units with regards to their interface with ETCS on-board and related to the train interface function 'direction controller' when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B].

(6) Requirements applicable to units with regards to their interface with ETCS on-board and related to the train interface function 'cab status information' when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B].;

(95) in point 4.2.9.1.7, point (2), '(as defined in the clause 4.2.9.1.3.)' is replaced by '(as defined in the point 4.2.9.1.3.)';

(96) point 4.2.9.2 is replaced by the following:

4.2.9.2. **Windscreen**

4.2.9.2.1. **Mechanical characteristics**

(1) The dimension, location, shape and finishes (including those for maintenance purpose) of the windows shall not inhibit the drivers external view (as defined in point 4.2.9.1.3.1) and shall support the driving task.

(2) The driver's cab windscreens shall be able to resist impacts from projectiles and spalling as specified in the specification referenced in Appendix J-1, index [28].

4.2.9.2.2. **Optical characteristics**

(1) The driver's cab windscreens shall be of an optical quality that does not alter the visibility of signs (shape and colour) in any operating condition (including as example when the windscreen is heated to prevent misting and frost).

(2) The windscreen shall fulfil the requirements specified in the specification referenced in Appendix J-1, index [28] with regards to the following characteristics:

(a) The angle between primary and secondary images in the installed position

(b) Permissible optical distortions of vision

(c) Haze

(d) Light transmittance

(e) Chromaticity';

(97) Points from 4.2.9.3.6 to 4.2.9.6 are replaced by the following:

4.2.9.3.6. **Radio Remote control function by staff for shunting operation**

(1) If a radio remote control function is provided for a staff member to control the unit during shunting operations, it shall be designed to allow him to control the train movement safely, and to avoid any mistake when used.

(2) It is assumed that the staff member using the remote control function can visually detect train movement when using the remote control device.

(3) The design of the remote control function, including safety aspects, shall be assessed according to recognised standards.

(4) Requirements applicable to units with regards to their interface with ETCS on-board and related to the train interface function 'remote shunting' when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B].

4.2.9.3.7. **Derailment detection and prevention signal processing**

(1) This point is applicable to locomotives intended to process signals emitted by freight wagons, if provided with Derailment Prevention Function ('DPF') or Derailment Detection Function ('DDF') as defined in point 4.2.3.5.3 of TSI WAG.

- (2) These locomotives shall be equipped with means to receive a signal from the freight wagons forming a train which are equipped with the DPF and DDF informing of:
 - a precursor of a derailment, in case of the DPF in accordance with point 4.2.3.5.3.2 of TSI WAG and
 - a derailment, in case of the DDF in accordance with point 4.2.3.5.3.3 of TSI WAG.
- (3) At the reception of the signal above, both visual and acoustic alarms shall indicate in the driver's cab that the train is:
 - In risk of derailment, in case the alarm is sent by a DPF or
 - Just derailed, in case the alarm is sent from a DDF.
- (4) A device in the driver's cab shall allow the acknowledgment of the alarm above.
- (5) If the alarm is not acknowledged from the driver's cab in 10 +/-1 seconds, a full service brake or an emergency brake application shall be automatically applied.
- (6) It shall be possible to override the automatic brake application set out in point 4.2.9.3.7 (5) above from the driver's cab.
- (7) It shall be possible to deactivate the automatic brake application set out in point 4.2.9.3.7 (5) above from the driver's cab.
- (8) The presence of the derailment detection signal processing function in the locomotive as well as the conditions of use at train level shall be recorded in the technical documentation defined in point 4.2.12.

4.2.9.3.7a. **On-board derailment detection and prevention function**

- (1) This point is applicable to locomotives which are intended to detect derailments or precursors to derailments in freight wagons hauled by the locomotive.
- (2) The equipment fulfilling this function shall be located entirely on board the locomotive
- (3) At the detection of a derailment or precursor to derailment, both visual and acoustic alarms shall be triggered in the driver's cab.
- (4) A device in the driver's cab shall allow the acknowledgment of the alarm above.
- (5) If the alarm is not acknowledged from the driver's cab in 10 +/-1 seconds, a full service brake or an emergency brake application shall be automatically applied.
- (6) It shall be possible to override the automatic brake application set out in point 4.2.9.3.7a (5) above from the driver's cab.
- (7) It shall be possible to deactivate the automatic brake application set out in point 4.2.9.3.7a (5) above from the driver's cab.
- (8) The presence of the on-board derailment detection function in the locomotive as well as the conditions of use at train level shall be recorded in the technical documentation defined in point 4.2.12.

4.2.9.3.8. **Requirements for management of ETCS modes**

4.2.9.3.8.1. **Sleeping mode**

- (1) Requirements applicable to units with regards to their interface with ETCS on-board and related to the train interface function 'Sleeping' when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B].

4.2.9.3.8.2. Passive shunting

- (1) Requirements applicable to Locomotive and Trainset with regards to their interface with ETCS on-board and related to the train interface function 'Passive shunting' are defined in the specification referenced in Appendix J-2, index [B].

4.2.9.3.8.3. Non leading

- (1) Requirements applicable to Locomotive and Trainset with regards to their interface with ETCS on-board and related to the train interface function 'Non leading' when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B].

4.2.9.3.9. Traction status

- (1) Requirements applicable to units with regards to their interface with ETCS on-board and related to the train interface function 'traction status' when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B].

4.2.9.4. On-board tools and portable equipment

- (1) A space shall be available in or near the driver's cab to store the following equipment, in case they are needed by the driver in emergency situation:
- Hand-lamp with red and white light
 - Short circuiting equipment for track-circuits
 - Scotches, if the parking brake performance is not sufficient depending on track gradient (see point 4.2.4.5.5).
 - A fire extinguisher (to be located in the cab; see also point 4.2.10.3.1).
 - On manned traction units of freight trains: a self-rescue device, as specified in point 4.7.1 of Commission Regulation (EU) No 1303/2014 (*) ('TSI SRT').

4.2.9.5. Storage facility for staff personal effects

- (1) Each driver's cab shall be equipped with:
- Two hooks for clothing or a niche with a clothes beam.
 - A free space for storing a suitcase or bag of size 300 mm × 400 mm × 400 mm.

4.2.9.6. Recording device

- (1) The list of information to be recorded is defined in point 4.2.3.5 of the TSI OPE.
- (2) The unit shall be equipped with a means to record this information, complying with the following requirements specified in the specification referenced in Appendix J-1, index [29]:
- (a) Functional requirements shall be met.
 - (b) Recording performance shall be according to class R1.
 - (c) The integrity (consistency; correctness) of the recorded and extracted data shall be met.
 - (d) Data integrity shall be safeguarded.
 - (e) The level of protection that applies to the protected storage medium shall be 'A'.
 - (f) The time of day and date.
- (3) The tests of the requirements in clause 4.2.9.6(2) shall be carried out in accordance with the requirements of the specification referenced in Appendix J-1, index [72].

(*) Commission Regulation (EU) No 1303/2014 of 18 November 2014 concerning the technical specification for interoperability relating to 'safety in railway tunnels' of the rail system of the European Union (OJ L 356, 12.12.2014, p. 394).;

(98) point 4.2.10.2.1 is replaced by the following:

4.2.10.2.1. Material requirements

- (1) The selection of materials and components shall take into account their fire behaviour properties, such as flammability, smoke opacity and toxicity.
- (2) Materials used to construct the rolling stock unit shall comply with the requirements of the specification referenced in Appendix J-1, index [30] for the 'Operation Category' as defined below:
 - 'Operation Category 2' for Category A passenger rolling stock (including passenger locomotive).
 - 'Operation Category 3' for Category B passenger rolling stock (including passenger locomotive).
 - 'Operation Category 2' for freight locomotives, and self-propelling units designed to carry other payload (mail, freight, etc.).
 - 'Operation Category 1' for OTMs, with requirements limited to areas which are accessible to staff when the unit is in transport running configuration (see point 2.3).
- (3) In order to ensure constant product characteristics and manufacturing process, it is required that:
 - the test reports to prove compliance of a material with the standard, which shall be issued immediately after testing of this material, shall be renewed every 5 years,
 - in case there is no change in the product characteristics and manufacturing process, and no change in the related requirements (TSI), it is not required to perform new testing of this material; expired test reports shall be accepted provided they are accompanied with a statement delivered at the placing on the market of the product from the original equipment manufacturer, and stating that there has been no change in the product characteristics and in the manufacturing process, covering the complete supply chain involved, since the fire behaviour properties of the product were tested. This statement shall not be delivered later than 6 months after the initial test report is expired. This statement shall be renewed every 5 years.;

(99) in point 4.2.10.2.2, point (2), 'index 59' is replaced by 'index [30].';

(100) point 4.2.10.3.4 is amended as follows:

- (a) in point (3), third indent, 'index 60' is replaced by 'index [31].';
- (b) point (5) and the last paragraph are replaced by the following:

'(5) If other FCCS are used and rely on reliability and availability of systems, components, or functions, they shall be subject to a reliability study considering the failure mode of components, redundancies, software, periodic checks and other provisions, and the estimated failure rate of the function (lack of control of the spread of heat and fire effluents) shall be provided in the technical documentation described in point 4.2.12.

Based on this study, operating and maintenance conditions of the FCCS shall be defined and provided in the maintenance and operating documentation described in points 4.2.12.3 and 4.2.12.4.;

(101) in point 4.2.10.3.5, point (3), 'index 61' is replaced by 'index [31].';

(102) in point 4.2.10.4.1, point (5), 'index 62' is replaced by 'index [32].';

(103) in point 4.2.10.4.2 points (5) is replaced and point (6) is inserted as follows:

- '(5) Requirements applicable to units with regards to their interface with ETCS on-board and related to the train interface function 'Air tightness area – Trackside orders' when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B]. The subsequent commands of close all means of external ventilation can be automatic or manual through intervention of the driver. The rolling stock configuration on automatic or manual command shall be recorded in the technical documentation described in point 4.2.12.2.

(6) Requirements applicable to units with regards to their interface with ETCS on-board and related to the train interface function 'Air tightness – STM orders' when ETCS is installed are defined in the specification referenced in Appendix J-2, index [B]. The subsequent commands of close all means of external ventilation can be automatic or manual through intervention of the driver. The rolling stock configuration on automatic or manual command shall be recorded in the technical documentation described in point 4.2.12.2.;

(104) in point 4.2.10.4.4, point (3), 'index 63' is replaced by 'index [33]';

(105) point 4.2.10.5.1 is amended as follows:

(a) point (8) is replaced by the following:

'(8) All external passenger doors shall be equipped with emergency opening devices allowing them to be used as emergency exits (see point 4.2.5.5.9).';

(b) point (12) is replaced by the following:

'(12) The number of the doors and their dimensions shall allow the complete evacuation within three minutes by passengers without their baggage. It is permitted to consider that passengers with reduced mobility are to be assisted by other passengers or staff, and that wheelchair users are evacuated without their wheelchair.

Verification of this requirement shall be made either by a physical test under normal operating conditions or by numerical simulation.

In case the requirement is verified by numerical simulation, the simulation report shall include:

- A summary of the verification and validation of the simulation (tool and models)
- The hypothesis and parameters used for the simulation
- The results of an appropriate number of simulations runs allowing a statistically sound statement.;

(106) point 4.2.11.3 is replaced by the following:

4.2.11.3. Connection to Toilet discharge system

(1) This point is applicable to units equipped with sealed retention systems (using clear or recycled water) that have to be emptied at sufficient intervals on a scheduled basis at designated depots.

(2) The following connections of the unit to the toilet discharge system shall comply with the following specifications:

- (i) The 3 inch Evacuation nozzle (Inner part): see Appendix G Figure G-1.
- (ii) The flushing connection for the toilet tank (Inner part), the use of which is optional: see Appendix G Figure G-2.;

(107) point 4.2.11.4 is replaced by:

4.2.11.4. Not used;

(108) point 4.2.11.5 is replaced by the following:

4.2.11.5. Interface for water refilling

(1) This point is applicable to units equipped with a water tank supplying water to sanitary systems covered by the point 4.2.5.1.

(2) The inlet connection for water tanks shall comply with the specification referenced in Appendix J-1, index [34].;

(109) point 4.2.11.6 is replaced as follows:

4.2.11.6. Special requirements for stabling of trains

(1) This point is applicable to units intended to be powered while stabled,

- (2) The unit shall be compatible with at least one of the following external power supply systems, and shall be equipped (where relevant) with the corresponding interface for electrical connection to that external power supply (plug):
- power supply contact line (see point 4.2.8.2 ‘Power supply’)
 - ‘Single pole’ power supply line (AC 1 kV, AC/DC 1,5 kV, DC 3 kV), in accordance with the specification referenced in Appendix J-1, index [52]
 - Local external auxiliary power supply 400 V that can be connected to socket type ‘3P+ground’ according to the specification referenced in Appendix J-1, index [35].;

(110) point 4.2.12.2 is replaced by the following:

‘4.2.12.2. General documentation

The following documentation describing the rolling stock shall be provided; the point of this TSI where the documentation is required is referenced:

- (1) General drawings.
- (2) Electrical, pneumatic and hydraulic diagrams, Control-circuit diagrams necessary to explain the function and operation of the concerned systems.
- (3) Description of computerised on-board systems including description of functionality, specification of interfaces and data processing and protocols.
- (3a) For units designed and assessed for general operation, this shall include a description of the electric interfaces between units and of communication protocols, with the reference to the standards or other normative documents that have been applied.
- (4) Reference profile, and compliance to interoperable reference profile G1, GA, GB, GC or DE3, as required in point 4.2.3.1.
- (5) Weight balance with hypothesis on load conditions considered, as required in point 4.2.2.10.
- (6) Axle load, spacing of axles and any EN line category, as required in point 4.2.3.2.1.
- (7) Test report concerning running dynamic behaviour, including the test track quality recording and the track loading parameters including possible limitations of use if testing of the vehicle only covers a part of the test conditions, as required in point 4.2.3.4.2.
- (8) The hypothesis taken to evaluate the loads due to bogie running, as required in points 4.2.3.5.1 and in point 6.2.3.7 for wheelsets.
- (9) Braking performance, including failure mode analysis (degraded mode) as required in point 4.2.4.5
- (9a) Maximum distance between the eddy current track brake and the track corresponding to “brake released”, fixed speed threshold, vertical force and braking force as a function of the train speed, for the case of full application of eddy current track brake (emergency braking) and limited application of eddy current brake (service braking), as required in point 4.2.4.8.3.
- (10) The presence and type of toilets in a unit, the characteristics of the flushing medium, if it is not clean water, the nature of the treatment system for released water and the standards against which conformity has been assessed, as required in point 4.2.5.1.
- (11) Provisions taken in relation with the selected range of environmental parameters if different than the nominal one, as required in point 4.2.6.1.
- (12) Characteristic Wind Curve (“CWC”) as required in point 4.2.6.2.4.
- (13) Traction performance, as required in point 4.2.8.1.1.

- (14) Fitment of an on-board energy measurement system, and of its on-board location function (optional), as required in point 4.2.8.2.8. Description of on-board to ground communication and the metrological control including functions related to the accuracy classes of the voltage measurement, current measurement and energy calculation.

When point 4.2.8.2.8.2 (6) applies, the characteristics of the compliance of components of the on-board energy measurement system with the limited set of requirements, and the conditions for use of these components.

- (15) Hypothesis and data considered as required in point 4.2.8.2.7.
- (16) The number of pantographs simultaneously in contact with the Overhead Contact Line (“OCL”) equipment, their spacing and the OCL design distance type (A, B or C) used for assessment tests, as required in point 4.2.8.2.9.7.
- (17) Existence of communication devices as required in point 4.2.5.4 for units designed for operation without staff on-board (other than driver).
- (18) The presence of one or several of the functions described in points 4.2.9.3.7 and 4.2.9.3.7a and their conditions of use at train level.
- (19) The type(s) of pantograph head geometry that an Electric unit is equipped with, as required in point 4.2.8.2.9.2.
- (20) The maximum current assessed (rated current), as required in point 4.2.8.2.4.
- (21) For DC systems: the documentation for operation of electric energy storage, the measured value of maximum current at standstill and measurement conditions regarding the material of the contact wire, as required in point 4.2.8.2.5.
- (22) Fitment of the controls to activate and to inhibit the flashing/blinking mode of head lamps as defined in point 4.2.7.1.4.
- (23) Description of train interface functions implemented including specification of interfaces and protocols of communication, general drawings, control-circuit diagrams necessary to explain the function and operation of the interface.
- (24) Documentation related to:
- space envelope available for installation of ETCS on-board equipment’s defined in TSI CCS (e.g. ETCS cabinet, DMI, antenna, odometry etc.) and,
 - conditions for ETCS equipment’s installation (e.g. mechanical, electrical etc.).
- (25) The rolling stock configuration on automatic or manual execution of commands as referred in points: 4.2.4.4.4, 4.2.4.8.2, 4.2.4.8.3, 4.2.8.2.4, 4.2.8.2.9.8 and 4.2.10.4.2. This information shall be made available upon request when ETCS is installed.
- (26) For units applying the conditions specified in point 7.1.1.5, the following characteristics shall be provided:
- (i) Applicable “single pole” power supply line voltages in accordance with point 4.2.11.6(2);
 - (ii) Maximum “single pole” power supply line current consumption of the unit at standstill (A) for each applicable “single pole” power supply line voltages;
 - (iii) For each band of the frequency management defined in the specification referenced in Appendix J-2 index [A] and in the specific cases or technical documents referred to in Article 13 of TSI CCS when they are available:
 - (1) Maximum interference current (A), and applicable summation rule;
 - (2) Maximum magnetic field (dB μ A/m) both radiated field and field due to the return current, and applicable summation rule;
 - (3) Minimum vehicle impedance (Ohm).
 - (iv) Comparable parameters specified in the specific cases or in the technical documents referred to in Article 13 of CCS TSI when they are available.

(27) For units applying the conditions specified in point 7.1.1.5.1, the compliance/non-compliance of the unit with the requirements of points (19) to (22) of point 7.1.1.5.1 shall be provided.;

(111) the following point 4.2.13 is inserted:

‘4.2.13. Interface requirements with Automated Train Operation on-board

- (1) This basic parameter describes the interface requirements applicable to units equipped with ETCS on-board and intended to be fitted with Automated Train Operation on-board up to Grade of Automation 2. The requirements relate to the functionality needed to operate a train up to Grade of Automation 2 as defined in TSI CCS.
- (2) Requirements applicable to units with regards to their interface with ETCS on-board and related to the train interface function ‘Automatic Driving’, when ATO is installed, are defined in the specification referenced in Appendix J-2, index [B].
- (3) Where ATO on-board GoA1/2 functionality is implemented in newly developed vehicle designs, the index [84] and index [88] of Appendix A of TSI CCS shall be applied.
- (4) Where ATO onboard GoA1/2 functionality is implemented in existing vehicle types and rolling stock in operation, the index [84] shall be applied, whereas index [88] may be used on a voluntary basis.;

(112) point 4.3 is replaced by the following:

‘4.3. Functional and technical specification of the interfaces

4.3.1. Interface with Energy subsystem

Table 6

Interface with the Energy subsystem

Reference TSI LOC & PAS		Reference TSI Energy	
Parameter	Point	Parameter	Point
Gauging	4.2.3.1	Pantograph gauge	4.2.10
Pantograph head geometry	4.2.8.2.9.2		Appendix D
Operation within range of voltages and frequencies	4.2.8.2.2	Voltage and frequency	4.2.3
Max current from OCL	4.2.8.2.4	Traction power supply performance	4.2.4
Power factor	4.2.8.2.6	Traction power supply performance	4.2.4
Maximum current at standstill	4.2.8.2.5	Current at standstill	4.2.5
Regenerative brake with energy to OCL	4.2.8.2.3	Regenerative braking	4.2.6
Energy consumption measuring function	4.2.8.2.8	On-ground energy data collecting system	4.2.17
Height of pantograph	4.2.8.2.9.1	Geometry of the overhead contact line	4.2.9
Pantograph head geometry	4.2.8.2.9.2		
Contact strip material	4.2.8.2.9.4	Contact wire material	4.2.14
Pantograph static contact force	4.2.8.2.9.5	Mean contact force	4.2.11

Pantograph contact force and dynamic behaviour	4.2.8.2.9.6	Dynamic behaviour and quality of current collection	4.2.12
Arrangements of pantographs	4.2.8.2.9.7	Pantograph spacing	4.2.13
Running through phase or system separation section	4.2.8.2.9.8	Separation sections:	
		— phase	4.2.15
		— system	4.2.16
Electrical protection of the train	4.2.8.2.10	Electrical Protection Coordination Arrangements	4.2.7
Harmonics and dynamic effects for AC systems	4.2.8.2.7	Harmonics and Dynamic Effects for AC traction power supply systems	4.2.8

4.3.2. Interface with Infrastructure subsystem

Table 7

Interface with the Infrastructure subsystem

Reference TSI LOC & PAS		Reference TSI Infrastructure	
Parameter	Point	Parameter	Point
Rolling stock kinematic gauge	4.2.3.1.	Structure gauge	4.2.3.1
		Distance between track centres	4.2.3.2
		Minimum radius of vertical curve	4.2.3.5
Axle load parameter	4.2.3.2.1	Track resistance to vertical loads	4.2.6.1
		Lateral track resistance	4.2.6.3
		Resistance of new bridges to traffic loads	4.2.7.1
		Equivalent vertical loading for new earthworks and earth pressure effects	4.2.7.2
		Resistance of existing bridges and earthworks to traffic loads	4.2.7.4
Running dynamic behaviour	4.2.3.4.2.	Cant deficiency	4.2.4.3
Running dynamic limit values for track loading	4.2.3.4.2.2	Track resistance to vertical loads	4.2.6.1
		Lateral track resistance	4.2.6.3
Equivalent conicity	4.2.3.4.3	Equivalent conicity	4.2.4.5
Geometrical characteristics of wheelset	4.2.3.5.2.1	Nominal track gauge	4.2.4.1
Geometrical characteristics of wheels	4.2.3.5.2.2	Rail head profile for plain line	4.2.4.6
Automatic variable gauge systems	4.2.3.5.3	In service geometry of switches and crossings	4.2.5.3

Minimum curve radius	4.2.3.6	Minimum radius of horizontal curve	4.2.3.4
Maximum average deceleration	4.2.4.5.1	Longitudinal track resistance	4.2.6.2
		Actions due to traction and braking	4.2.7.1.5
Slipstream effects	4.2.6.2.1	Resistance of new structures over or adjacent to tracks	4.2.7.3
Head pressure pulse	4.2.6.2.2	Maximum pressure variations in tunnels	4.2.10.1
Maximum pressure variations in tunnels	4.2.6.2.3	Distance between track centres	4.2.3.2
Crosswind	4.2.6.2.4	Effect of crosswinds	4.2.10.2
Aerodynamic effect on ballasted track	4.2.6.2.5	Ballast pick-up	4.2.10.3
Toilet discharge system	4.2.11.3	Toilet discharge	4.2.12.2
Exterior cleaning through a washing plant	4.2.11.2.2	Train external cleaning facilities	4.2.12.3
Interface for water refilling	4.2.11.5	Water restocking	4.2.12.4
Refuelling equipment	4.2.11.7	Refuelling	4.2.12.5
Special requirements for stabling of trains	4.2.11.6	Electric shore supply	4.2.12.6

4.3.3. Interface with Operation subsystem

Table 8

Interface with the Operation subsystem

Reference TSI LOC & PAS		Reference TSI Operation	
Parameter	Point	Parameter	Point
Rescue coupling	4.2.2.2.4	Contingency arrangements	4.2.3.6.3
Axle load parameter	4.2.3.2	Train composition	4.2.2.5
Braking performance	4.2.4.5	Train braking	4.2.2.6
External front and rear lights	4.2.7.1	Train visibility	4.2.2.1
Horn	4.2.7.2	Train audibility	4.2.2.2
External visibility	4.2.9.1.3	Requirements for lineside signal and marker sighting	4.2.2.8
Optical characteristics of the windscreen	4.2.9.2.2		
Internal lighting	4.2.9.1.8		
Driver's activity control function	4.2.9.3.1	Driver vigilance	4.2.2.9
Recording device	4.2.9.6	Recording of monitoring data on-board the train	4.2.3.5 Appendix I

4.3.4. Interface with the Control, command and signalling subsystem

Table 9

Interface with the Control, command and signalling subsystem

Reference TSI LOC & PAS		Reference TSI CCS	
Parameter	Point	Parameter	Point
Gauging	4.2.3.1	Position of Control-Command and Signalling on-board antennas	4.2.2
Rolling stock characteristics compatible with train detection system based on track circuits	4.2.3.3.1.1	Compatibility with trackside train detection systems: vehicle design	4.2.10
		Electromagnetic compatibility between rolling stock and Control-Command and Signalling trackside equipment	4.2.11
Rolling stock characteristics compatible with train detection system based on axle counters	4.2.3.3.1.2	Compatibility with trackside train detection systems: vehicle design	4.2.10
		Electromagnetic compatibility between rolling stock and Control-Command and Signalling trackside equipment	4.2.11
Rolling stock characteristics compatible with loop equipment	4.2.3.3.1.3	Compatibility with trackside train detection systems: vehicle design	4.2.10
Running dynamic behaviour	4.2.3.4.2	ETCS onboard: Forwarding information/orders and receiving state information from rolling stock	4.2.2
Type of brake system	4.2.4.3		
Emergency braking command	4.2.4.4.1		
Service braking command	4.2.4.4.2		
Dynamic braking command	4.2.4.4.4		
Magnetic track brake	4.2.4.8.2		
Eddy current track brake	4.2.4.8.3		
Door opening	4.2.5.5.6		
Requirements on performance	4.2.8.1.2		
Maximum power and current from the overhead contact line	4.2.8.2.4		
Separation sections	4.2.8.2.9. 8		
Driver's desk — Ergonomics	4.2.9.1.6		
Radio Remote control function by staff for shunting operation	4.2.9.3.6		

Reference TSI LOC & PAS		Reference TSI CCS	
Parameter	Point	Parameter	Point
Requirements for management of ETCS modes	4.2.9.3.8		
Traction status	4.2.9.3.9		
Smoke control	4.2.10.4.2		
Emergency braking performance	4.2.4.5.2	Guaranteed train braking performance and characteristics	4.2.2
Service braking performance	4.2.4.5.3.		
Head lights	4.2.7.1.1	Trackside Control-Command and Signalling objects	4.2.15
External visibility	4.2.9.1.3	Visibility of track-side Control-command Signalling objects	4.2.15
Optical characteristics	4.2.9.2.2		
Recording device	4.2.9.6	Interface to data recording for regulatory purposes	4.2.14
Dynamic braking command (Regenerative brake command)	4.2.4.4.4	ETCS DMI configuration	4.2.12
Magnetic track brake (command)	4.2.4.8.2		
Eddy current track brake (command)	4.2.4.8.3		
Separation sections	4.2.8.2.9.8		
Smoke control	4.2.10.4.2		
Interface requirements with Automated Train Operation	4.2.13	On-Board ATO functionality	4.2.18
		System Requirements Specification	Specification referenced in Appendix A, Table A.2, index 84 of TSI CCS
		ATO-OB / ROLLING STOCK FFFIS	Specification referenced in Appendix A, Table A.2, index 88 of TSI CCS
		ETCS onboard: Forwarding information/orders and receiving state information from rolling stock	4.2.2

4.3.5 Interface with the telematics applications subsystem

Table 10

Interface with the telematics applications subsystem

Reference TSI LOC & PAS		Reference TSI telematics applications for passengers	
Parameter	Point	Parameter	Point
Customer information (PRM)	4.2.5	On board device display	4.2.1.3.1
Public address system	4.2.5.2	Automatic voice and announcement	4.2.1.3.2'
Customer information (PRM)	4.2.5		

- (113) in point 4.4, point (4), 'clause 4.2.12.4' is replaced by 'point 4.2.12.4';
- (114) in point 4.5, point (1), 'Section 3' is replaced by 'Chapter 3';
- (115) in point 4.5, point (2), 'section 4.2' is replaced by 'point 4.2';
- (116) in point 4.8, point (2), 'in the clause 4.2.12' is replaced by 'in point 4.2.12';
- (117) point 4.9 is replaced by the following:

'4.9. Route compatibility checks before the use of authorised vehicles

The parameters of the subsystem 'rolling stock — locomotives and passenger rolling stock' to be used by the railway undertaking, for the purpose of route compatibility check, are described in Appendix D1 of the TSI OPE.;

- (118) in point 5.1, point (3), the third indent, 'in Section 6.1' is replaced by 'in point 6.1';
- (119) in point 5.2, point (1), 'clause 6.1.5' is replaced by 'point 6.1.5';
- (120) in point 5.3.1, point (1), 'index 66' is replaced by 'index [36]' and the text of the note is replaced by the following:

'Note: types of automatic couplers other than type 10 are not considered as an IC (specification not publicly available).';

- (121) in point 5.3.2, point (1), all references to 'index 67' are replaced by 'index [37]' and all references to 'index 68' are replaced by 'index [38]';
- (122) in point 5.3.3, point (1), 'index 69' is replaced by 'index [39].';
- (123) in point 5.3.4, point (4), 'clause 4.2.3.5.2.2.' is replaced by 'point 4.2.3.5.2.2.';
- (124) in point 5.3.4a, point (2) is replaced by the following:
- 'An automatic variable gauge system shall comply with the requirements set out in point 4.2.3.5.3; these requirements shall be assessed at IC level as set out in point 6.1.3.1a.';
- (125) points 5.3.6 to 5.3.15 are replaced by the following:

'5.3.6. Head lamps

- (1) A head lamp shall be designed and assessed without any limitation concerning its area of use.
- (2) A head lamp shall comply with requirements concerning the colour and the luminous intensity defined in point 4.2.7.1.1. These requirements shall be assessed at IC level.

5.3.7. Marker lamps

- (1) A marker lamp shall be designed and assessed without any limitation concerning its area of use.
- (2) A marker lamp shall comply with requirements concerning the colour and the luminous intensity defined in point 4.2.7.1.2. These requirements shall be assessed at IC level.

5.3.8. Tail lamps

- (1) A tail lamp shall be designed and assessed for an area of use: fixed lamp or portable lamp.
- (2) A tail lamp shall comply with the requirements concerning the colour and the luminous intensity defined in point 4.2.7.1.3. These requirements shall be assessed at IC level.
- (3) For portable tail lamps, the interface for attachment on the vehicle shall be in accordance with the Appendix E of the TSI WAG.

5.3.9. Horns

- (1) A horn shall be designed and assessed for an area of use defined by its sound pressure level on a reference vehicle (or reference integration); this characteristic may be affected by the integration of the horn in a particular vehicle.
- (2) A horn shall comply with the requirements concerning the soundings of signals defined in point 4.2.7.2.1. These requirements shall be assessed at IC level.

5.3.10. Pantograph

A pantograph shall be designed and assessed for an area of use defined by:

- (1) The type of voltage system(s), as defined in point 4.2.8.2.1.
In case it is designed for different voltage systems, the various sets of requirements shall be taken into account.
- (2) One of the 3 pantograph head geometries specified in point 4.2.8.2.9.2.
- (3) The current capacity, as defined in point 4.2.8.2.4.
- (4) The maximum current at standstill for AC and DC systems as defined in point 4.2.8.2.5. For DC 1,5 kV supply systems, the material of the contact wire shall be considered.
- (5) The maximum operating speed: assessment of the maximum operating speed shall be performed as defined in point 4.2.8.2.9.6.
- (6) Range of height for dynamic behaviour: standard, and/or for 1 520 mm or 1 524 mm track gauge systems.
- (7) The requirements listed above shall be assessed at IC level.
- (8) The working range in height of pantograph specified in point 4.2.8.2.9.1.2, the pantograph head geometry specified in point 4.2.8.2.9.2, the pantograph current capacity specified in point 4.2.8.2.9.3, the pantograph static contact force specified in point 4.2.8.2.9.5 and the dynamic behaviour of the pantograph itself specified in point 4.2.8.2.9.6 shall also be assessed at IC level.

5.3.11. Contact strips

The contact strips are the replaceable parts of the pantograph head which are in contact with the contact wire. Contact strips shall be designed and assessed for an area of use defined by:

- (1) Their geometry, as defined in point 4.2.8.2.9.4.1.
- (2) The material of the contact strips, as defined in point 4.2.8.2.9.4.2.
- (3) The type of voltage system(s), as defined in point 4.2.8.2.1.
- (4) The current capacity, as defined in point 4.2.8.2.4.
- (5) The maximum current at standstill, as defined in point 4.2.8.2.5.
- (6) The requirements listed above shall be assessed at IC level.

5.3.12. Main circuit breaker

A main circuit breaker shall be designed and assessed for an area of use defined by:

- (1) The type of voltage system(s), as defined in point 4.2.8.2.1.
- (2) The current capacity, as defined in point 4.2.8.2.4 (maximum current).

- (3) The requirements listed above shall be assessed at IC level.
- (4) The tripping shall be as specified in the specification referenced in Appendix J-1, index [22] (see point 4.2.8.2.10); it shall be assessed at the IC level.

5.3.13. Driver's seat

- (1) A driver's seat shall be designed and assessed for an area of use defined by the range of possible adjustments in height and longitudinal position.
- (2) A driver's seat shall comply to the requirements specified at component level in the point 4.2.9.1.5. These requirements shall be assessed at IC level.

5.3.14. Toilet discharge connection

- (1) A toilet discharge connection shall be designed and assessed without any limitation concerning its area of use.
- (2) A toilet discharge connection shall comply with requirements concerning the dimensions as defined in point 4.2.11.3. These requirements shall be assessed at IC level.

5.3.15. Inlet connection for water tanks

- (1) An inlet connection for water tanks shall be designed and assessed without any limitation concerning its area of use.
- (2) An inlet connection for water tanks shall comply with requirements concerning the dimensions as defined in point 4.2.11.5. These requirements shall be assessed at IC level.;

(126) in point 6.1.1, point (3), the first paragraph is replaced by the following:

'In case of a specific case applicable to a component defined as interoperability constituent in section 5.3, the corresponding requirement can be part of the verification at interoperability constituent level only in the case where the component remains compliant to the chapters 4 and 5 , and where the specific case does not refer to a national rule.;

(127) point 6.1.2 is replaced as follows:

'6.1.2. Application of modules

Modules for EC certification of conformity of interoperability constituents:

Module CA	Internal production control
Module CA1	Internal production control plus product verification by individual examination
Module CA2	Internal production control plus product verification at random intervals
Module CB	EC-Type examination
Module CC	Conformity to type based on internal production control
Module CD	Conformity to type based on quality management system of the production process
Module CF	Conformity to type based on product verification
Module CH	Conformity based on full quality management system
Module CH1	Conformity based on full quality management system plus design examination
Module CV	Type validation by in service experience (Suitability for use)

- (1) The manufacturer or his authorised representative established within the European Union shall choose one of the modules or module combinations indicated in the following table for the constituent to be assessed:

TSI point	Constituents to be assessed	Module						
		CA	CA1 or CA2	CB + CC	CB + CD	CB + CF	CH	CH1
5.3.1	Automatic centre buffer coupler		X ⁽¹⁾		X	X	X ⁽¹⁾	X
5.3.2	Manual end coupling		X ⁽¹⁾		X	X	X ⁽¹⁾	X
5.3.3	Towing coupler for rescue		X ⁽¹⁾		X	X	X ⁽¹⁾	X
5.3.4	Wheel		X ⁽¹⁾		X	X	X ⁽¹⁾	X
5.3.4a	Automatic variable gauge systems		X ⁽¹⁾		X	X	X ⁽¹⁾	X
5.3.5	Wheel slide protection system		X ⁽¹⁾		X	X	X ⁽¹⁾	X
5.3.6	Head lamp		X ⁽¹⁾	X	X		X ⁽¹⁾	X
5.3.7	Marker lamp		X ⁽¹⁾	X	X		X ⁽¹⁾	X
5.3.8	Tail lamp		X ⁽¹⁾	X	X		X ⁽¹⁾	X
5.3.9	Horns		X ⁽¹⁾	X	X		X ⁽¹⁾	X
5.3.10	Pantograph		X ⁽¹⁾		X	X	X ⁽¹⁾	X
5.3.11	Pantograph contact strips		X ⁽¹⁾		X	X	X ⁽¹⁾	X
5.3.12	Main circuit breaker		X ⁽¹⁾		X	X	X ⁽¹⁾	X
5.3.13	Driver's seat		X ⁽¹⁾		X	X	X ⁽¹⁾	X
5.3.14	Toilet discharge connection	X		X			X	
5.3.15	Inlet connection for water tanks	X		X			X	

⁽¹⁾ Modules CA1, CA2 or CH may be used only in the case of products manufactured according to a design developed and already used to place products on the market before the entry into force of relevant TSIs applicable to those products, provided that the manufacturer demonstrates to the notified body that design review and type examination were performed for previous applications under comparable conditions, and are in conformity with the requirements of this TSI; this demonstration shall be documented, and is considered as providing the same level of proof as module CB or design examination according to module CH1.

- (2) Where a particular procedure shall be used for the assessment, in addition to the requirements expressed in the point 4.2, this is specified in the point 6.1.3 below.;

(128) point 6.1.3 is replaced by the following:

‘6.1.3. Particular assessment procedures for interoperability constituents

6.1.3.1. Wheels (point 5.3.4)

- (1) The mechanical characteristics of the wheel shall be proven by mechanical strength calculations, taking into account three load cases: straight track (centred wheelset), curve (flange pressed against the rail), and negotiating of points and crossings (inside surface of flange applied to the rail), as specified in the specification referenced in Appendix J-1, index [40].
- (2) For forged and rolled wheels, the decision criteria are defined in the specification referenced in Appendix J-1, index [40]; where the calculation show values beyond the decision criteria, a bench test according to the same specification is required to be performed to demonstrate compliance.
- (3) Other types of wheels are permitted for vehicles restricted to national use. In that case the decision criteria and the fatigue stress criteria shall be specified in national rules. Those national rules shall be notified by Member States.
- (4) The assumption of the load conditions for the maximum vertical static force shall be explicitly stated in the technical documentation as set out in point 4.2.12.

Thermo-mechanical behaviour:

- (5) If the wheel is used to brake a unit with wheel tread brakes, the wheel shall be thermo-mechanically proven by taking into account the maximum braking energy foreseen. The wheel shall be subject to a conformity assessment in accordance with the specification referenced in Appendix J-1, index [40], in order to check that the lateral displacement of the rim during braking and the residual stress are within tolerance limits specified utilising the decision criteria specified.

Verification of the wheels:

- (6) A verification procedure shall exist to ensure at the production phase that no defects may detrimentally affect safety due to any change in the mechanical characteristics of the wheels.
The tensile strength of the material in the wheel, the hardness of the running surface, the fracture toughness, the resistance to impact, the material characteristics and the material cleanliness shall be verified.
The verification procedure shall specify the batch sampling used for each characteristic to be verified.
- (7) Other conformity assessment method for wheels is allowed under the same conditions as for wheelsets; these conditions are described in point 6.2.3.7.
- (8) In case of innovative design for which the manufacturer has no sufficient return of experience, the wheel should be subject to an assessment of suitability for use (module CV; see also point 6.1.6).;

(129) point 6.1.3.1a is replaced by the following:

‘6.1.3.1a. Automatic variable gauge system (point 5.3.4a)

- (1) The assessment procedure shall be based on a validation plan covering all aspects mentioned in points 4.2.3.5.3 and 5.3.4a.
- (2) The validation plan shall be consistent with the safety analysis required in point 4.2.3.5.3 and shall define the assessment needed in all the following different phases:
 - Design review;
 - Static tests (bench tests and integration in the running gear/unit tests);
 - Test on track gauge changeover facilities, representative of in-service conditions;
 - On-track tests, representative of in-service conditions.
- (3) Regarding the demonstration of compliance to point 4.2.3.5.3 (5), the assumptions considered for the safety analysis related to the vehicle the system is intended to be integrated in, and related to the mission profile of that vehicle, shall be clearly documented.

- (4) The automatic variable gauge system may be subject to an assessment of suitability for use (module CV; see also point 6.1.6).
- (5) The certificate delivered by the Notified Body in charge of the conformity assessment shall include both the conditions for use as per point 5.3.4a (1) and the type(s) and operating conditions of the track gauge changeover facility(ies) the automatic variable gauge system has been assessed for.;

(130) points 6.1.3.2 to 6.1.3.8 are replaced by the following:

6.1.3.2. Wheel slide protection system (point 5.3.5)

- (1) The wheel slide protection system shall be verified according to the methodology defined in the specification referenced in Appendix J-1, index [15].
- (2) In case of innovative design for which the manufacturer has no sufficient return of experience, the wheel slide protection system should be subject to an assessment of suitability for use (module CV; see also point 6.1.6).

6.1.3.3. Headlamps (point 5.3.6)

- (1) The colour and luminous intensity of headlamps shall be tested in accordance with the specification referenced in Appendix J-1, index [20].

6.1.3.4. Marker lamps (point 5.3.7)

- (1) The colour and luminous intensity of marker lamps and the spectral radiation distribution of light from marker lamps shall be tested in accordance with the specification referenced in Appendix J-1, index [20].

6.1.3.5. Tail lamps (point 5.3.8)

- (1) The colour and luminous intensity of tail lamps shall be tested in accordance with the specification referenced in Appendix J-1, index [20].

6.1.3.6. Horn (point 5.3.9)

- (1) Soundings and sound pressure levels of the warning horn shall be measured and verified in accordance with the specification referenced in Appendix J-1, index [21].

6.1.3.7. Pantograph (point 5.3.10)

- (1) For pantographs for DC systems, the maximum current at standstill up to the limit values defined in 4.2.8.2.5 shall be verified in the following conditions:
 - the pantograph shall be in contact with 2 plain copper contact wires or 2 copper alloyed with silver contact wires with a cross section of 100 mm² each for a 1,5 kV supply system,
 - the pantograph shall be in contact with 1 copper contact wire with a cross section of 100 mm² for a 3 kV supply system.
- (1a) For pantographs for DC systems the temperature of the contact wire with current at standstill shall be assessed by measurements according to the specification referenced in Appendix J-1, index [24].
- (2) For all pantographs, the static contact force shall be verified in accordance with the specification referenced in Appendix J-1, index [23].
- (3) The dynamic behaviour of the pantograph regarding current collection shall be assessed by simulation according to the specification referenced in Appendix J-1, index [41].

The simulations shall be made using at least two different types of overhead contact line; data for simulation shall correspond to sections of lines recorded as TSI compliant in the register of infrastructure (EC declaration of conformity, or declaration according to Commission Recommendation 2014/881/EU (*)) for the appropriate speed and supply system, up to the maximum design speed of the proposed Interoperability Constituent pantograph.

It is permitted to perform the simulation using types of overhead contact line that are under the process of IC certification or declaration according to Recommendation 2011/622/EU (**), provided that they fulfil the other requirements of TSI ENE. The simulated current collection quality shall be in accordance with point 4.2.8.2.9.6 for uplift, mean contact force and standard deviation for each of the overhead contact lines.

If the simulation results are acceptable, a site dynamic test shall be made using a representative section of one of the two types of overhead contact line used in the simulation.

The interaction characteristics shall be measured in accordance with the specification referenced in Appendix J-1, index [42]. Regarding the uplift measurement the uplift of at least two steady arms shall be measured.

The tested pantograph shall be mounted on a rolling stock producing a mean contact force within the upper and lower limits as required by point 4.2.8.2.9.6 up to the design speed of the pantograph. The tests shall be conducted in both directions of travel.

For pantographs intended to be operated on the 1 435 mm and 1 668 mm track gauge systems, the tests shall include track sections with low contact wire height (defined as between 5,0 to 5,3 m) and track sections with high contact wire height (defined as between 5,5 to 5,75 m).

For pantographs intended to be operated on the 1 520 mm and 1 524 mm track gauge systems, the tests shall include track sections with contact wire height between 6,0 to 6,3 m.

The tests shall be performed for a minimum of 3 speed increments up to and including the design speed of the tested pantograph.

The interval between successive tests shall be no greater than 50 km/h.

The measured current collection quality shall be in accordance with point 4.2.8.2.9.6 for uplift, and either mean contact force and standard deviation or percentage of arcing.

If all the assessments above are passed successfully, the tested pantograph design shall be considered as compliant to the TSI regarding quality of current collection.

For the use of a pantograph holding an EC declaration of verification on various designs of rolling stock, additional tests required at rolling stock level regarding quality of current collection are specified in point 6.2.3.20.

6.1.3.8. **Contact strips (point 5.3.11)**

- (1) Contact strips shall be verified as specified in the specification referenced in Appendix J-1, index [43].
- (2) Contact strips, being replaceable parts of the pantograph head, shall be verified once at the same time as a pantograph (see point 6.1.3.7) regarding the quality of current collection.
- (3) In case of use of a material for which the manufacturer has no sufficient return of experience, the contact strip should be subject to an assessment of suitability for use (module CV; see also point 6.1.6).

(*) Commission Recommendation 2014/881/EU of 18 November 2014 on the procedure 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).

(**) Commission Recommendation 2011/622/EU of 20 September 2011 on the procedure demonstrating the level of compliance of existing railway lines with the basic parameters of the technical specifications for interoperability (OJ L 243, 21.9.2011, p. 23).;

(131) point 6.1.4 is replaced by the following:

‘6.1.4. Project phases where assessment is required

(1) It is detailed in Appendix H in which phases of the project an assessment shall be done for the requirements applicable to the interoperability constituents:

(a) design and development phase:

(i) design review and/or design examination.

(ii) type test: test to verify the design, if and as defined in the Point 4.2;

(b) production phase: routine test to verify the conformity of production.

The entity in charge of the assessment of the routine tests is determined according to the assessment module chosen.

(2) Appendix H is structured according to point 4.2; the requirements and their assessment applicable to the interoperability constituents are identified in point 5.3 by reference to certain points of section 4.2; where relevant, a reference to a sub-point of point 6.1.3 above is also given.’;

(132) point 6.1.6 is replaced by the following:

‘6.1.6. Assessment of suitability for use

(1) Assessment of suitability for use according to the type validation of in service experience procedure (module CV) may be part of the assessment procedure for the following interoperability constituents:

— wheels (see point 6.1.3.1);

— automatic variable gauge system (see point 6.1.3.1a);

— wheel slide protection system (see point 6.1.3.2);

— contact strips (see point 6.1.3.8);

(2) Prior to commencing in service tests, a suitable module (CB or CH1) shall be used to certify the design of the constituent;

(3) The in service tests shall be organised on proposal from the manufacturer, who has to obtain an agreement with a railway undertaking for its contribution to such assessment.’;

(133) in point 6.2.2 point (4), ‘the clause 4.2’ is replaced by ‘point 4.2’;

(134) point 6.2.3.1 is replaced by the following:

‘6.2.3.1. Load conditions and weighed mass (point 4.2.2.10)

(1) Weighed mass shall be measured, for a load condition corresponding to ‘design mass in working order’ with the exception of consumables for which there is no imposition (for example ‘dead mass’ is acceptable).

(2) It is permissible to derive the other load conditions by calculation.

(3) Where a vehicle is declared as conformant to a type (in accordance with points 6.2.2 and 7.1.3):

— the weighed total vehicle mass in the load condition ‘design mass in working order’ shall not exceed by more than 3 % the declared total vehicle mass for that type which is reported in the type or design examination certificate of ‘EC’ verification and in the technical documentation described in point 4.2.12.

— additionally, for unit of maximum design speed higher than or equal to 250 km/h the mass per axle for the load conditions ‘design mass under normal payload’ and ‘operational mass under normal payload’ shall not exceed by more than 4 % the declared mass per axle for the same load condition.’;

(135) in point 6.2.3.3, point (1), ‘index 83’ is replaced by ‘index [9]’;

(136) point 6.2.3.4 is replaced by the following:

‘6.2.3.4. Running dynamic behaviour – technical requirements (Point 4.2.3.4.2a)

- (1) For units designed to be operated on 1 435 mm or 1 524 mm or 1 668 mm system, the demonstration of conformity shall be carried out in accordance with the specification referenced in Appendix J-1, index [9].

The parameters described in points 4.2.3.4.2.1 and 4.2.3.4.2.2 shall be assessed using criteria defined in the specification referenced in Appendix J-1, index [9].’;

(137) point 6.2.3.5 is replaced by the following:

‘6.2.3.5. Conformity assessment for safety requirements

The demonstration of compliance with the safety requirements expressed in the point 4.2 shall be performed as follows:

- (1) The scope of this assessment shall be strictly limited to the rolling stock design, considering that operation, test and maintenance are performed according to the rules defined by the applicant (as described in the technical file).

Notes:

- When defining the test and maintenance requirements, the safety level to be met has to be taken into account by the applicant (consistency); the demonstration of compliance covers also test and maintenance requirements.

- Other sub-systems and human factors (errors) shall not be considered.

- (2) All assumptions considered for the mission profile shall be clearly documented in the demonstration

- (3) The compliance with the safety requirements that are specified in points 4.2.3.4.2, 4.2.3.5.3, 4.2.4.2.2, 4.2.5.3.5, 4.2.5.5.8 and 4.2.5.5.9 in terms of level of severity/consequences associated to hazardous failure scenarios shall be demonstrated by one of the two following methods:

1. Application of a harmonised risk acceptance criterion associated to the severity specified in point 4.2 (e.g. “fatalities” for emergency braking.).

The applicant may choose to use this method, provided that there is an available harmonized risk acceptance criterion defined in the CSM on Risk Assessment.

The applicant shall demonstrate compliance with the harmonised criterion by applying Annex I-3 of the CSM on RA. The following principles (and their combinations) may be used for the demonstration: similarity with reference system(s); application of codes of practice; application of explicit risk estimation (e.g. probabilistic approach).

The applicant shall designate the body for the assessment of the demonstration he will provide: the notified body selected for the rolling stock subsystem or an assessment body as defined in the CSM on RA.

The demonstration shall be recognized in all Member States; or

2. Application of a risk evaluation and assessment in accordance with the CSM on RA, in order to define the risk acceptance criterion to be used, and demonstrate compliance to this criterion.

The applicant may choose to use this method in any case.

The applicant shall designate the assessment body for the assessment of the demonstration he will provide, as defined in the CSM on RA.

A safety assessment report shall be provided in compliance with the requirements defined in the CSM on RA and its amendments.

The safety assessment report shall be taken into account by the Authorising Entity, in accordance with point 2.5.6 of Annex I and Article 15(2) of the CSM on RA.

- (4) For each TSI point listed in point (3) above, the relevant documents accompanying the EC declaration of verification (e.g. EC certificate issued by the notified body or safety assessment report) shall explicitly mention the “used method” (“1” or “2”); in case of method “2”, they shall also mention the “used risk acceptance criterion”.’;

(138) point 6.2.3.6 is amended as follows:

(a) point (1) is amended as follows:

- (i) in the first subparagraph, '(Dimension SR in Figure 1 , § 4.2.3.5.2.1)' is replaced by '(Dimension SR in Figure 1, point 4.2.3.5.2.1)';
- (ii) in the second subparagraph, 'index 107' is replaced by 'index [9]';
- (iii) in Table 12, 'index 85' is replaced by 'index [44]';
- (iv) in the third subparagraph, 'index 86' is replaced by 'index [45]';

(b) point (2) is amended as follows:

- (i) in Table 14, 'index 85' is replaced by 'index [44]';
- (ii) in the second subparagraph, 'index 86' is replaced by 'index [45]';

(c) point (3) is amended as follows:

- (i) in Table 14, 'index 85' is replaced by 'index [44]';
- (ii) in the second subparagraph, 'index 86' is replaced by 'index [45]';

(139) point 6.2.3.7 is amended as follows:

(a) in point (1) 'index 87' is replaced by 'index [46]';

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

'(2) The demonstration of compliance for mechanical resistance and fatigue characteristics of the axle shall be in accordance with the specification referenced in Appendix J-1, index [47].

The decision criteria for the permissible stress is specified in the specification referenced in Appendix J-1, index [47].';

(c) in point (6), 'index 90' is replaced by 'index [48]';

(140) point 6.2.3.8 is amended as follows:

(a) in point (1) 'index 91' is replaced by 'index [66]';

(b) in point (3), the first paragraph is replaced by the following:

'(3) Tests shall be carried out for the load conditions of the unit 'design mass in working order', 'design mass under normal payload', and 'maximum braking load' (as defined in points 4.2.2.10 and 4.2.4.5.2).';

(141) point 6.2.3.9 is replaced:

'6.2.3.9. Service braking (point 4.2.4.5.3)

- (1) The maximum service braking performance which is subject to a test is the stopping distance as defined in the specification referenced in Appendix J-1, index [66]. The deceleration is evaluated from the stopping distance.
- (2) Tests shall be carried out on dry rail at the initial speed equal to the maximum design speed of the unit, the load condition of the unit being one of those defined in the point 4.2.4.5.2.
- (3) Test results shall be evaluated by a methodology that takes into account the following aspects:
 - correction of the raw data,
 - repeatability of the test: in order to validate a test result, the test is repeated several times; the absolute difference between results and the standard deviation are evaluated.;

(142) in point 6.2.3.10, point (1) 'index 93' is replaced by 'index [15]';

(143) point 6.2.3.13 is replaced by the following:

‘6.2.3.13. Slipstream effects on passengers on platform and on workers trackside (point 4.2.6.2.1)

- (1) Demonstration of conformity with the limit value of trackside maximum permissible air speed set out in point 4.2.6.2.1 shall be demonstrated on the basis of full-scale tests on straight track performed in accordance with the specification referenced in Appendix J-1, index [49].
- (2) Instead of the full assessment described above, it is permitted to carry out a simplified assessment for rolling stock of a similar design to rolling stock for which the full assessment defined in this TSI has been carried out. In such cases, the simplified conformity assessment defined in the specification referenced in Appendix J-1, index [49], can be applied as long as the differences in the design remain within the limits defined in the same specification.’;

(144) point 6.2.3.14 is replaced by the following:

‘6.2.3.14. Head pressure pulse (point 4.2.6.2.2)

- (1) Conformity shall be assessed on the basis of full-scale tests under conditions specified in the specification referenced in Appendix J-1, index [49]. Alternatively conformity may be assessed by means of either validated Computational Fluid Dynamics (CFD) simulations or by moving model tests as specified in the same specification.
- (2) Instead of the full assessment described above, it is permitted to carry out a simplified assessment for rolling stock of a similar design to rolling stock for which the full assessment defined in this TSI has been carried out. In such cases, the simplified conformity assessment defined in the specification referenced in Appendix J-1, index [49], can be applied as long as the differences in the design remain within the limits defined in the same specification.’;

(145) point 6.2.3.15 is replaced by the following:

‘6.2.3.15. Maximum pressure variations in tunnels (point 4.2.6.2.3)

The conformity assessment procedure is described in specification referenced to in Appendix J-1, Index [50].’;

(146) points 6.2.3.16 to 6.2.3.19 are replaced by the following:

‘6.2.3.16. Crosswind (point 4.2.6.2.4)

- (1) Conformity assessment is fully specified in point 4.2.6.2.4

6.2.3.17. Warning Horn sound pressure levels (point 4.2.7.2.2)

- (1) Sound pressure levels of the warning horn shall be measured and verified in accordance with the specification referenced in Appendix J-1, index [21].

6.2.3.18. Maximum power and current from the overhead contact line (point 4.2.8.2.4)

- (1) Conformity assessment shall be carried out in accordance with the specification referenced in Appendix J-1, index [22].

6.2.3.19. Power factor (point 4.2.8.2.6)

- (1) Conformity assessment shall be carried out according to the specification referenced in Appendix J-1, index [22].’;

(147) point 6.2.3.19a is replaced by the following:

‘6.2.3.19a. On-board energy measurement system (point 4.2.8.2.8)

- (1) Energy Measurement Function (“EMF”)

The accuracy of each device containing one or more functions of EMF shall be assessed by testing each function, under reference conditions, using the relevant method as described in the specification referenced in Appendix J-1, index [56]. The input quantity and power factor range when testing shall correspond to the values set out in the same specification.

The effects of temperature on accuracy of each device containing one or more functions of EMF shall be assessed by testing each function, under reference conditions (except for temperature), using the relevant method as described in the specification referenced in Appendix J-1, index [56].

The mean temperature coefficient of each device containing one or more functions of EMF shall be assessed by testing each function, under reference conditions (except for temperature), using the relevant method as described in the specification referenced in Appendix J-1, index [56].

In cases where point 4.2.8.2.8.2 (6) applies, the conformity of the existing components to that point may be assessed according to another standard than the specification referenced in Appendix J-1, index [56] or according to a previous version of that specification.

(2) Data Handling System (“DHS”)

The compiling and handling of data within the DHS shall be assessed by testing using the method as described in the specification referenced in Appendix J-1, index [55].

(3) On-board Energy Measurement System (“EMS”)

The EMS shall be assessed by testing as described in the specification referenced in the specification referenced in Appendix J-1, index [59].;

(148) point 6.2.3.20 is replaced by the following:

‘6.2.3.20. Current collection dynamic behaviour (point 4.2.8.2.9.6)

(1) When pantographs, holding an EC declaration of conformity or suitability for use as IC, are integrated in a rolling stock unit which is assessed according to point 4.2.8.2.9.6, dynamic tests shall be carried out in order to measure the uplift, and either mean contact force and standard deviation or the percentage of arcing, in accordance with the specification referenced in Appendix J-1, index [42] up to the design speed for the unit.

(2) For a unit designed to be operated on the 1 435 mm and 1 668 mm track gauge systems, the tests, for each installed pantograph, shall be conducted in both directions of travel and shall include track sections with low contact wire height (defined as between 5,0 to 5,3 m) and track sections with high contact wire height (defined as between 5,5 to 5,75 m).

For units designed to be operated on the 1 520 mm and 1 524 mm track gauge systems, the tests shall include track sections with contact wire height between 6,0 to 6,3 m.

(3) The tests shall be performed for a minimum of 3 speed increments up to and including the maximum design speed of the unit. The interval between successive tests shall be no greater than 50 km/h.

(4) During the test, the static contact force shall be adjusted for each particular power supply system within the range as specified in point 4.2.8.2.9.5.

(5) The measured results shall be in accordance with point 4.2.8.2.9.6 for uplift and either mean contact force and standard deviation or percentage of arcing. Regarding the uplift measurement, the uplift of at least two steady arms shall be measured.’;

(149) point 6.2.3.21 is replaced by following:

‘6.2.3.21. Arrangement of pantographs (point 4.2.8.2.9.7)

(1) The characteristics related to the dynamic behaviour of the current collection shall be verified as specified in point 6.2.3.20 above.

(2) Tests are required for the poorest performing pantographs regarding maximum uplift and regarding maximum standard deviation or arcing. The arrangements containing poorest performing pantographs shall be identified by simulation or measurement referenced in Appendix J-1, indexes [41] and [42].’;

(150) in point 6.2.3.22, point (1), 'index 101' is replaced by 'index [28]';

(151) in point 6.2.3.23, point (1), 'requirement 4.2.10.3.2(1)' is replaced by 'point 4.2.10.3.2(1)';

(152) in point 6.2.4, point (2), 'Section 4.2' is replaced by 'point 4.2';

(153) point 6.2.5 is replaced by the following:

'6.2.5. Innovative solutions

(1) If an innovative solution (as defined in Article 10), is proposed for the rolling stock subsystem, the applicant shall apply the procedure described in article 10';

(154) point 6.2.6 is replaced by the following:

'6.2.6. Assessment of documentation requested for operation and maintenance

Pursuant to Article 15(4) of Directive (EU) 2016/797, the applicant is responsible for compiling the technical file, containing the documentation requested for operation and maintenance.';

(155) point 6.2.7 is replaced by the following:

'6.2.7. Assessment of units intended to be used in general operation

(1) Where a new, upgraded or renewed unit to be used in general operation is subject to assessment against this TSI (in accordance with point 4.1.2), some of the TSI requirements require a reference train for their assessment. This is mentioned in the relevant provisions of point 4.2. Similarly, some of the TSI requirements at train level cannot be assessed at unit level; such cases are described for the relevant requirements in Point 4.2.

(2) The area of use in terms of rolling stock type which, coupled with the unit to be assessed, ensures that the train is compliant with the TSI is not verified by the Notified Body.

(3) After such a unit has received the authorisation to be placed in service, its use in a train formation (whether TSI compliant or not) shall be dealt with under the responsibility of the Railway Undertaking, according to the rules defined in point 4.2.2.5 of the TSI OPE (train composition).';

(156) point 6.2.7a is deleted;

(157) point 6.2.8 is replaced by the following:

'6.2.8. Assessment of units intended to be used in predefined formation(s)

(1) Where a new, upgraded or renewed unit to be included in predefined formation(s) is subject to assessment (in accordance with point 4.1.2), the EC certificate of verification shall identify the formation(s) for which the assessment is valid: the rolling stock type coupled with the unit to be assessed, number of vehicles in the formation(s), arrangement of the vehicles in the formation(s) that will ensure that the train formation will be compliant with this TSI.

(2) TSI requirements at train level shall be assessed with use of a reference train formation when and as specified in this TSI.

(3) After such a unit has received the authorisation to be placed in service, it may be coupled with other units to constitute the formations mentioned in the EC certificate of verification.';

(158) in point 6.2.9.2, point (1), '(see also clause 7.1.2.2)' is replaced by '(see also point 7.1.2.2).';

(159) the following points 6.2.10 and 6.2.11 are inserted:

'6.2.10. EC verification when ETCS is installed on-board a rolling stock/rolling stock type

(1) This case applies when ETCS on-board is installed into:

- newly developed vehicle designs requiring a first authorisation as defined in Article 14 of Commission Implementing Regulation 2018/545 (*),
- all other vehicle types and rolling stock in operation.

Compliance of the rolling stock with train interface functions requirements of each basic parameter that refers to Appendix A, Table A.2, index 7 of TSI CCS (see column 1 and 2 of Table 9) can be assessed only when ETCS is installed.

- (2) The assessment of the interface functions for installation of ETCS in the vehicle is part of the EC verification for the CCS on-board subsystem in accordance with point 6.3.3 of TSI CCS.

Note: Other requirements defined in this TSI applicable to Rolling stock are part of EC verification for the rolling stock subsystem.

6.2.11. **EC verification for rolling stock/rolling stock type when ATO on-board is installed**

- (1) This point applies to units equipped with ETCS on-board and intended to be fitted with Automated Train Operation on-board up to Grade of Automation 2.
- (2) The compliance of the rolling stock with interface requirements specified in Appendix A, Table A.2, indexes 84 and 88 of TSI CCS can be assessed only when ATO is installed.
- (3) The assessment of the interface requirements for integration of the ATO on-board in the vehicle is part of the EC verification for the CCS on-board subsystem in accordance with point 6.3.3 of TSI CCS.

(*) Commission Implementing Regulation (EU) 2018/545 of 4 April 2018 establishing practical arrangements for the railway vehicle authorisation and railway vehicle type authorisation process pursuant to Directive (EU) 2016/797 of the European Parliament and of the Council (OJ L 90, 6.4.2018, p. 66).;

(160) point 6.3 is replaced by the following:

‘6.3 Maintenance of subsystems containing Interoperability constituents not holding an EC declaration

- (1) For subsystems holding an EC certificate of verification and incorporating interoperability constituents not covered by an EC declaration of conformity or suitability for use, interoperability constituents which do not hold an EC declaration of conformity or suitability for use and of the same type are permitted to be used as components for maintenance related replacements (spare parts) for the subsystem, under the responsibility of the ECM.
- (2) In any case the ECM 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.
- (3) Points (1) and (2) above are applicable until the components in question are part of an upgrade or renewal of the subsystem according to point 7.1.2.’;

(161) point 7.1 is replaced by the following:

‘7.1. General rules for implementation

7.1.1. General

7.1.1.1. Application to newly built rolling stock

- (1) This TSI is applicable to all units of rolling stock in its scope which are placed on the market after the date of application set out in Article 12, except where point 7.1.1.2 ‘Application to ongoing projects’ or point 7.1.1.3 ‘Application to special vehicles, such as on-track machines’ below apply.
- (2) Compliance with this Annex in its version applicable before 28 September 2023 is deemed equivalent to compliance with this TSI, except for changes listed in Appendix L.

7.1.1.2. **Application to ongoing projects**

- (1) The application of the version of this TSI applicable from 28 September 2023 is not mandatory for projects that, on that date, are in phase A or phase B as defined in point 7.1.3.1 of the 'previous TSI' (i.e. this Regulation, as amended by Commission Implementing Regulation (EU) 2020/387 (*)).
- (2) Without prejudice to Appendix L, Table L.2, the application of the requirements of Chapters 4, 5, and 6 to projects referred in point (1) is possible on a voluntary basis.
- (3) If the applicant chooses not to apply this TSI version to an ongoing project, the version of this TSI applicable at the beginning of phase A as referred to in point (1) remains applicable.

7.1.1.3. **Application to special vehicles**

- (1) The application of this TSI and TSI NOI to special vehicles in running mode (as defined in points 2.2 and 2.3) is mandatory if the area of use covers more than one Member State.
- (2) The application of this TSI and TSI NOI to special vehicles in running mode other than the ones referred in to point (1) is not mandatory.
 - (a) If national rules different to this TSI or TSI NOI do not exist, the applicant shall use the conformity assessment process as described in the point 6.2.1 to establish an EC declaration of verification against this TSI; this EC declaration of verification shall be recognised as such by Member States.
 - (b) In case national rules different to this TSI or TSI NOI exist and the applicant chooses not to apply the respective TSIs as regards the relevant basic parameters of these TSIs, the special vehicle may be authorised in accordance with Article 21 of Directive (EU) 2016/797 against national rules as regards the selected basic parameters.
- (3) When applying point 2 (b), the assessment of the driver's cab interior noise level (see point 4.2.4 of the TSI NOI) is mandatory for all special vehicles.

7.1.1.4. **Transitional measure for fire safety requirement**

During a transitional period ending on 1st January 2026, it is permitted, as an alternative to material requirements specified in point 4.2.10.2.1, to apply the verification of conformity to the material fire safety requirements using the appropriate operation category from EN 45545-2:2013+A1:2015.

7.1.1.5. **Conditions for having a vehicle type authorisation and/or an authorisation for placing on the market of passenger coaches not limited to a particular area of use.**

- (1) This point applies to passenger coaches and other related cars as defined in point 2.2.2(A)(3), excluding those equipped with a driving cab.
- (2) The conditions for having a vehicle type authorisation and/or an authorisation for placing on the market not limited to a particular area of use are specified in points 7.1.1.5.1 and 7.1.1.5.2 as additional requirements to be covered in the EC verification of the subsystem rolling stock. These conditions shall be seen as complementary to the requirements of this TSI, the TSI PRM and the TSI NOI and shall be fulfilled in their entirety.
- (3) The compliance with the set of conditions specified in point 7.1.1.5.1 is mandatory. It lists the conditions applicable to coaches intended to be used in predefined formation.
- (4) The compliance with the set of conditions specified in point 7.1.1.5.2 is optional. That point lists additional conditions that are applicable to coaches intended to be used in general operation.

7.1.1.5.1. Conditions applicable to coaches intended to be used in predefined formations

- (1) The vehicle shall correspond to a unit (as defined in this TSI) composed of a rolling stock subsystem only without CCS on-board installed.
- (2) The unit is without traction.
- (3) The unit shall be designed for operation on at least one of the following track gauges:
 - (a) 1 435 mm,
 - (b) 1 668 mm.
- (4) The unit shall be equipped with forged and rolled wheels assessed in accordance with point 6.1.3.1.
- (5) The unit shall be equipped with wheels having minimum wheel diameter above 760 mm.
- (6) The unit shall be compatible with following rail inclination: 1/20, 1/30 and 1/40. Non compatibility with one or several rail inclinations shall exclude the concerned network(s) of the area of use.
- (7) The unit shall be declared as compliant with one of the following reference profiles: G1, GA, GB, GC or DE3 including those used for the lower part GI1, GI2 or GI3.
- (8) The maximum speed of the unit shall be lower than 250 km/h.
- (9) Units of category B referred to in point 4.1.4 shall be equipped with full cross section partitions in accordance with point 4.2.10.3.4 (3), except sleeping coaches which shall be equipped with other Fire Containment and Control Systems (FCCS) in accordance with point 4.2.10.3.4 (4).
- (10) If the unit is equipped with flange lubricators, it shall be possible to activate/deactivate them in accordance with the specification referenced in Appendix J-2 index [A].
- (11) If the unit is equipped with eddy current track brake, it shall be possible to activate/deactivate them in accordance with the specification referenced in Appendix J-2 index [A].
- (12) If the unit is equipped with magnetic track brake, it shall be possible to activate/deactivate them in accordance with the specification referenced in Appendix J-2 index [A].
- (13) Units fitted with an EN-UIC brake system shall be tested in accordance with the specification referenced in Appendix J-1 index [71].
- (14) If the unit is intended to operate in mixed traffic in tunnels, higher aerodynamic loads shall be considered in accordance with the specification referenced in Appendix J-1 index [50].
- (15) The unit shall be compliant with the specification referenced in Appendix J-2 index [A].
- (16) The following unit characteristics shall be recorded in the technical documentation described in point 4.2.12.2 (26):
 - (a) Applicable “single pole” power supply line voltages in accordance with point 4.2.11.6 (2),
 - (b) Maximum “single pole” power supply line current consumption of the unit at standstill (A) for each applicable “single pole” power supply line voltages,
 - (c) For each band of the frequency management defined in the specification referenced in Appendix J-2 index [A] and in the specific cases or technical documents referred to in Article 13 of TSI CCS when they are available. Pending the notification of specific cases referred to in Article 13 of CCS TSI, the notified national rules remain applicable:
 - (i) Maximum interference current (A), and applicable summation rule,

- (ii) Maximum magnetic field ($dB_{\mu A/m}$) both radiated field and field due to the return current, and applicable summation rule,
 - (iii) Minimum vehicle impedance (Ohm).
- (d) Comparable parameters specified in the specific cases or in the technical documents referred to in Article 13 of CCS TSI when they are available.

In order to determine the characteristics listed in subclauses (c) and (d), the unit shall be tested. The parameters of subclauses (a) and (b) can be determined by simulation, calculation or testing.

- (17) Electric interfaces between units and communication protocols shall be described in the general documentation described in point 4.2.12.2(3a) of this TSI, with the reference to the standards or other normative documents that have been applied.
- (18) Communication networks shall comply with the specification referenced in Appendix J-1, index [53].
- (19) The compliance/non-compliance with the specific case on the step position for vehicle access and egress defined in point 7.3.2.6 of the TSI PRM shall be recorded in the technical file. For units intended to operate in Germany, the compliance/non-compliance with the specific cases shall be documented by the application of the specification referenced in Appendix J-1 index [74] to Table 20 and Table 21 of the PRM TSI.
- (20) For units designed for operation on 1 435 mm track gauge, the following specific cases shall also be considered:
- (a) The compliance/non-compliance with the requirements regarding aerodynamic effects as set out in point 7.3.2.8 shall be recorded in the technical file. Non-compliance with the requirements shall exclude Italy from the area of use.
 - (b) The compliance/non-compliance with the requirements regarding fire safety and evacuation as set out in point 7.3.2.20 shall be recorded in the technical file. Non-compliance with the requirements shall exclude Italy from the area of use.
 - (c) The compliance/non-compliance with requirements regarding running capability and fire containment and control system as set out in point 7.3.2.21 shall be recorded in the technical file. Non-compliance with the requirements shall exclude the Channel tunnel from the area of use.
 - (d) The compliance/non-compliance with the requirements regarding the axle bearing condition monitoring by line side equipment as set out in point 7.3.2.3 shall be recorded in the technical file. Non-compliance with the requirements shall exclude France and/or Sweden from the area of use.
 - (e) For units intended to operate in Germany, the compliance/non-compliance of the unit characteristic wind curve (CWC) with the limits defined in the document referenced in Appendix J-2 index [C] shall be recorded in the technical file. Non-compliance with the requirements shall exclude Germany from the area of use.
 - (f) For units intended to operate in Germany on lines with a gradient above 40 ‰, the compliance/non-compliance with requirements defined in the document referenced in Appendix J-2 index [D] shall be recorded in the technical file. Non-compliance does not prevent the access of the unit to the national network.
 - (g) For units intended to operate in Germany, the compliance/non-compliance of the emergency exits with the document referenced in Appendix J-2 index [E] shall be recorded in the technical file. Non-compliance with the requirements shall exclude Germany from the area of use.
 - (h) For units intended to operate in Austria, the verification of the requirement for wheel-rail contact geometry, shall consider in addition to point 4.2.3.4.3, the following network characteristics:
 - $V \leq 160 \text{ km/h}$: $0.7 \leq \tan \gamma_e < 0.8$
 - $160 \text{ km/h} < V \leq 200 \text{ km/h}$: $0.5 \leq \tan \gamma_e < 0.6$
 - $V > 200 \text{ km/h}$: $0.3 \leq \tan \gamma_e < 0.4$

The compliance/non-compliance with requirements shall be recorded in the technical file. Non-compliance with the requirements shall result in a limitation of the vehicle speed.

- (i) For units intended to operate in Germany, the verification of the requirement for wheel-rail contact geometry, shall consider in addition to point 4.2.3.4.3, the following network characteristics:

- $V \leq 160$ km/h: $\tan \gamma_e \leq 0.8$;
- $160 < V \leq 230$ km/h: $\tan \gamma_e \leq 0.5$;
- $V > 230$ km/h: $\tan \gamma_e \leq 0.3$.

The compliance/non-compliance with requirements shall be recorded in the technical file. Non-compliance with the requirements shall result in a limitation of the vehicle speed.

- (21) For units designed for operation on 1 668 mm track gauge, the compliance with points 7.3.2.5 and 7.3.2.6 is mandatory and the following specific cases shall be considered:
- (a) The compliance/ non-compliance with the specific case on bogies designed to run on 1 668 mm track gauge defined in point 7.3.2.5a shall be recorded in the technical file. Non-compliance shall exclude Spanish 1 668 mm track gauge network from the area of use.
- (b) The compliance/ non-compliance with the specific case on the step position for vehicle access and egress defined in point 7.3.2.6 of the TSI PRM shall be recorded in the technical file. For units designed for operation on 1 435 mm track gauge and not compliant with the specific case, point 7.3.2.7 of the TSI PRM shall apply.
- (22) Non-compliance with any specific environmental condition as set out in point 7.4 shall result in restrictions of use on the network for which the specific condition has been defined, but not in the exclusion of that network from the area of use.
- (23) The unit shall be marked in accordance with the specification referenced in Appendix J-1, index [5]

7.1.1.5.2. **Additional optional conditions applicable to coaches intended to be used in general operation**

- (1) The compliance with the following set of conditions set out in points (2) to (12) is optional and aims to facilitate exchange of units intended to be used within train formations that aren't defined at design phase, i.e. units for general operations. Compliance with these provisions does not assure full interchangeability of units and does not exempt the railway undertaking of its responsibilities regarding the use of these units in a train formation as defined in point 6.2.7. If the applicant selects this option, a notified body shall assess the compliance within the EC verification procedure. This shall be reported in the certificate and in the technical documentation.
- (2) The unit shall be fitted with a manual coupling system as defined in points 4.2.2.2.3(b) and 5.3.2.
- (3) The unit shall be fitted with an EN-UIC braking system as defined in the specification referenced in Appendix J-1, index [12] and index [70]. The braking system shall be tested in accordance with the specification referenced in Appendix J-1 index [71].
- (4) The unit shall meet the requirements of this TSI at least within the temperature range T1 (– 25 °C to + 40 °C; nominal) as defined in point 4.2.6.1 and in the specification referenced in Appendix J-1, index [18].
- (5) The tail lights requested in point 4.2.7.1 shall be provided by fixed tail lamps.
- (6) If the unit is fitted with a gangway, the gangway shall fulfil the specification referenced in Appendix J-1, index [54].
- (7) “Single pole” power supply shall be compliant to point 4.2.11.6 (2).

- (8) The physical interface between units for the signal transmission shall ensure that the cable and plug of at least one line is compatible with the 18-conductor cable defined in the plate 2 of the specification referenced in Appendix J-1, index [61].
- (9) The door control device specified in point 4.2.5.5.3 shall be in accordance with the specifications described in Appendix J-1 index [17].

7.1.2. **Changes to rolling stock in operation or to an existing rolling stock type**

7.1.2.1. **Introduction**

- (1) This point 7.1.2 defines the principles to be applied by the entities managing the change and authorising entities in line with the EC verification procedure described in Article 15(9), Article 21(12) of Directive (EU) 2016/797 and Annex IV thereto. This procedure is further developed in Article 13, 15 and 16 of Implementing Regulation (EU) 2018/545 and in Decision 2010/713/EU.
- (2) This point 7.1.2 applies in case of any change(s) to rolling stock in operation or to an existing rolling stock type, including renewal or upgrade. It does not apply in case of changes:
- that do not introduce a deviation from the technical files accompanying the EC declarations for verification for the subsystems, if any, and
 - that do not have an impact on basic parameters not covered by the EC declaration, if any.

The holder of the vehicle type authorisation shall provide, under reasonable conditions, the information necessary for assessing the changes to the entity managing the change.

7.1.2.2. **Rules to manage changes in both rolling stock and rolling stock type**

- (1) Parts and basic parameters of the rolling stock that are not affected by the change(s) are exempt from conformity assessment against the provisions in this TSI.
- (2) Without prejudice to points 7.1.2.2a and 7.1.3, compliance with the requirements of this TSI, the TSI NOI (see point 7.2 of that TSI) and the TSI PRM (see point 7.2.3 of that TSI) shall only be needed for the basic parameters in this TSI which may be affected by the change(s).
- (3) In accordance with Articles 15 and 16 of Implementing Regulation (EU) 2018/545 and Decision 2010/713/EU and by application of modules SB, SD/SF or SH1 for the EC verification, and if relevant in accordance with Article 15(5) of Directive (EU) 2016/797, the entity managing the change shall inform a notified body of all changes affecting the conformity of the subsystem with requirements of the relevant TSI(s) requiring new checks by a notified body. This information shall be provided by the entity managing the change with corresponding references to the technical documentation relating to the existing EC type or design examination certificate.
- (4) Without prejudice of the general safety judgement mandated in Article 21(12), point (b), of Directive (EU) 2016/797, in case of changes requiring reassessment of the safety requirements set out in points 4.2.3.4.2, 4.2.3.5.3, 4.2.4.2.2, 4.2.5.3.5, 4.2.5.5.8 and 4.2.5.5.9, the procedure set out in point 6.2.3.5 shall be applied. Table 17 below sets out when a new authorisation is required.

Table 17

Vehicle originally assessed against

		First method of point 6.2.3.5(3)	Second method of point 6.2.3.5(3)	No CSM on RA applied
Change assessed against...	First method of point 6.2.3.5(3)	No new authorisation required	Check (!)	No new authorisation required

	Second method of point 6.2.3.5(3)	Check (!)	Check (!)	Check (!)
	No CSM on RA applied	Not possible	Not possible	Not possible

(!) The word “Check” means that the applicant will apply Annex I of the CSM on RA in order to demonstrate that the changed vehicle ensures an equal or higher level of safety. This demonstration shall be independently assessed by an assessment body as defined in CSM on RA. If the body concludes that the new safety assessment demonstrates a lower level of safety or the result is unclear, the applicant shall request an authorization for placing on the market.

- (4a) Without prejudice of the general safety judgement mandated in Article 21(12), point (b), of Directive (EU) 2016/797, in case of changes impacting requirements set out in 4.2.4.9, 4.2.9.3.1 and 4.2.10.3.4 which require a new reliability study, a new authorisation for placing in the market shall be required unless the NoBo concludes that the safety-related requirements covered by the reliability study are improved or maintained. The NoBo will consider in its judgement the revised maintenance and operation documentation, where required.
- (5) National migration strategies related to the implementation of other TSIs (e.g. TSIs covering fixed installations) shall be taken into account when defining to what extent the TSIs covering rolling stock needs to be applied.
- (6) The basic design characteristics of the rolling stock are defined in Table 17a and Table 17b below. Based on these tables and on the safety judgement mandated in Article 21(12), point (b), of Directive (EU) 2016/797, the changes shall be categorised as follows:
- (a) as defined by Article 15(1), point (c), of Implementing Regulation (EU) 2018/545 if they are above the thresholds set out in column 3 and below thresholds set out in column 4 unless the safety judgement mandated in Article 21(12), point (b), of Directive (EU) 2016/797 requires to categorise them as defined by Article 15(1), point (d), of Implementing Regulation (EU) 2018/545, or
- (b) as defined by Article 15(1), point (d), of Implementing Regulation (EU) 2018/545 if they are above the thresholds set out in column 4 or if the safety judgement mandated in Article 21(12), point (b), of Directive (EU) 2016/797 requires to categorise them as as defined by Article 15(1), point (d), of Implementing Regulation (EU) 2018/545.
- The determination whether the changes are beyond or above the thresholds mentioned in the first paragraph shall be done in reference to the values of the parameters at the time of the last authorisation of the rolling stock or rolling stock type.
- (7) Changes not covered by point 7.1.2.2(6) are deemed not to have any impact on the basic design characteristics and may be categorised as defined by Article 15(1), point (a) or Article 15(1), point (b), of Implementing Regulation (EU) 2018/545, unless the safety judgement mandated in Article 21(12), point (b), of Directive (EU) 2016/797 requires to categorise them as defined by Article 15(1), point (d), of Implementing Regulation (EU) 2018/545.
- (8) The safety judgement mandated in Article 21(12), point (b), of Directive (EU) 2016/797 shall cover changes concerning basic parameters of the table of point 3.1, related to all the essential requirements, in particular the requirements ‘Safety’ and ‘Technical compatibility’.
- (9) Without prejudice to point 7.1.2.2a, all changes shall remain compliant with the applicable TSIs regardless their classification.
- (10) The replacement of one or more vehicle(s) within a fixed formation after a severe damage does not require a conformity assessment against this TSI, as long as the unit or the vehicle(s) are unchanged in technical parameters and function to the ones they replace. Such units must be traceable and certified in accordance with any national or international rule, or any code of practice widely acknowledged in the railway domain.

Table 17a

Basic design characteristics related to basic parameters set out in this TSI

TSI point	Related basic design characteristic(s)	Changes impacting the basic design characteristic and not classified as defined by Article 21(12), point (a), of Directive (EU) 2016/797	Changes impacting the basic design characteristic and classified as defined by Article 21(12), point (a), of Directive (EU) 2016/797
4.2.2.2.3 End coupling	Type of end coupling	Change of end coupler type	N/A
4.2.2.10 Load conditions and weighed mass	Design mass in working order	Change in any of the corresponding basic design characteristics resulting in a change of the EN line category(ies) the vehicle is compatible with	N/A
4.2.3.2.1 Axle load parameter	Design mass under normal payload		
	Design mass under exceptional payload		
	Operational mass in working order		
	Operational mass under normal payload		
	Maximum design speed (km/h)		
	Static axle load in working order		
	Static axle load under exceptional payload		
	Vehicle length		
	Static axle load under normal payload		
	Position of the axles along the unit (axle spacing)		
EN line category(ies)			
	Total vehicle mass (for each vehicle of the unit)	Change in any of the corresponding basic design characteristics resulting in a change of the EN line category(ies) the vehicle is compatible with	Change of more than ± 10 %
	Mass per wheel	Change in any of the corresponding basic design characteristics resulting in a change of the EN line category(ies) the vehicle is compatible with or Change of more than ± 10 %	N/A

4.2.3.1 Gauging	Reference profile	N/A	Change of reference profile the vehicle is conform to
	Minimum vertical convex curve radius capability	Change in minimum vertical convex curve radius capability the vehicle is compatible with of more than 10 %	N/A
	Minimum vertical concave curve radius capability	Change in minimum vertical concave curve radius capability the vehicle is compatible with of more than 10 %	N/A
4.2.3.3.1 Rolling stock characteristics for the compatibility with train detection systems	Compatibility with train detection systems	N/A	Change of declared compatibility with one or more of the three following train detection systems: — Track circuits — Axle counters — Loop equipment
	Flange lubrication	Fitting/removal of the flange lubrication function	NA
	Possibility of preventing the use of flange lubrication	NA	Fitting/removal of the control preventing the use of flange lubrication”
4.2.3.3.2 Axle bearing condition monitoring	On-board detection system	Fitting of on-board detection system	Removal of declared on-board detection system
4.2.3.4. Rolling stock dynamic behaviour	Combination of maximum speed and maximum cant deficiency for which the vehicle was assessed	N/A	Increase in maximum speed of more than 15 km/h or change of more than ± 10 % in maximum admissible cant deficiency
	Rail inclination	N/A	Change of rail inclination(s) the vehicle is conform to ⁽¹⁾
4.2.3.5.2.1. Mechanical and geometric characteristics of wheelsets	Wheelset gauge	N/A	Change of track gauge the wheelset is compatible with

4.2.3.5.2.2 Characteristics of wheels	Minimum required in-service wheel diameter	Change of minimum required in-service diameter of more than ± 10 mm	N/A
4.2.3.5.2.3 Automatic variable gauge systems	Wheelset gauge changeover facility	Change in the vehicle leading to a change in the changeover facility(ies) the wheelset is compatible with	Change of track gauge(s) the wheelset is compatible with
4.2.3.6. Minimum curve radius	Minimum horizontal curve radius capability	Increase of minimum horizontal curve radius of more than 5 m	N/A
4.2.4.5.1 Braking performance — General requirements	Maximum average deceleration	Change of more than ± 10 % on the maximum average brake deceleration	N/A
4.2.4.5.2 Braking performance – Emergency braking	Stopping distance and deceleration profile for each load condition per design maximum speed.	Change of stopping distance of more than ± 10 % Note: Brake weight percentage (also called 'lambda' or 'braked mass percentage') or braked mass may also be used, and can be derived (directly or via stopping distance) from deceleration profiles by a calculation. The allowed change is the same (± 10 %)	N/A
4.2.4.5.3 Braking performance – Service braking	Stopping distance and maximum deceleration for the load condition 'design mass under normal payload' at the design maximum speed	Change of stopping distance of more than ± 10 %	N/A
4.2.4.5.4 Braking performance – Thermal capacity	Maximum brake thermal energy capacity	N/A	Change of maximum brake thermal energy ≥ 10 %
	or		
	Thermal capacity in terms of maximum line gradient, associated length and operating speed	Change of maximum gradient, associated length or operating speed for which the brake system is designed in relation with brake thermal energy capacity	
4.2.4.5.5 Braking performance – Parking brake	Maximum gradient on which the unit is kept immobilized by the parking brake alone (if the vehicle is fitted with it)	Change of declared maximum gradient of more than ± 10 %	N/A

4.2.4.6.2. Wheel slide protection system	Wheel slide protection system	N/A	Fitting/removal of WSP function
4.2.4.8.2 Magnetic track brake	Magnetic track brake	N/A	Fitting/removal of magnetic track brake function
	Possibility of preventing the use of the magnetic track brake	N/A	Fitting/removal of the brake control allowing the activation/deactivation of magnetic track brake
4.2.4.8.3 Eddy current track brake	Eddy current track brake	N/A	Fitting/removal of the eddy current track brake function
	Possibility of preventing the use of the eddy current track brake	N/A	Fitting/removal of the brake control allowing the activation/deactivation of eddy current track brake
4.2.6.1.1 Temperature	Temperature range	Change of temperature range (T1, T2, T3)	N/A
4.2.6.1.2 Snow, ice and hail	Snow, ice and hail conditions	Change of the selected range 'snow, ice and hail' (nominal or severe)	N/A
4.2.8.2.2 Operation within range of voltages and frequencies	Energy supply system (voltage and frequency)	N/A	Change of voltage(s)/ frequency(ies) of the energy supply system (AC 25 kV-50 Hz, AC 15 kV-16,7 Hz, DC 3 kV, DC 1,5 kV, DC 750 V, third rail, others)
4.2.8.2.3 Regenerative brake with energy to the overhead contact line	Regenerative brake	N/A	Fitting/removal of regenerative brake function
	Possibility of preventing the use of the regenerative brake when fitted	Fitting/removing the possibility of preventing the use of regenerative brake	N/A
4.2.8.2.4 Maximum power and current from the overhead contact line	Applicable to Electric units with power higher than 2 MW only: Power or current limitation function	Power or current limitation function fitted/removed	N/A

4.2.8.2.5 Maximum current at standstill	Maximum current at standstill per pantograph for each DC system the vehicle is equipped for	Change of the maximum current value by 50 A without exceeding the limit set in this TSI	N/A
	Vehicle equipped with electric energy storage for traction purposes and equipped with the function of charging with OCL at standstill	Adding or removing the function	N/A
4.2.8.2.9.1.1 Height of interaction with contact wires (RST level)	Height of interaction of pantograph with contact wires (over top of rail)	Change of height of interaction allowing/no longer allowing mechanical contact with one of the contact wires at heights above rail level between: 4 800 mm and 6 500 mm 4 500 mm and 6 500 mm 5 550 mm and 6 800 mm 5 600 mm and 6 600 mm	N/A
4.2.8.2.9.2 Pantograph head geometry (IC level)	Pantograph head geometry	N/A	Change of pantograph head geometry to or from one of the types defined in points 4.2.8.2.9.2.1, 4.2.8.2.9.2.2 or 4.2.8.2.9.2.3
4.2.8.2.9.4.2 Contact strip material	Contact strip material	New contact strip as per 4.2.8.2.9.4.2(3)	N/A
4.2.8.2.9.6 Pantograph contact force and dynamic behaviour	Mean contact force curve	Change requiring a new assessment of pantograph dynamic behaviour.	N/A
4.2.8.2.9.7 Arrangement of pantographs (RST level)	Number of pantograph and shortest distance between two pantographs	N/A	Where the spacing of 2 consecutive pantographs in fixed or predefined formations of the assessed unit is reduced by means of removing a vehicle
4.2.8.2.9.10 Pantograph lowering (RST level)	Automatic dropping device (ADD)	Automatic dropping device (ADD) function fitted/removed	N/A

4.2.9.3.7 Derailment detection and prevention signal processing	Presence of derailment prevention and detection signal processing	Fitting/removing of prevention/detection function	N/A
4.2.9.3.7a On-board derailment detection and prevention function	Presence of derailment prevention and detection function	Fitting/removing of prevention/detection function	N/A
4.2.10.1. General and categorisation	Fire safety category	N/A	Change of fire safety category
4.2.12.2. General documentation — number of units in multiple operation	Maximum number of trainsets or locomotives coupled together in multiple operation.	N/A	Change of maximum allowed number of trainsets or locomotives coupled together in multiple operation
4.2.12.2. General documentation – number of vehicles in a unit	For fixed formations only: Vehicles composing the fixed formation	N/A	Change in the number of vehicles composing the fixed formation

(¹) The rolling stock fulfilling one of the following conditions are deemed to be compatible with all rail inclinations:

- Rolling stock assessed according to the specification referenced in Appendix J-1 index [9] or [73]
- Rolling stock assessed according to the specification referenced in Appendix J-1 index [63] (amended or not amended by ERA/TD/2012-17/INT) or to the specification referenced in Appendix J-1 index [64] with the result, that there is no restriction to one rail inclination
- Rolling stock assessed according to the specification referenced in Appendix J-1 index [63] (amended or not amended by ERA/TD/2012-17/INT) or to the specification referenced in Appendix J-1 index [64] with the result, that there is a restriction to one rail inclination and a new assessment of the wheel-rail-contact test conditions based on real wheel- and rail profiles and measured track gauge show compliance with the requirements on wheel-rail-contact conditions of the specification referenced in Appendix J-1 index [9].

Table 17b

Basic design characteristics related to basic parameters set out in the TSI PRM

TSI point	Related basic design characteristic(s)	Changes impacting the basic design characteristic and not classified as defined by Article 21(12), point (a), of Directive (EU) 2016/797	Changes impacting the basic design characteristic and classified as defined by Article 21(12), point (a), of Directive (EU) 2016/797
2.2.11. Step position for vehicle access and egress	Platform heights for which the vehicle is designed	N/A	Change of platform height the vehicle is compatible with

(11) In order to establish the EC type or design examination certificate, the notified body selected by the entity managing the change may refer to:

- the original EC type or design examination certificate for parts of the design that are unchanged or those that are changed but do not affect the conformity of the subsystem, as far as it is still valid;

- additional EC type or design examination certificate (amending the original certificate) for modified parts of the design that affect the conformity of the subsystem with the TSIs referred to in the certification framework defined in point 7.1.3.1.1.

In case the validity period of the EC type or design examination certificate for the original type is limited to 7 years (due to the application of the former Phase A/B concept), the validity period of the EC type or design examination certificate for the modified type, type variant or type version shall be limited to 14 years after the date of appointment of a notified body by the applicant for the initial rolling stock type (beginning of phase A of the original EC type or design examination certificate).

- (12) In any case, the entity managing the change shall ensure that the technical documentation which is relating to the EC type or design examination certificate is updated accordingly.
- (13) The updated technical documentation, related to the EC type or design examination certificate is referred to in the technical file accompanying the EC declaration of verification issued by the entity managing the change for rolling stock declared as conformant to the modified type.

7.1.2.2a. **Particular rules for rolling stock in operation not covered by an EC declaration of verification with a first authorisation for placing in service before 1 January 2015**

In addition to point 7.1.2.2 the following rules apply to rolling stock in operation with a first authorisation for placing in service before 1 January 2015, where the scope of the change has an impact on basic parameters not covered by the EC declaration (if any):

- (1) The compliance with technical requirements of this TSI is deemed established when a basic parameter is improved in the direction of the TSI defined performance and the entity managing the change demonstrates that the corresponding essential requirements are met and the safety level is maintained and, where reasonably practicable, improved. The entity managing the change shall in this case justify, the reasons for which the TSI defined performance was not met, taking into account point 7.1.2.2 (5). This justification shall be included in the technical file, if any, or in the original technical documentation of the vehicle.
- (2) The rule set out in point (1) is not applicable to changes to basic parameters classified as defined by Article 21(12), point (a), of Directive (EU) 2016/797, as specified in Tables 17c and 17d. For those changes, compliance with this TSI requirements is mandatory.

Table 17c

Changes to basic parameters for which compliance with TSI requirements is mandatory for rolling stock not holding an EC type or design examination certificate

TSI point	Related basic design characteristic(s)	Changes impacting the basic design characteristic and classified as defined by Article 21(12), point (a), of Directive (EU) 2016/797
4.2.3.1 Gauging	Reference profile	Change of reference profile the vehicle is conform to
4.2.3.3.1 Rolling stock characteristics for the compatibility with train detection systems	Compatibility with train detection systems	Change of declared compatibility with one or more of the three following train detection systems: <ul style="list-style-type: none"> — Track circuits — Axle counters — Loop equipment

4.2.3.3.2 Axle bearing condition monitoring	On-board detection system	Fitting/Removal of declared on-board detection system
4.2.3.5.2.1. Mechanical and geometric characteristics of wheelsets	Wheelset gauge	Change of track gauge the wheelset is compatible with
4.2.3.5.2.3 Automatic variable gauge systems	Wheelset gauge changeover facility	Change of track gauge(s) the wheelset is compatible with
4.2.8.2.3 Regenerative brake with energy to the overhead contact line	Regenerative brake	Fitting/removal of regenerative brake function

Table 17d

Changes to basic parameters of the TSI PRM for which compliance with TSI requirements is mandatory for rolling stock not holding an EC type or design examination certificate

TSI point	Related basic design characteristic(s)	Changes impacting the basic design characteristic and classified as defined by Article 21(12), point (a), of Directive (EU) 2016/797
4.2.2.11. Step position for vehicle access and egress	Platform heights for which the vehicle is designed	Change of platform height the vehicle is compatible with

7.1.2.2b. Particular rules for vehicles modified to test performance or reliability of technological innovations for a limited period of time

- (1) The following rules apply, in addition to point 7.1.2.2, in case of modifications to single authorised vehicles for the purpose of testing the performance and reliability of technological innovations for a fixed period of time not longer than 1 year. They don't apply if the same modifications are made to several vehicles.
- (2) The compliance with technical requirements of this TSI is deemed established when a basic parameter is kept unchanged or improved in the direction of the TSI defined performance and the entity managing the change demonstrates that the corresponding essential requirements are met and the safety level is maintained and, where reasonably practicable, improved.

7.1.3. Rules related to the EC type or design examination certificates.

7.1.3.1. Rolling stock subsystem

7.1.3.1.1. Definitions

(1) Initial assessment framework

The initial assessment framework is the set of TSIs (i.e. this TSI, TSI NOI and TSI PRM) applicable at the beginning of the design phase when the notified body is contracted by the applicant.

(2) Certification framework

The certification framework is the set of TSIs (i.e. this TSI, the TSI NOI and the TSI PRM) applicable at the time of issuing the EC type or design examination certificate. It is the initial assessment framework amended with the revisions of TSIs that came into force during the design phase.

(3) Design phase

The design phase is the period starting once a notified body, which is responsible for EC verification, is contracted by the applicant and ending when the EC type or design examination certificate is issued.

A design phase can cover a type and one or several type variant(s) and type version(s). For all type variant(s) and type version(s), the design phase is considered as starting at the same time as for the main type.

(4) Production phase

The production phase is the period during which rolling stock subsystems may be placed on the market on the basis of an EC declaration of verification referring to a valid EC type or design examination certificate.

(5) Rolling stock in operation:

Rolling stock is in operation when it is registered with “Valid” registration code “00”, in the National Vehicle Register in accordance with Decision 2007/756/EC or in the European Vehicle Register in accordance with Implementing Decision (EU) 2018/1614 and maintained in a safe state of running in accordance with Commission Implementing Regulation (EU) 2019/779 (**).

7.1.3.1.2. **Rules related to the EC type or design examination certificate**

(1) The notified body shall issue the EC type or design examination certificate referring to the certification framework

(2) When a revision of this TSI or of the TSI NOI or the TSI PRM comes into force during the design phase, the notified body shall issue the EC type or design examination certificate according to the following rules:

— For changes in the TSIs that are not referenced in appendix L, conformity with the initial assessment framework leads to conformity to the certification framework. The Notified Body shall issue the EC type or design examination certificate referring to the certification framework without additional assessment.

— For changes in the TSIs that are referenced in appendix L, their application is mandatory according to the transition regime defined in the appendix. During the defined transition period, the Notified Body may issue the EC type or design examination certificate referring to the certification framework without additional assessment. The Notified Body shall list in the EC type or design examination certificate all the points assessed according to the initial assessment framework.

(3) When several revisions of this TSI or of the TSI NOI or the TSI PRM come into force during the design phase, point (2) shall apply to all revisions successively

(4) It is always permissible (but not mandatory) to use a most recent version of any TSI, either totally or for particular points, unless explicitly otherwise specified in the revision of these TSIs; in case of application limited to particular points, the applicant has to justify and document that applicable requirements remain consistent, and this has to be approved by the notified body.

7.1.3.1.3. **Validity of the EC type or design examination certificate**

(1) When a revision of this TSI or of the TSI NOI or the TSI PRM comes into force, the EC type or design examination certificate for the subsystem remains valid unless it is required to be revised according to the specific transition regime of a TSI change.

(2) Only the changes to the TSIs with a specific transition regime can apply to Rolling Stock in production phase or to Rolling Stock in operation.

7.1.3.2. Interoperability constituents

- (1) This point concerns an interoperability constituent which is subject to type or design examination or to suitability for use.
- (2) Unless otherwise explicitly specified in the revision of this TSI or of the TSI NOI or the TSI PRM, the type or design examination or suitability for use remains valid even if a revision of these TSIs enters into force.

During this time, new constituents of the same type are permitted to be placed on the market without a new type assessment.

7.1.4. Rules for the extension of the area of use for rolling stock having an authorisation in accordance with Directive 2008/57/EC or in operation before 19 July 2010

- (1) In the absence of full conformity with this TSI, point 2 applies to rolling stock that fulfils the following conditions when requesting the extension of its area of use in accordance with Article 21(13) of Directive (EU) 2016/797:
 - (a) it has been authorised in accordance with Directive 2008/57/EC or put in operation before 19 July 2010;
 - (b) it is registered with 'Valid' registration code '00', in the National Vehicle Register in accordance with Decision 2007/756/EC or in the European Vehicle Register in accordance with Implementing Decision (EU) 2018/1614 and maintained in a safe state of running in accordance with Implementing Regulation (EU) 2019/779.

The following provisions for extension of area of use apply also in combination with a new authorisation as defined in Article 14(3), point (a), of Implementing Regulation (EU) 2018/545.

- (2) Authorisation for an extended area of use of the rolling stock referred to in point 1 shall be based on the existing authorisation, if any, and on the technical compatibility between the rolling stock and the network in accordance with point (d) of Article 21(3) of Directive (EU) 2016/797 and compliance with the Basic Design Characteristics of Tables 17a and 17b, taking into account any restrictions or limitations.

The applicant shall provide an 'EC declaration of verification' accompanied by technical files giving evidence of compliance with the requirements set out in this TSI, or with provisions having equivalent effect, for each basic parameter referred to in column 1 of Tables 17a and 17b and with the following points of this TSI:

- 4.2.4.2.2, 4.2.5.5.8, 4.2.5.5.9, 4.2.6.2.3, 4.2.6.2.4, 4.2.6.2.5, 4.2.8.2.7, 4.2.8.2.9.8 (when running through phase or system separation sections is managed automatically), 4.2.9.3.1, 4.2.9.6, 4.2.12 and 4.2.12.6
- 4.2.5.3 in Italy
- 4.2.5.3.5 and 4.2.9.2.1 in Germany

through one or a combination of the following:

- (a) compliance with requirements set out in this TSI;
 - (b) compliance with corresponding requirements set out in a previous TSI;
 - (c) compliance with alternative specifications deemed to have equivalent effect;
 - (d) evidence that the requirements for technical compatibility with the network of the extended area of use are equivalent to the requirements for technical compatibility with the network for which the rolling stock is already authorised or in operation. Such evidence shall be provided by the applicant and may be based on the information of the register of railway infrastructure (RINF).
- (3) The equivalent effect of alternative specifications to the requirements of this TSI (point 2(c)) and the equivalence of requirements for technical compatibility with the network (point 2(d)) shall be justified and documented by the applicant by applying the risk management process set out in Annex I of Regulation (EU) No 402/2013. The justification has to be assessed and confirmed by an assessment body (CSM RA).

- (4) In addition to the requirements mentioned referred to in point (2) above and where applicable, the applicant shall provide an “EC declaration of verification” accompanied by technical files giving evidence of compliance with the following:
 - (a) specific cases relating to any part of the extended area of use, listed in this TSI, the TSI NOI, the TSI PRM and the TSI CCS;
 - (b) the national rules referred to in Article 13(2), points (a), (c) and (d), of Directive (EU) 2016/797 as notified in accordance with Article 14 of that Directive.
- (5) The authorising entity shall make publicly available through the Agency website details of the alternative specifications referred to in point 2(c) and of the requirements for technical compatibility with the network referred to in point 2(d) on the basis of which it granted authorisations for the extended area of use.
- (6) Where an authorised vehicle benefited from non-application of TSIs or part of them pursuant to Article 9 of Directive 2008/57/EC, the applicant shall seek derogation(s) in the Member States of the extended area of use in accordance to Article 7 of Directive (EU) 2016/797.
- (7) In accordance with Article 54(2) of Directive (EU) 2016/797, coaches used under Regolamento Internazionale Carrozze (RIC) shall be deemed authorised in accordance with the conditions under which they were used, including the area of use where they are operated. Following a change which requires a new authorisation for placing on the market in accordance with Article 21(12) of Directive (EU) 2016/797, coaches accepted under the latest RIC agreement shall conserve the area of use in which they were operating without further checks on the unchanged parts.

7.1.5. **Pre fitment requirements for new rolling stock design where ETCS is not yet installed**

- (1) This case applies to newly developed vehicle design, including special vehicle referred to in point 7.4.3.2 of TSI CCS when point 7.1.1.3 (1) of LOC&PAS TSI applies, where ETCS on-board is not yet installed, with the aim to have rolling stock subsystem ready when this system will be installed.
- (2) The following requirements apply to newly developed vehicle designs requiring a first authorisation as defined in Article 14 of Implementing Regulation 2018/545:
 - (a) Compliance with the requirements related to train interface functions as mentioned in basic parameters that refers to Appendix A, Table A.2, index 7 of TSI CCS (see column 1 and 2 of Table 9 of the TSILOC&PAS).
 - (b) Description of train interface functions implemented including specification of interfaces and protocols of communication shall be documented in the technical documentation described in point 4.2.12.2 (23).
 - (c) A space shall be available for installation of ETCS on-board equipments defined in TSI CCS (e.g ETCS DMI, antennas, etc.). The conditions for installation of equipments must be documented in the technical documentation described in point 4.2.12.2 (24).
- (3) The Notified Body in charge of EC verification for the Rolling Stock subsystem shall verify that the documentation requested in points 4.2.12.2 (23) and (24), is provided.
- (4) When ETCS on-board is installed, the assessment of the integration of the interface functions in the vehicle is part of the EC verification for the CCS on-board subsystem in accordance with point 6.3.3 of TSI CCS.

(*) Commission Implementing Regulation (EU) 2020/387 of 9 March 2020 amending Regulations (EU) No 321/2013, (EU) No 1302/2014 and (EU) 2016/919 as regards the extension of the area of use and transition phases (OJ L 73, 10.3.2020, p. 6).

(**) Commission Implementing Regulation (EU) 2019/779 of 16 May 2019 laying down detailed provisions on a system of certification of entities in charge of maintenance of vehicles pursuant to Directive (EU) 2016/798 of the European Parliament and of the Council and repealing Commission Regulation (EU) No 445/2011 (OJ L 139I, 27.5.2019, p. 360).;

(162) point 7.3.2 is replaced by the following:

7.3.2. List of specific cases

7.3.2.1. Mechanical interfaces (4.2.2.2)

Specific case Ireland and the United Kingdom in respect of Northern Ireland ("P")

End coupling, height above rail (clause 4.2.2.2.3).

A.1 Buffers

The height of the centre line of the buffers shall be in the range 1 090 mm (+ 5/- 80 mm) above rail level in all loading and wear conditions.

A.2 Screw coupling

The height of the centre line of the draw hook shall be in the range 1 070 mm (+ 25/- 80 mm) above rail level in all loading and wear conditions.

7.3.2.2. Gauging (4.2.3.1)

Specific case Ireland and the United Kingdom in respect of Northern Ireland ("P")

It is permissible for the reference profile of the upper and the lower part of the unit to be established in accordance with the national technical rules notified for this purpose.

7.3.2.3. Rolling stock requirements for compatibility with trackside equipment (4.2.3.3.2.2)

Specific case Finland ("P")

For rolling stock intended to be used on Finnish network (1 524 mm track gauge) which depends on track side equipment for axle bearing condition monitoring, the target areas on the underside of an axle box that shall remain un-obstructed to permit observation by a trackside HADB shall use dimensions as defined in EN 15437-1:2009, and replace the values by the following:

System based on trackside equipment:

The dimensions in points 5.1 and 5.2 of EN 15437-1:2009 are replaced respectively by the following dimensions. There are two different target areas (I and II) including their prohibitive and measuring zones defined:

Dimensions for the target area I:

- W_{TA} , greater than or equal to 50 mm
- L_{TA} , greater than or equal to 200 mm
- Y_{TA} shall be 1 045 mm to 1 115 mm
- W_{PZ} , greater than or equal to 140 mm
- L_{PZ} , greater than or equal to 500 mm
- Y_{PZ} shall be 1 080 mm \pm 5 mm

Dimensions for the target area II:

- W_{TA} , greater than or equal to 14 mm
- L_{TA} , greater than or equal to 200 mm
- Y_{TA} shall be 892 mm to 896 mm
- W_{PZ} , greater than or equal to 28 mm
- L_{PZ} , greater than or equal to 500 mm
- Y_{PZ} shall be 894 mm \pm 2 mm

Specific case France ("P")

This specific case is applicable to all units which are not fitted with on-board axle bearing condition monitoring equipment.

Points 5.1 and 5.2 of standard EN 15437-1 apply with the following specificities. The notations are the ones used in picture 3 of standard.

— $W_{TA} = 70$ mm

— $Y_{TA} = 1\,092,5$ mm

— $L_{TA} = V_{max} \times 0,56$ (V_{max} being the maximal line speed at the level of HABC, expressed in km/h)

Specific case Ireland and the United Kingdom in respect of Northern Ireland ("P")

Rolling stock that depends on track side equipment for axle bearing condition monitoring, shall meet the following the target areas on the underside of an axle box (dimensions as defined in EN 15437-1:2009):

Table 18

Target area

	Y_{TA} [mm]	W_{TA} [mm]	L_{TA} [mm]	Y_{PZ} [mm]	W_{PZ} [mm]	L_{PZ} [mm]
1 600 mm	$1\,110 \pm 2$	≥ 70	≥ 180	$1\,110 \pm 2$	≥ 125	≥ 500

Specific case Sweden ("T2")

This specific case is applicable to all units which are not fitted with on-board axle bearing condition monitoring equipment and are intended for operation on lines with non-upgraded axle bearing detectors. These lines are indicated in the infrastructure register as being non-TSI compliant in this respect.

The two zones underneath the axle box/journal set out in table below referring to the parameters of the standard EN 15437-1:2009 shall be free to facilitate vertical monitoring by trackside axle box detection system:

Table 19

Target and prohibitive zone for units intended to be operated in Sweden

	Y_{TA} [mm]	W_{TA} [mm]	L_{TA} [mm]	Y_{PZ} [mm]	W_{PZ} [mm]	L_{PZ} [mm]
System 1	862	≥ 40	whole	862	≥ 60	≥ 500
System 2	905 ± 20	≥ 40	whole	905	≥ 100	≥ 500

The compatibility with these systems shall be set out in the technical file for the vehicle.

7.3.2.4. Internal air quality (4.2.5.8)*Specific case Channel Tunnel ("P")*

Passenger vehicles: passenger trains must have systems in place to provide ventilation capable of ensuring CO₂ levels remain under 10 000ppm for at least 90 minutes in the event of a failure of traction systems.

7.3.2.5. Running dynamic behaviour (4.2.3.4.2, 6.2.3.4)*Specific case Finland ("P")*

The following modifications to the running dynamic behaviour points of the TSI applies to vehicle to be operated solely on Finnish 1 524 mm network:

— Test zone 4 is not applicable for running dynamic testing.

- Mean value of curve radius of all track sections for test zone 3 shall be 550 ± 50 metres for running dynamic testing.
- Track quality parameters in running dynamics testing shall be according to RATO 13 (Track inspection).
- Measuring methods are according to EN 13848-1:2019.

Specific case Ireland and the United Kingdom in respect of Northern Ireland (“P”)

For technical compatibility with the existing network it is permissible to use notified national technical rules for the purpose of assessing running dynamic behaviour.

Specific case Spain (“P”)

For rolling stock intended to be used on 1 668 mm track gauge, the quasi-static guiding force Y_{qst} limit value shall be evaluated for curve radii $250 \text{ m} \leq R_m < 400 \text{ m}$.

The limit value shall be: $(Y_{qst})_{lim} = 66 \text{ kN}$.

For the normalisation of the estimated value to the radius $R_m = 350 \text{ m}$ according to point 7.6.3.2.6 (2) of EN 14363:2016, the formula ' $Y_{a,nf,qst} = Y_{a,f,qst} - (10\,500 \text{ m}/R_m - 30) \text{ kN}$ ' shall be replaced by ' $Y_{a,nf,qst} = Y_{a,f,qst} - (11\,550 \text{ m}/R_m - 33) \text{ kN}$ '.

Values of cant deficiency can be adapted to 1 668 mm track gauge by multiplying the corresponding 1 435 mm parameter values by the following conversion factor: 1733/1500.

7.3.2.5a. Structural design of bogie frame (4.2.3.5.1)

Specific case Spain (“P”)

For bogies designed to run on 1 668 mm track gauge, alpha (α) and beta (β) parameters shall be considered as 0,15 and 0,35 respectively in conformity with the specification referenced in Appendix J-1, index [11] [Annex F of EN 13749]

7.3.2.6. Mechanical and geometric characteristics of wheelset and wheel (4.2.3.5.2.1 and 4.2.3.5.2.2)

Specific case Estonia, Latvia, Lithuania, and Poland for 1 520 mm system (“P”)

The geometrical dimensions of the wheels as defined in Figure 2 shall be compliant with limit values specified in the Table 20.

Table 20

In-service limits of the geometric dimensions of wheel

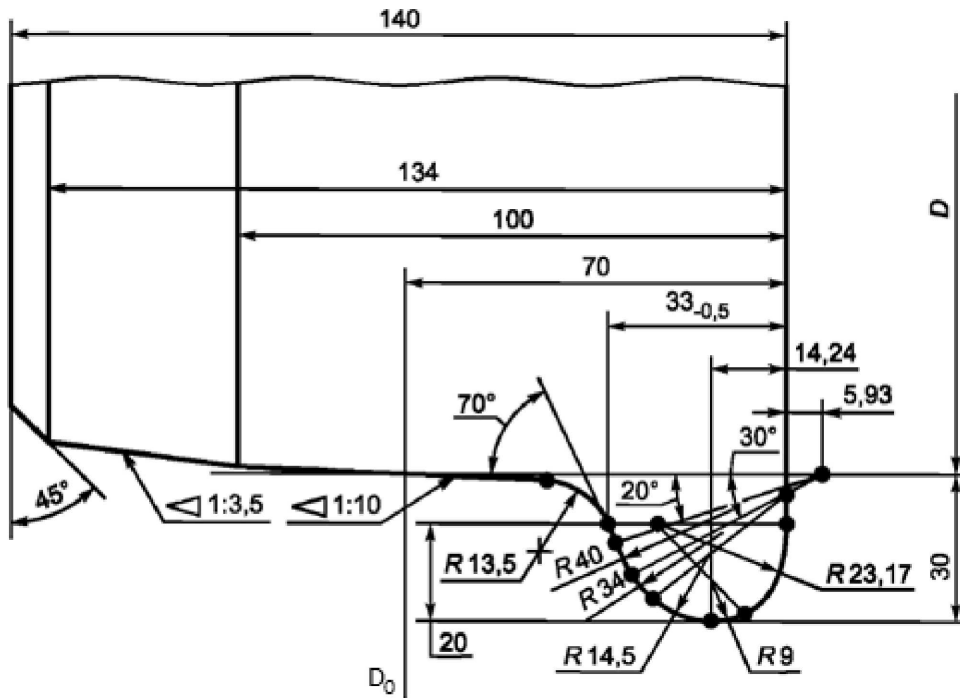
Designation	Wheel diameter D (mm)	Minimum value (mm)	Maximum value (mm)
Width of the rim ($B_R + \text{Burr}$)	$400 \leq D \leq 1\,220$	130	146
Thickness of the flange (S_d)		25 ⁽¹⁾	33
Height of the flange (S_h)		28	37

⁽¹⁾ For inner wheels of the 3-axle bogies a dimension of 21mm is permitted

New wheel profile for locomotives and trainsets of maximum speed up to 200 km/h is defined in the figure 3 below:

Figure 3

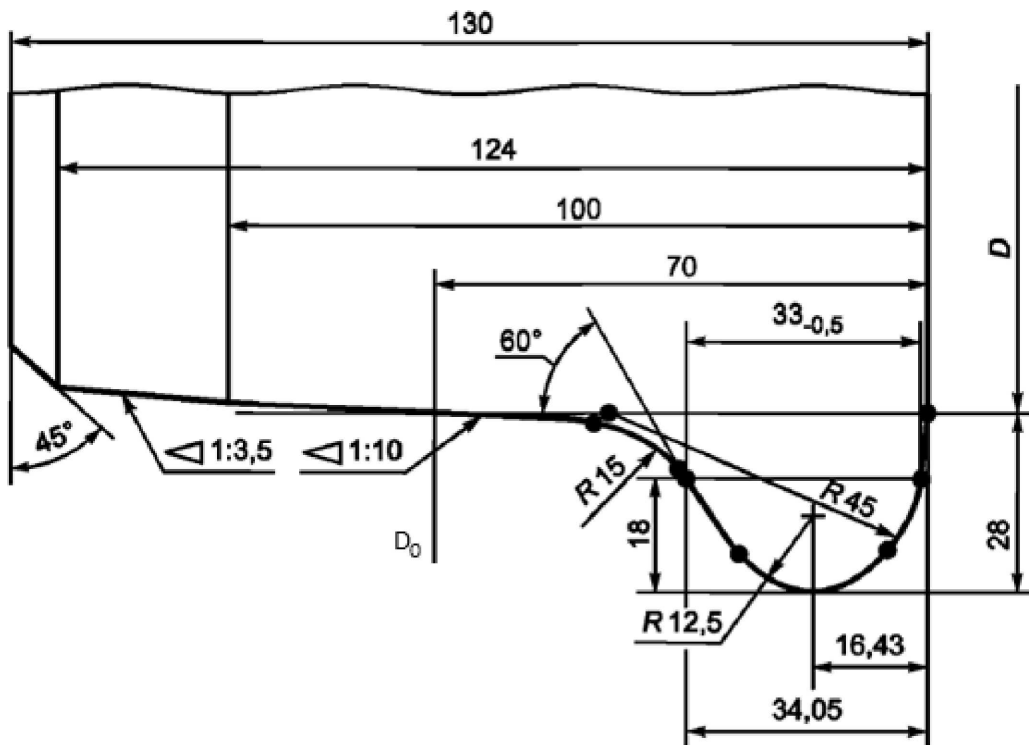
New wheel profile for locomotives and trainsets of maximum speed up to 200 km/h



New wheel profile for trainsets of maximum speed up to 130 km/h is defined in Figure 4 below

Figure 4

New wheel profile for trainsets of maximum speed up to 130 km/h



Specific case Finland ("P")

The minimum wheel diameter shall be taken as 400 mm.

For rolling stock to be used in traffic between Finnish 1 524 network and a third country 1 520 network, it is allowed to use special wheelsets designed to accommodate the differences in track gauges.

Specific case Ireland ("P")

The geometrical dimensions of the wheels (as defined in Figure 2) shall be compliant with limit values specified in the Table 21:

Table 21

In-service limits of the geometric dimensions of wheel

	Designation	Wheel diameter D (mm)	Minimum value (mm)	Maximum value (mm)
1 600 mm	Width of the rim (B_R) (with maximum BURR of 5 mm)	$690 \leq D \leq 1\ 016$	137	139
	Thickness of the flange (S_d)	$690 \leq D \leq 1\ 016$	26	33
	Height of the flange (S_h)	$690 \leq D \leq 1\ 016$	28	38
	Face of the flange (q_R)	$690 \leq D \leq 1\ 016$	6,5	—

Specific case for the United Kingdom in respect of Northern Ireland ("P")

The geometrical dimensions of the wheelsets and the wheels (as defined in Figure 1 and 2) shall be compliant with limit values specified in the Table 22:

Table 22

In-service limits of the geometric dimensions of wheelsets and wheel

	Designation	Wheel diameter D (mm)	Minimum value (mm)	Maximum value (mm)
1 600 mm	Front-to-front dimension (SR) SR = AR + S_d , left + S_d , right	$690 \leq D \leq 1\ 016$	1 573	1 593,3
	Back to back distance (AR)	$690 \leq D \leq 1\ 016$	1 521	1 527,3
	Width of the rim (BR) (with maximum BURR of 5 mm)	$690 \leq D \leq 1\ 016$	127	139
	Thickness of the flange (S_d)	$690 \leq D \leq 1\ 016$	24	33
	Height of the flange (S_h)	$690 \leq D \leq 1\ 016$	28	38
	Face of the flange (q_R)	$690 \leq D \leq 1\ 016$	6,5	—

Specific case Spain for 1 668 mm track gauge ("P")

The minimum value of thickness of the flange (S_d) for wheel diameter $D \geq 840$ mm shall be taken as 25 mm.

For wheel diameters $330 \text{ mm} \leq D < 840$ mm, the minimum value shall be taken as 27,5 mm.

Specific case Czech Republic ("TO")

For the inner wheels of 3-axle bogies, that are not involved in track guidance, lower limit values of the wheels geometrical dimensions than those required in Table 1 and in Table 2 are permitted for the thickness of the flange (S_a) and for the front to front dimension (S_R).

7.3.2.6a. Minimum curve radius (4.2.3.6)*Specific case Ireland ("P")*

In the case of track gauge system 1 600 mm, the minimum curve radius to be negotiated shall be 105 m for all units.

7.3.2.7 Not used**7.3.2.8. Aerodynamic effects (4.2.6.2)***Specific case Italy ("P")*

Maximum pressure variations in tunnels (4.2.6.2.3):

For unrestricted operation on the existing lines taking into account the numerous tunnels with a cross section of 54 m² which are traversed at 250 km/h, and those with a cross section of 82,5 m² and traversed at 300 km/h, units of maximum design speed higher than or equal to 190 km/h shall conform to the requirements set out in the Table 23.

Table 23

Requirements for interoperable train in a solo run in a non-inclined tube-like tunnel

	Gauge	Reference Case		Criteria for the Reference Case			Allowed maximum speed [km/h]
		V_{tr} [km/h]	A_{tu} [m ²]	Δ_{pN} [Pa]	$\Delta_{pN} + \Delta_{pFr}$ [Pa]	$\Delta_{pN} + \Delta_{pFr} + \Delta_{pT}$ [Pa]	
$V_{tr,max} < 250$ km/h	GA or smaller	200	53,6	$\leq 1\ 750$	$\leq 3\ 000$	$\leq 3\ 700$	≤ 210
	GB	200	53,6	$\leq 1\ 750$	$\leq 3\ 000$	$\leq 3\ 700$	≤ 210
	GC	200	53,6	$\leq 1\ 750$	$\leq 3\ 000$	$\leq 3\ 700$	≤ 210
$V_{tr,max} < 250$ km/h	GA or smaller	200	53,6	$\leq 1\ 195$	$\leq 2\ 145$	$\leq 3\ 105$	< 250
	GB	200	53,6	$\leq 1\ 285$	$\leq 2\ 310$	$\leq 3\ 340$	< 250
	GC	200	53,6	$\leq 1\ 350$	$\leq 2\ 530$	$\leq 3\ 455$	< 250
$V_{tr,max} \geq 250$ km/h	GA or smaller	250	53,6	$\leq 1\ 870$	$\leq 3\ 355$	$\leq 4\ 865$	250
$V_{tr,max} \geq 250$ km/h	GA or smaller	250	63,0	$\leq 1\ 460$	$\leq 2\ 620$	$\leq 3\ 800$	> 250
	GB	250	63,0	$\leq 1\ 550$	$\leq 2\ 780$	$\leq 4\ 020$	> 250
	GC	250	63,0	$\leq 1\ 600$	$\leq 3\ 000$	$\leq 4\ 100$	> 250

If a vehicle does not fulfil the values specified in the table above (e.g. TSI compliant vehicle), operating rules (e.g. speed restrictions) may apply.

7.3.2.8.a. **Lamp controls (4.2.7.1.4)**

Specific case France, Luxembourg, Belgium, Spain, Sweden, Poland (“T0”)

It shall be possible for the driver to activate the head lamps in flashing/blinking mode to inform of an emergency situation.

7.3.2.9. **Not used**

7.3.2.10. **Not used**

7.3.2.11 **Operation within range of voltages and frequencies (4.2.8.2.2)**

Specific case Estonia (“T1”)

Electric units designed to be operated on DC 3,0 kV lines shall be able to operate within the ranges of voltages and frequencies as set out in the TSI ENE point 7.4.2.1.1.

Specific case France (“T2”)

To avoid restrictions of use, electric units designed to be operated on DC 1,5 kV or AC 25 kV lines shall comply with the characteristics described in the register of infrastructure (parameter 1.1.1.2.2.1.3). The maximum current at standstill per pantograph (point 4.2.8.2.5) allowed on DC 1,5 kV existing lines may be lower than the limit values as set out in the TSI ENE point 4.2.5; the current at standstill per pantograph shall be limited accordingly on electric units designed to be operated on these lines.

Specific case Latvia (“T1”)

Electric units designed to be operated on DC 3,0 kV lines shall be able to operate within the ranges of voltages and frequencies as set out in the TSI ENE point 7.4.2.4.1.

7.3.2.12. **Use of regenerative brakes (4.2.8.2.3)**

Specific case Belgium (“T2”)

For technical compatibility with the existing system, the maximum voltage regenerated to the catenary (U_{max2} according to EN 50388-1:2022 point 12.2.1) on 3 kV network shall not be higher than 3,8 kV.

Specific case Czech Republic (“T2”)

For technical compatibility with the existing system, the maximum voltage regenerated to the catenary (U_{max2} according to EN 50388-1:2022 point 12.2.1) on 3 kV network shall not be higher than 3,55 kV.

Specific case Sweden (“T2”)

For technical compatibility with the existing system, the maximum voltage regenerated to the catenary (U_{max2} according to EN 50388-1:2022 point 12.2.1) on 15 kV network shall not be higher than 17,5 kV.

7.3.2.13. **Height of interaction with contact wires (RST level) (4.2.8.2.9.1.1)**

Specific case The Netherlands (“T0”)

For unrestricted access to the 1 500 V DC lines, the maximum height of pantograph shall be limited to 5 860 mm.

7.3.2.14. **Pantograph head geometry (4.2.8.2.9.2)**

Specific case Croatia (“T1”)

For operation on the existing network 3 kV DC system, it is allowed to equip electric units with a pantograph having a head geometry of length 1 450 mm as depicted in EN 50367:2020+A1:2022 annex B.3 figure B1 (as alternative to requirement in point 4.2.8.2.9.2).

Specific case Finland (“T1”)

For technical compatibility with the existing network, the width of the pantograph head shall not exceed 0.422 metres.

Specific case France ("T2")

For operation on the existing network, in particular on lines with catenary system only compatible with narrow pantograph, and for operation in France and Switzerland, it is allowed to equip electric units with a pantograph having a head geometry of length 1 450 mm as depicted in EN 50367:2020+A1:2022, Annex B.3 figure B.1 (as alternative to requirement in point 4.2.8.2.9.2).

Specific case Italy ("T0")

For operation on the existing network 3 kV DC and 25 kV AC HST systems (and additionally in Switzerland on 15 kV AC system), it is allowed to equip electric units with a pantograph having a head geometry of length 1 450 mm as depicted in EN 50367: 2020+A1:2022 annex B.3 figure B1 (as alternative to requirement in point 4.2.8.2.9.2).

Specific case Portugal ("T0")

For operation on the existing network 25 kV 50 Hz system, it is allowed to equip electric units with a pantograph having a head geometry of length 1 450 mm as depicted in EN 50367:2020+A1:2022, Annex B.3 figure B.1 (as alternative to requirement in point 4.2.8.2.9.2).

For operation on the existing network 1,5 kV DC system, it is allowed to equip electric units with a pantograph having a head geometry of length 2 180 mm as depicted in national rule notified for this purpose (as alternative to requirement in point 4.2.8.2.9.2).

Specific case Slovenia ("T0")

For operation on the existing network 3 kV DC system, it is allowed to equip electric units with a pantograph having a head geometry of length 1 450 mm as depicted in EN 50367:2020+A1:2022, Annex B.3 figure B.1 (as alternative to requirement in point 4.2.8.2.9.2).

Specific case Sweden ("T0")

For operation on the existing network, it is allowed to equip electric units with a pantograph having a head geometry of length 1 800 mm as depicted in EN 50367:2020+A1:2022, Annex B.3 figure B.5 (as alternative to requirement in point 4.2.8.2.9.2).

7.3.2.15. Contact strip material (4.2.8.2.9.4.2)*Specific case France ("P")*

The metallic content of the carbon contact strips is allowed to be increased up to 60 % by weight where used on 1 500 V DC lines.

7.3.2.16. Pantograph contact force and dynamic behaviour (4.2.8.2.9.6)*Specific case France ("T2")*

For technical compatibility with the existing network, electric units intended to be operated on DC 1,5 kV lines shall, in addition to the requirement of point 4.2.8.2.9.6, be validated with consideration of a mean contact force in the following range:

$70 \text{ N} < F_m < 0,00178 \cdot v^2 + 110 \text{ N}$ with a value of 140 N at standstill.

The conformity assessment procedure (simulation and/or test according to points 6.1.3.7 and 6.2.3.20) shall take into account the following environmental conditions:

summer conditions	:	ambient temperature $\geq 35 \text{ }^\circ\text{C}$; contact wire temperature $> 50 \text{ }^\circ\text{C}$ for simulation.
winter conditions	:	ambient temperature $0 \text{ }^\circ\text{C}$; contact wire temperature $0 \text{ }^\circ\text{C}$ for simulation.

Specific case Sweden ("T2")

For technical compatibility with the existing network in Sweden, the static contact force of the pantograph shall fulfil the requirements in EN 50367:2020+A1:2022 Annex B Table B3 column SE (55 N). The compatibility with these requirements shall be set out in the technical file for the vehicle.

Specific case Channel tunnel ("P")

For technical compatibility with existing lines, the verification at interoperability constituent level (points 5.3.10 and 6.1.3.7) shall validate capability of the pantograph to collect current for the additional range of contact wire heights between 5 920 mm and 6 020 mm.

7.3.2.17. Not used**7.3.2.18. Not used****7.3.2.19. Not used****7.3.2.20. Fire safety and evacuation (4.2.10)***Specific case Italy ("TO")*

Additional specifications for units intended to be operated in the existing Italian tunnels are detailed below.

Fire detection systems (points 4.2.10.3.2 and 6.2.3.23)

In addition to the areas specified in point 6.2.3.23, fire detection systems shall be installed in all passenger and train staff areas.

Fire containment and control systems for passenger rolling stock (point 4.2.10.3.4)

In addition to requirements of the point 4.2.10.3.4, units of category A and B passenger rolling stock shall be equipped with active Fire Containment and Control Systems.

Fire Containment and Control Systems shall be assessed according to the notified National Rules about fire automatic extinguishing systems.

In addition to the requirements specified in point 4.2.10.3.4, the units of category A and B passenger rolling stock shall be equipped with automatic fire extinguishing systems in all technical areas.

Freight locomotives and freight self-propelling units: fire spreading protection measures (point 4.2.10.3.5) and running capability (point 4.2.10.4.4)

In addition to the requirements specified in point 4.2.10.3.5, freight locomotives and freight self-propelling units shall be equipped with fire automatic extinguishing systems in all technical areas.

In addition to the requirements specified in point 4.2.10.4.4, freight locomotives and freight self-propelling units shall have a running capability equivalent to that of category B passenger rolling stock.

Review clause:

At the latest by 31 July 2025, the Member State shall deliver to the Commission a report on possible alternatives to the above additional specifications, in order to remove or significantly reduce the constraints on rolling stocks caused by the non-compliance of the tunnels with the TSIs.

7.3.2.21. Running capability (4.2.10.4.4) and fire containment and control system (4.2.10.3.4)*Specific case Channel Tunnel ("P")*

Passenger rolling stock intended to be operated in the Channel Tunnel shall be of category B, considering the length of the tunnel.

Due to the lack of firefighting points with safe area (see TSI SRT, point 4.2.1.7) amendments to the following points of this TSI apply:

Point 4.2.10.4.4 (3):

The running capability of a Passenger rolling stock intended to be operated in the Channel Tunnel shall be demonstrated by application of the specification referenced in Appendix J-1, index [33], in which the system functions impacted by a “type 2” fire shall be braking and traction; these functions shall be assessed in the following conditions:

- for a duration of 30 minutes at a minimum speed of 100 km/h, or
- for a duration of 15 minutes at a minimum speed of 80 km/h (according to point 4.2.10.4.4) under the condition specified in the national rule notified by the Channel tunnel safety authority for this purpose.

Point 4.2.10.3.4 (3) & (4):

Where the running capability is specified for a duration of 30 minutes according to the point above, the fire barrier between the driver's cab and the compartment to the rear of it (assuming the fire starts in the rear compartment) shall satisfy requirements for integrity for a minimum of 30 minutes (instead of 15 minutes).

Where the running capability is specified for a duration of 30 minutes according to the point above, and for passenger vehicles that do not allow the exit of passengers at both ends (no through route), measures to control the spread of heat and fire effluents (full cross section partitions or other FCCS, fire barriers between combustion engine/electrical supply/traction equipment and passenger/staff areas) shall be designed for a minimum of 30 minutes fire protection (instead of 15 minutes).

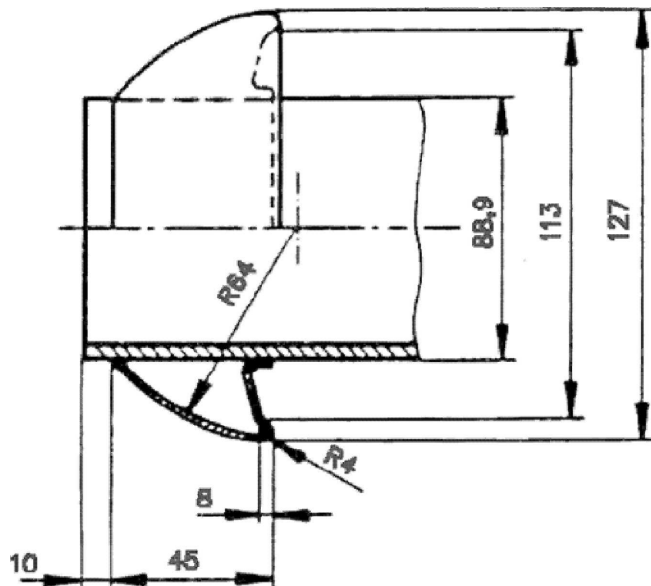
7.3.2.22. Interface for toilet discharge (4.2.11.3)

Specific case Finland (“P”)

Alternatively to, or in addition to what is specified in point 4.2.11.3, it is allowed to install connections for toilet discharge and for rinsing of the sanitary discharge tanks, compatible with the track side installations on the Finnish network in accordance with figure AI1.

Figure AI 1

Emptying connections for toilet tank



Quick connector SFS 4428, connector part A, size DN80

Material: acid-proof stainless steel

Sealing on the counter-connector's side.

Specific definition in the standard SFS 4428

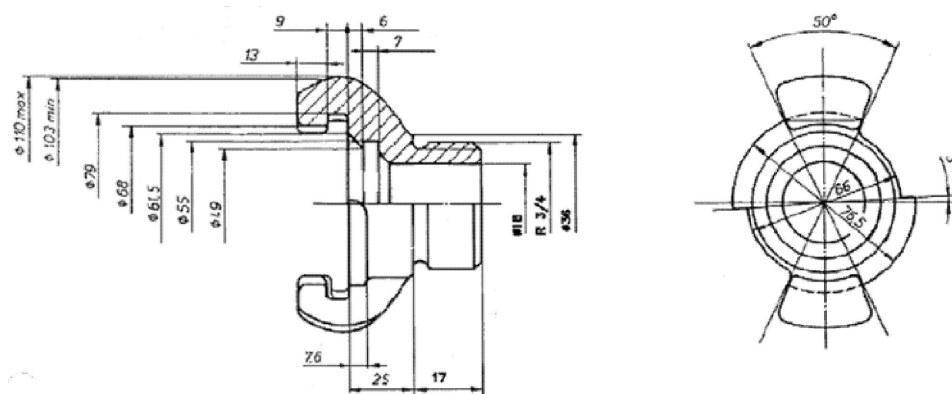
7.3.2.23. Interface for water refilling (4.2.11.5)

Specific case Finland ("P")

Alternatively to, or in addition to what is specified in point 4.2.11.5, it is allowed to install water filling connections compatible with the track side installations on the Finnish network in accordance with Figure AIII.

Figure A III

The water filling adapters



Type: Connector C for fire fighting NCU1

Material: brass or aluminium

Specific definition in the standard SFS 3802 (sealing defined by each connector manufacturer).

Specific case Ireland and the United Kingdom in respect of Northern Ireland ("P")

Alternatively to, or in addition to what is specified in point 4.2.11.5, it is allowed to install a nozzle type water refilling interface. This nozzle type refilling interface must fulfil the requirements of the national technical rules notified for the purpose.

7.3.2.24. Special requirements for stabling of trains (4.2.11.6)

Specific case Ireland and the United Kingdom in respect of Northern Ireland ("P")

Shore supply of electrical power to stabled trains must fulfil the requirements of the national technical rules notified for the purpose

7.3.2.25. Refuelling equipment (4.2.11.7)

Specific case Finland ("P")

In order to be able to be refuelled on the Finnish network, the fuel tank of units with a diesel filling interface has to be equipped with the over flow controller according to standards SFS 5684 and SFS 5685.

Specific case Ireland and the United Kingdom in respect of Northern Ireland ("P")

The refuelling equipment interface must fulfil the requirements of the national technical rules notified for the purpose.

7.3.2.26. Rolling stock originated from third country (general)

Specific case Finland ("P")

The application of national technical rules instead of the requirements in this TSI is allowed for third countries' rolling stock to be used on the Finnish 1 524 network in traffic between Finland and 3rd countries 1 520 network.

7.3.2.27. Not used;

(163) point 7.4 is replaced as follows:

‘7.4. Specific environmental conditions

Specific conditions Austria

Unrestricted access in Austria under winter conditions is granted if the following conditions are met:

- The additional capability of the obstacle deflector to remove snow as specified for snow, ice and hail severe conditions in point 4.2.6.1.2 shall be provided.
- Locomotives and power head units shall be provided with sanding system.

Specific conditions Bulgaria

Unrestricted access in Bulgaria under winter conditions is granted if the following condition is met:

- Locomotives and railcars shall be equipped with sanding system.

Specific conditions Croatia

Unrestricted access in Croatia under winter conditions is granted if the following condition is met:

- Traction vehicles and vehicles with a driving cab shall be equipped with sanding system.

Specific conditions Estonia Latvia and Lithuania

For unrestricted access of rolling stock on the Estonian, Latvian and Lithuanian network under winter conditions, it shall be demonstrated that the rolling stock meets the following requirements:

- Temperature zone T2 as specified in point 4.2.6.1.1 shall be selected.
- Snow, ice and hail severe conditions as specified in point 4.2.6.1.2, excluding the scenario “Snowdrift” shall be selected.

Specific conditions Finland

For unrestricted access of rolling stock on the Finnish network under winter conditions, it shall be demonstrated that the rolling stock meets the following requirements:

- Temperature zone T2 as specified in point 4.2.6.1.1 shall be selected
- Snow, ice and hail severe conditions as specified in point 4.2.6.1.2, excluding the scenario “Snowdrift” shall be selected
- Regarding the braking system, unrestricted access in Finland under winter conditions is granted if the following conditions are met:
 - at least half of the bogies are equipped with a magnetic track brake for trainset or passenger coach of nominal speed exceeding 140 km/h.
 - all bogies are equipped with a magnetic track brake for trainset or passenger coach of nominal speed exceeding 180 km/h.

Specific conditions France

Unrestricted access in France under winter conditions is granted if the following condition is met:

- locomotives and power head units shall be provided with sanding system.

Specific conditions Germany

Unrestricted access in Germany under winter conditions, is granted if the following condition is met:

- locomotives and power head units shall be provided with sanding system.

Specific conditions Greece

For unrestricted access to the Greek network under summer conditions, temperature zone T3 as specified in point 4.2.6.1.1 shall be selected.

Unrestricted access in Greece under winter conditions is granted if the following condition is met:

- Traction vehicles shall be equipped with sanding system.

Specific conditions Portugal

For unrestricted access to the Portuguese network under:

- (a) summer conditions, temperature zone T3 as specified in point 4.2.6.1.1 shall be selected,
- (b) winter conditions, locomotives shall be equipped with sanding system.

Specific conditions Spain

For unrestricted access to the Spanish network under summer conditions, temperature zone T3 as specified in point 4.2.6.1.1 shall be selected.

Specific conditions Sweden

For unrestricted access of rolling stock on the Swedish network under winter conditions, it shall be demonstrated that the rolling stock meets the following requirements:

- Temperature zone T2 as specified in point 4.2.6.1.1 shall be selected
- Snow, ice and hail severe conditions as specified in point 4.2.6.1.2 shall be selected.;

(164) point 7.5 is replaced as follows:

7.5. Aspects that have to be considered in the revision process or in other activities of the Agency

Further to the analysis performed during the drafting process of this TSI, particular aspects have been identified as of interest for the future development of the EU railway system.

These aspects are of 3 different groups:

- (1) Those already subject of a basic parameter in this TSI, with a possible evolution of the corresponding specification when the TSI will be revised.
- (2) Those not considered in the current state of the art as basic parameter, but which are subject to research projects.
- (3) Those relevant in the framework of ongoing studies related to the EU railway system, which are not in the scope of TSIs.

These aspects are identified below, classified according to the breakdown of the point 4.2 of the TSI.

7.5.1. Aspects related to a basic parameter in this TSI**7.5.1.1. Axle load parameter (point 4.2.3.2.1)**

This basic parameter covers the interface between infrastructure and rolling stock regarding the vertical load.

Further development is required for route compatibility check regarding static and dynamic compatibility.

Regarding dynamic compatibility, no harmonised classification method of the Rolling Stock is yet available including requirements related to High Speed Load Model (HSLM) compatibility:

- TSI LOC&PAS requirements should further be developed based on finding from CEN enhancing EN1991-2 Annex E with corresponding rolling stock requirements for dynamic compatibility, including compatibility with HSLM compliant structures,
- New basic design characteristics "Compliance of vehicle design with the High Speed Load Model (HSLM)" should be created,

- A harmonised process should be referenced accordingly for route compatibility check purposes in TSI OPE Appendix D.1 based on RINF and ERATV,
- Documents required in RINF parameter 1.1.1.1.2.4.4 should be harmonised as far as possible to facilitate automatic route compatibility check.

7.5.1.2. **Not used**

7.5.1.3. **Aerodynamic effects on ballasted tracks (point 4.2.6.2.5)**

Requirements on aerodynamic effects on ballasted tracks have been set up for units of maximum design speed higher than 250 km/h.

As the current state of the art does not allow to provide for a harmonized requirement nor assessment methodology, the TSI allows the application of national rules.

This will need to be reviewed in order to consider the following:

- Study of ballast-pick-up occurrences, and corresponding safety impact (if any).
- Development of a harmonized, cost-effective methodology applicable in EU.

7.5.2. **Aspects not related to a basic parameter in this TSI but subject to research projects**

7.5.2.1. **Not used**

7.5.2.2. **Further activities related to the conditions for having vehicle type authorisation and/or an authorization for placing on the market not limited to a particular area of use**

To facilitate free circulation of locomotives and passenger coaches, conditions for having an authorization for placing on the market not limited to a particular area of use are lay down in clause 7.1.1.5.

These provisions should be complemented with harmonised limit values for interference currents and magnetic fields at unit level, either as a percentage of the value defined for an Influencing unit, or as absolute limit values. These harmonised limits will be determined based on the specific cases or technical documents referred to in Article 13 of CCS TSI and on the future standard EN 50728 expected to be published in 2024.

The specification of interfaces between coaches intended to be used in general operations should be further detailed in point 7.1.1.5.2 with the objective to facilitate the interchangeability of those coaches (new and existing coaches).

7.5.2.3. **Equipment of a rolling stock with places for bicycles - Impact of the Passenger Rights Regulation**

Article 6(4) of Regulation (EU) 2021/782 of the European Parliament and of the Council (*) specifies the requirements for equipping rolling stock with places for bicycles.

Places for bicycles need to be realised in case of:

- a major change of the layout and furnishing of the passenger area, and
- when the above-mentioned upgrade of existing rolling stock leads to the need for a new vehicle authorisation for placing it on the market.

According to the principle specified in point 7.1.2.2.(1), major upgrades affecting other parts and basic parameters than the layout and furnishing of the passenger area may not entail the equipment of the rolling stock with places for bicycles.

(*) Regulation (EU) 2021/782 of the European Parliament and of the Council of 29 April 2021 on rail passengers' rights and obligations (recast). (OJ L 172, 17.5.2021, p. 1).;

(165) the appendices are amended as follows:

(a) the contents list is replaced by the following:

‘Appendix A: Not used

Appendix B: 1 520 mm system gauge T.

Appendix C: Special provisions for On Track Machines (OTMs)

Appendix D: Not used

Appendix E: Anthropometric measurements of the driver

Appendix F: Front visibility

Appendix G: Servicing

Appendix H: Assessment of the rolling stock subsystem

Appendix I: Aspects for which the technical specification is not available (open points)

Appendix J: Technical specifications referred to in this TSI

Appendix J-1: Standards or normative documents

Appendix J-2: Technical documents

Appendix K: Validation process for new end pieces of Magnetic Track Brake (MTB)

Appendix L: Changes of requirements and transition regimes’;

(b) Appendix C is replaced by the following:

‘Appendix C

Special provisions for On-Track-Machines (OTMs)

C.1 Strength of vehicle structure

The requirements of the point 4.2.2.4 are complemented as follow:

The machine frame shall be able to withstand either the static loads of the specification referenced in Appendix J-1, index [1] or the static loads according to the specification referenced in Appendix J-1, index [51] without exceeding the permissible values given there in.

The corresponding structural category of the specification referenced in Appendix J-1, index [51] is as follows:

- for machines not permitted to be loose shunted or hump shunted: F-II;
- for all other machines: F-I.

The acceleration in x-direction according to the specification referenced in Appendix J-1, index [1], Table 13 or to the specification referenced in Appendix J-1, index [51], Table 10 shall be ± 3 g.

C.2 Lifting and jacking

The machine body shall incorporate lifting points by which the whole machine is capable of being safely lifted or jacked. The location of the lifting and jacking points shall be defined.

To facilitate the work during repair or inspection or when on-tracking the machines, the machines shall be provided on both long sides with at least two lifting points, at which the machines can be lifted in empty or loaded condition.

To allow positioning of jacking devices, clearances shall be provided under the lifting points which shall not be blocked by the presence of non-removable parts. The load cases shall be consistent with the ones chosen in Appendix C.1 and shall apply for lifting and jacking under workshop and servicing operations.

C.3 Running dynamic behaviour

The running characteristics are permitted to be determined by running tests or by reference to a similar type approved machine as detailed in point 4.2.3.4.2 of this TSI or by simulation. Running behaviour can be proven by simulation of the tests described in the specification referenced in Appendix J-1, index [9] (with the exceptions as specified below) when there is a validated model of representative track and operating conditions of the machine.

The following additional deviations apply:

- (i) The simplified method for this type of machines shall be always accepted;
- (ii) if the required test speed cannot be obtained by the machine itself, the machine shall be hauled for the tests.

A model of a machine for simulation of running characteristics shall be validated by comparing the model results against the results of running tests when the same input of track characteristic is used.

A validated model is a simulation model that has been verified by an actual running test that excites the suspension sufficiently and where there is a close correlation between the results of the running test and the predictions from the simulation model over the same test track.

C.4 Acceleration at the maximum speed

No residual acceleration, as specified in point 4.2.8.1.2 (5), is required for Special vehicles.;

- (c) The content of Appendix D is replaced by 'Not used';
- (d) Appendix E is replaced by the following:

'Appendix E

Anthropometric measurements of the driver

The following data represents the 'state of the art' and shall be used.

- Principal anthropometric measurements of the shortest and tallest driving staff:

The dimensions given in the specification referenced in Appendix J-1, index [62] shall be taken into consideration.;

- (e) Appendix F is replaced by the following:

'Appendix F

Front visibility

F.1. General

The design of the cab shall support the drivers' view of all external information that form part of the driving task as well as protecting the driver from external sources of visual interference. This shall include the following:

- Flicker at the lower edge of the windscreen, which can cause fatigue, shall be reduced
- Protection shall be provided from the sun and glare of headlights from oncoming trains, without reducing the drivers' view of external signs, signals and other visual information
- Location of cab equipment shall not block or distort the drivers view of external information
- The dimension, location, shape and finishes (including maintenance) of the windows shall not inhibit the drivers external view and shall support the driving task
- The location, type and quality of windscreen cleaning and clearance devices shall ensure that the driver is able to maintain a clear external view in most weather and operating conditions, and shall not inhibit the drivers external view.
- The driver's cab shall be designed in such a way that the driver is facing forwards when driving.
- The driver's cab shall be designed to allow the driver at standing and/or seated driving positions a clear and unobstructed line of sight in order to distinguish fixed signals set to both the left and right of the track, as defined in the specification referenced in Appendix J-1 index [62].

The rules expressed in the Appendix above govern the conditions of visibility for each running direction along straight track and in curves with a radius of 300 m and more. They apply to the position(s) of the driver.

Notes:

in case of cab fitted with 2 driver's seats (option with 2 driving positions), they apply to the 2 seated positions.

for locomotives with central cab and for Special Vehicles, the point 4.2.9.1.3.1 of the TSI specifies particular conditions.

F.2. Reference position of vehicle in relation to track:

The specification referenced in Appendix J-1 index [62] shall apply.

The supplies and payload shall be considered as defined in the specification referenced in Appendix J-1, index [6] and point 4.2.2.10.

F.3. Reference position for the eyes of crew members

The specification referenced in Appendix J-1 index [62] shall apply.

The distance from the driver's eyes in seating posture to the windscreen shall be higher than or equal to 500 mm.

F.4. Conditions of visibility

The specification referenced in Appendix J-1 index [62] shall apply.;

(f) in Appendix H, Table H.1 is amended as follows:

- (i) in the row 'Cross wind', 'Cross wind' is replaced by 'Crosswind';
- (ii) the row 'Maximum current at standstill for DC systems' is replaced by the following:

'Maximum current at standstill	4.2.8.2.5	X	X (only for DC systems)	n.a	—		
--------------------------------	-----------	---	-------------------------	-----	---	--	--

(iii) the title 'System energy disturbances' is replaced by 'Harmonics and dynamic effects AC systems';

(iv) the row 'Diesel and other thermal traction system' is deleted;

(v) the title 'Onboard tools and portable equipment' is replaced by 'On-board tools and portable equipment';

(vi) the row 'Water refilling equipment' is deleted;

(g) Appendix I is replaced by the following:

'Appendix I

Aspects for which the technical specification is not available

(open points)

Open points that relate to technical compatibility between the vehicle and the network:

Element of the Rolling Stock sub-system	Point of this TSI	Technical aspect not covered by this TSI	Comments
Compatibility with train detection systems	4.2.3.3.1	See specification referenced in Appendix J-2, index [A]	Open points also identified in the TSI CCS.
Running dynamic behaviour for 1 520 mm track gauge system	4.2.3.4.2 4.2.3.4.3	Running dynamic behaviour. Equivalent conicity.	Normative documents referred to in the TSI are based on experience gained on the 1 435 mm system.

Equivalent conicity for 1 600 mm track gauge system	4.2.3.4.3	Running dynamic behaviour. Equivalent conicity.	Normative documents referred to in the TSI are based on experience gained on the 1 435 mm system.
Braking system independent of adhesion conditions	4.2.4.8.3	Eddy current track brake	The conditions for use of eddy current track brake for technical compatibility with the track are not harmonised
Aerodynamic effect on ballasted track for rolling stock of maximum design speed > 250 km/h	4.2.6.2.5	Limit value and conformity assessment in order to limit risks induced by the projection of ballast	On-going work within CEN. Open point also in TSI INF.

Open points that do not relate to technical compatibility between the vehicle and the network:

Element of the Rolling Stock sub-system	Point of this TSI	Technical aspect not covered by this TSI	Comments
Fire Containment and Control Systems	4.2.10.3.4	Conformity assessment of FCCS other than full partitions.	Assessment procedure of efficiency for controlling fire and smoke developed by CEN according to a request for standard issued by ERA'

(h) Appendix J is replaced by the following:

'Appendix J

Technical specifications referred to in this TSI

J-1 Standards or normative documents

Index	Characteristics to be assessed	TSI point	Mandatory standard point
[1]	EN 12663-1:2010+A1:2014 Railway applications - Structural requirements of railway vehicle bodies - Part 1: Locomotives and passenger rolling stock (and alternative method for freight wagons)		
[1.1]	Inner coupling for articulated units	4.2.2.2.2 (3)	6.5.3, 6.7.5
[1.2]	Strength of vehicle structure – general	4.2.2.4 (3)	5.1, 5.2, 5.3, 5.4, 5.6
[1.3]	Strength of vehicle structure – method of verification	4.2.2.4 (4)	9.2, 9.3
[1.4]	Strength of vehicle structure – alternative requirements for OTMs	Appendix C Point C.1	6.1 to 6.5
[1.5]	Lifting and jacking — loads for the structure design	4.2.2.6 (9)	6.3.2, 6.3.3
[1.6]	Lifting and jacking — strength demonstration	4.2.2.6 (9)	9.2, 9.3

[1.7]	Fixing of devices to carbody structure	4.2.2.7 (3)	6.5.2, 6.7.3
[1.8]	Structural design of the bogie frame – body to bogie connection	4.2.3.5.1 (2)	6.5.1, 6.7.2
[2]	EN 16839:2022 Railway applications - Rolling stock - Head stock layout		
[2.1]	Staff access for coupling and uncoupling – space for shunting staff	4.2.2.2.5 (2)	4
[2.2]	End coupling – Compatibility between units –manual UIC type Buffers and screw coupling installation	4.2.2.2.3 (b) (b-2) (1)	5, 6
[2.3]	Dimensions and layout of brake pipes and hoses, couplings and cocks	4.2.2.2.3 (b) (b-2) (2)	7, 8
[2.4]	Rescue coupling — interface with recovery unit	4.2.2.2.4 (3) (a)	7
[3]	EN 15227:2020 Railway applications - Crashworthiness requirements for railway vehicles		
[3.1]	Passive safety – general	4.2.2.5	4, 5, 6, 7 and annexes B, C, D (excluding annex A)
[3.2]	Passive safety – categorisation	4.2.2.5 (5)	5.1-table 1
[3.3]	Passive safety – scenarios	4.2.2.5 (6)	5.2, 5.3, 5.4 (excluding annex A)
[3.4]	Passive safety – requirements	4.2.2.5 (7)	6.1, 6.2, 6.3, 6.4 (excluding annex A)
[3.5]	Passive safety – obstacle deflector	4.2.2.5 (8)	6.5.1
[3.6]	Lifeguards	4.2.3.7	6.6.1
[3.7]	Environmental conditions – obstacle deflector	4.2.6.1.2 (4)	6.5.1
[4]	EN 16404:2016 Railway applications - Re-railing and recovery requirements for railway vehicles		
[4.1]	Lifting and jacking — geometry of permanent points	4.2.2.6 (7)	5.2, 5.3
[4.2]	Lifting and jacking — geometry of removable points	4.2.2.6 (7)	5.2, 5.3
[5]	EN 15877-2:2013 Railway applications - Markings of railway vehicles - Part 2: External markings on coaches, motive power units, locomotives and on track machines		
[5.1]	Lifting and jacking – marking	4.2.2.6 (8)	4.5.19
[5.2]	Coaches intended to be used in general operation	7.1.1.5.1(23)	4.5.5.1, 4.5.6.3

[6]	EN 15663:2017+A1 :2018 Railway applications - Vehicle reference masses		
[6.1]	Load conditions and weighed mass – load conditions	4.2.2.10 (1)	4.5
[6.2]	Load conditions and weighed mass – hypothesis of load conditions	4.2.2.10 (2)	4.1, 4.2, 4.3, 4.4, 4.5, 5, 6, 7.1, 7.2, 7.3 (design conditions)
[7]	EN 15273-2:2013+A1:2016 Railway applications - Gauges - Part 2: Rolling stock gauge		
[7.1]	Gauging – method, reference profile	4.2.3.1 (3), (4)	5 and depending on the profile : annex A (G1), B (GA,GB,GC), C (GB1,GB2), D (GI3), E(G2), F (FIN1), G (FR3,3), H (BE1,BE2, BE3),I (PTb,PTb+,PTc), J(SEa,Sec), K(OSJD), L (DE1 DE2 DE3), M(NL1NL2), P (GHE16....)
[7.2]	Gauging – method, reference profile Verification of pantograph gauge	4.2.3.1 (5)	A.3.12
[7.3]	Gauging – method, reference profile Verification of eddy current track brakes	4.2.4.8.3(3)	5 and depending on the profile : annex A (G1), B (GA,GB,GC), C (GB1,GB2), D (GI3), E(G2), F (FIN1), G (FR3,3), H (BE1,BE2, BE3),I (PTb,PTb+,PTc), J(SEa,Sec), K(OSJD), L (DE1 DE2 DE3), M(NL1NL2), P (GHE16....)
[8]	EN 15437-1:2009 Railway applications – Axle box condition monitoring – Interface and design requirements - Part 1: Track side equipment and rolling stock axle box		
[8.1]	Axle bearing condition monitoring – zone visible to track side equipment	4.2.3.3.2.2 (1), (2a) 7.3.2.3	5.1, 5.2
[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]	Axle loads range	4.2.3.4.1, 4.2.3.4.2(4)	1.1, 5.3.2

[9.2]	Combination(s) of speed and cant deficiency	4.2.3.4.2 (3)	1.4, 7.3.1
[9.3]	Track loading parameters	4.2.3.4.2 (5)	7.5.1, 7.5.3
[9.4]	Running dynamic behaviour – limit values for running safety	4.2.3.4.2.1	7.5.1, 7.5.2
[9.5]	Running dynamic behaviour – track loading limit values	4.2.3.4.2.2 (1)	7.5.1, 7.5.3
[9.6]	Safety against derailment running on twisted track	6.2.3.3 (1)	4, 5, 6.1
[9.7]	Running dynamic behaviour – method of verification	6.2.3.4 (1)	7
[9.8]	Running dynamic behaviour – criteria for assessment	6.2.3.4 (1)	4, 5
[9.9]	Design values for new wheel profiles – evaluation of the equivalent conicity	6.2.3.6 (1)	Annex O, Annex P
[9.10]	Vehicles conformity with rail inclination	7.1.2 Table 17a note (1)	4, 5, 6, 7.
[9.11]	Provision for special vehicles: simulation of the tests	Appendix C Section C.3	Annexe T
[10]	EN 15528:2021 Railway applications - Line categories for managing the interface between load limits of vehicles and infrastructure		
[10.1]	EN line category as the result of a categorisation of the unit	4.2.3.2.1 (2)	6.1, 6.3, 6.4
[10.2]	Standard value of payload in standing areas	4.2.3.2.1 (2a)	Table 4 column 2
[10.3]	Documentation indicating the payload used in standing areas	4.2.3.2.1 (2c)	6.4.1
[11]	EN 13749:2021 Railway applications - Wheelsets and bogies - Method of specifying the structural requirements of bogie frames		
[11.1]	Structural design of the bogie frame	4.2.3.5.1 (1) 4.2.3.5.1 (3)	6.2
[12]	EN 14198:2016+A1:2018+A2:2021 Railway applications - Braking - Requirements for the brake system of trains hauled by locomotives		
[12.1]	Braking – type of brake system, UIC brake system	4.2.4.3	5.4
[12.2]	Coaches intended to be used in general operation	7.1.1.5.2 (3)	5.3.2.6, 5.4

[13]	EN 14531-1:2015+A1 :2018 Railway applications - Methods for calculation of stopping distances, slowing distances and immobilization braking - Part 1:General algorithms		
[13.1]	Braking performance – calculation – general	4.2.4.5.1 (1)	4
[13.2]	Emergency braking performance – calculation	4.2.4.5.2 (3)	4
[13.3]	Service braking performance – calculation	4.2.4.5.3 (1)	4
[13.4]	Parking brake performance – calculation	4.2.4.5.5 (3)	5
[13.5]	Braking performance – friction coefficient	4.2.4.5.1 (2)	4.4.6
[13.6]	Emergency braking performance – response time/delay time	4.2.4.5.2 (1)	4.4.8.2.1, 4.4.8.3
[14]	EN 14531-2:2015 Railway applications - Methods for calculation of stopping and slowing distances and immobilisation braking - Part 2: Step by step calculations for train sets or single vehicles		
[14.1]	Braking performance – calculation – general	4.2.4.5.1 (1)	4, 5
[14.2]	Emergency braking performance – calculation	4.2.4.5.2 (3)	4, 5
[14.3]	Service braking performance – calculation	4.2.4.5.3 (1)	4, 5
[15]	EN 15595:2018+AC :2021 Railway applications - Braking - Wheel slide protection		
[15.1]	Wheel slide protection system – design	4.2.4.6.2 (6)	5.1, 5.2, 5.4
[15.2]	Wheel slide protection system – verification method and test program	6.1.3.2 (1)	6.1.1, 6.2, 6.5, 7
[15.3]	Wheel slide protection system – wheel rotation monitoring system	4.2.4.6.2 (8)	5.1.7
[15.4]	Wheel slide protection, method of verification of performance	6.2.3.10 (1)	6.3, 7
[16]	EN 16207:2014+A1 :2019 Railway applications - Braking - Functional and performance criteria of Magnetic Track Brake systems for use in railway rolling stock		
[16.1]	Magnetic track brake	4.2.4.8.2 (3) Appendix K	Annex C
[17]	EN 14752:2019+A1 :2021 Railway applications - Bodyside entrance systems for rolling stock		
[17.1]	Door obstacle detection – sensitivity	4.2.5.5.3 (5)	5.2.1.4.1
[17.2]	Door obstacle detection – maximum force	4.2.5.5.3 (5)	5.2.1.4.2.2

[17.3]	Door emergency opening – manual force to open the door	4.2.5.5.9 (6)	5.5.1.5
[17.4]	Coaches intended to be used in general operation – door control device	7.1.1.5.2 (10)	5.1.1, 5.1.2, 5.1.5, 5.1.6
[18]	EN 50125-1:2014 Railway applications - Environmental conditions for equipment -Part 1: Rolling stock and on-board equipment		
[18.1]	Environmental conditions – temperature	4.2.6.1.1 (1)	4.3
[18.2]	Environmental conditions – snow, ice and hail conditions	4.2.6.1.2 (1)	4.7
[18.3]	Environmental conditions – temperature	7.1.1.5.2 (4)	4.3
[19]	EN 14067-6:2018 Railway applications - Aerodynamics - Part 6: Requirements and test procedures for crosswind assessment		
[19.1]	Aerodynamic effects –crosswind method of verification	4.2.6.2.4 (2)	5
[19.2]	Aerodynamic effects –crosswind for units of maximum design speed equal or higher than 250 km/h	4.2.6.2.4 (3)	5
[20]	EN 15153-1:2020 Railway applications - External visible and audible warning devices - Part 1: Head, marker and tail lamps for heavy rail		
[20.1]	Head lamps – colour	4.2.7.1.1 (4)	5.3.3
[20.2]	Head lamps – full-beam and dimmed headlamp luminous intensity	4.2.7.1.1 (5)	5.3.3, 5.3.4 table 2 first line
[20.3]	Head lamps – means of alignment	4.2.7.1.1 (6)	5.3.3, 5.3.5
[20.4]	Marker lamps – colour	4.2.7.1.2 (6) (a)	5.4.3.1 table 4
[20.5]	Marker lights – spectral radiation distribution	4.2.7.1.2 (6) (b)	5.4.3.2
[20.6]	Marker lights – luminous intensity	4.2.7.1.2 (6) (c)	5.4.4 table 6
[20.7]	Tail lights – colour	4.2.7.1.3 (4) (a)	5.5.3 table 7
[20.8]	Tail lights – luminous intensity	4.2.7.1.3 (4) (b)	5.5.4 table 8
[20.9]	Head lamps – colour	6.1.3.3 (1)	5.3.3, 6.3
[20.10]	Head lamps – luminous intensity	6.1.3.3 (1)	5.3.3, 6.4
[20.11]	Marker lamps – colour	6.1.3.4 (1)	6.3
[20.12]	Marker lamps – luminous intensity	6.1.3.4 (1)	6.4
[20.13]	Tail lamps – colour	6.1.3.5 (1)	6.3
[20.14]	Tail lamps – luminous intensity	6.1.3.5 (1)	6.4
[20.15]	Marker lamps – means of alignment	4.2.7.1.2 (7)	5.4.5

[21]	EN 15153-2:2020 Railway applications - External visible and audible warning devices - Part 2: Warning horns for heavy rail		
[21.1]	Warning horn sound pressure levels	4.2.7.2.2 (1)	5.2.2
[21.2]	Horn – sounding	6.1.3.6 (1)	6
[21.3]	Horn – sound pressure level	6.1.3.6 (1)	6
[21.4]	Horn – sound pressure level	6.2.3.17 (1)	6
[22]	EN 50388-1:2022 Railway Applications - Fixed installations and rolling stock - Technical criteria for the coordination between electric traction power supply systems and rolling stock to achieve interoperability - Part 1: General		
[22.1]	Regenerative brake with energy to the overhead contact line	4.2.8.2.3 (1)	12.2.1
[22.2]	Maximum power and current from the overhead contact line – automatic regulation of current	4.2.8.2.4 (2)	7.3
[22.3]	Power factor – verification method	4.2.8.2.6 (1)	6
[22.4]	Harmonics and dynamic effects for AC systems –	4.2.8.2.7 (1)	10 (except 10.2)
[22.5]	Electrical protection of the train – coordination of protection	4.2.8.2.10 (3)	11
[22.6]	Main circuit breaker – coordination of protection	5.3.12 (4)	11.2, 11.3
[22.7]	Maximum power and current from the overhead contact line – method of verification	6.2.3.18 (1)	15.3.1
[22.8]	Power factor — method of verification	6.2.3.19 (1)	15.2
[23]	EN 50206-1:2010 Railway applications - Rolling stock - Pantographs: Characteristics and tests - Part 1: Pantographs for main line vehicles		
[23.1]	Working range in height of pantograph (IC level) – characteristics	4.2.8.2.9.1.2 (2)	4.2, 6.2.3
[23.2]	Pantograph current capacity (IC level)	4.2.8.2.9.3a (2)	6.13.2
[23.3]	Pantograph lowering (RST level) – time to lower the pantograph	4.2.8.2.9.10 (1)	4.7
[23.4]	Pantograph lowering (RST level) – ADD	4.2.8.2.9.10 (3)	4.8
[23.5]	Pantograph – verification method	6.1.3.7 (2)	6.3.1
[24]	EN 50367:2020+A1:2022 Railway applications - Fixed installations and rolling stock - Criteria to achieve technical compatibility between pantographs and overhead contact line		
[24.1]	Maximum current at standstill	4.2.8.2.5 (1)	Table 5 of 7.2
[24.2]	Pantograph head geometry	4.2.8.2.9.2 (5)	5.3.2.3

[24.3]	Pantograph head geometry – type 1 600 mm	4.2.8.2.9.2.1 (1)	Annex A.2 Figure A.6
[24.4]	Pantograph head geometry – type 1 950 mm	4.2.8.2.9.2.2 (1)	Annex A.2 Figure A.7
[24.5]	Pantograph – temperature of contact wire	6.1.3.7 (1a)	7.2
[25]	Not used		
[26]	EN 50119:2020 Railway applications - Fixed installations - Electric traction overhead contact lines		
[26.1]	Pantograph lowering (RST level) – dynamic insulating distance	4.2.8.2.9.10 (1)	Table 2
[27]	EN 50153:2014-05/A1:2017-08/A2:2020-01 Railway applications -Rolling stock -Protective provisions relating to electrical hazards		
[27.1]	Protection against electrical hazard	4.2.8.4 (1)	5, 6, 7, 8
[28]	EN 15152:2019 Railway applications - Front windscreens for train cabs		
[28.1]	Windscreen – resistance to impacts from projectiles	4.2.9.2.1 (2)	6.1
[28.2]	Windscreen – resistance to spalling	4.2.9.2.1 (2)	6.1
[28.3]	Windscreen –secondary image separation	4.2.9.2.2 (2) (a)	5.2.1
[28.4]	Windscreen – optical distortion	4.2.9.2.2 (2) (b)	5.2.2
[28.5]	Windscreen – haze	4.2.9.2.2 (2) (c)	5.2.3
[28.6]	Windscreen – light transmittance	4.2.9.2.2 (2) (d)	5.2.4
[28.7]	Windscreen – chromaticity	4.2.9.2.2 (2) (e)	5.2.5
[28.8]	Windscreen – characteristics	6.2.3.22 (1)	5.2.1 to 5.2.5 6.1
[29]	EN/IEC 62625-1:2013+A11:2017 Electronic railway equipment - On board driving data recording system -Part 1: System specification		
[29.1]	Recording device – functional requirements	4.2.9.6 (2) (a)	4.2.1, 4.2.2, 4.2.3, 4.2.4
[29.2]	Recording device – recording performance	4.2.9.6 (2) (b)	4.3.1.2.2
[29.3]	Recording device – integrity	4.2.9.6 (2) (c)	4.3.1.4
[29.4]	Recording device – data integrity safeguard	4.2.9.6 (2) (d)	4.3.1.5
[29.5]	Recording device – level of protection	4.2.9.6 (2) (e)	4.3.1.7
[29.6]	Recording device – time of day and date	4.2.9.6 (2) (f)	4.3.1.8

[30]	EN 45545-2:2020 Railway applications - Fire protection on railway vehicles -Part 2: Requirements for fire behaviour of materials and components		
[30.1]	Measures to prevent fire – material requirements	4.2.10.2.1 (2)	4, 5, 6
[30.2]	Specific measures for flammable liquids	4.2.10.2.2 (2)	Table 5
[31]	EN 1363-1:2020 Fire resistance tests - Part 1: General Requirements		
[31.1]	Fire spreading protection measures for passenger rolling stock – partition test	4.2.10.3.4 (3)	4 to 12
[31.2]	Fire spreading protection measures for passenger rolling stock – partition test	4.2.10.3.5 (3)	4 to 12
[32]	EN 13272-1:2019 Railway applications - Electrical lighting for rolling stock in public transport systems - Part 1: Heavy rail		
[32.1]	Emergency lighting – lighting level	4.2.10.4.1 (5)	4.3, 5.3
[33]	EN 50553:2012/A2:2020 Railway applications - Requirements for running capability in case of fire on board of rolling stock		
[33.1]	Running capability	4.2.10.4.4 (3)	5, 6
[34]	EN 16362:2013 Railway applications - Ground based services - Water restocking equipment		
[34.1]	Interface for water filling	4.2.11.5 (2)	4.1.2 figure 1
[35]	EN/IEC 60309-2:1999/A11:2004, A1: 2007 and A2:2012 Plugs, socket-outlets and couplers for industrial purposes - Part 2: Dimensional interchangeability requirements for pin and contact-tube accessories		
[35.1]	Special requirements for stabling of trains – local external auxiliary power supply	4.2.11.6 (2)	8
[36]	EN 16019:2014 Railway applications - Automatic coupler - Performance requirements, specific interface geometry and test method		
[36.1]	Automatic centre buffer coupler – type 10 The type of end coupling (mechanical and pneumatic interface of the head)	5.3.1 (1)	4
[37]	EN 15551:2022 Railway applications - Railway rolling stock - Buffers		
[37.1]	Manual end coupling – UIC type	5.3.2 (1)	6.2.2, annex A

[38]	EN 15566:2022 Railway applications - Railway rolling stock - Draw gear and screw coupling		
[38.1]	Manual end coupling – UIC type	5.3.2 (1)	Annex B, C, D except the dimension 'a' in Annex B Figure B.1 which shall be treated as informative
[39]	EN 15020:2022 Railway applications - Rescue coupler - Performance requirements, specific interface geometry and test methods		
[39.1]	Rescue coupler – rescue coupler interfaced with the 'type 10"	5.3.3 (1)	4.2.1, 4.2.2, 4.3, 4.5.1, 4.5.2, 4.6 and 5.1.2
[40]	EN 13979-1:2020 Railway applications - Wheelsets and bogies - Monobloc wheels - Technical approval procedure - Part 1: Forged and rolled wheels		
[40.1]	Wheels – mechanical strength calculations	6.1.3.1 (1)	8
[40.2]	Wheels – decision criteria for forged and rolled wheels	6.1.3.1 (2)	8
[40.3]	Wheels – specification for further verification method (bench test)	6.1.3.1 (2)	8
[40.4]	Wheels – verification method Thermomechanical behaviour	6.1.3.1 (5)	7
[41]	EN 50318:2018+A1 :2022 Railway applications -Current collection systems -Validation of simulation of the dynamic interaction between pantograph and overhead contact line		
[41.1]	Pantograph – dynamic behaviour	6.1.3.7 (3)	5, 6, 7, 8, 9, 10, 11
[41.2]	Pantograph – arrangement of pantographs	6.2.3.21 (2)	5, 6, 7, 8, 9, 10, 11
[42]	EN 50317:2012/AC:2012+A1:2022 Railway applications - Current collection systems - Requirements for and validation of measurements of the dynamic interaction between pantograph and overhead contact line		
[42.1]	Pantograph – interaction characteristics	6.1.3.7 (3)	3, 4, 5, 6, 7, 8, 9
[42.2]	Current collection dynamic behaviour – dynamic tests	6.2.3.20 (1)	3, 4, 5, 6, 7, 8, 9
[42.3]	Arrangement of pantographs	6.2.3.21 (2)	3, 4, 5, 6, 7, 8, 9

[43]	EN 50405:2015+A1:2016 Railway applications - Current collection systems - Pantographs, testing methods for contact strips		
[43.1]	Contact strips – verification method	6.1.3.8 (1)	7.2, 7.3 7.4, 7.6 7.7
[44]	EN 13674-1:2011+A1:2017 Railway applications - Track - Rail - Part 1: Vignole railway rails 46 kg/m and above		
[44.1]	Equivalent conicity – rail section definitions	6.2.3.6 - tables 12, 14 and 16	figures A.15, A.23 and A.24
[45]	EN 13715:2020 Railway applications - Wheelsets and bogies - Wheels - Tread profile		
[45.1]	Equivalent conicity – wheel profile definitions	6.2.3.6 (1), (2) and (3)	Annex B and Annex C
[46]	EN 13260:2020 Railway applications - Wheelsets and bogies - Wheelsets - Product requirements		
[46.1]	Wheelset – assembly	6.2.3.7 (1)	4.2.1
[47]	EN 13103-1:2017 Railway applications - Wheelsets and bogies - Part 1: Design method for axles with external journals		
[47.1]	Wheelset – Powered and non-powered axles, method of verification	6.2.3.7 (2)	5, 6, 7
[47.2]	Wheelset – Powered and non-powered axles, decision criteria	6.2.3.7 (2)	8
[48]	EN 12082:2017+A1:2021 Railway applications – Axle boxes - Performance testing		
[48.1]	Axle boxes/bearings	6.2.3.7 (6)	7
[49]	EN 14067-4:2013+A1:2018 Railway applications - Aerodynamics - Part 4: Requirements and test procedures for aerodynamics on open track		
[49.1]	Slipstream effect – full scale tests	6.2.3.13 (1)	6.2.2.1
[49.2]	Slipstream effect – simplified assessment	6.2.3.13 (2)	4.2.4 and limits in table 7
[49.3]	Head pressure pulse – method of verification	6.2.3.14 (1)	6.1.2.1
[49.4]	Head pressure pulse – CFD	6.2.3.14 (1)	6.1.2.4
[49.5]	Head pressure pulse – moving model	6.2.3.14 (1)	6.1.2.2

[49.6]	Head pressure pulse – simplified assessment method	6.2.3.14 (2)	4.1.4 and limits in table 4
[49.7]	Slipstream effects – Definition of measurement points	4.2.6.2.1 (1)	4.2.2.1, Table 5
[49.8]	Reference train for fixed/predefined formations	4.2.6.2.1 (3)	4.2.2.2
[49.9]	Formation for single units fitted with a driver cab	4.2.6.2.1 (3)	4.2.2.3
[49.10]	Reference train for units for general operation	4.2.6.2.1 (3)	4.2.2.4
[49.11]	Head pressure pulse – Maximum peak-to-peak pressure	4.2.6.2.2 (2)	Table 2
[49.12]	Head pressure pulse – Measurement positions	4.2.6.2.2 (2)	4.1.2
[50]	EN 14067-5:2021/AC:2023 Railway applications - Aerodynamics - Part 5: Requirements and test procedures for aerodynamics in tunnels		
[50.1]	pressure variations in tunnels: general	4.2.6.2.3(1)	5.1
[50.2]	Unit assessed in fixed or predefined formation	4.2.6.2.3(2)	5.1.2.2
[50.3]	Unit assessed for general operation and fitted with a driver's cab	4.2.6.2.3(2)	5.1.2.3
[50.4]	coaches for general operation	4.2.6.2.3(2)	5.1.2.4
[50.5]	conformity assessment procedure	6.2.3.15	5.1.4, 7.2.2, 7.2.3, 7.3
[50.6]	Unique authorisation - coaches intended to be used in mixed traffic in tunnels – aerodynamic loads	7.1.1.5.1 (14)	6.3.9
[51]	EN 12663-2:2010 Railway applications - Structural requirements of railway vehicle bodies - Part 2: Freight wagons		
[51.1]	Structural strength	Appendix C Point C.1	5.2.1 to 5.2.4
[52]	CLC/TS 50534:2010 Railway applications - Generic system architectures for onboard electric auxiliary power systems		
[52.1]	'Single pole' power supply line	4.2.11.6 (2)	Annex A
[53]	IEC 61375-1:2012 Electronic railway equipment –Train communication network (TCN) –Part 1: General architecture		
[53.1]	Unique authorisation - Communication networks	7.1.1.5.1 (18)	5, 6
[53.2]	Coaches intended to be used in general operation - Communication networks	7.1.1.5.2 (12)	5, 6

[54]	EN 16286-1:2013 Railway applications - Gangway systems between vehicles - Part 1: Main applications		
[54.1]	Gangways-Flange intercommunication connections	7.1.1.5.2 (6)	Annexes A and B
[55]	EN 50463-3:2017 Railway applications - Energy measurement on board trains - Part 3: Data handling		
[55.1]	On-board location function-Requirements	4.2.8.2.8.1 (7)	4.4
[55.2]	The compiling and handling of data within the data handing system-Assessment methodology	6.2.3.19a (2)	5.4.8.3, 5.4.8.5 and 5.4.8.6
[56]	EN 50463-2:2017/AC :2018-10 Railway applications - Energy measurement on board trains - Part 2: Energy measuring		
[56.1]	Energy measurement function – accuracy for active energy measurement:	4.2.8.2.8.2 (3)	4.2.3.1 to 4.2.3.4
[56.2]	Energy measurement function – Class designations	4.2.8.2.8.2 (4)	4.3.3.4, 4.3.4.3 and 4.4.4.2
[56.3]	Energy measurement function — Assessment of the accuracy of devices	6.2.3.19a (1)	5.4.3.4.1, 5.4.3.4.2, 5.4.4.3.1
[56.4]	Energy measurement function — values for input quantity and power factor range	6.2.3.19a (1)	Table 3,
[56.5]	Energy measurement function — effects of temperature on accuracy	6.2.3.19a (1)	5.4.3.4.3.1 and 5.4.4.3.2.1
[56.6]	Energy measurement function: mean temperature coefficient of each device — Assessment methodology	6.2.3.19a (1)	5.4.3.4.3.2 and 5.4.4.3.2.2
[57]	EN 50463-1:2017 Railway applications - Energy measurement on board trains - Part 1: General		
[57.1]	Energy measurement function: consumption point identification — Definition	4.2.8.2.8.3 (4)	4.2.5.2
[58]	EN 50463-4:2017 Railway applications - Energy measurement on board trains - Part 4: Communication		
[58.1]	Data exchange between EMS and DCS - application services (service layer) of the EMS	4.2.8.2.8.4 (1)	4.3.3.1,
[58.2]	Data exchange between EMS and DCS – User access rights	4.2.8.2.8.4 (2)	4.3.3.3
[58.3]	Data exchange between EMS and DCS - XML schema for structure (data layer)	4.2.8.2.8.4 (3)	4.3.4

[58.4]	Data exchange between EMS and DCS – Methods and XML schema for message mechanism (message layer)	4.2.8.2.8.4 (4)	4.3.5
[58.5]	Data exchange between EMS and DCS – Application protocols for supporting the message mechanism	4.2.8.2.8.4 (5)	4.3.6
[58.6]	Data exchange between EMS and DCS – EMS communication architecture	4.2.8.2.8.4 (6)	4.3.7
[59]	EN 50463-5:2017 Railway applications - Energy measurement on board trains - Part 5: Conformity assessment		
[59.1]	On-board energy measurement system-Tests	6.2.3.19a (3)	5.3.3 and 5.5.4
[60]	Reserved		
[61]	IRS UIC 50558:2017 Railway Application - Rolling Stock - Remote control and data cables interfaces - Standard technical features		
[61.1]	Physical interface between units for the signal transmission	7.1.1.5.2 (8)	7.1.1
[62]	EN 16186-1:2014+A1 :2018 Railway applications - Driver's cab - Part 1: Anthropometric data and visibility		
[62.1]	Anthropometric measurements of the driver	Appendix E	4
[62.2]	Front visibility	F.1	Annex A
[62.3]	Front visibility	F.2, F.3, F.4	5.2.1.
[63]	EN 14363:2005 Railway applications - Testing for the acceptance of running characteristics of railway vehicles – Testing for running behaviour and stationary tests		
[63.1]	Vehicles conformity with rail inclination	7.1.2 Table 17a note (1)	5
[64]	UIC 518:2009 Testing and approval of railway vehicles from the point of view of their dynamic behaviour - Safety - Track fatigue - Running behaviour		
[64.1]	Vehicles conformity with rail inclination	7.1.2 Table 17a note (1)	5 to 11
[65]	EN 16834:2019 Railway applications - Braking - Brake performance		
[65.1]	Braked weight percentage	4.2.4.5.2 (4)	8.1
[66]	EN 14478:2017 Railway applications - Braking - Generic vocabulary		
[66.1]	Emergency braking performance	6.2.3.8 (1)	4.6.3
[66.2]	Service braking performance	6.2.3.9 (1)	4.6.3

[67]	EN 15328:2020 Railway applications - Braking - Brake pads		
[67.1]	Emergency braking performance – friction coefficient	4.2.4.5.2 (5)	5.2
[68]	EN 16452:2015+A1:2019 Railway applications - Braking - Brake blocks		
[68.1]	Emergency braking performance – friction coefficient	4.2.4.5.2 (5)	5.3.1, 5.3.3
[69]	EN 50163:2004+A1:2007+A2:2020+A3:2022 Railway applications - Supply voltages of traction systems		
[69.1]	Operation within range of voltages and frequencies	4.2.8.2.2.(1)	4
[70]	UIC 541-6:2010-10 Brakes - Electropneumatic brake (ep brake) and Passenger alarm signal (PAS) for vehicles used in hauled consists		
[70.1]	Coaches intended to be used in general operation	7.1.1.5.2 (3)	3, 7
[71]	EN 17065:2018 Railway applications - Braking - Passenger coach test procedure		
[71.1]	Coaches intended to be used in predefined formations	7.1.1.5.1 (13)	5, 6
[71.2]	Coaches intended to be used in general operation	7.1.1.5.2 (3)	5, 6
[72]	EN/IEC 62625-2:2016 Electronic railway equipment - On board driving data recording system - Part 2: Conformity testing		
[72.1]	Testing	4.2.9.6 (3)	5, 6
[73]	EN 14363:2016 Railway applications - Testing and Simulation for the acceptance of running characteristics of railway vehicles - Running Behaviour and stationary tests		
[73.1]	Vehicles conformity with rail inclination	7.1.2 Table 17a note (1)	4,5,7
[74]	EN 16586-1:2017 Railway applications - Design for PRM use - Accessibility of persons with reduced mobility to rolling stock - Part 1: Steps for access and egress		
[74.1]	Coaches intended to be used in predefined formations	7.1.1.5.1 (19)	Annex A

J-2 Technical documents (available on ERA website)

Index	Characteristics to be assessed	TSI point	Mandatory technical document point
[A]	ERA/ERTMS/033281 - V 5.0 Interfaces between Control-Command and Signalling Trackside and other Subsystems TSI CCS, Appendix A, Table A 2, index [77]		
	Rolling stock characteristics for compatibility with train detection system based on track circuits	4.2.3.3.1.1	
[A.1]	Maximum distance between following axles	4.2.3.3.1.1 (1)	3.1.2.1 (distance a_i in Figure 1)
[A.2]	Maximum distance between front/ rear end of train and first/last axle	4.2.3.3.1.1 (2)	3.1.2.4 3.1.2.5 (distance b_x in Figure 1)
[A.3]	Minimum distance between first and last axle	4.2.3.3.1.1 (3)	3.1.2.3
[A.4]	Minimum axle load in all load conditions	4.2.3.3.1.1 (4)	3.1.7.1
[A.5]	Electrical resistance between the running surfaces of the opposite wheels of a wheelset	4.2.3.3.1.1 (5)	3.1.9
[A.6]	For electric units equipped with a pantograph, the minimum vehicle impedance	4.2.3.3.1.1 (6)	3.2.2.1
[A.7]	use of shunting assisting devices	4.2.3.3.1.1 (7)	3.1.8
[A.8]	use of sanding equipment	4.2.3.3.1.1 (8)	3.1.4
[A.9]	use of composite brake blocks	4.2.3.3.1.1 (9)	3.1.6
[A.10]	Requirements for flange lubricators	4.2.3.3.1.1 (10)	3.1.5
[A.11]	requirements related to conducted interference	4.2.3.3.1.1 (11)	3.2.2
	Rolling stock characteristics for compatibility with train detection system based on axle counters	4.2.3.3.1.2	
[A.12]	maximum distance between following axles	4.2.3.3.1.2 (1)	3.1.2.1 (distance a_i in Figure 1)
[A.13]	minimum distance between following axles	4.2.3.3.1.2 (2)	3.1.2.2
[A.14]	at the end of a unit intended to be coupled, minimum distance between front/ rear end of train and first/last axle (equal to half of the value specified)	4.2.3.3.1.2 (3)	3.1.2.2
[A.15]	maximum distance between front/ rear end of train and first/last axle	4.2.3.3.1.2 (4)	3.1.2.4 3.1.2.5 (distance b_x in Figure 1)

[A.16]	wheel geometry	4.2.3.3.1.2 (5)	3.1.3.1 to 3.1.3.4
[A.17]	Metal and inductive-components-free space between wheels	4.2.3.3.1.2 (6)	3.1.3.5
[A.18]	characteristics of the wheel material	4.2.3.3.1.2 (7)	3.1.3.6
[A.19]	requirements related to electromagnetic fields	4.2.3.3.1.2 (8)	3.2.1
[A.20]	use of magnetic or eddy current track brakes	4.2.3.3.1.2 (9)	3.2.3
Rolling stock characteristics for compatibility with loop equipment		4.2.3.3.1.3	
[A.21]	vehicle metal construction	4.2.3.3.1.3 (1)	3.1.7.2
Conditions for unique authorisation		7.1.1.5	
[A.22]	unit equipped with flange lubricators	7.1.1.5.1 (10)	3.1.5
[A.23]	unit equipped with eddy current track brake	7.1.1.5.1 (11)	3.2.3
[A.24]	unit equipped with magnetic track brake	7.1.1.5.1 (12)	3.2.3
[A.25]	Design of the unit	7.1.1.5.1 (15)	3.1
[A.26]	Bands of the frequency management	7.1.1.5.1 (16)	3.2
[B]	SUBSET-034 Train Interface FIS TSI CCS, Appendix A, Table A 2, index [7]		
[B.1]	Status of the tilting system	4.2.3.4.2	2.6.2.4.3, 2.9 and 3
[B.2]	Brake pressure	4.2.4.3	2.3.2, 2.9 and 3
[B.3]	Special brake status 'Electro Pneumatic (EP) brake'.		2.3.6, 2.9 and 3
[B.4]	Emergency brake command	4.2.4.4.1	2.3.3, 2.9 and 3
[B.5]	Service brake command	4.2.4.4.2	2.3.1, 2.9 and 3
[B.6]	Special brake inhibition area – Trackside orders: regenerative brake	4.2.4.4.4	2.3.4, 2.9 and 3
[B.7]	Special brake inhibit – STM Orders : regenerative brake		2.3.5, 2.9 and 3
[B.8]	Special brake status: regenerative brake		2.3.6, 2.9 and 3
[B.9]	Special brake inhibition area – Trackside orders: Magnetic track brake	4.2.4.8.2	2.3.4, 2.9 and 3
[B.10]	Special brake inhibit – STM Orders: Magnetic track brake		2.3.5, 2.9 and 3
[B.11]	Special brake status: Magnetic track brake		2.3.6, 2.9 and 3

[B.12]	Special brake inhibition area – Trackside orders: Eddy current track brake	4.2.4.8.3	2.3.4, 2.9 and 3
[B.13]	Special brake inhibit – STM Orders: Eddy current track brake		2.3.5, 2.9 and 3
[B.14]	Special brake status: Eddy current track brake		2.3.6, 2.9 and 3
[B.15]	Station platform	4.2.5.5.6	2.4.6, 2.9 and 3
[B.16]	Traction cut off	4.2.8.1.2	2.4.9, 2.9 and 3
[B.1]	Change of allowed current consumption	4.2.8.2.4	2.4.10, 2.9 and 3
[B.17]	Change of traction system	4.2.8.2.9.8 4.2.8.2.9.8	2.4.1, 2.9 and 3
[B.18]	Powerless section with pantograph to be lowered – Trackside orders		2.4.2, 2.9 and 3
[B.19]	Powerless section with main power switch to be switched off – Trackside orders		2.4.7, 2.9 and 3
[B.20]	Main Power Switch – STM orders		2.4.8, 2.9 and 3
[B.21]	Pantograph – STM orders		2.4.3, 2.9 and 3
[B.22]	Cab Status	4.2.9.1.6	2.5.1, 2.9 and 3
[B.23]	Direction controller		2.5.2, 2.9 and 3
[B.24]	Remote shunting	4.2.9.3.6	2.5.5, 2.9 and 3
[B.25]	Sleeping	4.2.9.3.7.1	2.2.1, 2.9 and 3
[B.26]	Passive shunting	4.2.9.3.7.2	2.2.2, 2.9 and 3
[B.27]	Non leading	4.2.9.3.7.3	2.2.3, 2.9 and 3
[B.28]	Traction status	4.2.9.3.8	2.5.4, 2.9 and 3
[B.29]	Air tightness area – Trackside orders	4.2.10.4.2	2.4.4, 2.9 and 3
[B.30]	Air tightness – STM orders		2.4.5, 2.9 and 3
[B.31]	On-Board ATO functionality	4.2.13	2.2.5, 2.9 and 3
[C]	Leitfaden Sicherstellung der technischen Kompatibilität für Fahrzeuge mit Seitenwindnachweis nach TSI LOC&PAS zu Anforderungen der Ril 807.04: 2016-09		
[C.1]	unit characteristic wind curve (CWC) limits for units intended to operate in Germany	7.1.1.5.1(20)(f)	Relevant cl.
[D]	Ergänzungsregelung Nr. B017 zur bremstechnischen Ausrüstung von Fahrzeugen zum Betrieb auf Steilstrecken: 2021-05		
[D.1]	units intended to operate in Germany on lines with a gradient above 40 ‰	7.1.1.5.1(20)(g)	Relevant cl.
[E]	Verwaltungsvorschrift zur Prüfung von Notein- und Notausstiegfenstern (NEA) in Schienenfahrzeugen: 2007-02-26		
[E.1]	emergency exits for units intended to operate in Germany	7.1.1.5.1(20)(h)	3.2'

(i) the following Appendix K is added:

‘Appendix K





Validation process for new end pieces of Magnetic Track Brake (MTB)

The aim of the validation process is to check the compatibility of the MTB with the track elements. Any new end piece or a geometrical modified end pieces shall be tested with the following parameters:

- The tangents of the fixed crossings of the switches shall be in the range between 0,034 and 0,056 and in the range between 0,08 and 0,12 (see Table 1).
- For the test, the switches shall be crossed three times in each of the four possible directions with activated MTB with every following constant velocity (see Table 1).

Table K.1

Parameters for testing

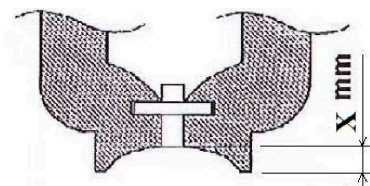
Type of switch	Velocity [km/h] direction			
				
0,08 – 0,12	15	15	15	15
0,08 – 0,12	120	40	120	40
0,034 – 0,056	15	15	15	15
0,034 – 0,056	120	80-100	120	80-100

Note: For the testing, it might be necessary to adapt the control system of the MTB.

- The test shall be performed under dry conditions.
- The test shall be performed in new and worn conditions of the pole shoes and end pieces.
- The test in worn conditions shall be performed at the maximum allowed hollow wear of the friction surface or the pole shoe respectively, defined by the specification (see Figure 1).

Figure K.1

Maximum hollow wear



Key

X maximum allowed hollow wear expressed in mm

Test possibility 1

This test applies for changes of end pieces listed in the specification referenced in Appendix J-1, index [16]. Only deviations of maximum 10% for no more than 5 dimensions are allowed.

During the test optical check shall be performed by video of all end pieces. The lateral surfaces of all end pieces and pole shoes of the MTB shall be pale painted.

Acceptance criteria:

— No mechanical damage of any part of the MTB;

— No evidence of a permanent derailment of the MTB;

NOTE: Sparks are allowed during braking.

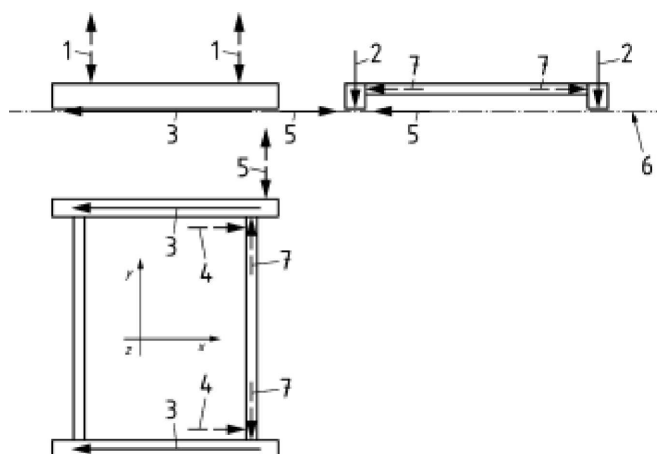
— No evidence of a contact at the lateral side of the MTB outside of 55 mm in the vertical direction from the top of rail.

Test possibility 2

This test applies for new designed end pieces. In addition to test possibility 1, the lateral and longitudinal forces (see Figure 2) between MTB and the bogie shall be measured.

Figure K.2

Overview of transmission of force



Key

1 interface forces with bogie frame F_{BZ}

2 attractive force F_{HZ}

3 longitudinal force $F_{B,x}$

4 brake force F_x

5 lateral force F_Q

6 top of the rail

7 interface forces

Acceptance criteria:

Acceptance criteria for test possibility 1:

— Lateral force F_Q and longitudinal force $F_{B,x}$ when running over switches and crossings in inside direction:

Action of a lateral force equal to 0,18 times the magnetic attractive force in inside direction (toward the track centre) in the vicinity of the end pieces with a simultaneous longitudinal force of 0,2 times the magnetic attractive force shall be respected.

— Lateral force F_Q and longitudinal force $F_{B,x}$ when running over switches and crossings in outside direction:

Action of a lateral force equal to 0,12 times the magnetic attractive force in outside direction in the vicinity of the end pieces with a simultaneous longitudinal force of 0,2 times the magnetic attractive force shall be respected.

- Exceptional lateral force FQ in inside direction (toward the track centre) when running over switches and crossings:

Measurements so far performed on vehicles have identified forces in inside direction up to about 0,35 times the magnetic attractive force (greatly dependent on the wear condition of the switch and crossing that has been traversed).

- Exceptional lateral force FQ in outside direction when running over switches and crossings:

Measurements so far performed on vehicles have identified forces in outside direction up to about 0,23 times the magnetic attractive force (greatly dependent on the wear condition of the switch and crossing that has been traversed).

Test possibility 3

This test applies for new designed end pieces. Subsequent to test possibility 2, the test possibility 3 shall be performed if the measurement of the displacement of the switches is required. It is allowed to perform the possibilities 2 and 3 in one test run.

Measurement of displacement of switch:

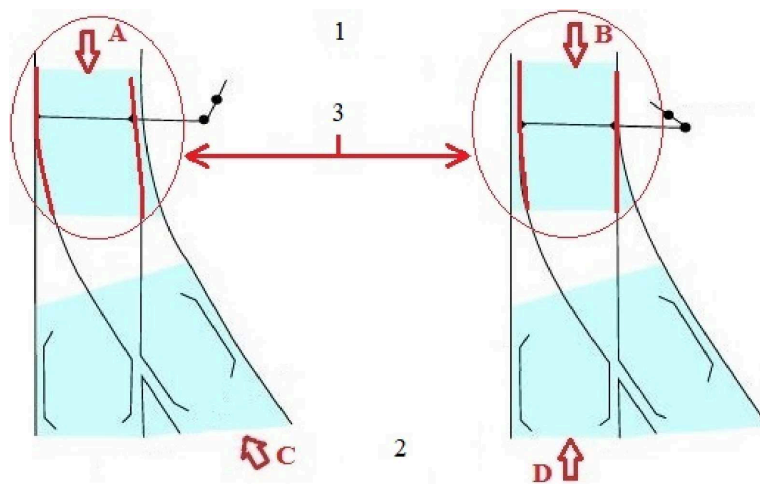
The switch is equipped with sensors for measuring the displacement of moving parts identified in red in Figure 3 below (zone toe).

Test sequence:

The test sequence consists of performing 3 runs per position A, B, C and D at constant speed. The speed of test shall correspond to the speed inducing the maximum coefficient of friction (typically around a speed of 15 km/h).

Figure K.3

Measurement of Displacement of Switch



Key

- 1 Switch toe
- 2 Switch heel
- 3 Zone equipped with sensors

Acceptance criteria :

- The displacement for runs types A and B from switch toe to switch heel shall not exceed 4,0 mm.
- The displacement for runs types C and D from switch heel to switch toe shall not exceed 7,0 mm.;

(j) the following Appendix L is added:

'Appendix L

Changes of requirements and transition regimes

For other TSI points than these listed in Table L.1 and Table L.2, compliance with the 'previous TSI' (i.e. this Regulation, as amended by Implementing Regulation (EU) 2020/387) imply compliance with this TSI applicable from 28 September 2023.

Changes with a generic transition regime of 7 years:

For TSI points listed in Table L.1, compliance with the previous TSI does not imply compliance with the version of this TSI applicable from 28 September 2023.

Projects already in design phase on 28 September 2023 shall comply with the requirement of this TSI from 28 September 2030.

Projects in production phase and rolling stock in operation are not affected by the TSI requirements listed in Table L.1

Table L.1

Transition regime of 7 years

TSI point(s)	TSI point(s) in previous TSI	Explanation of the TSI change
4.2.2.5 (7)	4.2.2.5 (7)	Evolution of the specification referenced in Appendix J-1 index [3]
4.2.2.10 (1)	4.2.2.10 (1)	Additional requirements
4.2.3.2.1 (2)	4.2.3.2.1 (2)	Change of the requirement
4.2.3.7	4.2.3.7	Change of the requirements
4.2.4.3 7.1.1.5.2 (3)	4.2.4.3 6.2.7a	Evolution of the specification referenced in Appendix J-1 index [12]
4.2.4.5.1 4.2.4.5.2 4.2.4.5.3 4.2.4.5.5	4.2.4.5.1 4.2.4.5.2 4.2.4.5.3 4.2.4.5.5	Evolution of the specification referenced in Appendix J-1 indexes [13] and [14]
4.2.4.5.2 (4)	4.2.4.5.2 (4)	Evolution of the specification referenced in Appendix J-1 (index [65])
4.2.4.5.2 (5)	4.2.4.5.2 (5)	Evolution of the specification referenced in Appendix J-1 (index [67] or [68])
4.2.4.6.2 (6) 6.1.3.2 (1) 4.2.4.6.2 (8) 6.2.3.10 (1)	4.2.4.6.2 (6) 6.1.3.2 (1) 4.2.4.6.2 (8) 6.2.3.10 (1)	Evolution of the specification referenced in Appendix J-1 index [15]
4.2.6.2.4 (3)	4.2.6.2.4 (3)	Updated reference to the standard – removal of the reference to the HS TSI 2008
4.2.5.3.2 (4a)	No requirement	New requirement
4.2.5.4 (7)	No requirement	New requirement to record in the documentation the existence or not of communication devices
4.2.7.1.4 (3)	4.2.7.1.4 Note	Clear requirement on where it is required to use the head lamps in automatic flashing / Blinking mode

4.2.8.2.5 (1)	4.2.8.2.5 (1)	Extension to AC systems
4.2.8.2.9.6 (3a) and 6.2.3.20	n.a	New requirement
4.2.8.2.9.7 (3) and (4) and 6.2.3.21	4.2.8.2.9.7 (3) and (4)	Change of parameter
4.2.9.2.1 and 4.2.9.2.2	4.2.9.2.1 and 4.2.9.2.2	Evolution of the specification referenced in Appendix J-1 index [28]
4.2.9.3.7 and 4.2.9.3.7a	No requirement	New requirement
4.2.10.2.1 (2) and 4.2.10.2.2 (2)	4.2.10.2.1 (2) and 4.2.10.2.2 (2)	Evolution of the standard referenced See also point 7.1.1.4
4.2.12.2	4.2.12.2	Evolution of the required documentation in relation to the evolution of requirements
7.1.1.3 (1)	7.1.1.3 (1)	New requirement
7.1.6	No requirement	This case applies to newly developed vehicle design where ETCS onboard is not yet installed with the aim to have rolling stock subsystem ready when ETCS will be installed.
Points referring to Appendix J-2, index [A] (except point 3.2.2)	Points referring to Appendix J-2, index 1	ERA/ERTMS/033281 version 5 replaces ERA/ERTMS/033281 Version 4, main changes concern frequency management for interference current limits and closure of open points. Transition regime is defined in Appendix B, Table B.1 of the TSI CCS

Changes with a specific transition regime

For TSI points listed in table L.2, compliance with the previous TSI does not imply compliance with this TSI applicable from 28 September 2023.

Projects already in design phase on 28 September 2023, projects in production phase, and units in operation shall comply with the requirement of this TSI in accordance with the respective transition regime set out in Table L.2 starting from 28 September 2023.

Table L.2

Specific transition regime

TSI point(s)	TSI point(s) in previous version	Explanation on TSI change	Transition regime			
			Design phase not started	Design phase started	Production phase	units in operation
Points referring to the specification referenced in Appendix J-2, index [B]	4.2.4.4.1, 4.2.5.3.4, 4.2.5.5.6, 4.2.8.2.9.8, 4.2.10.4.2	Train interface functions specified between ETCS onboard and rolling stock are identified end to end including provisions on EC verification	For new train interface functions identified in index 7, transition regimes are defined in Appendix B, Table B.1 – ETCS system version of TSI CCS. For train interface functions not modified in index 7, transition regimes are defined in Appendix B, Table B1 – partial fulfilment of TSI CCS			

4.2.13	No requirements	Interface requirements applicable to units equipped with ETCS onboard and intended to be fitted with Automated Train Operation onboard up to Grade of Automation 2.	Transition regimes for ATO On-Board Implementation are defined in Appendix B; Table B1 – ATO On-Board Implementation of TSI CCS	
Points referring to point 3.2.2 of Appendix J-2, index [A]	points referring to point 3.2.2 of Appendix J-2, index 1	ERA/ERTMS/033281 V5 replaces ERA/ERTMS/033281 V4, main changes concern frequency management for interference current limits and closure of open points.	Transition regime is defined in Appendix B, Table B.1 of TSI CCS	
7.1.1.3 point 2 (a)	7.1.1.3	Mandatory EC certification for special vehicles	6 months	N.A.’

ANNEX VI

'ANNEX

Table of contents

1. INTRODUCTION	308
1.1. Technical scope	308
1.1.1. Scope related to rolling stock	308
1.1.2. Scope related to operational aspects	308
1.2. Geographical scope	308
2. DEFINITION OF THE SUBSYSTEM	308
3. ESSENTIAL REQUIREMENTS	309
4. CHARACTERISATION OF THE SUBSYSTEM	309
4.1. Introduction	309
4.2. Functional and technical specifications of the subsystems	309
4.2.1. Limits for stationary noise	310
4.2.2. Limits for starting noise	310
4.2.3. Limits for pass-by noise	311
4.2.4. Limits for the driver's cab interior noise	311
4.3. Functional and technical specifications of the interfaces	312
4.4. Operating rules	312
4.4.1. Specific rules for the operation of wagons on quieter routes in case of degraded operation	312
4.4.2. Specific rules for the operation of wagons on quieter routes in case of infrastructure works and wagons maintenance	312
4.5. Maintenance rules	312
4.6. Professional qualifications	312
4.7. Health and safety conditions	312
5. INTEROPERABILITY CONSTITUENTS	312
5.1. General	312
5.2. Interoperability constituent specifications	312
5.2.1. Friction element for wheel tread brakes	312
6. CONFORMITY ASSESSMENT AND EC VERIFICATION	313
6.1. Interoperability constituents	313
6.1.1. Modules	313
6.1.2. Conformity assessment procedures	313
6.2. Subsystem rolling stock regarding noise emitted by rolling stock	313
6.2.1. Modules	313
6.2.2. EC verification procedures	314
6.2.3. Simplified evaluation	316

7. IMPLEMENTATION	317
7.1. Application of this TSI to new subsystems	317
7.2. Application of this TSI to existing subsystems	317
7.2.1. Provisions in case of changes to rolling stock in operation or to an existing rolling stock type	317
7.2.2. Additional provisions for the application of this TSI to existing wagons	318
7.3. Specific cases	318
7.3.1. Introduction	318
7.3.2. List of specific cases	318
7.4. Particular implementation rules	319
7.4.1. Particular implementation rules for the application of this TSI to existing wagons (point 7.2.2)	319
7.4.2. Particular implementation rules for wagons operated on quieter routes (point 7.2.2.2)	319
Appendixes	321

1. INTRODUCTION

Technical Specifications for Interoperability (TSI) lay down the optimal level of harmonised specifications for each subsystem (or part of it), to ensure the safety and interoperability of the rail system, to facilitate, improve and develop rail transport services within the Union and with third countries, and to contribute to the completion of the single European railway area and the progressive achievement of the internal market. The specifications of the TSIs must meet the essential requirements as set out in Annex III to Directive (EU) 2016/797.

In accordance with the proportionality principle, this TSI sets out the optimal level of harmonisation related to specifications on the rolling stock subsystem as defined in point 1.1 intended to limit the noise emission of the rail system within the Union.

1.1. Technical scope

1.1.1. Scope related to rolling stock

This TSI applies to all rolling stock within the scope of the Annex to Regulation (EU) No 1302/2014 (“TSI LOC&PAS”) and the Annex to Regulation (EU) No 321/2013 (“TSI WAG”).

1.1.2. Scope related to operational aspects

Alongside with the Annex to Commission Implementing Regulation (EU) 2019/773 ⁽¹⁾ (“TSI OPE”), this TSI applies to the operation of freight wagons, which are used on railway infrastructure designated as “quieter routes”.

1.2. Geographical scope

The geographical scope of this TSI corresponds to the scopes defined in point 1.2 of LOC&PAS TSI and in point 1.2 of WAG TSI, each for their rolling stock (RST) concerned.

2. DEFINITION OF THE SUBSYSTEM

A “unit” means the rolling stock, which is subject to the application of this TSI, and therefore subject to the “EC” verification procedure. Chapter 2 of LOC&PAS TSI and Chapter 2 of WAG TSI describe what a unit can consist of.

⁽¹⁾ 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).

The requirements of this TSI apply to the following categories of rolling stock set out in Section 2 of Annex I to Directive (EU) 2016/797:

- (a) locomotives and passenger rolling stock including thermal or electric traction units, self-propelling thermal or electric passenger trains, and passenger coaches. This category is further defined in Chapter 2 of LOC&PAS TSI and shall be referred to in this TSI as locomotives, electric multiple units (EMU), diesel multiple units (DMU) and coaches;
- (b) freight wagons, including low-deck vehicles designed for the entire network and vehicles designed to carry lorries. This category is further defined in Chapter 2 of WAG TSI and shall be referred to in this TSI as wagons;
- (c) special vehicles, such as on-track machines. This category is further defined in Chapter 2 of LOC&PAS TSI.

3. ESSENTIAL REQUIREMENTS

All basic parameters set out in this TSI shall be linked to at least one of the essential requirements as set out in Annex III to Directive (EU) 2016/797. Table 1 indicates the allocation.

Table 1

Basic parameters and their link to the essential requirements

Point	Basic parameter	Essential requirements					
		Safety	Reliability and availability	Health	Environmental protection	Technical compatibility	Accessibility
4.2.1	Limits for stationary noise				1.4.4		
4.2.2	Limits for starting noise				1.4.4		
4.2.3	Limits for pass-by noise				1.4.4		
4.2.4	Limits for driver's cab interior noise				1.4.4		

4. CHARACTERISATION OF THE SUBSYSTEM

4.1. Introduction

This Chapter sets out the optimal level of harmonisation related to specifications on the rolling stock subsystem intended to limit the noise emission of the Union rail system and to achieve interoperability.

4.2. Functional and technical specifications of the subsystems

The following parameters have been identified as critical for the interoperability (basic parameters):

- (a) "stationary noise";
- (b) "starting noise";
- (c) "pass-by noise";
- (d) "driver's cab interior noise".

The corresponding functional and technical specifications allocated to the different categories of rolling stock are set out in this point. In case of units equipped with both thermal and electric power, the relevant limit values under all normal operation modes shall be respected. If one of those operation modes plans the use of both thermal and electric power at the same time, the less restrictive limit value applies. In accordance with Article 4(5) and Article 2(13) of Directive (EU) 2016/797, provision may be made for specific cases. Such provisions are indicated in point 7.3.

The assessment procedures for the requirements in this point are defined in the indicated points of Chapter 6.

4.2.1. Limits for stationary noise

The limit values for the following sound pressure levels under normal vehicle conditions concerning the stationary noise allocated to the categories of the rolling stock subsystem are set out in Table 2:

- (a) the A-weighted equivalent continuous sound pressure level of the unit ($L_{pAeq,T[unit]}$);
- (b) the A-weighted equivalent continuous sound pressure level at the nearest measuring position i considering the main air compressor ($L_{pAeq,T}^i$);
- (c) the AF-weighted sound pressure level at the nearest measuring position i considering impulsive noise of the exhaust valve of the air dryer (L_{pAFmax}^i).

The limit values are set at a distance of 7,5 m from the centre of the track and 1,2 m above top of rail.

Table 2

Limit values for stationary noise

Category of the rolling stock subsystem	$L_{pAeq,T[unit]}$ [dB]	$L_{pAeq,T}^i$ [dB]	L_{pAFmax}^i [dB]
Electric locomotives and special vehicles with electric traction	70	75	85
Diesel locomotives and special vehicles with diesel traction	71	78	
EMUs	65	68	
DMUs	72	76	
Coaches	64	68	
Wagons	65	n.a.	n.a.

The demonstration of conformity is described in point 6.2.2.1.

4.2.2. Limits for starting noise

The limit values for the AF-weighted maximum sound pressure level ($L_{pAF,max}$) concerning the starting noise allocated to the categories of the rolling stock subsystem are set out in Table 3. The limit values are set at a distance of 7,5 m from the centre of the track and 1,2 m above top of rail.

Table 3

Limit values for starting noise

Category of the rolling stock subsystem	$L_{pAF,max}$ [dB]
Electric locomotives with total tractive power $P < 4\,500$ kW	81
Electric locomotives with total tractive power $P \geq 4\,500$ kW Special vehicles with electric traction	84
Diesel locomotives $P < 2\,000$ kW at the engine output shaft	85
Diesel locomotives $P \geq 2\,000$ kW at the engine output shaft Special vehicles with diesel traction	87
EMUs with a maximum speed $v_{max} < 250$ km/h	80
EMUs with a maximum speed $v_{max} \geq 250$ km/h	83
DMUs $P < 560$ kW/engine at the engine output shaft	82
DMUs $P \geq 560$ kW/engine at the engine output shaft	83

The demonstration of conformity is described in point 6.2.2.2.

4.2.3. Limits for pass-by noise

The limit values for the A-weighted equivalent continuous sound pressure level at a speed of 80 km/h ($L_{pAeq,Tp,(80 \text{ km/h})}$) and, if applicable, at 250 km/h ($L_{pAeq,Tp,(250 \text{ km/h})}$) concerning the pass-by noise allocated to the categories of the rolling stock subsystem are set out in Table 4. The limit values are set at a distance of 7,5 m from the centre of the track and 1,2 m above top of rail.

Measurements at speeds higher than or equal to 250 km/h shall also be made at the “additional measurement position” with a height of 3,5 m above top of rail in accordance with the specification referenced in Appendix B, Index [1] and assessed against the applicable limit values of Table 4.

Table 4

Limit values for pass-by noise

Category of the rolling stock subsystem	$L_{pAeq,Tp} (80 \text{ km/h})$ [dB]	$L_{pAeq,Tp} (250 \text{ km/h})$ [dB]
Electric locomotives and special vehicles with electric traction	84	99
Diesel locomotives and special vehicles with diesel traction	85	n.a.
EMUs	80	95
DMUs	81	96
Coaches	79	n.a.
Wagons (normalised to APL = 0,225) (¹)	83	n.a.

(¹) APL: the number of axles divided by the length over the buffers (m⁻¹)

The demonstration of conformity is described in point 6.2.2.3.

4.2.3.a. Friction elements for wheel tread brakes

The friction element for wheel tread brakes (i.e. brake block) has an influence on the pass-by noise by creating roughness on the wheel tread when braking.

The demonstration of conformity of brake blocks for freight wagons is described in point 6.1.2.1 of this TSI. Conformity of its brake blocks to that point does not exempt the unit under assessment from the requirements set out in point 4.2.3 and the demonstration of conformity set out in point 6.2.2.3.

4.2.4. Limits for the driver's cab interior noise

The limit values for the A-weighted equivalent continuous sound pressure level ($L_{pAeq,T}$) concerning the noise within the driver's cab of electric and diesel locomotives, EMUs, DMUs and coaches fitted with a cab are set out in Table 5. The limit values are set in the vicinity of the driver's ear.

These limit values are not mandatory for special vehicles. However, the demonstration of conformity referred to in point 6.2.2.4 shall be performed and the resulting values shall be recorded in the technical file.

Table 5

Limit values for driver's cab interior noise

Noise within the driver's cab	$L_{pAeq,T}$ [dB]
At standstill with horns sounding	95
At maximum speed v_{max} if $v_{max} < 250 \text{ km/h}$	78
At maximum speed v_{max} if $250 \text{ km/h} \leq v_{max} < 350 \text{ km/h}$	80

The demonstration of conformity is described in point 6.2.2.4.

4.3. **Functional and technical specifications of the interfaces**

This TSI has the following interfaces with the rolling stock subsystem:

Interface with subsystems referred to in Chapter 2, points (a) and (c), of this Annex (dealt with in LOC&PAS TSI) with regard to:

- stationary noise,
- starting noise (not applicable to coaches),
- pass-by noise,
- interior noise within the driver's cab, where applicable.

Interface with subsystems referred to in Chapter 2, point (b), of this Annex (dealt with in WAG TSI) with regard to:

- pass-by noise,
- stationary noise.

This TSI has the following interface with OPE TSI with regard to:

- pass-by noise.

4.4. **Operating rules**

Requirements concerning the operating rules for the subsystem rolling stock are set out in point 4.4 of LOC&PAS TSI and in point 4.4 of WAG TSI.

4.4.1. **Specific rules for the operation of wagons on quieter routes in case of degraded operation**

The contingency arrangements as set out in point 4.2.3.6.3 of OPE TSI include the operation of wagons not compliant with point 7.2.2.2 of this Annex on quieter routes.

This measure can be applied to address capacity restrictions or operational constraints caused by rolling stock failures, extreme weather conditions, accidents or incidents and infrastructure failures.

4.4.2. **Specific rules for the operation of wagons on quieter routes in case of infrastructure works and wagons maintenance**

The operation of wagons not compliant with point 7.2.2.2 on quieter routes shall be possible in case of wagons maintenance activities where only a quieter route is available in order to access the maintenance workshop.

Contingency arrangements set out in point 4.4.1 are applicable in case of infrastructure works where a quieter route is the only suitable alternative.

4.5. **Maintenance rules**

Requirements concerning the maintenance rules for the subsystem rolling stock are set out in point 4.5 of TSI LOC&PAS and in point 4.5 of TSI WAG.

4.6. **Professional qualifications**

Not applicable.

4.7. **Health and safety conditions**

See Article 6.

5. **INTEROPERABILITY CONSTITUENTS**

5.1. **General**

Interoperability constituents (ICs), as defined in Article 2(7) of Directive (EU) 2016/797, are listed in point 5.2 of this Annex together with the reference to corresponding requirements set out in point 4.2 of this Annex.

5.2. **Interoperability constituent specifications**

5.2.1. **Friction element for wheel tread brakes**

This interoperability constituent is only applicable to the “rolling stock - freight wagons” subsystem.

A friction element for wheel tread brakes shall comply with the requirements set out in point 4.2.3.a. Those requirements shall be assessed at IC level.

6. CONFORMITY ASSESSMENT AND EC VERIFICATION

6.1. Interoperability constituents

6.1.1. Modules

The conformity assessment of an interoperability constituent shall be performed in accordance with the module(s) described in Table 5a.

Table 5a

Modules for conformity assessment of interoperability constituents

Module CB	EC-Type examination
Module CD	Conformity to type based on quality management system of the production process
Module CF	Conformity to type based on product verification
Module CH1	Conformity based on full quality management system plus design examination

Those modules are specified in detail in Decision 2010/713/EU.

6.1.2. Conformity assessment procedures

The manufacturer or his authorised representative established within the Union shall choose one of the modules or module combinations indicated below for the constituent “Friction element for wheel tread brakes”:

- CB+CD,
- CB+CF,
- CH1.

Within the application of the chosen module or combination of modules, the interoperability constituent shall be assessed against the requirements set out in point 4.2. If necessary, additional requirements concerning the assessment of particular interoperability constituents are defined in the following points.

6.1.2.1. Friction element for wheel tread brakes of freight wagons

A friction element for wheel tread brakes of freight wagons shall comply with the requirements set out in Appendix F.

Until the end of the transition period set out in Appendix G, the types of friction elements for wheel tread brakes listed in Appendix G are deemed compliant with the requirements set out in Appendix F without testing.

6.2. Subsystem rolling stock regarding noise emitted by rolling stock

6.2.1. Modules

The EC verification shall be performed in accordance with the module(s) described in Table 6.

Table 6

Modules for EC verification of subsystems

SB	EC-Type Examination
SD	EC verification based on quality management system of the production process
SF	EC verification based on product verification
SH1	EC verification based on full quality management system plus design examination

Those modules are specified in detail in Decision 2010/713/EU.

6.2.2. EC verification procedures

The applicant shall choose one of the following assessment procedures consisting of one or more modules for the EC verification of the subsystem:

- (SB+SD),
- (SB+SF),
- (SH1).

Within the application of the chosen module or module combination the subsystem shall be assessed against the requirements set out in point 4.2. If necessary, additional requirements concerning the assessment are given in the following points.

6.2.2.1. Stationary noise

The demonstration of conformity with the limit values on stationary noise as set out in point 4.2.1 shall be carried out in accordance with the specification referenced in Appendix B, Index [1].

For the assessment of the main air compressor noise at the nearest measuring position i , the $L_{pAeq,T}^i$ indicator shall be used with T representative of one operating cycle as defined in the specification referenced in Appendix B, Index [1]. Only the train systems that are required for the air compressor to run under normal operating conditions shall be used for that purpose. The train systems which are not needed for the operation of the compressor may be switched off to prevent contribution to the noise measurement. The demonstration of conformity with the limit values shall be carried out under the conditions solely necessary for operation of the main air compressor at the lowest rpm.

For the assessment of the impulsive noise sources at the nearest measuring position i , the L_{pAFmax}^i indicator shall be used. The relevant noise source is the exhaust from the valves of the air dryer.

6.2.2.2. Starting noise

The demonstration of conformity with the limit values on starting noise as set out in point 4.2.2 shall be carried out in accordance with the specification referenced in Appendix B, Index [1]. The maximum level method shall apply. Deviating from the test procedure of the specification, the train shall accelerate from standstill up to 30 km/h and then maintain the speed.

In addition the noise shall be measured at the same distance from the centre of the track and the same height above top of rail as set out in point 4.2.2. The “averaged level method” and the “maximum level method” in accordance with the specification referenced in Appendix B, Index [1] shall apply and the train shall accelerate from standstill up to 40 km/h and then maintain the speed. The measured values are not assessed against any limit value and shall be recorded in the technical file and communicated to the Agency.

For special vehicles the starting procedure shall be performed without additional trailer loads.

6.2.2.3. Pass-by noise

The demonstration of conformity with the limit values on pass-by noise as set out in point 4.2.3 shall be carried out in accordance with points 6.2.2.3.1 and 6.2.2.3.2.

6.2.2.3.1. Test track conditions

The tests shall be performed on a reference track as defined in the specification referenced in Appendix B, Index [1].

However, it is permitted to carry out the test on a track that does not comply with the reference track conditions in terms of acoustic rail roughness level and track decay rates as long as the noise levels measured in accordance with point 6.2.2.3.2 do not exceed the limit values set out in point 4.2.3.

The acoustic rail roughness and the decay rates of the test track shall be determined in any case. If the track on which the tests are performed does meet the reference track conditions, the measured noise levels shall be marked “comparable”, otherwise they shall be marked “non-comparable”. It shall be recorded in the technical file whether the measured noise levels are “comparable” or “non-comparable”.

The measured acoustic rail roughness values of the test track remain valid during a period starting 3 months before and ending 3 months after that measurement, provided that during that period no track maintenance has been performed which influences the rail acoustic roughness.

The measured track decay rate values of the test track shall remain valid during a period starting 1 year before and ending 1 year after that measurement, provided that during that period no track maintenance has been performed which influences the track decay rates.

Confirmation shall be provided in the technical file that the track data related to the type's pass-by noise measurement were valid during the day(s) of testing, e.g. by providing the date of last maintenance having an impact on noise.

Furthermore, it is permitted to carry out tests at speeds equal to or higher than 250 km/h on slab tracks. In that case the limit values shall be 2 dB higher than those set out in point 4.2.3.

6.2.2.3.2. Procedure

The tests shall be carried out in accordance with the specification referenced in Appendix B, Index [1]. Any comparison against limit values shall be carried out with results rounded to the nearest integer decibel. Any normalisation shall be performed before rounding. The detailed assessment procedure is set out in points 6.2.2.3.2.1, 6.2.2.3.2.2 and 6.2.2.3.2.3.

6.2.2.3.2.1. EMU, DMUs, locomotives and coaches

For EMU, DMUs, locomotives and coaches three classes of maximum operational speed are distinguished:

- (1) If the maximum operational speed of the unit is lower than or equal to 80 km/h, the pass-by noise shall be measured at its maximum speed v_{\max} . That value shall not exceed the limit value $L_{pAeq, Tp(80 \text{ km/h})}$ as set out in point 4.2.3.
- (2) If the maximum operational speed v_{\max} of the unit is higher than 80 km/h and lower than 250 km/h, the pass-by noise shall be measured at 80 km/h and at its maximum speed. Both measured pass-by noise values $L_{pAeq, Tp(v_{\text{test}})}$ shall be normalised to the reference speed of 80 km/h $L_{pAeq, Tp(80 \text{ km/h})}$ using Formula (1). The normalised value shall not exceed the limit value $L_{pAeq, Tp(80 \text{ km/h})}$ as set out in point 4.2.3.

Formula (1):

$$L_{pAeq, Tp(80 \text{ km/h})} = L_{pAeq, Tp(v_{\text{test}})} - 30 * \log(v_{\text{test}}/80 \text{ km/h})$$

v_{test}	=	Actual speed during the measurement
-------------------	---	-------------------------------------

- (3) If the maximum operational speed v_{\max} of the unit is equal to or higher than 250 km/h, the pass-by noise shall be measured at 80 km/h and at its maximum speed with an upper test speed limit of 320 km/h. The measured pass-by noise value $L_{pAeq, Tp(v_{\text{test}})}$ at 80 km/h shall be normalised to the reference speed of 80 km/h $L_{pAeq, Tp(80 \text{ km/h})}$ using Formula (1). The normalised value shall not exceed the limit value $L_{pAeq, Tp(80 \text{ km/h})}$ as set out in point 4.2.3. The measured pass-by noise value at maximum speed $L_{pAeq, Tp(v_{\text{test}})}$ shall be normalised to the reference speed of 250 km/h $L_{pAeq, Tp(250 \text{ km/h})}$ using Formula (2). The normalised value shall not exceed the limit value $L_{pAeq, Tp(250 \text{ km/h})}$ as set out in point 4.2.3.

Formula (2):

$$L_{pAeq, Tp(250 \text{ km/h})} = L_{pAeq, Tp(v_{\text{test}})} - 50 * \log(v_{\text{test}}/250 \text{ km/h})$$

v_{test}	=	Actual speed during the measurement
-------------------	---	-------------------------------------

6.2.2.3.2.2. Wagons

For wagons two classes of maximum operational speed are distinguished:

- (1) If the maximum operational speed v_{\max} of the unit is lower than or equal to 80 km/h, the pass-by noise shall be measured at its maximum speed. The measured pass-by noise value $L_{pAeq, Tp(v_{\text{test}})}$ shall be normalised to a reference APL of $0,225 \text{ m}^{-1} L_{pAeq, Tp(APL_{\text{ref}})}$ using Formula (3). That value shall not exceed the limit value $L_{pAeq, Tp(80 \text{ km/h})}$ as set out in point 4.2.3.

Formula (3):

$$L_{pAeq,Tp(APLref)} = L_{pAeq,Tp(Vtest)} - 10 * \log(APL_{wag}/0,225 \text{ m}^{-1})$$

APL_{wag}	=	Number of axles divided by the length over the buffers [m^{-1}]
V_{test}	=	Actual speed during the measurement

- (2) If the maximum operational speed v_{max} of the unit is higher than 80 km/h, the pass-by noise shall be measured at 80 km/h and at its maximum speed. Both measured pass-by noise values $L_{pAeq,Tp(Vtest)}$ shall be normalised to the reference speed of 80 km/h and to a reference APL of $0,225 \text{ m}^{-1}$ $L_{pAeq,Tp(APL_{ref}, 80 \text{ km/h})}$ using Formula (4). The normalised value shall not exceed the limit value $L_{pAeq,Tp(80 \text{ km/h})}$ as set out in point 4.2.3.

Formula (4):

$$L_{pAeq,Tp(APLref, 80 \text{ km/h})} = L_{pAeq,Tp(Vtest)} - 10 * \log(APL_{wag}/0,225 \text{ m}^{-1}) - 30 * \log(v_{test}/80 \text{ km/h})$$

APL_{wag}	=	Number of axles divided by the length over the buffers [m^{-1}]
V_{test}	=	Actual speed during the measurement

6.2.2.3.2.3. Special vehicles

For special vehicles the same assessment procedure as set out in 6.2.2.3.2.1 applies. The measuring procedure shall be performed without additional trailer loads.

Special vehicles are deemed to comply with the pass-by noise level requirements in point 4.2.3 without measuring when they are:

- solely braked by either composite brake blocks or disc brakes, and
- equipped with composite scrubbers, if scrubber blocks are fitted.

6.2.2.4. Driver's cab interior noise

The demonstration of conformity with the limit values on the driver's cab interior noise as set out in point 4.2.4 shall be carried out in accordance with the specification referenced in Appendix B, Index [2]. For special vehicles the measuring procedure shall be performed without additional trailer loads.

6.2.3. Simplified evaluation

Instead of the test procedures as set out in point 6.2.2, it is permitted to substitute some or all of the tests by a simplified evaluation. The simplified evaluation consists of acoustically comparing the unit under assessment to an existing type (further referred to as the reference type) with documented noise characteristics.

The simplified evaluation may be used for each of the applicable basic parameters "stationary noise", "starting noise", "pass-by noise" and "driver's cab interior noise" autonomously and shall consist of providing evidence that the effects of the differences of the unit under assessment do not result in exceeding the limit values set out in point 4.2.

For the units under simplified evaluation, the proof of conformity shall include a detailed description of the noise relevant changes compared to the reference type. On the basis of that description, a simplified evaluation shall be performed. The estimated noise values shall include the uncertainties of the applied evaluation method. The simplified evaluation can either be a calculation and/or simplified measurement.

A unit certified on the basis of the simplified evaluation method shall not be used as a reference unit for a further evaluation.

If the simplified evaluation is applied for pass-by noise, the reference-type shall comply with at least one of the following:

- Chapter 4 of this Annex and for which the pass-by noise results are marked “comparable”,
- Chapter 4 of the Annex to Decision 2011/229/EU and for which the pass-by noise results are marked “comparable”,
- Chapter 4 of the Annex to Decision 2006/66/EC,
- Chapter 4 of the Annex to Decision 2008/232/EC.

In case of a wagon whose parameters remain, compared to the reference type, within the permitted range of Table 7 it is deemed without further verification that the unit complies with the limit values on pass-by noise as set out in point 4.2.3.

Table 7

Permitted variation of wagons for the exemption from verification

Parameter	Permitted variation (compared to the reference unit)
Max. unit speed	Any speed up to 160 km/h
Type of wheel	Only if equally or less noisy (acoustic characterisation i. a. w. the specification referenced in Appendix B, Index [3])
Tare weight	Only within the range of +20 %/- 5 %
Brake block	Only if the reference unit is fitted with brake blocks and the brake block of the unit under assessment is covered either by an EC Declaration of Conformity in accordance with this TSI or it is listed in Appendix G to this TSI.

7. IMPLEMENTATION

7.1. Application of this TSI to new subsystems

- (1) This TSI is applicable to all units of rolling stock in its scope which are placed on the market after 28 September 2023, except where point 7.1.1.2 “Application to ongoing projects” or point 7.1.1.3 “Application to special vehicles” of TSI LOC&PAS or point 7.1.1 “Application to ongoing projects” of TSI WAG applies.
- (2) Compliance with this Annex in its version applicable before 28 September 2023 is deemed equivalent to compliance with this TSI, except for the TSI changes listed in Appendix H.
- (3) For the rolling stock subsystem and the associated interoperability constituents, the rules related to the EC type or design examination certificates shall be as specified in point 7.1.3 of TSI LOC&PAS, and point 7.2.3 of TSI WAG.

7.2. Application of this TSI to existing subsystems

The principles to be applied by the applicants and authorising entities in case of change(s) to a rolling stock in operation or to an existing rolling stock type are defined in point 7.1.2 of LOC&PAS TSI and point 7.2.2 of WAG TSI.

7.2.1. Provisions in case of changes to rolling stock in operation or to an existing rolling stock type

The applicant shall ensure that the noise levels of rolling stock subject to change(s) remain below the limits set out in the version of the TSI which was applicable when the rolling stock in question was first authorised. If no TSI existed at the time of the first authorisation, the applicant shall ensure that the noise levels of the rolling stock subject to change(s) are either not increased or remain below the limits set out in Decision 2006/66/EC or Commission Decision 2002/735/EC ⁽²⁾.

If an assessment is required, it shall be limited to the basic parameters affected by the change(s).

⁽²⁾ Commission Decision 2002/735/EC of 30 May 2002 concerning the technical specification for interoperability relating to the rolling stock subsystem of the trans-European high-speed rail system referred to in Article 6(1) of Directive 96/48/EC (OJ L 245, 12.9.2002, p. 402).

If the simplified evaluation is applied, the original unit may represent the reference unit in accordance with the provisions of point 6.2.3.

The replacement of a whole unit or (a) vehicle(s) within a unit (e.g. a replacement after a severe damage) does not require a conformity assessment against this TSI, as long as the unit or the vehicle(s) are identical to the ones they replace.

7.2.2. Additional provisions for the application of this TSI to existing wagons

The restriction of the operation set out in Article 5a shall not apply to wagons mostly operated on lines with a gradient of more than 40 ‰, wagons with a maximum operating speed higher than 120 km/h, wagons with a maximum axle load higher than 22,5 t, wagons exclusively operated for infrastructure works and wagons used in rescue trains.

If a wagon is being equipped with either friction elements for wheel tread brakes covered by an EC Declaration of Conformity in accordance with this TSI or with friction elements for wheel tread brakes listed in Appendix G and no noise sources are added to the wagon, then it shall be assumed that the requirements of point 4.2.3 are met without further testing.

7.2.2.1. Not used

7.2.2.2. Wagons operated on quieter routes

Wagons belonging to one of the following categories may be operated on the quieter routes within their area of use:

- wagons holding an EC declaration of verification against Decision 2006/66/EC,
- wagons holding an EC declaration of verification against Decision 2011/229/EU,
- wagons holding an EC declaration of verification against this TSI,
- wagons fitted with either of the following:
 - friction elements for wheel tread brakes covered by an EC Declaration of Conformity in accordance with this TSI,
 - friction elements for wheel tread brakes listed in Appendix G,
 - brake discs for the service brake function,
- wagons fitted with composite brake blocks listed in Appendix E for the service brake function. The operation of those wagons on the quieter routes shall be limited in accordance with the conditions described in this Appendix.

7.2.2.3. Interoperability constituents

- This point concerns interoperability constituents, which are subject to type examination or design examination.
- The type or design examination or suitability for use remains valid even if a revision of this TSI comes into force, unless explicitly otherwise specified in the revision of this TSI.
- During this time, new constituents of the same type are permitted to be placed on the market without a new type assessment.

7.3. Specific cases

7.3.1. Introduction

The specific cases, as listed in point 7.3.2, are classified as:

- (a) “P cases”: “permanent” cases
- (b) “T cases”: “temporary” cases

7.3.2. List of specific cases

7.3.2.1. Specific cases

- (a) Specific case Estonia, Finland, Latvia, Lithuania, Poland and Slovakia

(“P”) For units, which are in shared use with third countries, the track gauge of which is different from that of the main rail network within the Union, the application of national technical rules instead of the requirements in this TSI shall be permitted.

(b) Specific case Finland

(“T”) Decision 2011/229/EU may continue to apply for freight wagons to be used only on the territory of Finland and until the relevant technical solution in relation to severe winter conditions is found, but in any case not later than until 31 December 2032. That shall not prevent freight wagons from other Member States to operate on the Finnish network.

7.3.2.2. **Limits for stationary noise (point 4.2.1)**

(a) Specific case Finland

(“T”) For coaches and wagons equipped with a diesel generator for electrical power supply higher than 100 kW and intended to operate solely on the railway network of Finland the limit value for stationary noise $L_{pAeq,T}$ [unit] in Table 2 may be raised up to 72 dB.

7.3.2.3. **Limits for starting noise (point 4.2.2)**

(a) Specific case Sweden

(“T”) For locomotives with total tractive power of more than 6 000 kW and a maximum axle load of more than 25 t the limit values for starting noise $L_{pAF,max}$ in Table 3 may be raised up to 89 dB.

7.3.2.4. **Limits for pass-by noise (point 4.2.3)**

(a) Specific case Channel Tunnel

(“P”) For the Channel Tunnel, the limits for pass-by noise shall not apply to wagons dedicated to the transport of heavy goods vehicles between Coquelles (France) and Folkestone (United Kingdom).

(b) Specific case Sweden

(“T”) For locomotives with total tractive power of more than 6 000 kW and a maximum axle load of more than 25 t the limit values for pass-by noise $L_{pAeq,Tp}$ (80 km/h) in Table 4 may be raised up to 85 dB.

7.4. **Particular implementation rules**

7.4.1. **Particular implementation rules for the application of this TSI to existing wagons (point 7.2.2)**

(a) Particular implementation rules for the application of this TSI to existing wagons in the Channel Tunnel

(“P”) For the calculation of the annual average daily operated freight trains during night-time the freight trains composed of wagons dedicated to the transport of heavy goods vehicles confined in the Coquelles (France) - Folkestone (United Kingdom) line shall not be taken into account.

(b) Particular implementation rules for the application of this TSI to existing wagons in Finland and Sweden

(“T”) The concept of quieter routes shall not apply on the Finnish and Swedish networks due to uncertainties related to the operation in severe winter conditions with composite brake blocks until 31 December 2032. That shall not prevent freight wagons from other Member States to operate on the Finnish and Swedish network.

7.4.2. **Particular implementation rules for wagons operated on quieter routes (point 7.2.2.2)**

(a) Particular implementation rules for wagons operated on quieter routes of Belgium

(“T”) On top of the wagons listed in point 7.2.2.2, the following existing wagons may be operated on quieter routes in the territory of Belgium:

- wagons with tyred wheels until 31 December 2026,
- wagons which require the fitting of a kink valve in order to replace the cast iron block with composite brake blocks until 31 December 2026,
- wagons fitted with cast iron blocks which require the replacement of wheels with wheels compliant with the requirements set out in the specification referenced in Appendix B, Index [3] in order to be retrofitted with composite brake blocks until 31 December 2026.

- (b) Particular implementation rules for wagons operated on quieter routes of Channel Tunnel
- (“P”) On top of the wagons listed in point 7.2.2.2, the following existing wagons may be operated on quieter routes in the Channel Tunnel concession:
- Wagons dedicated to the transport of heavy goods vehicles between Coquelles (France) and Folkestone (United Kingdom).
- (c) Particular implementation rules for wagons operated on quieter routes of Czechia
- (“T”) On top of the wagons listed in point 7.2.2.2, the following existing wagons may be operated on quieter routes in the territory of Czechia:
- wagons with tyred wheels, until 31 December 2026,
 - wagons with 59V type bearings until 31 December 2034,
 - wagons which require the fitting of a kink valve in order to replace the cast iron block with composite brake blocks, until 31 December 2034,
 - wagons with 1Bg or 1Bgu brake configuration fitted with cast iron brake blocks until 31 December 2036,
 - wagons fitted with cast iron blocks which require the replacement of wheels with wheels compliant with the requirements set out in the specification referenced in Appendix B, Index [3] in order to be retrofitted with composite brake blocks until 31 December 2029.
- Furthermore, it shall not be mandatory to use composite brake blocks on quieter routes for existing wagons not covered by the first paragraph and for which there exists no one-to-one-solution for replacement of cast iron brake blocks until 31 December 2030.
- (d) Particular implementation rules for wagons operated on quieter routes of France
- (“T”) On top of the wagons listed in point 7.2.2.2, the following existing wagons may be operated on quieter routes in the territory of France:
- wagons with 1Bg or 1Bgu brake configuration fitted with cast iron brake blocks until 31 December 2030,
 - wagons fitted with small wheels (diameter under 920 mm) until 31 December 2030.
- (e) Particular implementation rules for wagons operated on quieter routes of Italy
- (“T”) On top of the wagons listed in point 7.2.2.2, the following existing wagons may be operated on quieter routes in the territory of Italy:
- wagons with tyred wheels until 31 December 2026,
 - wagons which require the fitting of a kink valve in order to replace the cast iron block with composite brake blocks until 31 December 2026,
 - wagons fitted with cast iron blocks which require the replacement of wheels with wheels compliant with the requirements set out in the specification referenced in Appendix B, Index [3] in order to be retrofitted with composite brake blocks until 31 December 2026.
- Furthermore, it shall not be mandatory to use composite brake blocks on quieter routes for existing wagons not covered by the first paragraph and for which there exists no one-to-one-solution for replacement of cast iron brake blocks until 31 December 2030.
- (f) Particular implementation rules for wagons operated on quieter routes of Poland
- (“T”) On top of the wagons listed in point 7.2.2.2, the following existing wagons may be operated on quieter routes in the territory of Poland until 31 December 2036:
- wagons with tyred wheels,
 - wagons with 1Bg or 1Bgu brake configuration fitted with cast iron blocks,
 - wagons designed for “S” traffic equipped with “SS” brake fitted with cast iron blocks,
 - wagons fitted with cast iron blocks and designed for “SS” traffic for which retrofitting with LL brake blocks would require fitting with wheels complying with the specification referenced in Appendix B, Index [3] and a kink valve.

(g) Particular implementation rules for wagons operated on quieter routes of Slovakia

(“T”) On top of the wagons listed in point 7.2.2.2, the following existing wagons may be operated on quieter routes in the territory of Slovakia:

- wagons with tyred wheels until 31 December 2026,
- wagons with bogies of type 26-2.8 fitted with cast iron blocks P10 until 31 December 2036,
- wagons which require the fitting of a kink valve in order to replace the cast iron block with composite brake blocks until 31 December 2036.

(“P”) Wagons with bogies 2TS intended for circulation between Slovakia and third countries by means of exchange of bogies in the border station.

Appendix A

Not used

Appendix B

Standards referred to in this TSI

Table B.1

Standards or normative documents

Index	Characteristics to be assessed	TSI Point	Mandatory standard point
[1]	EN ISO 3095 :2013 Acoustics — Railway applications — Measurement of noise emitted by railbound vehicles		
[1.1]	Pass-by noise - measurements at speeds higher than or equal to 250 km/h	4.2.3	6
[1.2]	Stationary noise – demonstration of conformity	6.2.2.1	5.1, 5.2, 5.3, 5.4, 5.5 (without 5.5.2), 5.7 and clause 5.8.1
[1.3]	Stationary noise – operating cycle of the main air compressor	6.2.2.1	5.7
[1.4]	Starting noise	6.2.2.2	7 (without 7.5.1.2) Deviation to 7.5.3
[1.5]	Pass-by noise – test track conditions	6.2.2.3.1	6.2
[1.6]	Pass-by noise - procedure	6.2.2.3.2	6.1, 6.3, 6.4, 6.5, 6.6 and 6.7 (without 6.7.2)
[2]	EN ISO 3381:2021 Railway applications - Acoustics - Noise measurement inside railbound vehicles		
[2.1]	Driver's cab interior noise	6.2.2.4	7, 8 except 8.4.5 and 8.7.2

[3]	EN 13979-1:2020 Railway applications - Wheelsets and bogies - Monobloc wheels - Technical approval procedure - Part 1: Forged and rolled wheels Note: EN 13979-1:2003+A2:2011 is also acceptable		
[3.1]	Simplified evaluation	6.2.3 – table 7	Annex E
[3.2]	Particular implementation rules for wagons operated on quieter routes	7.4.2	All
[4]	UIC 541-4 :2020 Composite brake blocks - General conditions for certification and use		
[4.1]	Brake performance test program	Appendix F	Test programs A1_a and A2_a
[5]	EN 16452:2015+A1:2019 Railway applications - Braking - Brake blocks		
[5.1]	Brake performance test program – LL-blocks and K-blocks	Appendix F	Test programs D.1 and C.1
[5.2]	Brake performance test program – other blocks	Appendix F	Test program J.2
[6]	EN 15610:2019 Railway applications - Acoustics - Rail and wheel roughness measurement related to noise generation		
[6.1]	Wheel acoustic roughness measurement procedure	Appendix F	All except clause 6.2.2.2

Appendix C

Assessment of the rolling stock subsystem

Characteristics to be assessed, as specified in point 4.2		Design review	Type Test	Routine Test	Particular assessment procedure
Element of the rolling stock subsystem	TSI point				TSI point
Stationary noise	4.2.1	X ⁽¹⁾	X	n.a.	6.2.2.1
Starting noise	4.2.2	X ⁽¹⁾	X	n.a.	6.2.2.2
Pass-by noise	4.2.3	X ⁽¹⁾	X	n.a.	6.2.2.3
Driver's cab interior noise	4.2.4	X ⁽¹⁾	X	n.a.	6.2.2.4

⁽¹⁾ Only if the simplified evaluation in accordance with point 6.2.3 is applied.

Appendix D

Quieter routes**D.1 Identification of quieter routes**

In accordance with Article 5c(1), the Member States shall provide the Agency with a list of quieter routes and ensure that the infrastructure managers identify them in the RINF (application) as set out in Commission Implementing Regulation (EU) 2019/777 ^(*) (RINF). The list shall contain at least the following information:

- start and end points of the quieter routes and their corresponding sections, using geographical code location in the register set out in RINF. If one of those points is at the border of the Member State, it shall be reflected;
- identification of the sections making up the quieter route

The list shall be provided using the template below:

Quieter route	Sections in the route	Unique section ID	Quieter route starts/finishes at the border of the Member State
Point A — Point E	Point A — Point B	201	Yes POINT E (Country Y)
	Point B — Point C	202	
	Point C — Point D	203	
	Point D — Point E	204	
Point F — Point I	Point F — Point G	501	No
	Point G — Point H	502	
	Point H — Point I	503	

In addition, the Member States may provide maps illustrating the quieter routes on a voluntary basis. All lists and maps shall be published on the Agency website (<http://www.era.europa.eu>) no later than 9 months after 27.5.2019.

By the same date the Agency shall inform the Commission of the lists and maps of quieter routes. The Commission shall inform the Member States accordingly through the committee referred to in Article 51 of Directive (EU) 2016/797.

D.2 Update of quieter routes

The freight traffic data used for the update of quieter routes in accordance with Article 5c(2) shall refer to the last three years preceding the update for which the data is available. Where, due to exceptional circumstances, the freight traffic diverges in a given year from that average number by more than 25 %, the Member State concerned may calculate the average number on the basis of the remaining two years. Member States shall ensure that the infrastructure managers update quieter routes in the RINF (application) as soon as these updates become available. Updates shall apply from the next timetable change following their publication.

The routes designated as quieter routes shall remain as such following the update unless during the period concerned the volume of traffic has decreased by more than 50 % and the average number of daily operated freight trains during the night-time is lower than 12.

In the case of new and upgraded lines, the expected volume of traffic shall be used for the designation of those lines as quieter routes.

^(*) 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 (OJ L 139I, 27.5.2019, p. 312).

Appendix E

Historic composite brake blocks**E.1 Historic composite brake blocks for international use**

Existing wagons equipped with the brake blocks listed in the table are allowed to be used on the quieter routes within their area of use, until the relevant date set out in Appendix N of UIC 541-4.

Manufacturer/name of product	Designation/type of block	Type of friction coefficient
Valeo/Hersot Wabco/Cobra	693 W554	K
Ferodo	I/B 436	K
Abex	229	K (Fe — sintered)
Jurid	738	K (Fe — sintered)

Wagons equipped with historic composite brake blocks not listed in the table but already authorised for international traffic in conformity with Commission Decision 2004/446/EC ⁽⁴⁾ or Commission Decision 2006/861/EC ⁽⁵⁾ may still be used without any deadline within the area of use covered by their authorisation.

E.2 Historic composite brake blocks for national use

Existing wagons equipped with the brake blocks listed in the table are only allowed to be used on the railway networks, including quieter routes, of the corresponding Member States within their area of use.

Manufacturer/name of the product	Designation/type of block	Member State
Cobra/Wabco	V133	Italy
Cofren	S153	Sweden
Cofren	128	Sweden
Cofren	229	Italy
ICER	904	Spain, Portugal
ICER	905	Spain, Portugal
Jurid	838	Spain, Portugal

Appendix F

Assessment of acoustic performance of a brake block

The purpose of this procedure is to demonstrate the acoustic performance of a composite brake block at interoperability constituent level.

⁽⁴⁾ Commission Decision 2004/446/EC of 29 April 2004 specifying the basic parameters of the 'Noise', 'Freight Wagons' and 'Telematic applications for freight' Technical Specifications for Interoperability referred to in Directive 2001/16/EC (OJ L 155, 30.4.2004, p. 1).

⁽⁵⁾ Commission Decision 2006/861/EC of 28 July 2006 concerning the technical specification of interoperability relating to the subsystem 'rolling stock — freight wagons' of the trans-European conventional rail system (OJ L 344, 8.12.2006, p. 1).

The procedure consists of the following steps:

1. **Measure the acoustic roughness of a wheel representative of the brake block under assessment.**

Wheel acoustic roughness development on bench test

New brake blocks shall be used. Only new or reprofiled wheels shall be used. The wheels shall be free of any damage (cracks, flats, etc.).

One of the following brake performance test programs shall be applied to at least one wheel of 920 mm nominal diameter:

- A2_a for LL-Blocks and A1_a for K-blocks of the specification referenced in Appendix B, index [4];
- D.1 for LL-Blocks and C.1 for K-blocks of the specification referenced in Appendix B, index [5];
- J.2 of the specification referenced in Appendix B, index [5] for other blocks.

The selected program shall be completed and the results of the measurement series after completion shall be used to determine the wheel roughness index.

It is optional to continue with a second run of the selected program. If that option is chosen, the results of the measurement series after completion of the second run shall be used to determine the wheel roughness index. The results from both runs shall be documented.

The second run shall be performed with the same wheel, but the brake block may be renewed and replaced with another block of the same type. In that option, the bedding-in of the new brake block shall be completely executed at the beginning of the second run.

Wheel acoustic roughness measurement procedure

The measurement will be performed as set out in the specification referenced in Appendix B, Index [6]. In order to ensure the representativeness of the acoustic roughness of the wheel tread, 8 measurement lines spaced 5 mm are deemed sufficient instead of the positions set out in the specification referenced in Appendix B, Index [6].

The measurement shall be performed during the wheel acoustic roughness development on bench test specified in the previous section in accordance with one of the tables below:

If the selected program is A2_a of the specification referenced in Appendix B, index [4]:

Acoustic roughness measurement series / Label		Programme section	Brake application No.
1 st run	2 nd run		
A		At start	Initial condition
B	I	After bedding-in	after Br 6
C	J	After conditioning the block for empty load	after Br. 26
D	K	Dry and empty conditions	after Br. 51
E	L	Wet and empty conditions	after Br. 87
F	M	Laden conditions	after Br. 128
G	N	Drag braking (steep gradient downhill simulation)	after Br. 130
H	O	End of programme	after Br. 164

If the selected program is A1_a of the specification referenced in Appendix B, index [4]:

Acoustic roughness measurement series / Label		Programme section	Brake application No.
1 st run	2 nd run		
A		At start	Initial condition
B	I	After bedding-in	after Br 6
C	J	After conditioning the block for empty load	after Br. 26
D	K	Dry and empty conditions	after Br. 51
E	L	Wet and empty conditions	after Br. 87
F	M	Laden conditions	after Br. 128
G	N	Drag braking (steep gradient downhill simulation)	after Br. 130
H	O	End of programme	after Br. 164

If the selected program is D.1 of the specification referenced in Appendix B, index [5]

Acoustic roughness measurement series / Label		Programme section	Brake application No.
1 st run	2 nd run		
A		At start	Initial condition
B	I	After bedding-in	after Br 6
C	J	After conditioning the block for empty load	after Br. 26
D	K	Dry and empty conditions	after Br. 51
E	L	Wet and empty conditions	after Br. 87
F	M	Laden conditions	after Br. 128
G	N	Drag braking (steep gradient downhill simulation)	after Br. 130
H	O	End of programme	after Br. 149

If the selected program is C.1 of the specification referenced in Appendix B, index [5]

Acoustic roughness measurement series / Label		Programme section	Brake application No.
1 st run	2 nd run		
A		At start	Initial condition
B	I	After bedding-in	after Br 6
C	J	After conditioning the block for empty load	after Br. 26
D	K	Dry and empty conditions	after Br. 51
E	L	Wet and empty conditions	after Br. 87

F	M	Laden conditions	after Br. 128
G	N	Drag braking (steep gradient downhill simulation)	after Br. 130
H	O	End of programme	after Br. 149

If the selected program is J.2 of the specification referenced in Appendix B, index [5]

Acoustic roughness measurement series / Label		Programme section	Brake application No.
1 st run	2 nd run		
A		At start	Initial condition
B	I	After bedding-in	after Br 6
C	J	After conditioning the block for empty load	after Br. 26
D	K	Dry and empty conditions	after Br. 51
E	L	Wet and empty conditions	after Br. 87
F	M	Laden conditions	after Br. 128
G	N	Drag braking (steep gradient downhill simulation)	after Br. 130
H	O	End of programme	after Br. 149

- Sampling: The acoustic roughness of 1 wheel shall be measured.
- Averaging: the RMS average of the acoustic roughness shall be used.

The result is a representative one-third octave wavelength wheel roughness spectrum in the wavelength domain L_r .

2. Derive a scalar indicator from the measured wheel roughness L_r in step 1

$$C(i) = B(i) + 10 \log_{10}[10^{0,1L_r(i)} + 10^{0,1A(i)}]$$

$$\text{Indicator} = 10 \log_{10}(\sum_{i=1}^{19} 10^{0,1 C(i)})$$

Where A(i) and B(i) are tabulated as follows ⁽⁶⁾:

i	Wavelength λ [m]	A dB re 1 micrometer	B dB re 1/(10 ⁻⁶ m)	L_r dB re 1 micrometer
1	0,00315	- 17,9	- 16,6	
2	0,004	- 16,2	- 13,9	
3	0,005	- 15,5	- 10,0	
4	0,0063	- 14,4	- 6,9	
5	0,008	- 13,3	- 6,2	
6	0,01	- 13,1	- 5,4	
7	0,0125	- 12,8	- 3,3	Obtained from
8	0,016	- 12,4	- 2,2	wheel roughness

⁽⁶⁾ Coefficients A(i) and B(i) are tailored to the current limit values for pass-by noise and reference track conditions

9	0,02	- 10,9	- 4,2	measurements
10	0,025	- 11,1	- 8,5	
11	0,0315	- 10,5	- 11,2	
12	0,04	- 9,8	- 14,3	
13	0,05	- 4,8	- 15,6	
14	0,063	- 5,9	- 17,3	
15	0,08	- 5,6	- 23,7	
16	0,1	- 0,5	- 29,0	
17	0,125	2,4	- 30,7	
18	0,16	4,8	- 31,7	
19	0,2	2,4	- 30,7	

3. Pass-fail criterion

The indicator measured in step 2 shall be lower than or equal to 1.

The indicator measured in step 2 as well as the representative one-third octave wavelength wheel roughness spectrum in the wavelength domain L_r shall be recorded in the IC certificate.

Appendix G

Exempted brake blocks

The blocks listed below are exempted from an EC Declaration of conformity until 28 September 2033. Until that date, the manufacturer or its representative may notify to the Commission the need to revise the pass-fail criterion set out in point 3 of Appendix F or the methodology set out in that Appendix.

Manufacturer	Type description and abbreviated designation (if different)
Becorit	K40
CoFren	C333
CoFren	C810
Knorr-Bremse	Cosid 704
Knorr-Bremse	PROBLOCK J816M
Frenoplast	FR513
Federal Mogul	Jurid 816 M abbreviated: J816M
Federal Mogul	Jurid 822
Knorr-Bremse	PROBLOCK J822
CoFren	C952-1
Federal Mogul	J847
Knorr-Bremse	PROBLOCK J847
Icer Rail / Becorit	IB 116*
Alstom/Flertex	W30-1

Appendix H

Changes of requirements and transition regimes

For other TSI points than these listed in Table H.1 and Table H.2, compliance with the 'previous TSI' (i.e. this Regulation as amended by Commission Implementing Regulation (EU) 2019/774 ⁽⁷⁾) imply compliance with this TSI applicable from 28 September 2023.

Changes with a generic transition regime of 7 years:

For TSI points listed in Table H.1, compliance with the previous TSI does not imply compliance with the version of this TSI applicable from 28 September 2023.

Projects already in design phase on 28 September 2023 shall comply with the requirement of this TSI from 28 September 2030.

Projects in production phase and rolling stock in operation are not affected by the TSI requirements listed in Table H.1.

Table H.1

Transition regime of 7 years

TSI point(s)	TSI point(s) in the previous TSI	Explanation of the TSI change
Not applicable		

Changes with a specific transition regime:

For TSI points listed in Table H.2, compliance with the previous TSI does not imply compliance with this TSI applicable from 28 September 2023.

Projects already in design phase on 28 September 2023, projects in production phase, and rolling stock in operation shall comply with the requirement of this TSI in accordance with the respective transition regime set out in Table H.2 starting from 28 September 2023.

Table H.2

Specific transition regime

TSI point(s)	TSI points(s) in the previous TSI	Explanation on TSI change	Transition regime			
			Design phase not started	Design phase started	Production phase	rolling stock in operation
Not applicable'						

⁽⁷⁾ Commission Implementing Regulation (EU) 2019/774 of 16 May 2019 amending Regulation (EU) No 1304/2014 as regards application of the technical specification for interoperability relating to the subsystem 'rolling stock — noise' to the existing freight wagons (OJ L 139I, 27.5.2019, p. 89).

ANNEX VII

The Annex to Implementing Regulation (EU) 2019/777 is amended as follows:

(1) point 3 is replaced by:

‘3. COMMON CHARACTERISTICS

The characteristics set out in this Annex shall be applied across the Union rail system, as a common vocabulary specification enabling:

- (1) the infrastructure managers to publish their railway network data;
- (2) the railway undertakings and any other infrastructure data users to access and use these data.’;

(2) a new point (6) is added in point 3.1 as follows:

‘(6) “common characteristics subset” means a subset of items shared by sections of lines and/or operational points.’;

(3) point 3.2.1 is replaced by the following:

‘3.2.1. For the purposes of the register of infrastructure, each infrastructure manager shall describe its railway network at least by sections of line and operational points and optionally via common characteristic subsets.’;

(4) point 3.3.3 is replaced as follows:

‘3.3.3. The value of a parameter shall be provided when the corresponding item exists on the network that is described in accordance with the deadlines in Table 1.

The data presentation of the parameters listed in Table 1 shall be in accordance with the ERA Vocabulary referred to in Article 7a and referenced in Appendix A-1, index [A].

Any information relevant to the parameters is provided in Table 1. When Table 1 refers to a document of the infrastructure manager, the infrastructure manager in accordance with Article 5 shall submit such document to the Agency in an electronic format. Documents referred to in parameters 1.1.1.1.2.4.4, 1.1.1.1.6.4, 1.1.1.1.6.5, 1.1.1.3.7.1.3 and 1.1.1.3.11.3 shall be submitted in two EU languages.’;

(5) Table 1 is replaced by the following:

Table 1

Items for the register of infrastructure (RINF)

Number	Title	Definition	Deadline to provide the parameter
1	MEMBER STATE		
1.1	SECTION OF LINE		
1.1.0.0.0	Generic information		
1.1.0.0.0.1	Infrastructure manager (IM)'s code	Infrastructure manager means anybody or undertaking that is responsible in particular for establishing and maintaining railway infrastructure or a part thereof.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.0.0.0.2	National line identification	Unique line identification or unique line number within Member State.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.0.0.0.3	Operational point at start of section of line	Unique OP ID at start of section of line (kilometres increasing from start OP to the end OP).	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.0.0.0.4	Operational point at end of section of line	Unique OP ID at end of section of line (kilometres increasing from start OP to the end OP)	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.0.0.0.5	Length of section of line	Length between operational points at start and end of section of line.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.0.0.0.6	Nature of Section of Line	Kind of section of line expressing size of presented data which depends on fact whether it connects OPs generated by division of a big node into several OPs or not.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.0.0.1	Route book specific parameters (Specific technical characteristics)		
1.1.0.0.1.1	Industrial risks — locations where it is dangerous for the driver to step out	Well Known Text polygonal shape	12 months after publication of Article 7 Guide
1.1.0.0.1.2	Operating language	The language or languages used in daily operation by infrastructure manager and published in its Network Statement, for the communication of operational or safety related messages between the staff of the infrastructure manager and the railway undertaking	12 months after publication of Article 7 Guide

1.1.0.0.1.3	Operational regime	Double track type	12 months after publication of Article 7 Guide
1.1.1	RUNNING TRACK		
1.1.1.0.0	Generic information		
1.1.1.0.0.1	Identification of track	Unique track identification or unique track number within section of line	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.0.0.2	Normal running direction	The normal running direction is: — the same as the direction defined by the start and end of the SoL: (N) — the opposite to the direction defined by the start and end of the SoL: (O) — both directions: (B)	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.0.0.3	Lineside indications of distance (frequency, appearance and positioning)	[NNNN] frequency in meters Appearance – selectable list [L/R] – the side along the track where the lineside indication is positioned (left or right)	12 months after publication of Article 7 Guide
1.1.1.0.1	Topology information		
1.1.1.0.1.1	Accurate geographical description	Well Known Text line string representing the geographical shape of the track	12 months after publication of Article 7 Guide
1.1.1.0.1.2	Tracks connectivity to operational points	The first character string uniquely identifies the track inside the operational point at start connected to this track The second character string uniquely identifies the track inside the operational point at end connected to this track	12 months after publication of Article 7 Guide
1.1.1.1	Infrastructure subsystem		
1.1.1.1.1	Declarations of verification for track		
1.1.1.1.1.1	EC declaration of verification for track relating to compliance with the requirements from technical specifications for interoperability (TSIs) applicable to infrastructure subsystem	Unique number for EC declarations in accordance with Commission Implementing Regulation (EU) 2019/250 (1).	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest

1.1.1.1.2	EI declaration of demonstration (as defined Commission 2014/881/EU (?)) for track relating to compliance with the requirements from TSIs applicable to infrastructure subsystem	Unique number for EI declarations following the same format requirements as specified for EC declarations in Annex VII of Commission Implementing Regulation (EU) 2019/250.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.2	Performance parameter		
1.1.1.1.2.1	Trans-European Network (TEN) classification of track	Indication of the part of the trans-European network the line belongs to.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.2.1.2	TEN geographic information system identity (GIS ID)	Indication of the GIS ID of the section of TEN-T database to which the track belongs	1 January 2021
1.1.1.1.2.2	Category of line	Classification of a line according to the TSI INF	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.2.3	Part of a Railway Freight Corridor	Indication whether the line is designated to a Railway Freight Corridor	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.2.4	Load capability	A combination of the line category and speed at the weakest point of the track	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.2.4.1	National classification for load capability	National classification for load capability	16 January 2020
1.1.1.1.2.4.2	Compliance of structures with the High Speed Load Model (HSLM)	For sections of line with a maximum permitted speed of 200 km/h or more. Information regarding the procedure to be used to perform the dynamic compatibility check	16 January 2020
1.1.1.1.2.4.3	Railway location of structures requiring specific checks	Localisation of structures requiring specific checks	16 January 2020
1.1.1.1.2.4.4	Document with the procedure(s) for static and dynamic route compatibility checks	Electronic document available in two EU languages from the IM stored by the Agency with: — precise procedures for the static and dynamic route compatibility checks; Or — relevant information for carrying out the checks for specific structures.	16 January 2020

1.1.1.1.2.5	Maximum permitted speed	Nominal maximum operational speed on the line as a result of infrastructure, energy and control, command and signalling subsystem characteristics expressed in kilometres/hour.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.2.6	Temperature range	Temperature range for unrestricted access to the line according to European standard.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.2.7	Maximum altitude	HighFest point of the section of line above sea level in reference to Normal Amsterdam's Peil (NAP).	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.2.8	Existence of severe climatic conditions	Climatic conditions on the line are severe according to European standard.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.3	Line layout		
1.1.1.1.3.1.1	Gauging	Gauges as defined in European standard or other local gauges, including lower or upper part. In accordance with point 7.3.2.2 of TSI LOC&PAS, sections of lines of the United Kingdom of Great Britain network may not have gauge reference profile.	16 January 2020
1.1.1.1.3.1.2	Railway location of particular points requiring specific checks	Location of particular points requiring specific checks due to deviations from gauging referred to in 1.1.1.1.3.1.1.	16 January 2020
1.1.1.1.3.1.3	Document with the transversal section of the particular points requiring specific checks	Electronic document available from the IM stored by the Agency with the transversal section of the particular points requiring specific checks due to deviations from gauging referred to in 1.1.1.1.3.1.1. Where relevant, guidance for the check with the particular point may be attached to the document with the transversal section.	16 January 2020

1.1.1.1.3.4	Standard combined transport profile number for swap bodies	Coding for combined transport with swap bodies (for all freight and mixed-traffic lines) in accordance with the specification referenced in Appendix A-1, index [B]	by 16 March 2019 at the latest for lines belonging to the TEN (1.1.1.1.2.1) For lines Off-TEN (1.1.1.1.2.1), when data not yet provided, upon justified request: - When data available, publication of the codification one month after the request - When data is not available and field measurements are needed, publication of the codification one year after the request
1.1.1.1.3.5	Standard combined transport profile number for semi-trailers	Coding for combined transport for semi-trailers (for all freight and mixed-traffic lines) in accordance with the specification referenced in Appendix A-1, index [B]	by 16 March 2019 at the latest for lines belonging to the TEN (1.1.1.1.2.1) For lines Off-TEN (1.1.1.1.2.1), when data not yet provided, upon justified request: — When data available, publication of the codification one month after the request — When data is not available and field measurements are needed, publication of the codification one year after the request
1.1.1.1.3.5.1	Specific information	Any relevant information from the IM relating to the line layout	1 January 2021
1.1.1.1.3.6	Gradient profile	Sequence of gradient values and locations of change in gradient	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.3.7	Minimum radius of horizontal curve	Radius of the smallest horizontal curve of the track in metres.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest

1.1.1.1.3.8	Standard combined transport profile number for containers	Coding for combined transport for containers (for all freight and mixed-traffic lines) in accordance with the specification referenced in Appendix A-1, index [B]	12 months after the adoption of the Article 7 Guide for lines belonging to the TEN (1.1.1.1.2.1) For lines Off-TEN (1.1.1.1.2.1), When data not yet provided, upon justified request: — When data available, publication of the codification one month after the request — When data is not available and field measurements are needed, publication of the codification one year after the request
1.1.1.1.3.9	Standard combined transport profile number for roller units	Coding for combined transport for roller units (for all freight and mixed-traffic lines) in accordance with the specification referenced in Appendix A-1, index [B]	12 months after the adoption of the Article 7 Guide for lines belonging to the TEN (1.1.1.1.2.1) For lines Off-TEN (1.1.1.1.2.1), When data not yet provided, upon justified request: — When data available, publication of the codification one month after the request — When data is not available and field measurements are needed, publication of the codification one year after the request
1.1.1.1.4	Track parameters		
1.1.1.1.4.1	Nominal track gauge	Value expressed in millimetres that identifies the track gauge.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.4.2	Cant deficiency	Maximum cant deficiency expressed in millimetres defined as difference between the applied cant and a higher equilibrium cant the line has been designed for.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.4.3	Rail inclination	An angle defining the inclination of the head of a rail relative to the running surface	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.4.4	Existence of ballast	Specifies whether track construction is with sleepers embedded in ballast or not.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest

1.1.1.1.5	Switches and crossings		
1.1.1.1.5.1	TSI compliance of in service values for switches and crossings	Switches and crossings are maintained to in service limit dimension as specified in TSI.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.5.2	Minimum wheel diameter for fixed obtuse crossings	Maximum unguided length of fixed obtuse crossings is based on a minimum wheel diameter in service expressed in millimetres.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.6	Track resistance to applied loads		
1.1.1.1.6.1	Maximum train deceleration	Limit for longitudinal track resistance given as a maximum allowed train deceleration and expressed in metres per square second.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.6.2	Use of eddy current brakes	Indication of limitations on the use of eddy current brakes.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.6.3	Use of magnetic brakes	Indication of limitations on the use of magnetic brakes.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.6.4	Document with the conditions for the use of eddy current brakes	Electronic document available in two EU languages from the IM stored by the Agency with conditions for the use of eddy current brakes identified in 1.1.1.1.6.2.	16 January 2020
1.1.1.1.6.5	Document with the conditions for the use of magnetic brakes	Electronic document available in two EU languages from the IM stored by the Agency with conditions for the use of magnetic brakes identified in 1.1.1.1.6.3.	16 January 2020
1.1.1.1.7	Health, safety and environment		
1.1.1.1.7.1	Use of flange lubrication forbidden	Indication whether the use of on-board device for flange lubrication is forbidden.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.7.2	Existence of level crossings	Indication whether level crossings (including pedestrian track crossing) exist on the section of line.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.7.3	Acceleration allowed near level crossing	Existence of limit for acceleration of train if stopping or recovering speed close to a level crossing expressed in a specific reference acceleration curve.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest

1.1.1.1.7.4	Existence of trackside hot axle box detector (HABD)	Existence of trackside HABD	16 January 2020
1.1.1.1.7.5	Trackside HABD TSI compliant	Specific for the French, Italian and Swedish networks. Trackside hot axle box detector TSI compliant.	16 January 2020
1.1.1.1.7.6	Identification of trackside HABD	Specific for the French, Italian and Swedish networks. Applicable if trackside HABD is not TSI compliant, identification of trackside hot axle box detector.	16 January 2020
1.1.1.1.7.7	Generation of trackside HABD	Specific for the French Italian and Swedish networks. Generation of trackside hot axle box detector.	16 January 2020
1.1.1.1.7.8	Railway location of trackside HABD	Specific for the French Italian and Swedish networks. Applicable if trackside HABD is not TSI compliant, localisation of trackside hot axle box detector.	16 January 2020
1.1.1.1.7.9	Direction of measurement of trackside HABD	Specific for the French Italian and Swedish networks. Applicable if trackside HABD is not TSI compliant, direction of measurement of trackside Hot Axle Box Detector. If the direction of measurement is: — the same as the direction defined by the start and end of the SoL: (N) — the opposite to the direction defined by the start and end of the SoL: (O) — both directions: (B)	16 January 2020

1.1.1.1.7.10	Steady red lights required	Sections where two steady red lights are required in accordance with TSI OPE	1 January 2021
1.1.1.1.7.11	Belonging to a quieter route	Belonging to a 'quieter route' in accordance with Article 5b of TSI NOI	1 January 2021
1.1.1.1.7.12	Permit of use of reflective plates	Sections where is permitted to use the reflective plates on rail freight corridors, with a view to prioritise the current bottlenecks. Specific case for Belgium, France, Italy, Portugal and Spain until 1.1.2026	12 months after publication of Article 7 Guide
1.1.1.1.7.12.1	Conditions for use of reflective plates	Details of any conditions for using the reflective plates on freight corridors. Specific case for Portugal and Spain until 1.1.2025 and Belgium and France until 1.1.2026	12 months after publication of Article 7 Guide
1.1.1.1.8	Tunnel		
1.1.1.1.8.1	IM's code	Infrastructure Manager means anybody or undertaking that is responsible in particular for establishing and maintaining railway infrastructure or a part thereof.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.8.2	Tunnel identification	Unique tunnel identification or unique number within Member State	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.8.3	Start of tunnel	Geographical coordinates in decimal degrees and km of the line at the beginning of a tunnel.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.8.4	End of tunnel	Geographical coordinates in decimal degrees and km of the line at the end of a tunnel.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.8.5	EC declaration of verification relating to compliance with the requirements from TSIs applicable to railway tunnel	Unique number for EC declarations in accordance with Commission Implementing Regulation (EU) 2019/250.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.8.6	EI declaration of demonstration (as defined in Recommendation 2014/881/EU) relating to compliance with the requirements from TSIs applicable to railway tunnel	Unique number for EI declarations following the same format requirements as specified for EC declarations in Annex VII of Commission Implementing Regulation (EU) 2019/250.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest

1.1.1.1.8.7	Length of tunnel	Length of a tunnel in metres from entrance portal to exit portal.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.8.8	Cross section area	Smallest cross section area in square metres of the tunnel	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.8.8.1	Compliance of the tunnel with TSI INF	compliance of the tunnel with TSI INF at the maximum permitted speed	1 January 2021
1.1.1.1.8.8.2	Document available from the IM with precise description of the tunnel	Electronic document available from the IM stored by the Agency with precise description of the clearance gauge and geometry of the tunnel	1 January 2021
1.1.1.1.8.9	Existence of emergency plan	Indication whether emergency plan exists.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.8.10	Fire category of rolling stock required	Passenger train fire category in accordance with point 4.1.4 of TSI LOC&PAS	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.8.11	National fire category of rolling stock required	Categorisation on how a passenger train with a fire on board will continue to operate for a defined time period.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.1.8.12	Existence of walkways	Indication of existence of walkways	12 months after publication of Article 7 Guide
1.1.1.1.8.12.1	Location of walkways	Value provided in Kilometric point of the start of the walkway and the length in m. Repeatable values for each location	12 months after publication of Article 7 Guide
1.1.1.1.8.13	Existence of evacuation and rescue points	Indication of existence of evacuation and rescue points	12 months after publication of Article 7 Guide
1.1.1.1.8.13.1	Location of evacuation and rescue points	Value provided in Kilometric point of the start of the point of evacuation and rescue point and the length in m. Repeatable values for each location	12 months after publication of Article 7 Guide

1.1.1.2	Energy subsystem		
1.1.1.2.1	Declarations of verification for track		
1.1.1.2.1.1	EC declaration of verification for track relating to compliance with the requirements from TSIs applicable to energy subsystem	Unique number for EC declarations in accordance with Commission Implementing Regulation (EU) 2019/250.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.2.1.2	EI declaration of demonstration (as defined Recommendation 2014/881/EU) for track relating to compliance with the requirements from TSIs applicable to energy subsystem	Unique number for EI declarations following the same format requirements as specified for EC declarations in Annex VII of Commission Implementing Regulation (EU) 2019/250.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.2.2	Contact line system		
1.1.1.2.2.1.1	Type of contact line system	Indication of the type of the contact line system.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.2.2.1.2	Energy supply system (Voltage and frequency)	Indication of the traction supply system (nominal voltage and frequency)	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.2.2.1.3	U _{max2} for the French network	Highest non-permanent voltage (U _{max2}) for France on lines not compliant with values defined in the the specification referenced in Appendix A-2, index [1]	16 January 2020
1.1.1.2.2.2	Maximum train current	Indication of the maximum allowable train current expressed in amperes.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.2.2.3	Maximum current at standstill per pantograph	Indication of the maximum allowable train current at standstill expressed in amperes.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest for DC systems 30 June 2024 for AC systems
1.1.1.2.2.4	Permission for regenerative braking	Indication whether regenerative braking is permitted, not permitted, or permitted under specific conditions.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest

1.1.1.2.2.4.1	Conditions applying in regards to regenerative braking	Name and/or reference of the document specifying the conditions applying in regards to regenerative braking	12 months after publication of Article 7 Guide
1.1.1.2.2.5	Maximum contact wire height	Indication of the maximum contact wire height expressed in metres.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.2.2.6	Minimum contact wire height	Indication of the minimum contact wire height expressed in metres.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.2.3	Pantograph		
1.1.1.2.3.1	Accepted TSI compliant pantograph heads	Indication of TSI compliant pantograph heads which are allowed to be used.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.2.3.2	Accepted other pantograph heads	Indication of pantograph heads which are allowed to be used	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.2.3.3	Requirements for number of raised pantographs and spacing between them, at the given speed	Indication of maximum number of raised pantographs per train allowed and minimum spacing centre line to centre line of adjacent pantograph heads, expressed in metres, at the given speed.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.2.3.4	Permitted contact strip material	Indication of which contact strip materials are permitted to be used.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.2.4	OCL separation sections		
1.1.1.2.4.1.1	Phase separation	Indication of existence of phase separation and required information.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.2.4.1.2	Information on phase separation	Indication of required several information on phase separation	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.2.4.2.1	System separation	Indication of existence of system separation	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.2.4.2.2	Information on system separation	Indication of required several information on system separation	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest

1.1.1.2.4.3	Distance between signboard and phase separation ending	Specific for route compatibility check on French network. Distance between the signboard authorizing the driver to 'raise pantograph' or 'close the circuit breaker' after passing the phase separation and the end of the phase separation section.	16 January 2020
1.1.1.2.5	Requirements for rolling stock		
1.1.1.2.5.1	Current or power limitation on board required	Indication of whether an on board current or power limitation function on vehicles is required.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.2.5.2	Contact force permitted	Indication of contact force allowed expressed in newton.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.2.5.3	Automatic dropping device required	Indication of whether an automatic dropping device (ADD) required on the vehicle.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.2.5.4	Document with restriction related to power consumption of specific electric traction unit(s)	Name and/or reference of the document specifying the restriction(s) related to power consumption of specific electric traction unit(s)	12 months after publication of Article 7 Guide
1.1.1.2.5.5	Document with restriction related to the position of Multiple Traction unit(s) to comply with contact line separation	Name and/or reference of the document specifying the restriction(s) related to the position of Multiple Traction unit(s) to comply with contact line separation	12 months after publication of Article 7 Guide
1.1.1.3	Control — command and signalling subsystem		
1.1.1.3.1	Declarations of verification for track		
1.1.1.3.1.1	EC declaration of verification for track relating to compliance with the requirements from TSIs applicable to control, command signalling subsystem	Unique number for EC declarations in accordance with Commission Implementing Regulation (EU) 2019/250.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest

1.1.1.3.1.2	ERTMS error corrections required for the on-board	List of unacceptable errors impacting the IM network that are required to be solved in the on-board according to the TSI CCS point 7.2.10.3 specification maintenance point	12 months after the entry into force of TSI CCS and at least 12 months after publication of Article 7 Guide
1.1.1.3.2	TSI compliant train protection system (ETCS)		
1.1.1.3.2.1	European Train Control System (ETCS) level	ETCS application level related to the track side equipment.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.3.2.2	ETCS baseline	ETCS baseline installed lineside.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.3.2.3	ETCS infill necessary for line access	Indication whether infill is required to access the line for safety reasons.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.3.2.4	ETCS infill installed line-side	Information about installed trackside equipment capable to transmit infill information by loop or Global System for Mobile communications for Railways (GSM-R) for level 1 installations.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.3.2.5	ETCS national packet 44 application implemented	Indication whether data for national applications is transmitted between track and train.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.3.2.6	Existence of operating restrictions or conditions	Indication whether restrictions or conditions due to partial compliance with the TSI CCS exist	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.3.2.8	Train integrity confirmation from on-board (not from driver) necessary for line access	Indication whether train confirmation from on-board is required to access the line for safety reasons.	16 January 2020
1.1.1.3.2.9	ETCS system compatibility	ETCS requirements used for demonstrating technical compatibility	16 January 2020
1.1.1.3.2.10	ETCS M_version	ETCS M_version according to the specification referenced in Appendix A-1, index [C]	1 January 2021

1.1.1.3.2.11	Safe consist length information from on-board necessary for access the line and SIL	Indication whether safe consist train length information from on-board is required to access the line for safety reasons and the required safety integrity level	12 months after publication of Article 7 Guide
1.1.1.3.2.12	Is the ETCS trackside engineered to transmit Track Conditions	According to the specification referenced in Appendix A-1, index [C] If the trackside does not provide Track Conditions, the driver will need to be informed about such conditions via alternative methods	12 months after publication of Article 7 Guide
1.1.1.3.2.12.1	Track conditions which can be transmitted	According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.1.1.3.2.13	ETCS trackside implements level crossing procedure or an equivalent solution	If the trackside does not implement any solution to cover defective LXs (which are normally protected by means of a technical system), then drivers will be required to comply with instructions received from other sources	12 months after publication of Article 7 Guide
1.1.1.3.2.14	Cant Deficiency used for the basic SSP	Essential information for drivers of trains with a worse (lower) tolerated cant deficiency than those for which the ETCS trackside provides SSP (Static Speed Profiles) in conjunction with 1.1.1.3.2.14.1 According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.1.1.3.2.14.1	Other Cant Deficiency train categories for which the ETCS trackside is configured to provide SSP	Essential information for drivers of trains with a worse (lower) tolerated cant deficiency than those for which the ETCS trackside provides SSP (Static Speed Profiles) in conjunction with 1.1.1.3.2.14. According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide

1.1.1.3.2.15	Reasons for which an ETCS Radio Block Center can reject a train	List of cases subject to system design choices made by the infrastructure manager according to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.1.1.3.2.16	ETCS National Values		
1.1.1.3.2.16.1	D_NVROLL	Parameter used by the ETCS on-board to supervise the distance allowed to be travelled under the roll-away protection and the reverse movement protection, in metres According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.1.1.3.2.16.2	Q_NVEMRRLS -	Qualifier defining whether the application of the emergency brake for reasons other than a trip can be revoked as soon as the conditions for it have disappeared or after the train has come to a complete standstill. According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.1.1.3.2.16.3	V_NVALLOWOVTRP -	Speed limit allowing the driver to select the “override” function in km/h According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.1.1.3.2.16.4	V_NVSUPOVTRP -	Override speed limit to be supervised when the “override” function is active in km/h According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide

1.1.1.3.2.16.5	D_NVOVTRP	Maximum distance for overriding the train trip in metres According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.1.1.3.2.16.6	T_NVOVTRP -	Maximum time for overriding the train trip in seconds According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.1.1.3.2.16.7	D_NVPOTRP -	Maximum distance for reversing in Post Trip mode in metres. According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.1.1.3.2.16.8	T_NVCONTACT -	Maximum time without a safe message from Radio Block Center before train reacts in seconds. According the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.1.1.3.2.16.9	M_NVCONTACT -	On-Board system reaction when T_NVCONTACT expires According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.1.1.3.2.16.10	M_NVDERUN -	Entry of Driver ID permitted while running According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide

1.1.1.3.2.16.11	Q_NVDRIVER_ADHES -	Qualifier determining whether the driver is allowed to modify the adhesion factor used by the ETCS on-board to calculate the braking curves According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.1.1.3.2.16.12	Q_NVSBTSMPerm	Permission to use service brake in target speed monitoring	12 months after publication of Article 7 Guide
1.1.1.3.2.16.13	National Values used for the brake model	Set of parameters for adapting the braking curves calculated by the ETCS on-board system to match accuracy, performance and safety margins imposed by the infrastructure manager. It copies the content of Packet 3 or of Packet 203 as defined in the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.1.1.3.2.17	ID and phone number of ERTMS/ETCS Radio Block Center	Unique RBC identification (NID_C+NID_RBC) and calling number (NID_RADIO) as defined in the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.1.1.3.2.18	Big Metal Mass	Indication of existence of metal mass in the vicinity of the location, susceptible of perturbing the reading of balises by the on-board system.	12 months after publication of Article 7 Guide
1.1.1.3.2.19	ETCS system version 2.2 or 3.0 functionalities to be required in the next 5 years	List of ETCS system version 2.2 or 3.0 functionalities to be required in the next 5 years according to TSI CCS point 6.1.1.2 and Appendix G	12 months after publication of Article 7 Guide

1.1.1.3.3	TSI compliant radio (RMR)		
1.1.1.3.3.1	GSM-R version	GSM-R functional requirements specification and system requirements specification in accordance with the specification respectively referenced in Appendix A-1, index [E] and index [F], version number installed lineside.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.3.3.2	Number of active GSM-R mobiles (EDOR) or simultaneous communication session on board for ETCS level 2 needed to perform radio block centre handovers without having an operational disruption	Number of simultaneous communication session on board for ETCS level 2 required for a smooth running of the train. This relates to the radio block centre (RBC) handling of communication sessions. Not safety critical and no matter of interoperability.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.3.3.3	Optional GSM-R functions	Use of optional GSM-R functions which might improve operation on the line. They are for information only and not for network access criteria.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.3.3.3.1	Additional information on network characteristics	Any additional information on network characteristics or corresponding document available from the IM and stored by the Agency, e.g.: interference level, leading to the recommendation of additional on-board protection	1 January 2021
1.1.1.3.3.3.2	GPRS for ETCS	Indication if GPRS can be used for ETCS	1 January 2021
1.1.1.3.3.3.3	Area of implementation of GPRS	Indication of the area in which GPRS can be used for ETCS	1 January 2021
1.1.1.3.3.4	GSM-R use of group 555	Indication if group 555 is used	16 January 2020
1.1.1.3.3.5	GSM-R networks covered by a roaming agreement	List of GSM-R networks which are covered by a roaming agreement	16 January 2020
1.1.1.3.3.6	Existence of GSM-R roaming to public networks	Existence of roaming to a public network In case of Y, provide the name of the public network under parameter 1.1.1.3.3.7:	1 January 2021

1.1.1.3.3.7	Details on GSM-R roaming to public networks	If roaming to public networks is configured, please indicate to which networks, for which users and in which areas.	1 January 2021
1.1.1.3.3.8	No GSMR coverage	Indication if there is a no GSMR coverage	1 January 2021
1.1.1.3.3.9	Radio system compatibility voice	Radio requirements used for demonstrating technical compatibility voice	16 January 2020
1.1.1.3.3.10	Radio system compatibility data	Radio requirements used for demonstrating technical compatibility data	16 January 2020
1.1.1.3.3.11	GSM-R network is configured to allow forced de-registration of a functional number by another driver	This feature will condition the applicable operational rules for drivers and signallers when dealing with cab radios registered under wrong numbers	12 months after publication of Article 7 Guide
1.1.1.3.3.12	Radio Network ID	Unique identification of the GSM-R network the calling mobile station has to register with, as defined in the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.1.1.3.4	Train detection systems defined based on frequency bands		
1.1.1.3.4.1	Existence of train detection system fully compliant with the TSI:	Indication if there is any train detection system installed and fully compliant with the TSI CCS	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.3.7.1.1	Type of train detection system	Indication of types of train detection systems installed.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.3.4.2	Frequency bands for detection	Bands of the frequency management of the train detection systems as defined in the specification referenced in Appendix A-1, index [D], and in the specific cases or technical documents referred to in Article 13 of TSI CCS when they are available	12 months after publication of Article 7 Guide

1.1.1.3.4.2.1	Maximum interference current	Maximum interference current limits allowed for track circuits for a defined frequency band.	For train detection system compliant with TSIs: 12 months after publication of Article 7 Guide. For train detection system not TSI compliant: in relation to article 13 of TSI CCS
1.1.1.3.4.2.2	Vehicle impedance	Impedance as defined in the specification referenced in Appendix A-1, index [D]	For train detection system compliant with TSIs, 12 months after publication of Article 7 Guide. For train detection system not TSI compliant: in relation to article 13 of TSI CCS
1.1.1.3.4.2.3	Maximum magnetic field	The maximum magnetic field limits allowed for axle counters (in dB μ A/m) for a defined frequency band. It should be provided in 3 directions	For train detection system compliant with TSIs, 12 months after publication of Article 7 Guide. For train detection system not TSI compliant: in relation to article 13 of TSI CCS
1.1.1.3.5	Train protection legacy systems		
1.1.1.3.5.3	Train protection legacy system	Indication of which class B system is installed	16 January 2020
1.1.1.3.6	Radio Legacy Systems		
1.1.1.3.6.1	Other radio systems installed (Radio Legacy Systems)	Indication of radio legacy systems installed.	16 January 2020
1.1.1.3.7	Other train detection systems		
1.1.1.3.7.1.2	Type of track circuits or axle counters to which specific checks are needed	Reference to the technical specification of train detection system, in accordance with the specification referenced in Appendix A-1, index [D]	12 months after publication of Article 7 Guide

1.1.1.3.7.1.3	Document with the procedure(s) related to the type of train detection systems declared in 1.1.1.3.7.1.2	Electronic document from the IM stored by the Agency with precise values in accordance with TSI CCS Article 13 and the specification referenced in Appendix A-1, index [D], for the specific check to be performed for train detection systems identified in 1.1.1.3.7.1.2.	In accordance with TSI CCS Art. 13 and 12 months after publication of Article 7 Guide
1.1.1.3.7.1.4	Section with train detection limitation	Specific for route compatibility check on French network.	16 January 2020
1.1.1.3.8	Transitions between systems		
1.1.1.3.8.1	Existence of switch over between different protection, control and warning systems while running	Indication whether a switch over between different systems whilst running exist	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.3.8.1.1	Special conditions to switch over between different class B train protection, control and warning systems	Conditions to switch over between different class B train protection, control and warning systems	12 months after publication of Article 7 Guide
1.1.1.3.8.2	Existence of switch over between different radio systems	Indication whether a switch over between different radio systems and no communication system whilst running exist	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.3.8.2.1	Special instructions to switch over between different radio systems	Name and/or reference of the document specifying the Special instructions to switch over between different radio systems	12 months after publication of Article 7 Guide
1.1.1.3.8.3	Special technical conditions required to switch over between ERTMS/ETCS and Class B systems	Name and/or reference of the document specifying the Special technical conditions required to switch over between ERTMS/ETCS and Class B systems	12 months after publication of Article 7 Guide
1.1.1.3.9	Parameters related to electromagnetic interferences		
1.1.1.3.9.1	Existence and TSI compliance of rules for magnetic fields emitted by a vehicle	Indication whether rules exist and are compliant with the TSI.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest

1.1.1.3.9.2	Existence and TSI compliance of limits in harmonics in the traction current of vehicles	Indication whether rules exist and are compliant with the TSI.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.3.10	Line-side system for degraded situation		
1.1.1.3.10.1	ETCS level for degraded situation	ERTMS/ETCS application level for degraded situation related to the track side equipment.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.3.10.2	Other train protection, control and warning systems for degraded situation	Indication of existence of other system than ETCS for degraded situation.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.3.11	Brake related parameters		
1.1.1.3.11.1	Maximum braking distance requested	The maximum value of the braking distance [in metres] of a train shall be given for the maximum line speed.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.1.1.3.11.2	Availability by the IM of additional information	Availability by the IM of additional information as defined in point (2) of point 4.2.2.6.2 of TSI OPE	16 January 2020
1.1.1.3.11.3	Documents available by the IM relating to braking performance	Electronic document available in two EU languages from the IM stored by the Agency providing additional information as defined in point (2) of point 4.2.2.6.2 of TSI OPE	16 January 2020
1.1.1.3.12	Intentionally blank		
1.1.1.3.13	Automated Train Operation (ATO)		
1.1.1.3.13.1	ATO Grade of Automation	ATO grade of automation installed lineside.	12 months after publication of Article 7 Guide
1.1.1.3.13.2	ATO System version	ATO system version according to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.1.1.3.13.3	ATO communication system	Supported ATO communication systems from trackside	12 months after publication of Article 7 Guide

1.1.1.3.14	Signal		
1.1.1.3.14.1	Name of signal	Identifier of signal.	12 months after publication of Article 7 Guide
1.1.1.3.14.2	Type of signal	Signalling information for Route Book compilation.	12 months after publication of Article 7 Guide
1.1.1.3.14.3	Location and orientation	Relative position to the line identified under parameter 1.1.0.0.0.2, given in km and indication if the signal refers to normal or opposite track direction	12 months after publication of Article 7 Guide
1.1.1.3.14.4	Relative distance of the danger point	Distance in meters to the danger point	12 months after publication of Article 7 Guide
1.1.1.3.14.5	Length of the non-stopping area	The length where is forbidden to stop the vehicle, value provided in meters	12 months after publication of Article 7 Guide
1.1.1.3.14.6	Geographical location of signal	Geographical coordinates in decimal degrees normally given for the position of the signal	12 months after publication of Article 7 Guide
1.1.1.4	Rules and restrictions		
1.1.1.4.1	Existence of rules and restrictions of a strictly local nature	Existence of rules and restrictions of a strictly local nature	1 January 2021
1.1.1.4.2	Documents regarding the rules or restrictions of a strictly local nature available by the IM	Electronic document available from the IM stored by the Agency providing additional information	1 January 2021
1.1.1.5	Vehicles for which Route compatibility is verified		
1.1.1.5.1	List of vehicle types already identified as compatible with Traffic load and load carrying capacity of infrastructure and train detection systems	The infrastructure managers shall provide through RINF the information to the RU regarding list of vehicle types compatible with the route for which they have already verified compatibility for parameter 'Traffic load and load carrying capacity of infrastructure and train detection systems', where such information is available.	12 months after publication of Article 7 Guide

1.1.1.5.2	List of vehicles already identified as compatible with Traffic load and load carrying capacity of infrastructure and train detection systems	The infrastructure managers shall provide through RINF the information or a document to the RU regarding list of vehicle(s) compatible with the route for which they have already verified compatibility for parameter 'Traffic load and load carrying capacity of infrastructure and train detection systems', where such information is available.	12 months after publication of Article 7 Guide
1.2	OPERATIONAL POINT		
1.2.0.0.0	Generic information		
1.2.0.0.0.1	Name of operational point	Name normally related to the town or village or to traffic control purpose	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.0.0.0.2	Unique OP ID	Code composed of country code and alphanumeric OP code.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.0.0.0.3	OP primary location code	Primary location code developed for information exchange in accordance with the TSIs relating to the telematics applications subsystem	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.0.0.0.4	Type of operational point	Type of facility in relation to the dominating operational functions.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.0.0.0.4.1	Type of track gauge changeover facility	Type of track gauge changeover facility	16 January 2020
1.2.0.0.0.5	Geographical location of operational point	Geographical coordinates in decimal degrees normally given for the centre of the OP.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.0.0.0.6	Railway location of Operational point	Kilometre related to line identification defining the location of the OP. This will normally be in the centre of the OP.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.0.0.0.7	Schematic overview of the operational point in digital form	The existence of a schematic overview of the operational point in digital form	12 months after publication of Article 7 Guide

1.2.0.0.7.1	Schematic overview of the operational point	Document providing the schematic overview of the operational point	12 months after publication of Article 7 Guide
1.2.0.0.7.2	Digital schematic overview	Diagrammatic representation of the operational point in Well Known Text polyline	12 months after publication of Article 7 Guide
1.2.0.0.8	Operating language	The language or languages used in daily operation by infrastructure manager and published in its Network Statement, for the communication of operational or safety related messages between the staff of the infrastructure manager and the railway undertaking	12 months after publication of Article 7 Guide
1.2.1	RUNNING TRACK		
1.2.1.0.0	Generic information		
1.2.1.0.0.1	IM's code	Infrastructure manager means any body or undertaking that is responsible in particular for establishing and maintaining railway infrastructure or a part thereof.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.0.2	Identification of track	Unique track identification or unique track number within OP	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.1	Declarations of verification for track		
1.2.1.0.1.1	EC declaration of verification for track relating to compliance with the requirements from TSIs applicable to infrastructure subsystem	Unique number for EC declarations in accordance with Commission Implementing Regulation (EU) 2019/250.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.1.2	EI declaration of demonstration (as defined Recommendation 2014/881/EU) relating to compliance with the requirements from TSIs applicable to infrastructure subsystem	Unique number for EI declarations following the same format requirements as specified for EC declarations in Annex VII of Commission Implementing Regulation (EU) 2019/250.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest

1.2.1.0.2	Performance parameters		
1.2.1.0.2.1	TEN classification of track	Indication of the part of the trans-European network the track belongs to.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.2.2	Category of line:	Classification of a line according to the TSI INF	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.2.3	Part of a Railway Freight Corridor	Indication whether the line is designated to a Railway Freight Corridor	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.3	Line layout		
1.2.1.0.3.4	Gauging	Gauges as defined in European standard or other local gauges, including lower or upper part.	16 January 2020
1.2.1.0.3.5	Railway location of particular points requiring specific checks	Location of particular points requiring specific checks due to deviations from gauging referred to in 1.2.1.0.3.4.	16 January 2020
1.2.1.0.3.6	Document with the transversal section of the particular points requiring specific checks	Electronic document available from the IM stored by the Agency with the transversal section of the particular points requiring specific checks due to deviations from gauging referred to in 1.2.1.0.3.4. Where relevant, guidance for the check with the particular point may be attached to the document with the transversal section.	16 January 2020
1.2.1.0.4	Track parameters		
1.2.1.0.4.1	Nominal track gauge	A single value expressed in millimetres that identifies the track gauge.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.4.2	Use of eddy current brakes	Indication of limitations on the use of eddy current brakes.	12 months after publication of Article 7 Guide
1.2.1.0.4.3	Use of magnetic brakes	Indication of limitations on the use of magnetic brakes.	12 months after publication of Article 7 Guide

1.2.1.0.5	Tunnel		
1.2.1.0.5.1	IM's code	Infrastructure manager means any body or undertaking that is responsible in particular for establishing and maintaining railway infrastructure or a part thereof.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.5.2	Tunnel identification	Unique tunnel identification or unique tunnel number within MS	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.5.3	EC declaration of verification for tunnel relating to compliance with the requirements from TSIs applicable to railway tunnel	Unique number for EC declarations in accordance with Commission Implementing Regulation (EU) 2019/250.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.5.4	EI declaration of demonstration (as defined Recommendation 2014/881/EU) for tunnel relating to compliance with the requirements from TSIs applicable to railway tunnel	Unique number for EI declarations following the same format requirements as specified for EC declarations in Annex VII of Commission Implementing Regulation (EU) 2019/250.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.5.5	Length of tunnel	Length of a tunnel in metres from entrance portal to exit portal.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.5.6	Existence of emergency plan	Indication whether emergency plan exists.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.5.7	Fire category of rolling stock required	Categorisation how a passenger train with a fire on board will continue to operate for a defined time period	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.5.8	National fire category of rolling stock required	Categorisation how a passenger train with a fire on board will continue to operate for a defined time period — according to national rules if they exist	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.5.9	Diesel or other thermal traction allowed	Indication whether it is allowed to use diesel or other thermal traction in the tunnel	1 January 2021
1.2.1.0.5.10	Existence of walkways	Indication of existence of walkways	12 months after publication of Article 7 Guide

1.2.1.0.5.10.1	Location of walkways	Value provided in Kilometric point of the start of the walkway and the length in m. Repeatable values for each location	12 months after publication of Article 7 Guide
1.2.1.0.5.11	Existence of evacuation and rescue points	Indication of existence of evacuation and rescue points	12 months after publication of Article 7 Guide
1.2.1.0.5.11.1	Location of evacuation and rescue points	Value provided in Kilometric point of the start of the evacuation and rescue point and the length in m. Repeatable values for each location	12 months after publication of Article 7 Guide
1.2.1.0.6	Platform		
1.2.1.0.6.1	IM's code	Infrastructure manager means any body or undertaking that is responsible in particular for establishing and maintaining railway infrastructure or a part thereof.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.6.2	Identification of platform	Unique platform identification or unique platform number within OP	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.6.3	TEN Classification of platform	Indicates the part of the trans-European network the platform belongs to.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.6.4	Usable length of platform	The maximum continuous length (expressed in metres) 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.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.6.5	Height of platform	Distance between the upper surface of platform and running surface of the neighbouring track. It is the nominal value expressed in millimetres.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.6.6	Existence of platform assistance for starting train	Indication of existence of equipment or staff supporting the train crew in starting the train.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest

1.2.1.0.6.7	Range of use of the platform boarding aid	Information of the train access level for which the boarding aid can be used.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.1.0.6.8	Curvature of the platform	Indication of the existence of the curvature of the platform	12 months after publication of Article 7 Guide
1.2.1.0.7	Contact line system		
1.2.1.0.7.1	Permission for charging electric energy storage for traction purposes at standstill	Point at which IM authorises charging of electric energy storage for traction purposes at standstill	30 June 2024 at the latest
1.2.1.0.7.2	Permitted conditions for charging electric energy storage for traction purposes at standstill	Conditions set by IMs according to a standardised document	30 June 2024 at the latest
1.2.1.0.8	Signal		
1.2.1.0.8.1	Name of signal	Identifier of signal	12 months after publication of Article 7 Guide
1.2.1.0.8.2	Type of signal	Signalling information for Route Book compilation. This list shall include “fixed signals that protect danger points”	12 months after publication of Article 7 Guide
1.2.1.0.8.3	Location and orientation	Relative position to the national line, given in km and indication if the signal refers to normal or opposite track direction	12 months after publication of Article 7 Guide
1.2.1.0.8.4	Relative distance of the danger point	Distance in meters to the danger point	12 months after publication of Article 7 Guide
1.2.1.0.8.5	Geographical location of signal	Geographical coordinates in decimal degrees normally given for the position of the signal	12 months after publication of Article 7 Guide
1.2.1.1	Control-command and signalling subsystem		
1.2.1.1.1	TSI compliant train protection system (ETCS)		
1.2.1.1.1.1	European Train Control System (ETCS) level	ETCS application level related to the track side equipment.	12 months after publication of Article 7 Guide

1.2.1.1.1.2	ETCS baseline	ETCS baseline installed lineside.	12 months after publication of Article 7 Guide
1.2.1.1.1.3	ETCS infill necessary for line access	Indication whether infill is required to access the line for safety reasons.	12 months after publication of Article 7 Guide
1.2.1.1.1.4	ETCS infill installed line-side	Information about installed trackside equipment capable to transmit infill information by loop or Global System for Mobile communications for Railways (GSM-R) for level 1 installations.	12 months after publication of Article 7 Guide
1.2.1.1.1.5	ETCS national packet 44 application implemented	Indication whether data for national applications is transmitted between track and train.	12 months after publication of Article 7 Guide
1.2.1.1.1.6	Existence of operating restrictions or conditions	Indication whether restrictions or conditions due to partial compliance with the TSI CCS exist.	12 months after publication of Article 7 Guide
1.2.1.1.1.8	Train integrity confirmation from on-board (not from driver) necessary for line access	Indication whether train confirmation from on-board is required to access the line for safety reasons.	12 months after publication of Article 7 Guide
1.2.1.1.1.9	ETCS system compatibility	ETCS requirements used for demonstrating technical compatibility	12 months after publication of Article 7 Guide
1.2.1.1.1.10	ETCS M_version	ETCS M_version according to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.2.1.1.1.11	Safe consist length information from on-board necessary for access the line and SIL	Indication whether safe consist train length information from on-board is required to access the line for safety reasons and the required safety integrity level	12 months after publication of Article 7 Guide
1.2.1.1.1.12	Is the ETCS trackside engineered to transmit Track Conditions	According to the specification referenced in Appendix A-1, index [C] If the trackside does not provide Track Conditions, the driver will need to be informed about such conditions via alternative methods	12 months after publication of Article 7 Guide

1.2.1.1.1.12.1	Track conditions which can be transmitted	According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.2.1.1.1.13	ETCS trackside implements level crossing procedure or an equivalent solution	If the trackside does not implement any solution to cover defective LXs (which are normally protected by means of a technical system), then drivers will be required to comply with instructions received from other sources	12 months after publication of Article 7 Guide
1.2.1.1.1.14	Cant Deficiency used for the basic SSP	Essential information for drivers of trains with a worse (lower) tolerated cant deficiency than those for which the ETCS trackside provides SSP (Static Speed Profiles) in conjunction with 1.2.1.1.1.14.1 According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.2.1.1.1.14.1	Other Cant Deficiency train categories for which the ETCS trackside is configured to provide SSP	Essential information for drivers of trains with a worse (lower) tolerated cant deficiency than those for which the ETCS trackside provides SSP (Static Speed Profiles) in conjunction with 1.2.1.1.1.14. According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.2.1.1.1.15	Reasons for which an ETCS Radio Block Center can reject a train	List of cases subject to system design choices made by the infrastructure manager according to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide

1.2.1.1.1.16	ETCS National Values		
1.2.1.1.1.16.1	D_NVROLL	Parameter used by the ETCS on-board to supervise the distance allowed to be travelled under the roll-away protection and the reverse movement protection, in metres According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.2.1.1.1.16.2	Q_NVEMRRLS	Qualifier defining whether the application of the emergency brake for reasons other than a trip can be revoked as soon as the conditions for it have disappeared or after the train has come to a complete standstill. According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.2.1.1.1.16.3	V_NVALLOWOVTRP	Speed limit allowing the driver to select the “override” function in km/h According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.2.1.1.1.16.4	V_NVSUPOVTRP	Override speed limit to be supervised when the “override” function is active in km/h According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.2.1.1.1.16.5	D_NVOVTRP	Maximum distance for overriding the train trip in metres According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide

1.2.1.1.1.16.6	T_NVOVTRP	Maximum time for overriding the train trip in seconds According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.2.1.1.1.16.7	D_NVPOTRP	Maximum distance for reversing in Post Trip mode in metres. According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.2.1.1.1.16.8	T_NVCONTACT	Maximum time without a safe message from Radio Block Center before train reacts in seconds. According the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.2.1.1.1.16.9	M_NVCONTACT	On-Board system reaction when T_NVCONTACT expires According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.2.1.1.1.16.10	M_NVDERUN	Entry of Driver ID permitted while running According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.2.1.1.1.16.11	Q_NVDRIVER_ADHES	Qualifier determining whether the driver is allowed to modify the adhesion factor used by the ETCS on-board to calculate the braking curves According to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide

1.2.1.1.1.16.12	Q_NVSBTSMPerm	Permission to use service brake in target speed monitoring	12 months after publication of Article 7 Guide
1.2.1.1.1.16.13	National Values used for the brake model	Set of parameters for adapting the braking curves calculated by the ETCS on-board system to match accuracy, performance and safety margins imposed by the infrastructure manager. It copies the content of Packet 3 or of Packet 203 as defined in the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.2.1.1.1.17	ID and phone number of ERTMS/ETCS Radio Block Center	Unique RBC identification (NID_C+NID_RBC) and calling number (NID_RADIO) as defined in the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.2.1.1.1.18	Big Metal Mass	Indication of existence of metal mass in the vicinity of the location, susceptible of perturbing the reading of balises by the on-board system.	12 months after publication of Article 7 Guide
1.2.1.1.1.19	ETCS error corrections required for the on-board	List of unacceptable errors impacting the IM network that are required to be solved in the on-board according to the TSI CCS point 7.2.10.3 specification maintenance point	12 months after the entry into force of TSI CCS and at least 12 months after publication of Article 7 Guide
1.2.1.1.1.20	ETCS system version 2.2 or 3.0 functionalities to be required in the next 5 years	List of ETCS system version 2.2 or 3.0 functionalities to be required in the next 5 years according to TSI CCS point 6.1.1.2 and Appendix G	12 months after publication of Article 7 Guide

1.2.1.1.2	TSI compliant radio (RMR)		
1.2.1.1.2.1	GSM-R version	GSM-R functional requirements specification and system requirements specification in accordance with the specification respectively referenced in Appendix A-1, index [E] and index [F], version number installed lineside.	12 months after publication of Article 7 Guide
1.2.1.1.2.2	Number of active GSM-R mobiles (EDOR) or simultaneous communication session on board for ETCS level 2 needed to perform radio block centre handovers without having an operational disruption	Number of simultaneous communication session on board for ETCS level 2 required for a smooth running of the train. This relates to the radio block centre (RBC) handling of communication sessions. Not safety critical and no matter of interoperability.	12 months after publication of Article 7 Guide
1.2.1.1.2.3	Optional GSM-R functions	Use of optional GSM-R functions which might improve operation on the line. They are for information only and not for network access criteria.	12 months after publication of Article 7 Guide
1.2.1.1.2.3.1	Additional information on network characteristics	Any additional information on network characteristics or corresponding document available from the IM and stored by the Agency, e.g.; interference level, leading to the recommendation of additional on-board protection	12 months after publication of Article 7 Guide
1.2.1.1.2.3.2	GPRS for ETCS	Indication if GPRS can be used for ETCS	12 months after publication of Article 7 Guide
1.2.1.1.2.3.3	Area of implementation of GPRS	Indication of the area in which GPRS can be used for ETCS	12 months after publication of Article 7 Guide
1.2.1.1.2.4	GSM-R use of group 555	Indication if group 555 is used	12 months after publication of Article 7 Guide
1.2.1.1.2.5	GSM-R networks covered by a roaming agreement	List of GSM-R networks which are covered by a roaming agreement	12 months after publication of Article 7 Guide

1.2.1.1.2.6	Existence of GSM-R roaming to public networks	Existence of roaming to a public network In case of Y, provide the name of the public network under parameter 1.2.1.1.2.7:	12 months after publication of Article 7 Guide
1.2.1.1.2.7	Details on GSM-R roaming to public networks	If roaming to public networks is configured, please indicate to which networks, for which users and in which areas.	12 months after publication of Article 7 Guide
1.2.1.1.2.8	No GSMR coverage	Indication if there is a no GSMR coverage	12 months after publication of Article 7 Guide
1.2.1.1.2.9	Radio system compatibility voice	Radio requirements used for demonstrating technical compatibility voice	12 months after publication of Article 7 Guide
1.2.1.1.2.10	Radio system compatibility data	Radio requirements used for demonstrating technical compatibility data	12 months after publication of Article 7 Guide
1.2.1.1.2.11	GSM-R network is configured to allow forced de-registration of a functional number by another driver	This feature will condition the applicable operational rules for drivers and signallers when dealing with cab radios registered under wrong numbers	12 months after publication of Article 7 Guide
1.2.1.1.2.12	Specific constraints imposed by the GSM-R network operator on ETCS on-board units only able to operate in circuit-switch	These constraints, where applicable, are meant to manage the limited number of circuit-switched radio connections that can be handled simultaneously by a Radio Block Center	12 months after publication of Article 7 Guide
1.2.1.1.2.13	Radio Network ID	Unique identification of the GSM-R network the calling mobile station has to register with, as defined in the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide

1.2.1.1.3	Train detection systems defined based on frequency bands		
1.2.1.1.3.1	Existence of train detection system fully compliant with the TSI:	Indication if there is any train detection system installed and fully compliant with the TSI CCS	12 months after publication of Article 7 Guide
1.2.1.1.3.1.1	Type of train detection system	Indication of types of train detection systems installed.	12 months after publication of Article 7 Guide
1.2.1.1.3.2	Frequency bands for detection	Bands of the frequency management of the train detection systems as defined in the specification referenced in Appendix A-1, index [D], and in the specific cases or technical documents referred to in Article 13 of TSI CCS when they are available	12 months after publication of Article 7 Guide
1.2.1.1.3.2.1	Maximum interference current	Maximum interference current limits allowed for track circuits for a defined frequency band.	12 months after publication of Article 7 Guide
1.2.1.1.3.2.2	Vehicle impedance	Impedance as defined in the specification referenced in Appendix A-1, index [D]	12 months after publication of Article 7 Guide
1.2.1.1.3.2.3	Maximum magnetic field	The maximum magnetic field limits allowed for axle counters (in dB μ A/m) for a defined frequency band. It should be provided in 3 directions	12 months after publication of Article 7 Guide
1.2.1.1.4	Train protection legacy systems		
1.2.1.1.4.1	Train protection legacy system	Indication of which class B system is installed	12 months after publication of Article 7 Guide
1.2.1.1.5	Radio Legacy Systems		
1.2.1.1.5.1	Other radio systems installed (Radio Legacy Systems)	Indication of radio legacy systems installed.	12 months after publication of Article 7 Guide

1.2.1.1.6	Other train detection systems		
1.2.1.1.6.1	Type of track circuits or axle counters to which specific checks are needed	Reference to the technical specification of train detection system, in accordance with the specification referenced in Appendix A-1, index [D]	12 months after publication of Article 7 Guide
1.2.1.1.6.2	Document with the procedure(s) related to the type of train detection systems declared in 1.2.1.1.6.1	Electronic document from the IM stored by the Agency with precise values in accordance with TSI CCS Article 13 and the specification referenced in Appendix A-1, index [D], for the specific check to be performed for train detection systems identified in 1.2.1.1.6.1	12 months after publication of Article 7 Guide
1.2.1.1.6.3	Section with train detection limitation	Specific for route compatibility check on French network.	12 months after publication of Article 7 Guide
1.2.1.1.7	Transitions between systems		
1.2.1.1.7.1	Existence of switch over between different protection, control and warning systems while running	Indication whether a switch over between different systems whilst running exist	12 months after publication of Article 7 Guide
1.2.1.1.7.1.1	Special conditions to switch over between different class B train protection, control and warning systems	Conditions to switch over between different class B train protection, control and warning systems	12 months after publication of Article 7 Guide
1.2.1.1.7.2	Existence of switch over between different radio systems	Indication whether a switch over between different radio systems and no communication system whilst running exist	12 months after publication of Article 7 Guide
1.2.1.1.7.2.1	Special instructions to switch over between different radio systems	Name and/or reference of the document specifying the Special instructions to switch over between different radio systems	12 months after publication of Article 7 Guide
1.2.1.1.7.3	Special technical conditions required to switch over between ERTMS/ETCS and Class B systems	Name and/or reference of the document specifying the Special technical conditions required to switch over between ERTMS/ETCS and Class B systems	12 months after publication of Article 7 Guide

1.2.1.1.8	Parameters related to electromagnetic interferences		
1.2.1.1.8.1	Existence and TSI compliance of rules for magnetic fields emitted by a vehicle	Indication whether rules exist and are compliant with the TSI.	12 months after publication of Article 7 Guide
1.2.1.1.8.2	Existence and TSI compliance of limits in harmonics in the traction current of vehicles	Indication whether rules exist and are compliant with the TSI.	12 months after publication of Article 7 Guide
1.2.1.1.9	Line-side system for degraded situation		
1.2.1.1.9.1	ETCS level for degraded situation	ERTMS/ETCS application level for degraded situation related to the track side equipment.	12 months after publication of Article 7 Guide
1.2.1.1.9.2	Other train protection, control and warning systems for degraded situation	Indication of existence of other system than ETCS for degraded situation.	12 months after publication of Article 7 Guide
1.2.1.1.10	Automated Train Operation (ATO)		
1.2.1.1.10.1	ATO Grade of Automation	ATO grade of automation installed lineside.	12 months after publication of Article 7 Guide
1.2.1.1.10.2	ATO System version	ATO system version according to the specification referenced in Appendix A-1, index [C]	12 months after publication of Article 7 Guide
1.2.1.1.10.3	ATO communication system	Supported ATO communication systems from trackside	12 months after publication of Article 7 Guide
1.2.2	SIDING		
1.2.2.0.0	Generic information		
1.2.2.0.0.1	IM's code	Infrastructure manager means any body or undertaking that is responsible in particular for establishing and maintaining railway infrastructure or a part thereof.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest

1.2.2.0.0.2	Identification of siding	Unique siding identification or unique siding number within OP	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.2.0.0.3	TEN Classification of siding	Indicates the part of the trans-European network the siding belongs to.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.2.0.1	Declaration of verification for siding		
1.2.2.0.1.1	EC declaration of verification for siding relating to compliance with the requirements from TSIs applicable to infrastructure subsystem	Unique number for EC declarations in accordance with Commission Implementing Regulation (EU) 2019/250.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.2.0.1.2	EI declaration of demonstration (as defined Recommendation 2014/881/EU) for siding relating to compliance with the requirements from TSIs applicable to infrastructure subsystem	Unique number for EI declarations following the same format requirements as specified for EC declarations in Annex VII of Commission Implementing Regulation (EU) 2019/250.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.2.0.2	Performance parameter		
1.2.2.0.2.1	Usable length of siding	Total length of the siding/stabling track expressed in metres where trains can be parked safely.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.2.0.3	Line layout		
1.2.2.0.3.1	Gradient for stabling tracks	Maximum value of the gradient expressed in millimetres per metre.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.2.0.3.2	Minimum radius of horizontal curve	Radius of the smallest horizontal curve, expressed in metres.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.2.0.3.3	Minimum radius of vertical curve	Radius of the smallest vertical curve expressed in metres.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest

1.2.2.0.4	Fixed installations for servicing trains		
1.2.2.0.4.1	Existence of toilet discharge	Indication whether exists an installation of toilet discharge (fixed installation for servicing trains) as defined in TSI INF	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.2.0.4.2	Existence of external cleaning facilities	Indication whether exists an installation of external cleaning facility (fixed installation for servicing trains) as defined in TSI INF	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.2.0.4.3	Existence of water restocking	Indication whether exists an installation of water restocking (fixed installation for servicing trains) as defined in TSI INF	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.2.0.4.4	Existence of refuelling	Indication whether exists an installation of refuelling (fixed installation for servicing trains) as defined in TSI INF.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.2.0.4.5	Existence of sand restocking	Indication whether an installation of sand restocking exists (fixed installation for servicing trains).	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.2.0.4.6	Existence of electric shore supply	Indication whether exists an installation of electric shore supply (fixed installation for servicing trains).	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.2.0.5	Tunnel		
1.2.2.0.5.1	IM's code	Infrastructure manager means any body or undertaking that is responsible in particular for establishing and maintaining railway infrastructure or a part thereof.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.2.0.5.2	Tunnel identification	Unique tunnel identification or unique number within Member State	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.2.0.5.3	EC declaration of verification for tunnel relating to compliance with the requirements from TSIs applicable to railway tunnel	Unique number for EC declarations in accordance with Commission Implementing Regulation (EU) 2019/250.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest

1.2.2.0.5.4	EI declaration of demonstration (as defined Recommendation 2014/881/EU) for tunnel relating to compliance with the requirements from TSIs applicable to railway tunnel	Unique number for EI declarations following the same format requirements as specified for EC declarations in Annex VII of Commission Implementing Regulation (EU) 2019/250.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.2.0.5.5	Length of tunnel	Length of a tunnel in metres from entrance portal to exit portal.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.2.0.5.6	Existence of emergency plan	Indication whether emergency plan exists.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.2.0.5.7	Fire category of rolling stock required	Categorisation how a passenger train with a fire on board will continue to operate for a defined time period.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.2.0.5.8	National fire category of rolling stock required	Categorisation how a passenger train with a fire on board will continue to operate for a defined time period — according to national rules if they exist.	In accordance with Implementing Decision 2014/880/EU and by 16 March 2019 at the latest
1.2.2.0.5.9	Existence of walkways	Indication of existence of walkways	12 months after publication of Article 7 Guide
1.2.2.0.5.9.1	Location of walkways	Value provided in Kilometric point of the start of the walkway and the length in m. Repeatable values for each location	12 months after publication of Article 7 Guide
1.2.2.0.5.10	Existence of evacuation and rescue points	Indication of existence of evacuation and rescue points	12 months after publication of Article 7 Guide
1.2.2.0.5.10.1	Location of evacuation and rescue points	Value provided in Kilometric point of the start of the evacuation and rescue point and the length in m. Repeatable values for each location	12 months after publication of Article 7 Guide
1.2.2.0.6	Contact line system		
1.2.2.0.6.1	Maximum current at standstill per pantograph	Indication of the maximum allowable train current at standstill expressed in amperes.	16 January 2020 for DC systems 30 June 2024 for AC systems

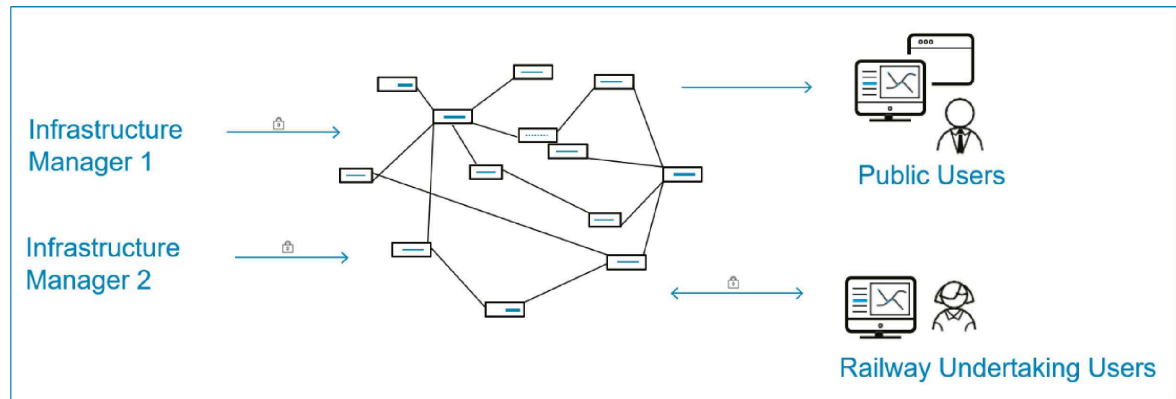
1.2.3	Rules and restrictions		
1.2.3.1	Existence of rules and restrictions of a strictly local nature	Existence of rules and restrictions of a strictly local nature	1 January 2021
1.2.3.2	Documents regarding the rules or restrictions of a strictly local nature available by the IM	Electronic document available from the IM stored by the Agency providing additional information	1 January 2021
1.2.4	Navigability		
1.2.4.1	Internal connection	Describes the internal connectivity between the tracks of the operational point and it is presented like a from-to network relation, where From and To are the names of the tracks connecting each other	12 months after publication of Article 7 Guide'

- (6) point 4.1 is amended as follows:

The first paragraph is replaced by the following:

‘The architecture of the registers of infrastructure system shall be as follows:’;

- (7) Figure 1 is replaced by the following:



- (8) point 4.2 is replaced by the following:

‘The RINF application shall be a web-based application set up, managed, maintained and administered by the Agency.

The Agency shall make available to infrastructure managers the following files and documents that shall be used for submitting the data to the RINF application:

- (a) user manual;
 - (b) specification of the structure of the files for the transmission of data;
 - (c) description of codes for preparing the files — Data provision guide describing the validation process of the transmitted files;
 - (d) the ERA vocabulary.’;
- (9) point 4.3 is amended as follows:
- (a) point (a) is replaced by the following:

‘(a) user management: the Agency must be able to manage users’ access rights;’;
 - (b) point (b) is replaced by the following:

‘(b) information auditing: RINF application must enable viewing the logs of activity of registered users, connectivity and authentication;’;
 - (c) points (d) to (n) are replaced by the following:
 - ‘(d) search for the register of infrastructure data including OPs and/or SoLs, including data validity dates;
 - (e) visual representation of data of the register of infrastructure allowing publication of thematic maps;
 - (f) list of tracks of SoLs and OPs which are part of a route defined by the user and export the corresponding characteristics;
 - (g) deliver a timestamped export file each time the export of characteristics resulting from a search is intended to be used by a railway undertaking in accordance with Article 23(1) of Directive (EU) 2016/797;
 - (h) application programming interface (API) and/or an open querying endpoint;
 - (i) validation, upload and reception of the data sets provided by an Infrastructure Manager.’;

(10) point 4.4 is replaced by the following:

‘4.4. Operating mode

The register of infrastructure system shall provide three main interfaces via the RINF application:

- (a) one to be used by the infrastructure managers in order to submit their set of data;
- (b) one to be used by RINF application users in order to connect to the system and retrieve information
- (c) one to be used by Railway Undertakings for subscription for notifications of changes in the infrastructure they operate on.

The RINF application central database shall make data provided by infrastructure managers publicly available without any modification.

The basic functionality of the RINF application shall allow users to search and retrieve data of register of infrastructure.

The RINF application shall retain the complete historical record of data made available by the infrastructure managers. Those records shall be stored for two years from the date of withdrawal of the data.

The Agency, as administrator of the RINF application, shall provide access to users upon request. Answers to the queries initiated by the RINF application users shall be provided within 24 hours from the moment the query was initiated. Infrastructure Managers shall be able to keep their data updated directly in RINF, following the specifications of Table 1 and submit it to the RINF application in accordance with Article 5.

Infrastructure Managers shall upload the files to the RINF application through a dedicated interface provided for this operation. A specific module shall facilitate the validation and uploading of data.;

(11) point 5 is amended as follows:

- (a) the first paragraph is replaced by the following:

‘The application guide for the common specifications referred to in Article 7 shall be made publicly available by the Agency on its website and updated as appropriate in compliance with the ERA Vocabulary referred to in Article 7a and referenced in Appendix A-1, index [A].’;

- (b) in the third paragraph, point (a) is deleted;

(12) a new appendix A is added as follows:

‘Appendix A

Technical specifications referenced in this Regulation

A-1 Technical documents (available on ERA website)

Index	Characteristics to be assessed	RINF point	Mandatory technical document point
[A]	ERA Vocabulary ERA/TD/Vocabulary version 3.0.0 (released on 2023-03-29)		
[B]	ERA Technical Document on codification of combined transport ERA/TD/2023-01/CCT version 1.1 (realased on 2023-03-21)		
[B.1]	Codification of lines	Table 1, 1.1.1.1.3.4 1.1.1.1.3.5 1.1.1.1.3.8 1.1.1.1.3.9	2.1

[C]	SUBSET-026 System Requirements Specification TSI CCS, Appendix A, index [4]		
[C.1]	ETCS M_version	Table 1, 1.1.1.3.2.10 1.2.1.1.1.10	Chapter 7, Section 7.5.1.79
[C.2]	ETCS trackside engineered to transmit Track Conditions	Table 1, 1.1.1.3.2.12 1.1.1.3.2.12.1 1.2.1.1.1.12 1.2.1.1.1.12.1	Chapter 5, section 5.18.1.1
[C.3]	Cant Deficiency used for the basic Static Speed Profile (SSP)	Table 1, 1.1.1.3.2.14 1.1.1.3.2.14.1 1.2.1.1.1.14 1.2.1.1.1.14.1	Chapter 7, section 7.5.1.82.1
[C.4]	Rejection of a train by an ETCS Radio Block Center	Table 1, 1.1.1.3.2.15 1.2.1.1.1.15	Chapter 5, section 5.4
[C.5]	ETCS National Values	Table 1, 1.1.1.3.2.16.1 1.2.1.1.1.16.1	Chapter 7, section 7.5.1.17
		Table 1, 1.1.1.3.2.16.2 1.2.1.1.1.16.2	Chapter 7, section 7.5.1.123
		Table 1, 1.1.1.3.2.16.3 1.2.1.1.1.16.3	Chapter 7, section 7.5.1.161
		Table 1, 1.1.1.3.2.16.4 1.2.1.1.1.16.4	Chapter 7, section 7.5.1.163
		Table 1, 1.1.1.3.2.16.5 1.2.1.1.1.16.5	Chapter 7, section 7.5.1.15

		Table 1, 1.1.1.3.2.16.6 1.2.1.1.1.16.6	Chapter 7, section 7.5.1.149
		Table 1, 1.1.1.3.2.16.7 1.2.1.1.1.16.7	Chapter 7, section 7.5.1.16
		Table 1, 1.1.1.3.2.16.8 1.2.1.1.1.16.8	Chapter 7, section 7.5.1.148
		Table 1, 1.1.1.3.2.16.9 1.2.1.1.1.16.9	Chapter 7, section 7.5.1.74
		Table 1, 1.1.1.3.2.16.10 1.2.1.1.1.16.10	Chapter 7, section 7.5.1.75
		Table 1, 1.1.1.3.2.16.11 1.2.1.1.1.16.11	Chapter 7, section 7.5.1.122
		Table 1, 1.1.1.3.2.16.13 1.2.1.1.1.16.13	— Packet 3 (for M_VERSION above 2.0): Chap- ter 7, 7.4.2.1.1 — Packet 203 (for M_VERSION 1.1): SRS Chapter 6, 6.5.1.5.22,
[C.6]	ID and phone number of ERTMS/ETCS Radio Block Center	Table 1, 1.1.1.3.2.17 1.2.1.1.1.17	Chapter 7, 7.5.1.86, 7.5.1.95 and 7.5.1.96
[C.7]	GSM-R version	Table 1, 1.1.1.3.3.1 1.2.1.1.2.1	Relevant point(s)
[C.8]	Radio Network ID	Table 1, 1.1.1.3.3.13 1.2.1.1.2.13	Chapter 7, 7.5.1.91.1

[C.9]	ATO System version	Table 1, 1.1.1.3.13.2 1.2.1.1.10.2	Chapter 1, 1.0.0
[D]	ERA/ERTMS/033281 - V 5.0 Interfaces between Control-Command and Signalling Trackside and other Subsystems TSI CCS, Appendix A, index [77]		
[D.1]	Frequency bands for detection	Table 1, 1.1.1.3.4.2 1.2.1.1.3.2	Relevant point(s)
[D.2]	Vehicle impedance	Table 1, 1.1.1.3.4.2.2 1.2.1.1.3.2.2	3.2.2.1
[D.3]	Type of track circuits	Table 1, 1.1.1.3.7.1.2 1.2.1.1.6.1	Relevant point(s)
[D.4]	Type of axle counters	Table 1, 1.1.1.3.7.1.2 1.2.1.1.6.1	Relevant point(s)
[E]	EIRENE FRS GSM-R Functional Requirements Specification TSI CCS, Appendix A, index [32]		
[E.1]	GSM-R version	1.1.1.3.3.1 1.2.1.1.2.1	Relevant point(s)
[F]	EIRENE SRS GSM-R System Requirements Specification TSI CCS, Appendix A, index [33]		
[F.1]	GSM-R version	1.1.1.3.3.1 1.2.1.1.2.1	Relevant point(s)

A-2 Standards

Index	Characteristics to be assessed	RINF point	Mandatory technical document point
[1]	EN50163:2004 Supply voltages of traction systems		
[1.1]	U _{max2}	Table 1, 1.1.1.2.2.1.3	Table 1'