

Official Journal of the European Union

L 222



English edition

Legislation

Volume 66

8 September 2023

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⁽¹⁾ Text with EEA relevance.

EN

Acts whose titles are printed in light type are those relating to day-to-day management of agricultural matters, and are generally valid for a limited period.

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II

(Non-legislative acts)

REGULATIONS

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****(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) Commission Implementing Regulation (EU) 2019/773 ⁽²⁾ lays down the technical specification for interoperability (TSI) relating to the operation and traffic management subsystem of Union rail system.
- (2) In accordance with Article 3(5), points (b) and (f), of Commission Delegated Decision (EU) 2017/1474 ⁽³⁾ TSIs must be reviewed in order to take into account the developments of the Union railway system and related research and innovation activities, and to update references to standards.
- (3) Having regard to the role railways are expected to play in a decarbonised transport system, as envisaged in the European Green Deal, and in the light of developments in this field, notably in research and innovation, an extensive revision of the current TSIs is required, in particular with a view to digitalising the railways and making rail freight more attractive.
- (4) On 24 January 2020, in accordance with Article 19(1) of Regulation (EU) 2016/796 of the European Parliament and of the Council ⁽⁴⁾, the Commission requested the European Union Agency for Railways (the 'Agency') to prepare recommendations implementing a selection of the specific objectives set out in Decision (EU) 2017/1474.

⁽¹⁾ OJ L 138, 26.5.2016, p. 44.

⁽²⁾ 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).

⁽³⁾ 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).

⁽⁴⁾ Regulation (EU) 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).

- (5) On 30 June 2022, the Agency issued the recommendation ERA 1175-1218 as regards the TSI relating to the operation and traffic management subsystem of the Union rail system. The Commission analysed the above recommendation and concluded that it is appropriate to amend Implementing Regulation (EU) 2019/773 to achieve greater harmonisation of rail operation in the Union.
- (6) The amendments to Implementing Regulation (EU) 2019/773 aim in particular to (i) incorporate new requirements for a greater harmonisation of the operational rules of the European Rail Traffic Management System (ERTMS), (ii) add new requirements covering ERTMS trackside engineering information relevant to operation that the infrastructure manager is required to provide to railway undertakings, and (iii) introduce a new format for the European Instructions and feedback from the examination of national rules on safety and operation.
- (7) In relation to the Future Railway Mobile Communication System (FRMCS) as successor to GSM-R, as it is not yet fully specified in Commission Implementing Regulation (EU) 2023/1695 ⁽⁵⁾, this Regulation deals with Global System for Mobile Communications – Railway (GSM-R) as the only Railway Mobile Radio (RMR) system.
- (8) Information exchange between infrastructure managers and railway undertakings relating to trains specifications and train operations newly defined in this Regulation should be further implemented in relevant provisions of TAF TSI and TAP TSI.
- (9) In accordance with Article 14(1) of Directive (EU) 2016/797, Member States are to notify national rules made redundant following the revision of technical specifications for interoperability. In view of the amendments proposed, it is appropriate to set a clear deadline for such notification to avoid legal uncertainty.
- (10) In accordance with the procedure laid down in Commission Implementing Regulation (EU) 2018/763 ⁽⁶⁾, the infrastructure managers and the railway undertaking need to ensure compliance with the Annex to Implementing Regulation (EU) 2019/773.
- (11) Implementing Regulation (EU) 2019/773 should therefore be amended accordingly.
- (12) The measures provided for in this Regulation are in accordance with the opinion of the Committee established in accordance with Article 51(1) of Directive (EU) 2016/797,

HAS ADOPTED THIS REGULATION:

Article 1

Implementing Regulation (EU) 2019/773 is amended as follows:

- (1) the following Articles 5a and 5b are inserted:

'Article 5a

By 28 March 2024, each Member State shall notify to the Commission and the Agency any national rules made redundant by the entry into force of Commission Implementing Regulation (EU) 2023/1693 ^(*), together with a timetable for their withdrawal if not yet done.

⁽⁵⁾ 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) 2016/91 (see page 380 of this Official Journal).

⁽⁶⁾ Commission Implementing Regulation (EU) 2018/763 of 9 April 2018 establishing practical arrangements for issuing single safety certificates to railway undertakings pursuant to Directive (EU) 2016/798 of the European Parliament and of the Council, and repealing Commission Regulation (EC) No 653/2007 (OJ L 129, 25.5.2018, p. 49).

Article 5b

By 28 June 2024, railway undertakings and infrastructure managers shall change their safety management system as defined in Article 9 of Directive (EU) 2016/798 in accordance with the requirements laid down in the Annex to this Regulation. Such changes, if limited to those strictly necessary to apply this Regulation, as amended, shall not be considered to be substantial changes to the safety regulatory framework within the meaning of Article 10(15) of Directive (EU) 2016/798.

(*) 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 (OJ L 222, 8.9.2023, p. 1).;

(2) the Annex to Implementing Regulation (EU) 2019/773 is amended in accordance with the Annex to this Regulation.

Article 2

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

- (g) table lines 4.2.1.3 and 4.2.1.4 are deleted;

(h) table line 4.2.3.1 is replaced by:

‘4.2.3.1	Train planning and timetable		X																X	X’	
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(i) table lines 4.2.3.5.1 and 4.2.3.5.2 are replaced by:

‘4.2.3.5.1	Recording of monitoring data outside the train						X												X		
4.2.3.5.2	Recording of monitoring data on-board the train						X												X’		

(4) point 4.1 is replaced by the following:

‘4.1. **Introduction**

In accordance with Directive 2012/34/EU of the European Parliament and of the Council (*), it is the overall responsibility of the infrastructure manager to provide all the appropriate parameters and characteristics of the infrastructure which shall be used by the railway undertaking to check the compatibility of railway undertaking’s trains to run on infrastructure manager’s network, taking into account the geographic particularities of individual lines and the functional or technical specifications set out in this section.

The fundamental operational principles and common operational rules applicable to the Union rail network are defined in Appendix B.

(*) 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).’;

(5) point 4.2 is replaced by the following:

‘4.2. **Functional and technical specifications of the subsystem**

The functional and technical specifications of the “operation and traffic management” subsystem define the specifications to ensure safe operation, system reliability and availability and operating efficiency of the Union rail system, with focus in particular on specifications relating to:

- staff executing safety-critical tasks,
- trains,
- train operations,
- ERTMS based harmonised operation.’;

(6) point 4.2.1.1 is replaced by the following:

‘4.2.1.1. General requirements

In its Safety Management Systems (SMS) established in accordance with Annexes I and II to Commission Delegated Regulation (EU) 2018/762 (*), each RU and IM shall identify its safety-critical tasks and safety-related functions, and the staff responsible for executing them. RUs and IMs shall define and describe in their SMS procedures and requirements to train, assess and monitor the competence of their staff executing safety-critical tasks, except the requirements laid down in the following provisions:

- (i) training, fitness and certification requirements for train drivers (addressed by Directive 2007/59/EC of the European Parliament and of the Council (**));
- (ii) elements relevant to professional qualification applicable to staff “accompanying trains” other than the train driver, to which Appendix F of this Annex shall apply;
- (iii) elements relevant to professional qualification applicable to staff “preparing trains” other than the train driver, to which Appendix G of this Annex shall apply.

Any qualification acquired based on the procedures and rules defined in the SMS of the RU or IM shall be recorded in the concerned SMS.

The documents providing evidence of training, experience and professional competences shall be delivered to the concerned staff executing safety-critical tasks, upon request.

Such a qualification shall allow the member of staff executing safety-critical tasks to undertake similar tasks for another RU or IM, subject to the identification of additional training needs on geographical and technical specifications and the SMS of the RU or IM in accordance with point 4.6.3.2, and to the satisfactory completion of that training.

- (*) Commission Delegated Regulation (EU) 2018/762 of 8 March 2018 establishing common safety methods on safety management system requirements pursuant to Directive (EU) 2016/798 of the European Parliament and of the Council and repealing Commission Regulations (EU) No 1158/2010 and (EU) No 1169/2010 (OJ L 129, 25.5.2018, p. 26).
- (**) Directive 2007/59/EC of the European Parliament and of the Council of 23 October 2007 on the certification of train drivers operating locomotives and trains on the railway system in the Community (OJ L 315, 3.12.2007, p. 51).;

- (7) point 4.2.1.2 is replaced by the following:

‘4.2.1.2. Information exchange between IMs and RUs, including information for staff executing safety-critical tasks

IMs and RUs shall plan, prepare and operate trains and instruct staff in accordance with the information contained in Rule Book and Route Book.

Their staff executing safety-critical tasks shall be trained, and train drivers certified, based on the information provided in the Rule Book and the Route Book in accordance with their SMS.

IMs and RUs shall cooperate to exchange information and follow a process for establishing and regularly updating the Rule Book and Route Book as appropriate. Such information shall be applicable for normal, degraded and emergency operations.

The IM, in consultation with the RUs operating on its network, shall define the appropriate procedures for communication in real time and emergency situations in order to ensure that information relevant for operation is provided to the RU and/or the driver as soon as such information is available.

IMs and RUs shall ensure that all infrastructure information and rules relevant for planning, preparing and operating of trains are shared and communicated to staff executing safety-critical tasks in accordance with each staff member’s tasks in all the IMs and RUs respective operating language(s).

IM and RUs may group the Rule Book and Route Book information into support for individual staff and/or individual operations.

IMs and RUs shall supply to each member of their respective staff executing safety-critical tasks, including train drivers, with versions of the Rule Book and the Route Book tailored to the information necessary for their operations. This shall include the interface information where staff executes safety-critical tasks with a direct interface between IM and RU, in particular to ensure safety-related communication between staff authorising the movement of trains and staff onboard trains.

Future developments:

1. 12 months after the Agency has delivered the updates to the RINF Application in accordance with Article 6(1) of Implementing Regulation (EU) 2019/777 as amended by Implementing Regulation (EU) 2023/1694 and the IMs have made the data available through RINF, RUs shall base their Route Books on the information contained in RINF.

2. 12 months after point 1, IMs and RUs shall digitalise the Rule Book and the Route Book.
 3. At the latest by 15 December 2025, the Agency shall deliver a Recommendation on how to harmonise the digitalisation of real time information exchange, based on Appendix C, between members of IMs' and RUs' staff';
- (8) point 4.2.1.2.1 is replaced by the following:

'4.2.1.2.1. Rule Book

The RU and the IM shall be responsible for the compilation of their respective Rule Book as integral part of their SMS to instruct staff executing safety-critical tasks, on operational rules applicable to their role.

The Rule Book is a description of the operational rules and procedures for a network or a part thereof and vehicles operated on that network or its part(s) in normal, degraded operation and emergency situations. It shall be consistent across all the lines over which the RU operates and it shall be consistent across all the lines managed by the IM.

The Rule Book shall cover:

(a) for the RU:

- (i) the common EU safety and operating rules and procedures in accordance with Appendices A, B, C and D;
- (ii) complemented by the national rules covering areas defined by Appendix I, including the IM's instructions to the RUs on the operations of its infrastructure and the rules for managing interfaces between the IM and the RUs, all of which need to be communicated to the RUs in accordance with the IM's SMS interface procedures;
- (iii) RU instructions to the staff executing safety-critical tasks including train driver laid down in its SMS;
- (iv) information relevant to the vehicles and trains operated by the RU; and
- (v) all the lines over which the RU operates;

(b) for the IM:

- (i) the common EU safety and operating rules and procedures in accordance with Appendices A, B, C and D;
- (ii) complemented by the national rules covering areas defined by Appendix I, including the rules for managing interfaces between the IM and the RUs;
- (iii) IM instructions to the staff executing safety-critical tasks laid down in its SMS;
- (iv) information relevant to the vehicles operated by the IM when applicable and when the IM is not acting as an RU; and
- (v) all the lines managed by the IM.

It shall include procedures covering, as a minimum, the following aspects:

- staff safety and security,
- signalling and control command (class A and class B systems),
- train operation, including degraded mode and related to line characteristics and vehicle characteristics,
- incidents and accidents, including the reporting scheme, incident or accident management plan and the detailed actions to be taken in the event of an accident or an incident,
- degraded and emergency situations,
- for the RU, traction and rolling stock, including all information relevant to the operation of the rolling stock during normal and degraded mode (such as trains requiring assistance); such documentation shall also focus on the specific interface with the infrastructure manager's staff in these cases.

It shall have two appendices:

- Appendix 1: Manual of communication procedures in accordance with Appendix C1,
- Appendix 2: Book of European and national instructions in accordance with Appendix C2.

Predefined messages and forms shall at least exist in the “operating” language(s) of infrastructure manager(s).

If the language chosen by the railway undertaking for the Rule Book is not the language in which the appropriate information was originally supplied, it is the responsibility of the railway undertaking to arrange for any necessary translation and/or provide explanatory notes in another language.’;

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

‘4.2.1.2.2. Route Book

The IM shall establish the infrastructure information covering its network for its own use and for the use of the RUs operating on this network. The IM shall provide each RU with the information for the RUs’ Route Book as defined in Appendix D2, including permanent or temporary restrictions and modifications.

The infrastructure manager shall ensure that the infrastructure information is complete and accurate; the information shall be managed in accordance with Annex II, point 4.4.3 of Delegated Regulation (EU) 2018/762.

The railway undertaking is responsible for the complete and correct compilation of the Route Book, using the information supplied by the infrastructure manager(s), in accordance with Annex I, point 4.4.3 of Delegated Regulation (EU) 2018/762. The railway undertaking shall ensure the Route Book duly describes operational conditions related to line characteristics and vehicle characteristics.

The infrastructure manager shall inform the railway undertaking of any changes to the infrastructure information, whenever such information becomes available and affects train operations, including permanent or temporary restrictions and modifications.

The IM, in consultation with the RUs operating on its network, shall define the appropriate procedures when modification of the Route Book is not transmitted from the IM to RU in the appropriate agreed timing, as defined in the SMS of the IM and reflected in the SMS of the RU; in that case, the IM shall also directly inform the driver.

RU Route Book:

Using the information received, the railway undertaking is responsible for the complete and correct compilation of the Route Book, covering the infrastructure on which it operates trains.

The railway undertaking shall ensure that the route information compiled in the Route Book consists in a description of the lines and the associated lineside equipment for the lines over which the driver will operate and relevant to the driving task.

The format of the Route Book shall be prepared in the same manner for all the infrastructures operated on by the trains of an individual railway undertaking.

When informed by the infrastructure manager of changes in the infrastructure information, the railway undertaking shall update the Route Book and communicate the modification in accordance with the procedures defined in their SMS, including instructing their drivers impacted by the change.

IM Route Book:

The IM shall compile in an IM Route Book the infrastructure information to be shared with their staff executing safety-critical tasks and compile it in accordance with its SMS.

The infrastructure manager shall update the IM Route Book, whenever such information becomes available and affects the tasks of its staff executing safety critical tasks, including permanent or temporary restrictions and modifications.’;

- (10) points 4.2.1.2.2.1, 4.2.1.2.2.2 and 4.2.1.2.2.3 are deleted;

(11) point 4.2.1.2.3 is replaced by the following:

‘4.2.1.2.3. Train running information for drivers

When the railway undertaking provides the drivers with their working plan, it shall provide information necessary for the normal running of the train and as a minimum include:

- the train identification,
- the train running days (if necessary),
- the stopping points and the activities associated with them,
- other timing points,
- the arrival/departure/passing times at each of those points.

Such train running information must be updated whenever appropriate prior to departure and shall be based on and supplement the Rule Book and Route Book information. The information shall be provided digitally to the train drivers by 15 December 2026.’;

(12) point 4.2.1.2.4 is replaced by the following:

‘4.2.1.2.4. Informing the driver in real time during train operation

The infrastructure manager shall inform and instruct drivers in real time about last minute changes to operations regarding the line or relevant lineside equipment, in accordance with the communication methodology established between IM and RU in line with Appendix C.

Real time information shall be limited to situation and changes that have not been managed under 4.2.1.2.2 and 4.2.1.2.3 in accordance with IMs and RUs SMS procedures and are directly affecting the driver’s route.

For emergency situations, appropriate alternative means of communication shall be established between the IM and RU in order to ensure that relevant information is made available.

Infrastructure managers and railway undertakings must have a process in place to be able to confirm the suitability of the vehicles and the drivers in respect of route knowledge for real time route deviation.’;

(13) point 4.2.1.3 and 4.2.1.4 are replaced by ‘Not used’;

(14) in point 4.2.2.1.2, the fifth paragraph is replaced by the following:

‘In order to access lines identified in RINF where permissive driving is used, by the dates mentioned below for the harmonisation of the rear-end signal as per Section 4.2.2.1.3.2, the luminous intensity of vehicle headlamps shall be in accordance with the level defined for the full-beam headlamps in point (5) of Section 4.2.7.1.1 of the Annex to Commission Regulation (EU) 1302/2014 (*) (“TSI Loc&Pas”).

(*) 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).’;

(15) in point 4.2.2.1.3.2, the following text is deleted:

‘Reports:

At the latest by 31 December 2020, the concerned Member States shall deliver to the Commission reports on their use of reflective plates, identifying any serious obstacles to the planned elimination of national rules.’;

(16) point 4.2.2.5.1 is amended as follows:

(a) point B is replaced by the following:

‘(B) The infrastructure manager shall provide the information for route compatibility as defined in Appendix D1 through RINF.

Appendix D1 sets out all the parameters that shall be used in the process of the railway undertaking before the first use of a vehicle or train configuration in order to ensure all vehicles composing a train are compatible with the route(s) the train is planned to operate on including, where appropriate, deviation routes and routes to workshops. Modifications of the route and changes of infrastructure characteristics have to be taken into account. When a parameter of Appendix D1 is harmonised at network(s) level of an area of use, conformity with that parameter may be presumed for any vehicle authorised for that area of use. National rules or additional national requirements for network access in respect of route compatibility are in principle considered incompatible with Appendix D1. The infrastructure manager shall not require additional technical checks for the purpose of route compatibility beyond the list laid down in Appendix D1.

At the latest by 15 December 2026, until RINF allows for hosting the following new parameters:

a) Specific check for Combined Transport

- (i) 1.1.1.1.3.4. Standard combined transport profile number for swap bodies
- (ii) 1.1.1.1.3.9. Standard combined transport profile number for roller units
- (iii) 1.1.1.1.3.8. Standard combined transport profile number for container
- (iv) 1.1.1.1.3.5. Standard combined transport profile number for semi-trailers
- (v) (CT Line code)

b) Train detection systems: influencing unit

- (i) 1.1.1.3.4. Train detection systems defined based on frequency bands
- (ii) 1.1.1.3.4.2. Frequency bands for detection
- (iii) 1.1.1.3.4.2.1. Maximum interference current
- (iv) 1.1.1.3.4.2.2. Minimum Input impedance
- (v) 1.1.1.3.4.2.3. Maximum magnetic field

c) 1.1.1.3.2.11. Safe consist length information from on-board necessary for access to the line and SIL

The infrastructure manager shall provide these information through other means free of charge as soon as possible and in electronic format to railway undertakings, authorised applicants for path requests and, where applicable, for the applicant referred to in Article 2(22) of Directive (EU) 2016/797.

The infrastructure manager shall inform the railway undertaking of the changes on characteristics of the route through RINF whenever such information becomes available and affects trains operation.;

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

‘(D) Specific elements for route compatibility of Combined Transport trains:

- a Combined Transport train not exceeding the loading gauge of all tracks of the line, and for which the CT code does not exceed the codification of all tracks of the line, shall be considered as a normal transport,
- a Combined Transport train exceeding the loading gauge, and for which the CT code does not exceed the codification of the line, shall be considered as a transport with specific requirements as referred to in Appendix I. Such requirements shall be universally applicable to all trains in this category and compliance with them shall not need to involve any further authorisation process between the RU and the IM,
- if the CT code exceeds the codification of the line, or if the line is not codified, a specific authorisation (exceptional transport), based on an evaluation of the operational and technical feasibility, shall be issued by the IM.

Operational procedures applicable to combined transport shall comply with the specifications set out in point 3 of the ERA Technical Document on codification of combined transport (ERA/TD/2023-01/CCT v1.1 21/03/2023 ⁽¹⁾).

(¹) ERA/TD/CCT publicly available on ERA website.;

(17) point 4.2.2.5.2 is amended as follows:

- (a) point (d) is deleted;
- (b) the following second paragraph is inserted:

‘The railway undertaking is responsible for ensuring that all vehicles composing the train including their load are technically fit for the journey to be undertaken and remain so throughout the journey.’;

(18) point 4.2.2.6 is replaced by the following:

‘4.2.2.6. Train braking

The railway undertaking shall set up and implement braking requirements in accordance with points 4.2.2.6.1 and 4.2.2.6.2 and shall manage them within its safety management system.’;

(19) point 4.2.2.6.2 is amended as follows:

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

‘(1) The infrastructure manager shall provide the railway undertaking with all relevant line characteristics for each route through RINF:

- (i) signalling distances (warning, stopping) containing their inherent safety margins, that are provided via the respective locations of “Stopping signal” and “Warning signal”, requested in Appendix D2 via the parameter 1.1.1.3.14.3;
- (ii) gradients;
- (iii) maximum permitted speeds;
- (iv) conditions of use of braking systems possibly affecting the infrastructure such as magnetic, regenerative and eddy current brake.

The infrastructure manager shall ensure that the information provided to the railway undertaking(s) is complete and accurate, and shall inform the railway undertaking of the changes on the line characteristics through RINF whenever such information becomes available and affects trains operation.’;

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

‘(3) The railway undertaking shall, in the planning stage, determine the braking regime, the braking capability and corresponding maximum speed of the train taking into account:

- (i) the relevant line characteristics as expressed in point (1) and, if available, the information provided by the infrastructure manager in accordance to point (2); and
- (ii) the rolling stock-related margins derived from reliability and availability of the braking system.

Furthermore, the railway undertaking shall ensure that during operation each train achieves at least the necessary braking performance. In particular the railway undertaking has to set up rules to be used if a train does not reach the necessary braking performance during operation. In this case, the railway undertaking shall immediately inform the infrastructure manager. The infrastructure manager may take appropriate measures to reduce the impact on the overall traffic on its network.’;

(20) point 4.2.2.8 is modified as follows:

‘4.2.2.8. Requirements for signal and lineside marker sighting

Without prejudice of ERTMS operations defined in Appendix A, the driver shall be able to observe signals and lineside markers. Signals and lineside markers as well as all other types of lineside signs that are safety related shall be observable by the driver whenever applicable.

Therefore, signals, lineside markers, signs and information boards shall be designed and positioned in such a consistent way to facilitate this. Issues that shall be taken into account include (see point 4.3.2 of this regulation for reference to CCS TSI):

- (i) that they are suitably sited so that train head lights allow the driver to read the information;
- (ii) suitability and intensity of lighting, where required to illuminate the information;
- (iii) where retro-reflectivity is employed, the reflective properties of the material used are in compliance with appropriate specifications and the signs are fabricated so that train head lights easily allow the driver to read the information.

Driving cabs shall be designed in such a consistent way that the driver is able to easily see the information displayed to him (see point 4.3.3.1 of this Regulation for reference to Loc&Pas TSI).;

(21) point 4.2.2.9 is replaced by the following:

‘4.2.2.9. Driver Vigilance

The driver's activity on board shall be monitored to automatically stop the train when a lack of driver's activity is detected. The requirements related to the means to monitor the driver's on-board activity are specified in the clause set out in point 4.2.9.3.1 of Loc&Pas TSI.;

(22) point 4.2.3 is replaced by the following:

‘4.2.3. Specifications relating to train operations, including ERTMS based operation

Fundamental operational principles and common operational rules set out in Appendix B shall apply in addition to this chapter for train operation in the Union rail system.

The ERTMS operational principles and rules specified in Appendix A of this TSI shall apply where ERTMS is deployed.;

(23) point 4.2.3.1 is replaced by the following:

‘4.2.3.1. Train planning and timetable

In accordance with Directive 2012/34/EU, the infrastructure manager shall advise what data is required when a train path is requested.

Every train has to follow a timetable, agreed between IM and RU under path allocation process; the IM shall ensure the punctual running of trains and shall assist in service performance when scheduling the timetable.;

(24) point 4.2.3.3.1 is replaced by the following:

‘4.2.3.3.1. Checks and tests before departure

The railway undertaking shall determine the checks and tests to ensure that any departure of train is undertaken safely.;

(25) the word ‘supervision’ in the title of points 4.2.3.5.1 and 4.2.3.5.2 is replaced by ‘monitoring’;

(26) in point 4.2.3.4.3, the second indent is replaced by the following:

‘— information to the driver of the presence and position of dangerous goods on the train’;

(27) in point 4.3.1, the table line ‘Modifications to information contained within the Route Book – Degraded Operation’ is replaced by the following:

‘Route Book	4.2.1.2.2	Operating rules	4.4’
Degraded operation	4.2.3.6		

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

(i) the line 'Driver's Rule Book Operating rules' is replaced by the following:

'Rule Book	4.2.1.2.1	Operating rules (normal and degraded conditions) List of harmonised text indications and messages displayed on the ETCS Driver Machine Interface	4.4 Appendix E'
Operating rules	4.4		
ERTMS trackside engineering information relevant to operation	Appendix D3		

(ii) the line 'Requirements for lineside signal and marker sighting' is replaced by the following:

'Requirements for lineside signal and marker sighting	4.2.2.8	Track-side control-command and signalling objects	4.2.15 4.2.18'
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(iii) the line 'Driver's Rule Book' is replaced by the following:

'Rule Book	4.2.1.2.1	Use of sanding equipment On-board flange lubrication Use of composite brake blocks	4.2.10'
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(29) in point 4.3.3.1:

(a) the line 'Recording of supervision data on-board the train' is replaced by the following:

'Recording of monitoring data on-board the train	4.2.3.5 Appendix I	Recording device	4.2.9.6'
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(b) the line 'Route Compatibility and Train composition, Minimum elements relevant to professional qualification for the tasks associated with "accompanying trains"' is replaced by the following:

'Route Compatibility and Train composition Elements relevant to professional qualification for the tasks associated with "accompanying trains"	4.2.2.5 Appendix F	Operating documentation	4.2.12.4'
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(30) in point 4.3.4, the table is replaced by:

'Reference this Regulation		Reference TSI ENE	
Parameter	Point	Parameter	Point
Route Compatibility and Train composition	4.2.2.5	Maximum train current	4.2.4.1
Route Book	4.2.1.2.2		

Route Compatibility and Train composition	4.2.2.5	Separation sections	Phase	4.2.15
Route Book	4.2.1.2.2		System	4.2.16
Parameters for the vehicle and train compatibility over the route intended for operation	Appendix D1	Route compatibility checks before the use of authorised vehicles		7.3.5'

- (31) in point 4.3.6, the line 'Train Planning' is replaced by the following:

'Train planning and timetable	4.2.3.1	Quieter routes	Appendix D'
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- (32) in point 4.4.3, the third and the fourth paragraphs are deleted;

- (33) in point 4.6.1, last paragraph is replaced by the following:

'Railway undertakings and Infrastructure managers shall define their own risk-based competence management system within their Safety Management Systems processes, in accordance with Annex I and Annex II to Delegated Regulation (EU) 2018/762.

Appendices F and G defines professional qualification relevant to the competence management system.;

- (34) in point 4.6.2.2, point (a), the third indent is replaced by the following:

— complete the forms associated with the use of the Book of European and national Instructions';

- (35) in points 4.6.3.1 and 4.6.3.2. the following text is deleted:

'or Commission Regulations (EU) No 1158/2010 ⁽¹⁵⁾ and (EU) No 1169/2010 ⁽¹⁶⁾

⁽¹⁵⁾ Commission Regulation (EU) No 1158/2010 of 9 December 2010 on a common safety method for assessing conformity with the requirements for obtaining railway safety certificates (OJ L 326, 10.12.2010, p. 11).

⁽¹⁶⁾ Commission Regulation (EU) No 1169/2010 of 10 December 2010 on a common safety method for assessing conformity with the requirements for obtaining a railway safety authorization (OJ L 327, 11.12.2010, p. 13).;

- (36) point 4.7.1 is replaced by the following:

'4.7.1. Introduction

Staff identified in point 4.2.1.1 and executing safety-critical tasks as specified in the SMS of a RU or IM shall have appropriate fitness to ensure that overall operational and safety standards are met.

Railway undertakings and infrastructure managers shall set up and document the process they put in place to meet the medical, psychological and health requirements for their staff within their safety management system in accordance with Delegated Regulation (EU) 2018/762 defining common safety method on SMS.

Medical examinations as specified in point 4.7.2 and 4.7.3 on the individual fitness of staff shall be conducted by a person established as medical doctor or a psychologist qualified to carry out such examinations. The results must be accepted by every IM and RU as proof of fitness of staff or potential staff members.

Such examinations shall allow the member of staff executing safety-critical tasks to undertake similar tasks for another RU or IM, subject to the identification of additional medical, psychological and health requirements in the SMS of the RU or IM and to the satisfactory fitness of staff or potential staff members.

Fitness requirements set in point 4.7.2 and in point 4.7.3 are applicable to:

- Staff “accompanying trains” other than the train driver,
- Staff undertaking the task of preparing trains,
- Staff undertaking the task of dispatching and authorising the movement of trains.

4.7.1.1. Alcohol, drugs and psychotropic medication limits

Staff shall not perform safety-critical tasks whilst vigilance is impaired by substances such as alcohol, drugs or psychotropic medication. Therefore, the railway undertaking and the infrastructure manager shall have in place procedures to control the risk that staff attend for work under the influence of such substances, or consume such substances at work.

European or National rules of the Member State where a train service is operated apply with regard to defined limits of the above mentioned substances.’;

(37) the title of point 4.7.2.1.1 is modified as follows:

‘4.7.2.1.1. *Content of the medical examination*’;

(38) the second paragraph of point 4.7.2.1.2 is modified as follows:

‘, as a minimum,’ is deleted;

(39) the title of point 4.7.2.2.2 is modified as follows:

‘4.7.2.2.2. *Content of the periodic medical examination*’;

(40) the first paragraph of point 4.7.2.2.2 is modified as follows:

‘as a minimum’ is deleted;

(41) point 4.8.1 is replaced by the following:

‘4.8.1. *Infrastructure*

The requirements for the rail infrastructure related data items with regard to the operation and traffic management subsystem, and which shall be made available to railway undertakings through RINF, are specified in Appendix D.

The infrastructure manager shall inform the railway undertaking of the changes on the infrastructure related data through RINF whenever such information becomes available and affects trains operation. The infrastructure manager is responsible for the accuracy of the data.

Until 15 December 2026, provided the necessary adaptations to RINF Application were implemented by the Agency, the infrastructure manager shall provide these information through other means free of charge as soon as possible and in electronic format to railway undertakings, authorised applicants for path requests and, where applicable, for the applicant referred to in Article 2(22) of Directive (EU) 2016/797.’;

(42) in point 6.2.1, the second and third paragraphs are replaced by the following:

‘In accordance with Articles 9 and 10 of Directive (EU) 2016/798, railway undertakings and infrastructure managers shall demonstrate compliance with the requirements of this Regulation within their safety management system when applying for any new or amended safety certificate or safety authorisation in accordance with Commission Implementing Regulation (EU) 2018/763 (*).

The common safety methods on safety management system requirements as laid down by Commission Delegated Regulation (EU) 2018/762 require national safety authorities to set up an inspection regime to supervise and monitor compliance with the safety management system in accordance with Commission Delegated Regulation (EU) 2018/761 (**), including all TSIs. None of the requirements contained within this Regulation require separate assessment by a Notified Body.

- (*) Commission Implementing Regulation (EU) 2018/763 of 9 April 2018 establishing practical arrangements for issuing single safety certificates to railway undertakings pursuant to Directive (EU) 2016/798 of the European Parliament and of the Council, and repealing Commission Regulation (EC) No 653/2007 (OJ L 129, 25.5.2018, p. 49).
- (**) Commission Delegated Regulation (EU) 2018/761 of 16 February 2018 establishing common safety methods for supervision by national safety authorities after the issue of a single safety certificate or a safety authorisation pursuant to Directive (EU) 2016/798 of the European Parliament and of the Council and repealing Commission Regulation (EU) No 1077/2012 (OJ L 129, 25.5.2018, p. 16).;

(43) point 7.1 is replaced by the following:

‘7.1. General rules for implementation

In accordance with Article 9 of Directive (EU) 2016/798 and Article 5b of this Regulation, railway undertakings and infrastructure managers shall ensure compliance with this Regulation under their SMS, established following Delegated Regulation (EU) 2018/762.

7.1.1. Specific transition rules for Appendices A and C

Infrastructure managers may postpone, in coordination with the railway undertakings operating on their networks and in accordance with Annex II point 5.1.1 of Commission Delegated Regulation (EU) 2018/762, the implementation of Appendix A and Appendix C to 16 December 2025 at the latest. This is subject to the condition that the Agency and the concerned NSA receive not later than 16 June 2024:

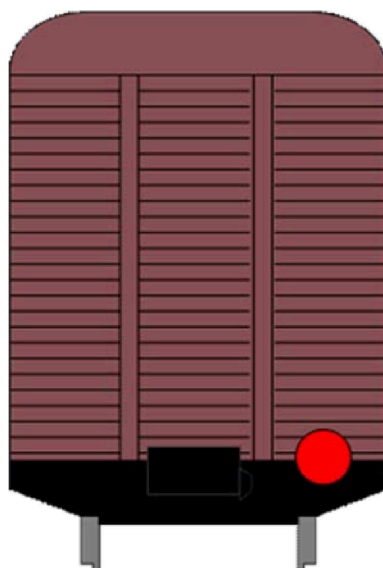
- (a) a commitment of implementation issued by the IM's management;
- (b) an implementation plan of the IM, including training schedules, which sets the delays for the application of the modified operational procedures necessary and, where relevant, the implementation of the respective appropriate IT tools.

RUs shall provide training to drivers and relevant staff to operate trains in accordance with Appendix A and C by 16 December 2025 at the latest or any earlier date defined by the IM.;

(44) point 7.2.2.1 is replaced by the following:

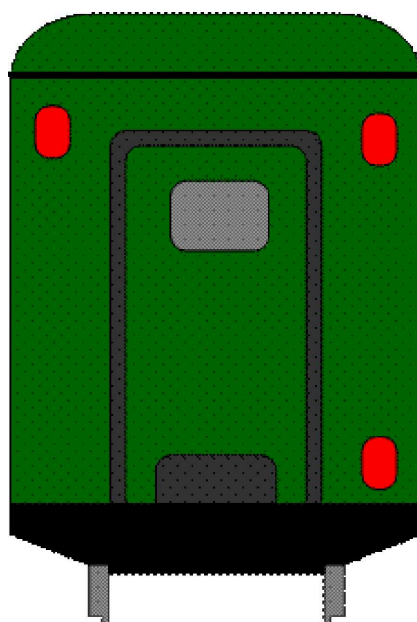
‘7.2.2.1. Permanent specific case (P) Estonia, Latvia, Lithuania, Poland, Hungary and Slovakia

For the implementation of point 4.2.2.1.3.2, freight trains which are operated solely on the 1 520 mm gauge network of Estonia, Latvia, Lithuania, Poland, Hungary and Slovakia may use the following train rear end signal.



The reflective disc shall have a diameter of 185 mm with a red circle diameter of 140 mm. Where justified by operating practices, the reflective disc may be replaced with one reflective plate in compliance with Appendix E to TSI WAG.

For the implementation of point 4.2.2.1.3.1, passenger trains which are operated solely on the 1 520 mm gauge network of Estonia, Latvia, Lithuania, Poland, Hungary and Slovakia may use 3 steady red lights as train rear end signal following the scheme:



This specific case does not prevent the access of TSI compliant rolling stock to their network.’;

(45) Appendix A is replaced by the following:

‘Appendix A

ERTMS operational principles and rules – version 6

1. INTENTIONALLY BLANK
2. INTENTIONALLY BLANK

3. INTRODUCTION

3.1. Purpose and structure of the document

This Appendix sets out the principles and harmonised rules for the operation of ERTMS.

The structure of each rule is the following:

- (i) title;
- (ii) when necessary, situations in which the rule applies, presented in a frame, including the applicable ETCS levels; sometimes the situation is described for some specific sub-sections of the rules;
- (iii) the rule itself.

When this Appendix refers to ETCS level 1 it applies to both applications, with or without trackside signals, unless otherwise stated.

When this Appendix refers to ETCS level 2 it applies to both applications, with or without trackside signals, unless otherwise stated.

The European Instructions referenced in this Appendix are listed under Appendix C2 to this TSI.

All language referring to people applies equally to male and female persons.

Part A is intentionally blank.

Part B contains the different ETCS operational train categories.

Part C contains the list of references to non-harmonised rules. In some situations a procedure is not related to ERTMS and therefore depends on non-harmonised rules.

The description of the technical functions for ETCS and GSM-R is contained in the corresponding system requirements specification.

If information displayed on the DMI does not require an action from the driver this information is not contained in the rules.

SCOPE AND FIELD OF APPLICATION

This Appendix is fully applicable to trains fitted with ETCS On-board units complying with the single set of specifications of Implementing Regulation (EU) 2023/1695 with an operated system version X.Y up to and including 2.2. It is also applicable to On-board units complying with Set of specifications #2 or Set of specifications #3 and largely applicable to ETCS On-board units complying with Set of specifications #1 of Regulation (EU) 2016/919, provided that the DMI used fulfills the specification ERA_ERTMS_015560.

The scope is the following:

- (i) ETCS level 0 application;
- (ii) ETCS level 1 application whether or not trackside signals or infill are present;
- (iii) ETCS level 2 application, whether or not trackside signals are present;
- (iv) ETCS transitions between level 0, level 1 and level 2 applications;
- (v) ETCS level NTC application;
- (vi) ETCS transitions to / from level NTC;
- (vii) GSM-R.

Class B systems (even when operated through the ETCS DMI) are out of the scope.

The rules have been developed independently of other control command systems that may be present including where lines are equipped with ETCS level 1 / 2.

When ETCS level 1 or ETCS level 2 are implemented on lines fitted with other control command systems it is necessary to assess the applicability of these rules and if necessary supplement them with non-harmonised rules. This includes those lines fitted with both ETCS level 1 and ETCS level 2.

GSM-R voice radio operational rules are applicable on lines equipped with GSM-R independently of the control command system in use. Conversely, ETCS operational rules are applicable on lines equipped with ETCS independently of the voice radio system in use.

The applicability of the rules further depends on the engineering solutions adopted by the ERTMS trackside subsystem. In this context, some rules may not need to apply if the relevant functions are not implemented trackside (e.g. when track conditions are not transmitted or the level crossing procedure is not implemented); yet when a rule needs to apply, it will always do so in the way described in this Appendix.

All actions involving the driver assume his physical presence in the driver's cab, unless when required to examine a technical failure of the train at standstill, obtain signaller's instructions through a fixed lineside phone or when requested by the signaller or non-harmonised rules.

Throughout this Appendix, the ETCS On-board unit is assumed to be powered on if not otherwise stated. The desk of the active driving cab is assumed to be open unless otherwise stated.

An End of Authority (EOA) can be physically identified by means of an ETCS Stop Marker or an ETCS Location Marker. The EOA can also be identified by a lineside signal or other marker board with a stop indication. Under certain conditions, an EOA can also be at the train's front end.

4. REFERENCES, TERMS AND ABBREVIATIONS

4.1. (not used)

4.2. Terms & abbreviations

Table 1

Terms*

Term	Definition
Acknowledgement	Confirmation given by the driver to a request from the ETCS on-board that he/she has received information he/she needs to take into account.
Applicable speed limit (in SR)	The lowest speed limit of: — maximum speed for SR, — maximum train speed, — timetable / Route Book, — temporary speed restrictions (transmitted by other means than European Instruction 1, 2, 5, 6, 7 or 8), — European Instruction.
Authorisation for ERTMS train movement	Permission for a train to move given by means of: — a trackside signal at proceed aspect, or — an MA, or — a European Instruction: — to start after preparing a movement, or — to pass EOA, or — to proceed after trip.

Border crossing	Location where trains cross from a railway network in one Member State to a railway network in another Member State.
De-registration	Termination of the temporary relationship between the telephone number and the train running number. This action can be initiated by the user of a GSM-R radio, by automatic systems or by the network authority. The de-registration allows the de-registered train running number to be re-used.
Driver Machine Interface (DMI)	Train device to enable communication between the ETCS on-board and the driver.
Emergency propelling area	Area where propelling movements in RV are allowed.
Emergency stop order	ETCS order braking a train with the maximum brake force until the train is at a standstill.
ETCS Location Marker	Harmonised trackside ETCS marker board defined in EN 16494/2015 (?) used to identify a potential EOA, e.g. the end of a block section.
ETCS on-board	The part of ETCS installed on a railway vehicle.
ETCS Stop Marker	Harmonised trackside ETCS marker board defined in EN 16494/2015 used to: — identify a potential EOA, and — indicate the location where a driver has to stop the train, if running without an MA.
ETCS operational train category	Set of technical and/or operational characteristics of a train to which a specific ETCS speed profile applies.
Functional number (GSM-R)	Full number used within the functional addressing scheme to identify an end user or a system by function or role rather than by a specific item of radio equipment or user subscription. The functional number can be divided into two parts: — functional addressing (process of addressing a call using a specific number, representing the function a user is performing, rather than a number identifying the GSM-R on-board), — location dependent addressing (process of addressing a particular function – typically a signaller – based on the current location of the user – typically a train).
GSM-R mode	Status of the GSM-R on-board which provides functions for: — train movement, — or movement of a shunting composition.
GSM-R network	Radio network which provides GSM-R functions.
GSM-R network marker	Harmonised trackside GSM-R signal defined in EN 16494/2015 to indicate the network to be selected.
GSM-R on-board	The part of GSM-R installed on a railway vehicle.
Maximum speed for RV	Maximum speed given from the ETCS trackside in RV.

Maximum speed for SR	Maximum speed given from the ETCS trackside in SR.
Movement Authority (MA)	Permission for a train (shunting composition) to move to a specific location with supervision of speed.
Non-stopping area	Area defined by the Infrastructure Manager where it may not be safe or suitable to stop a train.
Override EOA speed	Maximum speed when the override EOA function is active.
Permitted speed	Maximum speed at which a train can run without ETCS warning and/or brake intervention.
Proceed aspect	Any signal aspect which permits the driver to pass the signal.
Propelling	Movement of a train where the driver is not in the leading cab of the leading vehicle.
Radio communication	Exchange of information between the ETCS on-board and the RBC/radio infill unit.
Radio Block Centre (RBC)	ETCS trackside centralised unit controlling ETCS train movements in level 2.
Radio hole	A pre-defined area where it is not possible to establish a reliable radio communication channel.
Registration	Temporary relationship between the telephone number and the train running number.
Release speed	Maximum speed at which a train is allowed to reach the end of its MA.
Revocation of MA	Withdrawal of a previous given Movement Authority.
Route Book	Description of the lines and the associated line-side equipment for the lines over which the driver will operate and relevant to the driving task.
Securing	Measures to be applied to avoid unintentional movement of railway vehicles.
Shunting movement	Way of moving vehicles without train data and controlled by shunting orders.
Tandem	Two or more traction units mechanically and pneumatically but not electrically coupled in the same train, each one requiring its own driver.
Temporary speed restriction	Reduction of the line speed for a limited period of time.
Text message	Information in writing displayed on the Driver Machine Interface.
Train data	Information which describes the characteristics of a train.
Train preparer	Staff in charge of the preparation of a train.
Transition	Controlled change between the different ETCS levels.
Transition point	Point where a transition between ETCS levels takes place.
Trip	Irrevocable application of the emergency brakes by ETCS until the train/shunting composition is at a standstill.

(²) EN 16494/2015 – Railway applications – Requirements for ERTMS Trackside Boards.

Table 2

Abbreviations*

Abbreviation	
AD	Automatic Driving mode
ATO	Automated Train Operation
BMM	Big Metal Mass
BTM	Balise Transmission Module
DAS	Driver Advisory System
DMI	Driver Machine Interface
EOA	End Of Authority
ERTMS	European Rail Traffic Management System
ETCS	European Train Control System
FS	Full Supervision mode
G	Goods train braking mode
GSM-R	Global System for Mobile communication – Railway
IM	Infrastructure Manager
LS	Limited Supervision mode
MA	Movement Authority
NL	Non-Leading mode
NTC	National Train Control system
OS	On Sight mode
P	Passenger train braking mode
RBC	Radio Block Centre
REC	Radio Emergency Call
RU	Railway Undertaking
RV	Reversing mode
SH	Shunting mode
SL	Sleeping mode
SN	National System
SR	Staff Responsible mode
STM	Specific Transmission Module
TIMS	Train Integrity Monitoring System
UN	Unfitted mode
VBC	Virtual Balise Cover

* For a complete list of ERTMS terms and abbreviations refer to Subset 023 'Glossary of Terms and Abbreviations' under Appendix A of Implementing Regulation (EU) 2023/1695 ("TSI CCS").

5. PRINCIPLES

5.1. Principles for ETCS

5.1.1. CAB-signalling

The driver shall observe the displayed information on the DMI and shall react as required by this Appendix.

The driver may, depending on the trackside implementation, be required to take into account the harmonised marker boards defined in EN 16494:2015 – Railway applications – Requirements for ERTMS Trackside Boards as well as other non-harmonised trackside information.

5.1.2. Knowledge of operating level

The driver and the signaller shall always operate according to the ETCS rules that are particular to the specific operating ETCS level.

When more than one ETCS level are coexisting, the signaller shall ascertain what ETCS level the concerned train is operating in before issuing any instruction to the driver.

5.1.3. (not used)

5.1.4. (not used)

5.1.5. (not used)

5.1.6. Authorisation to start a movement in SR

The driver shall be authorised by the signaller to start a movement in SR by means of European Instruction 7, except in case of starting a movement in ETCS level 1 / 2 with trackside signals.

5.1.7. Speed restrictions in SR

The signaller shall give all speed restrictions lower than the maximum speed for SR to the driver of a train running in SR by means of a European Instruction 1, 2, 5, 6, 7 or 8 except if the driver is informed by a dedicated document/computer medium about these speed limitations.

5.1.8. Authorisation to pass an EOA

The driver shall only be authorised to pass an EOA by the signaller by means of a European Instruction 1 or 7.

5.1.9. Train/shunting composition being tripped

After a trip has occurred, the driver shall restart in the initial or opposite direction only if he/she has received authorisation by means of a European Instruction 2 from the signaller.

5.1.10. ETCS stop marker

The driver shall stop on the approach to an ETCS Stop Marker:

- (i) indicating the EOA of the current MA, or
- (ii) when running without an MA unless he/she has received a specific authorisation from the signaller by means of European Instruction 1 or 7.

5.1.11. ETCS location marker

The driver shall stop on the approach to an ETCS Location Marker:

- (i) indicating the EOA of the current MA, or
- (ii) when running without an MA if he/she has received a specific order from the signaller.

5.2. (not used)

6. ETCS OPERATIONAL RULES

6.1. Putting the ETCS on-board into service

The driver switches the ETCS on-board on.

Levels 0, 1, 2, NTC

6.1.1. Entering data during start of mission

When requested by the ETCS on-board, the driver shall enter, re-enter or re-validate the driver identification, the train running number, the ETCS level, the radio network identification and the RBC identification and phone number.

In case the following text message is displayed:

“Radio network registration failed”

the driver shall enter the radio network identification.

6.1.2. Manual change of data

If a change is required, the driver shall enter/modify and validate:

- (i) the train running number;
- (ii) the driver identification while at standstill or, if allowed by national value, while running;
- (iii) the ETCS level, the radio network identification and the RBC identification and phone number while at standstill.

6.2. Preparing a movement

The ETCS on-board is in service.

Levels 0, 1, 2, NTC

In ETCS level 2, in case the train is rejected the driver shall apply rule “Reacting to unexpected situations when preparing a train movement” (section 6.40.2).

6.2.1. The traction unit has to move as a train

The driver shall:

- (i) apply rule “Entering train data during train preparation” (section 6.4.1);
- (ii) select “Start”.

In case an acknowledgement for SR is requested, the driver shall apply rule “The traction unit has to move as a train and an acknowledgement for SR is requested” (section 6.2.4).

In case an acknowledgement for SH is requested in ETCS level 2, the driver shall apply rule “Reacting to unexpected situations when preparing a train movement” (section 6.40.1).

6.2.2. The traction unit has to move in SH

The driver shall prepare for shunting and apply rule “Performing shunting movements in SH” (section 6.3).

6.2.3. The traction unit has to move in NL

The driver of the non-leading traction unit shall prepare for tandem movement and apply rule “Performing a tandem movement” (section 6.32).

6.2.4. The traction unit has to move as a train and an acknowledgement for SR is requested

Levels 1 without trackside signals, 2 without trackside signals

When the following symbol is displayed with a flashing frame:



The driver shall inform the signaller, receive authorisation to start in SR by means of European Instruction 7 and acknowledge.

Before authorising a driver to start in SR, the signaller shall, according to non-harmonised rules:

- (i) check if all the conditions for the route are met;
- (ii) check all restrictions and/or instructions that are necessary and include them in European Instruction 7;
- (iii) check for temporary speed restrictions to be included in European Instruction 7.

If the train is located at an ETCS Stop Marker

The signaller shall authorise the driver to pass this ETCS Stop Marker by means of European Instruction 7. This authorisation is valid from this ETCS Stop Marker to the next one. If the conditions allow, the Signaller can authorise the driver to pass this second ETCS Stop Marker as well using the same European Instruction 7. The authorisation is then valid up to the ETCS Stop Marker following the second one in the direction of travel.

The driver shall:

- (i) receive European Instruction 7 from the signaller;
- (ii) check the applicable speed limit;
- (iii) use, unless instructed not to do so, the override function for each of the ETCS Stop Markers to be passed and wait for the following symbol:



- (iv) start the train;
- (v) not exceed the override EOA speed while this symbol is displayed.

If the train is not located at an ETCS Stop Marker

The signaller shall authorise the driver to start by means of European Instruction 7. This authorisation is valid from the current location of the train to the first ETCS Stop Marker in the direction of travel. If the conditions allow, the signaller can authorise the driver to pass this as well as the next ETCS Stop Marker by means of the same European Instruction 7. This authorisation is then valid up to the ETCS Stop Marker following the last one authorised by the European Instruction 7 to be passed.

The driver shall:

- (i) receive European Instruction 7 from the signaller;
- (ii) check the applicable speed limit;
- (iii) start the train;
- (iv) when approaching an ETCS Stop Marker and if authorised by the European Instruction 7 to pass it, use, unless instructed not to do so, the override function and wait for the following symbol:



- (v) start the train or continue moving;
- (vi) not exceed the override EOA speed while this symbol is displayed.

It is possible to provide more than one European Instructions for an equal number of consecutive ETCS Stop Markers to be passed.

If the signaller can establish that the track up to the end of the authorisation to be issued is free then he/she may exempt the driver from running on sight in SR.

Levels 1 with trackside signals, 2 with trackside signals

When the following symbol is displayed with a flashing frame:



The driver shall apply rule “Running in SR” (section 6.14).

6.2.5. *The traction unit has to move in SL*

The driver / train preparer shall make sure that all driving desks of any non-leading traction unit, which is electrically connected to and will be remotely controlled from the leading one, are closed and remain so as long as this traction unit is remotely controlled from the leading one.

6.3. **Performing shunting movements in SH**

Rolling stock has to be moved in SH.

Levels 1, 2

6.3.1. *Manual entry into SH*

The driver shall select “Shunting” according to non-harmonised rules.

6.3.2. *Automatic entry into SH*

When the following symbol is displayed with a flashing frame:



the driver shall:

- (i) first ensure he/she has the correct information concerning the movement he/she is to perform;
- (ii) then acknowledge.

6.3.3. *Running in SH*

When the following symbol is displayed:



the driver shall apply non-harmonised rules.

6.3.4. *Maintain SH when changing the cab*

When the shunting procedure requires the use of different cabs the driver is allowed to select “Maintain Shunting” before closing the driving desk.

6.3.5. *Exit from SH*

When all shunting movements to be performed in SH are finished the driver shall:

- (i) select “Exit Shunting”;
- (ii) ensure that no traction unit remains in the “Maintain Shunting” status.

6.3.6. *SH not granted*

Level 2

When one of the following text messages is displayed:

“SH refused”

“SH request failed”

the driver shall inform the signaller about the situation.

The driver and signaller shall apply non-harmonised rules.

6.3.7. *Passing a defined border of a shunting area*

When a shunting composition needs to pass a defined border of a shunting area the driver and signaller shall apply non-harmonised rules.

6.4. **Entering train data**

Train Data have to be entered or modified.

Levels 0, 1, 2, NTC

6.4.1. *Entering train data during train preparation*

The driver / train preparer shall enter/modify and validate all of the following train data if this data is not pre-configured on-board or received from ETCS external sources:

- (i) ETCS operational train category;
- (ii) train length;
- (iii) brake percentage;
- (iv) maximum train speed;
- (v) axle load category;
- (vi) train fitted with airtight system;
- (vii) loading gauge;
- (viii) additional data for the available STMs;
- (ix) specific data for ATO, if requested.

Before confirming train data that are pre-configured on-board or received from ETCS external sources and that are modifiable by the driver, the train preparer shall make sure the train data and the train composition match.

6.4.2. *Manual change of train data*

After each modification of the composition of the train and after a technical problem that leads to a change of the train data, the train preparer / driver shall:

- (i) determine the new train data;
- (ii) enter the new train data;
- (iii) validate the new train data.

6.4.3. *Change of train data by ETCS external sources*

When the following text message is displayed on the DMI:

“Train data changed”

a) **if the change of train data leads to an application of the brake**

When at a standstill, the driver shall:

- (i) acknowledge the brake application;
- (ii) modify and/or validate the train data if requested by the on-board system;
- (iii) take into account the modified train data.

In ETCS level 1, and in ETCS level 2 if no new MA is received, the signaller shall authorise the driver to pass the EOA (rule “Authorising the passing of an EOA” – section 6.39).

b) **in all other cases**

The driver shall take into account the modified train data.

6.5. **(not used)**

6.6. **(not used)**

6.7. **Entering and operating in ETCS level 0**

6.7.1. *Announcement*

The train is approaching an ETCS level 0 area.
Levels 1, 2, NTC

When a transition to ETCS level 0 is announced by displaying the following symbol:



the driver shall apply non-harmonised rules.

6.7.2. *Acknowledgement*

When the following symbol is displayed with a flashing frame:



the driver shall acknowledge.

6.7.3. *Running*

The train is running in an ETCS level 0 area.

When the following symbol is displayed:



the driver shall apply non-harmonised rules.

6.8. Entering and operating in ETCS level 1**6.8.1. Announcement**

The train is approaching an ETCS level 1 area.
Levels 0, 2, NTC

When a transition to ETCS level 1 is announced by displaying the following symbol:



the driver shall prepare to apply rules for ETCS level 1.

6.8.2. (not used)**6.8.3. Running**

The train is running in an ETCS level 1 area.

When the following symbol is displayed:



the driver shall apply rules according to ETCS level 1.

6.9. Entering and operating in ETCS level 2**6.9.1. Announcement**

The train is approaching an ETCS level 2 area.
Levels 0, 1, NTC

When a transition to ETCS level 2 is announced by displaying the following symbol:

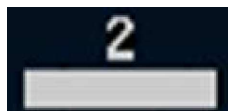


the driver shall prepare to apply rules for ETCS level 2.

6.9.2. (not used)**6.9.3. Running**

The train is running in an ETCS level 2 area.

When the following symbol is displayed:



the driver shall apply rules according to ETCS level 2.

When requested by the signaller to manually confirm train integrity on the DMI, the driver shall do so only at standstill and according to RU rules.

6.10. **(not used)**

6.11. **Entering and operating in ETCS level NTC**

6.11.1. *Announcement*

The train is approaching an ETCS level NTC area.
Levels 0, 1, 2

When a transition to ETCS level NTC is announced by displaying a symbol indicating the name of the applicable NTC, as example:



the driver shall apply non-harmonised rules.

A specific symbol for each NTC exists.

6.11.2. *Acknowledgement*

When the symbol indicating the applicable NTC is displayed with a flashing frame, as example:



the driver shall acknowledge.

A specific symbol for each NTC exists.

6.11.3. *Running*

The train is running in an ETCS level NTC area.

When the symbol indicating the entered NTC is displayed, as example:



the driver shall apply non-harmonised rules.

A specific symbol for each NTC exists.

6.12. **Running in FS**

Levels 1, 2

When the following symbol is displayed:



the driver

- (i) shall not exceed the permitted speed;
- (ii) may, if DAS information is available on-board:
 - follow the target advice speed when displayed on the DMI,



- coast when  is displayed,
- respect the stopping points if indicated,
- request a stopping point to be skipped if instructed and this option is available on the DMI,
- operate the doors when invited to do so by relevant DMI indications.

In ETCS level 1 with trackside signals the driver is authorised to proceed without a new MA when the trackside signal shows a proceed aspect.

If in addition the following text message is displayed:

“Entering FS”

the driver shall not exceed speed restrictions that apply for the part of the train that is not covered by the FS MA.

6.13. Running in OS

Levels 1, 2

When the following symbol is displayed with a flashing frame:



the driver shall:

- (i) acknowledge;
- (ii) start or continue applying rule 9 of Appendix B2.

When the following symbol is displayed:



the driver shall:

- (i) apply rule 9 of Appendix B2 as long as this symbol is displayed;
- (ii) not exceed the permitted speed.

If in addition the following text message is displayed:

“Entering OS”

the driver shall not exceed speed restrictions that apply for the part of the train that is not covered by the OS MA.

6.14. Running in SR

Levels 1, 2

When the following symbol is displayed with a flashing frame:



the driver shall:

- (i) first receive an authorisation for ERTMS train movement;
- (ii) check the applicable speed limit;
- (iii) then acknowledge.

When the following symbol is displayed:



the driver shall:

- (i) run on sight, unless a European Instruction 1, 2 or 7 exempts him from running on sight in SR;
- (ii) not exceed the applicable speed limit;
- (iii) in ETCS level 1 without trackside signals and in ETCS level 2 without trackside signals, when approaching the next ETCS Stop Marker inform the signaller and apply rule "Authorising the passing of an EOA" (section 6.39) unless already authorized to pass this ETCS Stop Marker by means of a European Instruction.

It is possible to provide more than one European Instructions for an equal number of consecutive ETCS Stop Markers to be passed.

6.15. Running in LS

Levels 1, 2

When the following symbol is displayed with a flashing frame:



the driver shall acknowledge according to non-harmonised rules.

When the following symbol is displayed:



the driver shall apply non-harmonised rules.

6.16. Running in UN

Level 0

When the following symbol is displayed with a flashing frame:



the driver shall acknowledge according to non-harmonised rules.

When the following symbol is displayed:



the driver shall apply non-harmonised rules.

6.17. **Running in SN**

Level NTC

When the following symbol is displayed with a flashing frame:



the driver shall acknowledge according to non-harmonised rules.

When the following symbol is displayed:



the driver shall apply non-harmonised rules.

6.18. **Approaching an EOA with a release speed indication**

Levels 1, 2

When the train is approaching an EOA and a release speed is displayed on the DMI, the driver is authorised:

- (i) to approach a signal, an ETCS Stop Marker, an ETCS Location Marker or a buffer stop which is a short distance behind the EOA indicated on the DMI without exceeding the release speed;
- (ii) in ETCS level 1 with trackside signals to proceed without exceeding the release speed when the trackside signal shows a proceed aspect.

6.19. **Managing a track ahead free request**

The train is at a standstill or approaching a trackside signal, or an ETCS Stop Marker / ETCS Location Marker.
Level 2

When the following symbol is displayed:



the driver is allowed to confirm that the track ahead is free if he/she can ascertain that the track section between the head of the train and the next trackside signal, ETCS Stop Marker or ETCS Location Marker is free.

6.20. Passing a section with lowered pantograph(s)

The train is approaching a section of the line to be passed with lowered pantograph(s).

Levels 1, 2

When the following symbol is displayed:



or, when running without an MA or if this functionality is not supported by the trackside, the following marker board is encountered



the driver shall lower the pantograph(s), taking into account their position.

When the following symbol is displayed:



or, when running without an MA or if this functionality is not supported by the trackside, the following marker board is encountered



the driver shall keep the pantograph(s) lowered.

When the following symbol is displayed:



or, when running without an MA or if this functionality is not supported by the trackside, the following marker board is encountered



the driver is authorised to raise the pantograph(s), taking into account their positions.

* For the exact dimensions and layout of the marker boards, EN 16494/2015 needs to be used.

6.21. Changing the electric power supply

The train is approaching a section of the line where the electric power supply must be changed.

Levels 1, 2

When one of the following symbols is displayed:



or, when running without an MA or if this functionality is not supported by the trackside, one of the following marker boards is encountered:



the driver shall change the electric power supply accordingly.

When one of the following symbols is displayed:

25
kV15
kV3000
V1500
V750
V

or, when running without an MA or if this functionality is not supported by the trackside, one of the following marker boards is encountered:

25 kV
XXX15 kV
XXX3000 V
XXX1500 V
XXX750 V
XXX

the driver shall ensure that the power supply has changed accordingly.

When the following symbol is displayed:



or, when running without an MA or if this functionality is not supported by the trackside, the following marker board is encountered:



the driver is informed about approaching a line without any traction system.

When the following symbol is displayed:



or, when running without an MA or if this functionality is not supported by the trackside, the following marker board is encountered:



the driver is informed about reaching a line without any traction system.

6.22. Passing a section with main power switch switched off

The train is approaching a section of the line where the main power switch must be switched off.

Levels 1, 2

When the following symbol is displayed:



or, when running without an MA or if this functionality is not supported by the trackside, the following marker board is encountered



the driver shall switch off the main power switch, taking into account the position of the pantographs, or, if allowed by the Infrastructure Manager, keep the main power switch on and refrain from applying traction.

When the following symbol is displayed:



or, when running without an MA or if this functionality is not supported by the trackside, the following marker board is encountered



the driver shall keep the main power switch switched off or, if allowed by the Infrastructure Manager, continue to refrain from applying traction.

When the following symbol is displayed:



or, when running without an MA or if this functionality is not supported by the trackside, the following marker board is encountered



the driver is authorised to switch on the main power switch, taking into account the position of the pantographs, and is allowed to apply traction again.

* For the exact dimensions and layout of the marker boards, EN 16494:2015 needs to be used.

6.23. **Passing a non-stopping area**

The train is approaching a non-stopping area.
Levels 1, 2

When the following symbol is displayed:



the driver is notified of an upcoming area in which he/she shall avoid stopping.

When the following symbol is displayed:



the driver shall avoid stopping.

6.24. **Passing a section with inhibition of magnetic shoe brake**

The train is approaching a section of the line where the magnetic shoe brake shall not be used.
Levels 1, 2

When the following symbol is displayed:



the driver shall release the magnetic shoe brake, if applied, except in an emergency.

When the following symbol is displayed:



the driver shall not use the magnetic shoe brake except in an emergency.

6.25. Passing a section with inhibition of eddy current brake

The train is approaching a section of the line where the eddy current brake shall not be used.

Levels 1, 2

When the following symbol is displayed:



the driver shall release the eddy current brake, if applied, except in an emergency.

When the following symbol is displayed:



the driver shall not use the eddy current brake except in an emergency.

6.26. Passing a section with inhibition of regenerative brake

The train is approaching a section of the line where the regenerative brake shall not be used.

Levels 1, 2

When the following symbol is displayed:



the driver shall release the regenerative brake, if applied, except in an emergency.

When the following symbol is displayed:



the driver shall not use the regenerative brake except in an emergency.

6.27. Passing a pressure seal section

The train is approaching a section of the line where the air condition intakes are to be closed.

Levels 1, 2

When the following symbol is displayed:



the driver shall close the air conditioning intakes.

When the following symbol is displayed:



the driver shall keep the air conditioning intakes closed.

When the following symbol is displayed:



the driver is authorised to open the air conditioning intakes.

6.28. Sounding the audible warning device

Levels 1, 2

When the following symbol is displayed:



or, when running without an MA or if this functionality is not supported by the trackside, the following marker board is encountered:



the driver shall apply the audible warning device unless prevented by non-harmonised rules.

6.29. Changing of adhesion factor

The train is in a section of line where the adhesion factor could be changed.

Levels 1, 2

If the national value allows the driver to select "Slippery rail", he/she may do so when the adhesion conditions are poor or when informed by the signaller. If the driver is not informed by the signaller before selecting "Slippery rail", the driver shall inform the signaller.

When a signaller is informed about poor adhesion conditions, he/she shall activate the ETCS reduced adhesion function, where possible, and if this is not possible he/she shall take measures as prescribed by the IM, until normal operation is restored.

When the following symbol is displayed:



the driver shall apply internal RU rules.

6.30. Passing a radio hole

The train is in a section of line without radio coverage.

Level 2

When the following symbol is displayed:



the driver may continue on any valid movement authority.

If the driver reaches the end of authority and the symbol is still displayed, the driver shall inform the signaller. The signaller and driver shall apply rule "Authorising the passing of an EOA" (section 6.39).

6.31. (not used)**6.32. Performing a tandem movement**

A non-leading traction unit is coupled to the leading traction unit (or to a train including the leading traction unit).

Levels 0, 1, 2, NTC

6.32.1. Entry into NL

The driver of the non-leading traction unit shall select "Non-Leading".

When the following symbol is displayed on the DMI:



the driver of the non-leading traction unit shall confirm to the driver of the leading traction unit that the non-leading traction unit is in NL.

6.32.2. Performing the tandem movement

Both drivers shall apply internal RU rules.

6.32.3. Exit from NL

When the train is at a standstill the driver of the non-leading traction unit shall:

- (i) apply the brakes;
- (ii) confirm to the driver of the leading traction unit that the non-leading traction unit is no longer in NL.

6.33. Revoking an authorisation for ERTMS train movement

The signaller decides to change existing traffic arrangements.

Levels 1, 2

6.33.1. Measures before making traffic arrangements

- (a) In case the co-operative shortening of the MA is possible

If possible in ETCS level 2 the signaller shall revoke an MA by the use of the co-operative shortening of MA.

(b) In all other cases

In all other cases, the signaller shall apply non-harmonised rules to stop the train if it is not already at standstill.

Once the train is at a standstill and before making traffic arrangements, the signaller shall order the driver to remain at a standstill by means of European Instruction 3 or other available means and to delete any MA remaining on-board if required.

6.33.2. *To restart the trains*

To restart the trains the signaller shall:

- (i) issue an authorisation for ERTMS train movement;
- (ii) revoke European Instruction 3 if one has been issued.

6.34. **Taking measures in the event of an emergency**

An emergency situation occurs.

Levels 1, 2

6.34.1. *To protect the trains*

When a member of staff discovers an emergency situation, he/she shall apply rule 14 of Appendix B2.

To stop trains in ETCS level 2, the signaller may use the emergency stop order; the emergency stop order shall not be revoked before it is safe for these trains to restart.

The signaller may use European Instruction 3 to keep the stopped trains at standstill if required.

When the following text message is displayed:

“Emergency stop”

and the train is tripped, the driver shall apply rule “Responding to a trip” (section 6.41).

6.34.2. *To restart the trains*

The signaller shall:

- (i) decide if it is possible to authorise train movement;
- (ii) decide if instructions and/or restrictions for train movement are necessary;
- (iii) revoke the emergency stop order if one has been issued;
- (iv) revoke European Instruction 3 if one has been issued;
- (v) give authorisation to the drivers to restart.

To restart trains that have not been tripped and if instructions and/or restrictions are necessary the signaller shall issue a European Instruction(s). In ETCS level 1 with trackside signals the driver shall run on sight up to the next trackside signal.

To restart trains that have been tripped, the signaller and driver shall apply rule “Responding to a trip – to restart” (section 6.41.2).

6.34.3. *To protect and restart shunting movements*

The signaller and driver shall apply non-harmonised rules.

6.35. **Stopping in a safe area**

The driver needs to stop the train in a safe area.

Levels 1, 2

The driver shall toggle-on the display of the indication of the safe areas where the train can stop.

When the following symbol is displayed:



or, when running without an MA or if this functionality is not supported by the trackside, the following marker board is encountered:



and the driver decides to stop at the indicated safe area he/she shall take into account the remaining distance displayed on the DMI or the distance up to the marker board marking the start of the safe area.

When the following symbol is displayed:



or, when running without an MA or if this functionality is not supported by the trackside, the following marker board is encountered:



and the driver decides to stop at the indicated safe area, he/she shall stop the train taking into account its length.

When the following marker board is encountered:



the driver is informed that he/she has reached the end of the safe area.

6.36. Propelling in RV

A train has to be moved in the reverse direction inside an emergency propelling area.

Levels 1, 2

6.36.1. Preparing the movement to be performed in RV

When the train is at a standstill and the following symbol is displayed:



the driver shall trigger the transition to RV while informing the signaller if possible and taking into account any further instructions.

6.36.2. *Running in RV*

When the following symbol is displayed with a flashing frame:



the driver shall:

- (i) acknowledge;
- (ii) propel the train following any instructions given by the signaller as soon as the following symbol is displayed:



- (iii) not exceed the maximum speed for RV;
- (iv) not exceed the permitted distance to run.

6.36.3. *Exceeding the permitted distance in RV*

When the following text message is displayed with a flashing frame:

“RV distance exceeded”,

the driver shall:

- (i) report to the signaller;
- (ii) acknowledge at a standstill if the permitted distance in RV has not been extended;
- (iii) release the brake.

6.36.4. *Exit from RV*

After the train has completed its propelling and as soon as it is at a standstill the driver shall report to the signaller. If no additional movement in RV is required the driver shall close the driving desk to exit RV.

6.37. **Reacting to unintentional movements**

After being at a standstill the train/shunting composition has moved unintentionally and the ETCS on-board has triggered the brake.

Levels 1, 2

When the following text message is displayed:

“Runaway movement”,

the driver shall secure the train/shunting composition according to internal RU rules and acknowledge the brake application.

6.38. **Managing route unsuitability detected by the on-board system**

Levels 1, 2

When any of the following messages is displayed:

“Route unsuitable – loading gauge”

“Route unsuitable – traction system”

“Route unsuitable – axle load category”

a route unsuitability is detected.

The driver shall stop the train using service brake.

The driver shall inform the signaller and follow any instructions given.

6.39. Authorising the passing of an EOA

It is necessary to authorise a driver to pass an EOA.

Levels 1, 2

Before authorising a driver to pass an EOA by means of European Instruction 1 the signaller shall, according to non-harmonised rules:

- (i) check if all the conditions for the route are met;
- (ii) check all restrictions and/or instructions that are necessary and include them in European Instruction 1;
- (iii) check for temporary speed restrictions to be included in European Instruction 1.

If the signaller can establish that the track up to the end of the authorisation to be issued is free then he/she may exempt the driver from running on sight in SR.

It is possible to provide more than one European Instructions for an equal number of consecutive ETCS Stop Markers to be passed.

To pass the EOA, the driver shall:

- (iv) receive European Instruction 1 from the signaller for this EOA;
- (v) check the applicable speed limit;
- (vi) use the override function; and
- (vii) when the following symbol is displayed:



start the train or continue moving,

not exceed the override EOA speed while this symbol is displayed.

6.40. Reacting to unexpected situations when preparing a train movement

Level 2

6.40.1. *The traction unit has to move as a train but an acknowledgement for SH is requested*

When the following symbol is displayed with a flashing frame:



the driver shall inform the signaller about the situation, then acknowledge and proceed according to the instructions received from the signaller.

6.40.2. *The train is rejected*

When the following text message is displayed on the DMI:

“Train is rejected”

the driver shall inform the signaller about the situation. The driver and signaller shall apply non-harmonised rules.

6.41. Responding to a trip

A train/shunting composition is tripped.

Levels 1, 2

6.41.1. Immediate measures

When the following symbol is displayed:



the driver shall assume that there is a potentially dangerous situation and he/she shall perform all actions necessary to avoid or reduce the effect of this situation. This may include moving the train/shunting composition backwards.

When the following symbol is displayed with a flashing frame:



the driver shall acknowledge and apply the brakes.

(a) In case an immediate backward movement is necessary due to an emergency

When the driver decides or is instructed by the signaller to move the train/shunting composition backwards due to an emergency

and

when the following symbol is displayed:



the driver shall move the train/shunting composition backwards following any instructions given by the signaller.

As soon as the train/shunting composition is at a standstill, the driver shall inform the signaller about the situation.

(b) In all other cases

When the following symbol is displayed:



the driver shall inform the signaller about the situation and follow any instructions given.

6.41.2. To restart**(a) In the initial direction**

Before giving authorisation to the driver to proceed after a trip by means of European Instruction 2 the signaller shall, according to non-harmonised rules:

- (i) check if all the conditions for the route are met;

- (ii) check all restrictions and/or instructions that are necessary and include them in European Instruction 2;
- (iii) check for temporary speed restrictions to be included in European Instruction 2.

If the signaller can establish that the track up to the end of the authorised movement is free then he/she may exempt the driver from running on sight in SR.

To proceed the driver shall:

- (i) receive European Instruction 2 with all additional instructions given by the signaller;
- (ii) according to the task to be performed select “Start” or “Shunting” and follow the instructions given in European Instruction 2;
- (iii) restart the train/shunting movement.

If in ETCS level 2, at any step of the procedure, the following text message is displayed:

“Communication error”,

the driver shall inform the signaller about the situation. The signaller and driver shall apply rule “Authorising the passing of an EOA” (section 6.39). In this case, European Instruction 1 shall be issued by the signaller instead of European Instruction 2.

(b) **In the opposite direction**

The signaller shall order the driver to remain at standstill and to perform End of Mission by means of European Instruction 3, and then to restart in the opposite direction by means of European Instruction 7.

The driver shall carry out the End of Mission and then apply rule “Putting the ETCS on-board into service” (section 6.1) and rule “Preparing a movement” (section 6.2). If the driver is not operating from the leading cab, he/she shall apply internal RU rules to ensure safe running.

6.41.3. *No movement required after a trip*

In the case of a train/shunting composition not required to be moved after a trip, the signaller shall order the driver to remain at standstill and to perform End of Mission by means of European Instruction 3.

6.41.4. *Trip in SH when passing a defined border of a shunting area*

Levels 1, 2

When a shunting composition is tripped when passing a defined border of a shunting area the driver and signaller shall apply non-harmonised rules.

6.42. **Managing an ETCS trackside malfunction**

The on-board receives the information of an ETCS trackside equipment malfunction.
Levels 1, 2

When the following text message is displayed:

“Trackside malfunction”,

the driver shall inform the signaller about the situation.

6.43. Managing incompatibility between ETCS trackside and ETCS on-board

An incompatibility between ETCS trackside and ETCS on-board is detected by the system and the train is tripped.

Levels 1, 2

When the following text message is displayed:

“Trackside not compatible”,

the train cannot continue in ETCS.

The driver shall apply rule “Responding to a trip” (section 6.41).

6.44. Managing a level crossing not protected

The train is approaching a level crossing which is not protected.

Levels 1, 2

6.44.1. If in FS, OS or LS

When the following symbol is displayed:



the driver shall apply rule 7 of Appendix B2.

6.44.2. If in SR

When the following text message is displayed:

“Level crossing not protected”,

the driver shall apply rule 7 of Appendix B2.

6.45. Managing a balise read error

A balise read error occurs and the brakes are triggered by the ETCS on-board (the train is not tripped).

Levels 1, 2

When the following text message is displayed:

“Balise read error”,

and the train is not tripped, the driver shall inform the signaller about the situation.

If no new MA is received when the train has come to a standstill, the signaller shall authorise the driver to pass the EOA by applying rule “Authorising the passing of an EOA” (section 6.39).

If the situation is repeated, the driver and signaller shall apply non-harmonised rules.

6.46. Managing a failed level transition

The transition takes place but no MA valid beyond the transition point is received on-board or the transition does not take place when passing the transition point.

Levels 1, 2

The ETCS level transition point may be marked through the following trackside marker board:



* For the exact dimensions and layout of the marker board, EN 16494:2015 needs to be used.

6.46.1. *If the train has been tripped*

The driver and signaller shall apply rule “Responding to a trip” (section 6.41).

After selecting “Start” the driver shall:

- (i) check the correct ETCS level to be selected;
 - (ii) change the ETCS level (rule “Manual change of data” (section 6.1.2)),
- and then restart the train.

In case the ETCS level to be selected is not available on-board, the driver and signaller shall apply rule 15 of Appendix B2.

6.46.2. *If in SR*

The driver shall:

- (i) stop the train;
- (ii) apply the following rule “In all other cases” (section 6.46.3).

6.46.3. *In all other cases*

The driver shall:

- (i) inform the signaller about the situation;
 - (ii) when at a standstill, check the correct ETCS level to be selected;
 - (iii) change the ETCS level (rule “Manual change of data” (section 6.1.2)),
- and then restart the train.

In case the ETCS level to be selected is not available on-board, the driver and signaller shall apply rule 15 of Appendix B2.

6.47. Managing absence of RBC information

There is no RBC information received in an area not identified as a radio hole and the brakes are triggered by the ETCS on-board (the train is not tripped).

Level 2

When the following text message is displayed:

“Communication error”,

the driver shall inform the signaller about the situation when at a standstill.

If no new MA is received when the train has come to a standstill, the signaller shall authorise the driver to pass the EOA by applying rule “Authorising the passing of an EOA” (section 6.39).

6.48. Managing a radio communication failure

An ETCS radio communication failure occurs.

Levels 0, 1, 2, NTC

When the following symbol is displayed:



the driver shall check the ETCS level, the radio network identification, the RBC identification and phone number, and correct them if necessary (rule “Manual change of data” (section 6.1.2)).

If the radio communication with the RBC still cannot be established, the driver shall inform the signaller about the situation.

(a) **when in ETCS level 2 preparing a movement and the traction unit has to move in SH**

The driver and the signaller shall apply non-harmonised rules.

(b) **when in ETCS level 2 preparing a tandem movement**

The driver of the non-leading traction unit shall inform the driver of the leading traction unit about the radio communication failure. Both drivers shall apply internal RU rules.

(c) **in all other cases**

The signaller shall authorise the driver to pass the EOA by applying rule “Authorising the passing of an EOA” (section 6.39).

6.49. Managing a failure of self test

Levels 0, 1, 2, NTC

When the information about the failure of an ETCS device is shown to the driver, he/she shall switch off the ETCS on-board and then switch it on again to trigger a new self test. If the same information is shown again, the driver shall attempt to troubleshoot the problem using the applicable technical information. If this attempt fails or is not possible, the driver shall inform the signaller about the situation.

The driver shall request a change of traction unit.

If the traction unit must be moved the driver and signaller shall apply rule 15 of Appendix B2.

6.50. **Managing a failure affecting the on-board radio equipment**

Levels 0, 1, 2, NTC

When a failure of the on-board radio equipment is detected the driver shall inform the signaller about the situation.

6.50.1. *During the preparation of the traction unit*

Level 2

The driver shall request a change of traction unit.

If the traction unit must be moved, the driver shall inform the signaller, apply RU rules and any instructions given by the signaller.

If the traction unit need not be moved, the driver shall switch off the ETCS on-board.

6.50.2. *While running*

Levels 1 with infill function by radio, 2

The driver and signaller shall apply rule 15 of Appendix B2.

6.51. **Managing a failed DMI**

The DMI fails.

Levels 0, 1, 2, NTC

When the DMI fails the driver and signaller shall apply rule 15 of Appendix B2, unless another DMI is available on the desk.

6.52. **Managing a system failure**

Levels 0, 1, 2, NTC

When the following symbol is displayed:



the driver shall attempt to troubleshoot the problem using the applicable technical information.

If this attempt fails or is not possible, the driver and signaller shall apply rule 15 of Appendix B2.

6.53. **Managing a NTC failure**

Levels 0, 1, 2, NTC

When the following text message is displayed:

“[name of NTC] failed”

the driver shall acknowledge and apply non-harmonised rules.

6.54. **Managing a VBC**

Levels 0, 1, 2, NTC

The driver and signaller shall apply non-harmonised rules.

6.55. **Running in AD**

The driver switches the ATO on-board on.

Levels 1, 2

6.55.1. Engaging ATO

When the following symbol is displayed, the driver may engage automated train operation by selecting it:



When ATO is engaged the following symbol is displayed:



Running in ATO

When the following symbol is displayed:



the driver:

- (i) shall activate “skip stopping point” when required by the timetable or if instructed to do so;
- (ii) after coming to a standstill at an operational stopping point, may manually move the train to correct its position,



in the forward direction (when  is displayed) after notifying any passengers or in the reverse direction



(when  is displayed, if authorised by the signaller and after notifying any passengers accordingly, until



 is displayed;

- (iii) shall operate door opening/closing if invited to do so by the respective DMI indications.

6.55.2. Disengaging ATO

The driver can disengage ATO by either:



- (i) selecting the button associated with this icon
- (ii) applying the brake;
- (iii) switching off the ATO;
- (iv) selecting Override.

Once the ATO disengages, the driver shall observe the icon displaying the current ETCS mode and shall follow the rule applicable for the mode entered.

6.56. Managing a TIMS failure

Level 2 when train integrity has to be confirmed

When the train preparer / driver of a train scheduled to run or running in an ETCS level 2 area where train integrity has to be confirmed becomes aware that the TIMS has failed, he/she shall apply rule 15 of Appendix B2.

6.57. Managing an impaired odometer

Levels 1, 2

When the following text message is displayed:

“odometer impaired”

the driver shall apply rule 15 of Appendix B2.

7. GSM/R VOICE RADIO OPERATIONAL RULES**7.1. Selecting the GSM-R mode**

The driver needs to change the GSM-R mode.

When the displayed GSM-R mode does not correspond with the task to be performed (train or shunting movement), the driver shall select the correct mode.

7.2. Entering the functional number

The train preparer / driver is performing the registration.

The train preparer / driver shall enter the functional number:

- (i) as early as possible before the initial departure,
- (ii) every time the functional number changes.

7.3. Selecting the GSM-R network at a border crossing

The train is approaching a border crossing.

7.3.1. Inhibition of automatic network selection

When approaching a section in the vicinity of network borders, the driver shall inhibit the (on-board) automatic network selection function in the cab radio, if activated, when instructed to do so by the Route Book.

7.3.2. Selection of another GSM-R network

When according to the Route Book or a GSM-R network marker



the driver is instructed to select another GSM-R network, he/she shall select the indicated GSM-R network on the cab radio unless the network is selected following an ETCS trackside command. If the driver is engaged in an emergency call, he/she shall not proceed with the manual selection as long as the call is active.

* For the exact dimensions and layout of the marker board, EN 16494:2015 needs to be used.

7.4. Performing a de-registration

The train has to be manually de-registered.

At the end of the train run or when requested by the signaller, the driver shall carry out the de-registration.

7.5. (not used)

7.6. Managing a failure of self test

When a text message indicating the failure of the GSM-R Cab Radio self-test is displayed (e.g. "Self-test failed"), the driver shall inform the signaller about the situation.

The driver and signaller shall apply rule 8 of Appendix B2.

7.7. Managing a lack of GSM-R network after the train has entered service

When a text message indicating the lack of GSM-R network is displayed (e.g. "No network", "GSM-R signal missing"), the driver and signaller shall apply rule 8.2 of Appendix B2.

7.8. (not used)

7.9. Managing a failure of de-registration

If the de-registration is not possible the driver shall inform the signaller about the situation, apply RU rules and follow any instructions given.

7.10. Taking measures in case the functional number is not available

When a text message indicating that the entered functional number is not available is displayed (e.g. "Number not available"), the train preparer / driver shall check the number and try again to register using the correct number.

If the registration fails again, he/she shall inform the signaller about the situation, apply RU rules and follow any instructions given.

7.11. Taking measures in case the functional number is already used

When a text message indicating that the entered functional number is already in use is displayed (e.g. "Number already used" or "Number already allocated"), the train preparer / driver shall check the number and try again to register using the correct number.

If the functional number used was correct, the train preparer / driver shall call that functional number and ask the other party to de-register the current number unless prevented from doing so by non-harmonised rules.

- (i) If the call is successful and the other party de-registers the number in question, the train preparer / driver shall re-start the functional number registration procedure.
- (ii) If there is no response to the call, the train preparer / driver shall initiate forced de-registration of the specific functional number.

In all other cases, the train preparer / driver shall inform the signaller on the issue and follow any instructions given.

7.12. Managing a failure when registering the functional number

When it is not possible to register the functional number, the train preparer / driver shall inform the signaller about the situation, apply RU rules and follow any instructions given.

7.13. GSM-public as primary communication (if this option is available on-board)

7.13.1. Changing-over from GSM-R to GSM-Public

When instructed through a marker board indicating entry in a GSM network or through instructions on the Route Book, the driver shall select the indicated public GSM network, unless the network is automatically selected.

The driver and signaller shall apply non-harmonised rules.

7.13.2. *Changing-over from GSM-Public to GSM-R*

When instructed through a marker board indicating (re-)entry into a GSM-R network or through instructions on the Route Book, the driver shall select the indicated GSM-R network, unless the GSM-R network is automatically selected.

If the GSM-R network is not available, the driver shall apply rule 8.2 Appendix B2.

7.14. **GSM-public as fall-back communication (if this option is available on-board)**

7.14.1. *Changing-over from GSM-R to GSM-Public*

When the connection to the GSM-R network is lost, the driver shall select an alternate GSM public network if authorised to do so according to instructions previously given by the signaller or provided in the Rule Book and/or Route Book, unless the on-board GSM-R terminal is configured to carry out an automatic network selection.

The driver and signaller shall apply non-harmonised rules.

7.14.2. *Changing-over from GSM-Public to GSM-R*

When instructed by the signaller or through instructions in the Rule and/or Route Book, the driver shall manually select the indicated GSM-R network on the cab radio, unless the on-board GSM-R terminal is configured to carry out an automatic network selection.

8. PART A – INTENTIONALLY BLANK

9. PART B – LIST OF ETCS OPERATIONAL TRAIN CATEGORIES

The ETCS operational train categories are listed in the table below:

Label	Type of train	Type of brake	Cant deficiency	
PASS 1	passenger train	P	80	
PASS 2			130	
PASS 3			150	
TILT 1	tilting passenger train		165	
TILT 2			180	
TILT 3			210	
TILT 4			225	
TILT 5			245	
TILT 6			275	
TILT 7			300	
FP 1	freight train		P	80
FP 2				100
FP 3				130
FP 4				150
FG 1		G	80	
FG 2			100	
FG 3			130	
FG 4			150	

10. PART C – TABLE OF REFERENCES TO NON-HARMONISED RULES

This Part lists the non-harmonised rules of Appendix A.

The table further defines the entity (IM or RU) that is in charge of laying down any necessary further details for each of those rules in their respective safety management system.

Reference	Subject	In charge
5.1.1	Driver's observance of the line in cab-signalling	RU
6.2.4 6.39 6.41.2	Checking route conditions	IM
6.2.4 6.39 6.41.2	Checking necessary restrictions and/or instructions for running in SR	IM
6.2.4 6.39 6.41.2	Checking speed restrictions lower than the maximum speed for SR	IM
6.3.1	Manual entry into SH	RU
6.3.3	Running in SH	IM
6.3.6	SH refused by the RBC/SH request failed	IM
6.3.7	Passing a defined border of a shunting area	IM
6.7.1	Announcement of an ETCS level 0 transition	IM
6.7.3	Running in ETCS level 0	IM
6.11.1	Announcement of an ETCS level NTC transition	IM
6.11.3	Running in ETCS level NTC	IM
6.15	Acknowledgement of LS	IM
6.15	Running in LS	IM
6.16	Acknowledgement of UN	IM
6.16	Running in UN	IM
6.17	Acknowledgement of SN	IM
6.17	Running in SN	IM
6.28	Sounding the audible warning device	IM
6.33.1	Revoking an authorisation for ERTMS train movement	IM
6.34.3	Protecting and restarting shunting movements	IM
6.40.2	The train is rejected when preparing a movement	IM
6.41.4	Trip in SH	IM
6.45	Managing a balise read error	IM
6.48 a)	Managing a radio communication failure when SH is requested	IM
6.53	Managing a NTC failure	IM
6.54	Managing a VBC	IM

Reference	Subject	In charge
7.11	Taking measures in case the functional number is already used	IM
7.13.1	Changing-over from GSM-R to GSM-Public	IM
7.14.1	Changing-over from GSM-R to GSM-Public	IM'

(46) Appendix B is amended as follows:

(a) the title is replaced by the following:

'Appendix B

Fundamental operational principles and common operational rules';

(b) point 11 is replaced as follows:

'11. AUTHORISATION TO PASS AN END OF AUTHORITY

The driver of the train concerned shall have authorisation to pass an EOA.

When giving authorisation, the signaller shall give the driver any instructions concerning the movement. The driver shall apply the instructions and shall not exceed any speed restriction, where one is imposed, until reaching the location where the normal operation may be resumed.';

(c) in point 13, the following fourth paragraph is added:

'Anyone who receives an emergency call shall listen, not intervene in the communication that is in progress except to provide elements relevant to the context.';

(d) point 14 is replaced by the following:

'14. IMMEDIATE ACTIONS TO PREVENT DANGER TO TRAINS

Any railway undertaking/infrastructure manager staff who becomes aware of a danger to trains shall take immediate action to stop any trains which may be affected, alert the signaller and take any other action as necessary to avoid harm or loss, and in particular:

- (1) Any driver made aware of a danger to their train shall stop as soon as it is safe to do so and alert the signaller immediately to the danger using the emergency call.
- (2) Any signaller made aware of a danger shall alert all drivers as appropriate through an emergency call or using any other available means.';

(e) point 15 is amended as follows;

(i) the third paragraph is replaced by the following:

'If the driver becomes aware of a failure of any on-board equipment that affects the running of the train, the driver shall:

- inform the signaller of the situation, the location and the restrictions on the train should the train be allowed to continue its mission,
- not commence or recommence the mission until permission to do so has been granted by the signaller.';

(ii) the following fourth paragraph is inserted:

'If the signaller gives permission for the train to start or continue its mission then the driver shall proceed in accordance with the restrictions placed upon the train.';

- (f) the following point 18 is added:

‘18. ENTERING AN OCCUPIED TRACK SECTION WITHIN A STATION

- In case of an unplanned entry into an occupied track section, the signaller shall, before authorising the entry to the occupied track section, ensure that the involved drivers are informed of the circumstances.
- In all cases when a train has to enter an occupied track section, the signaller shall, before authorising the entry to the occupied track section, obtain confirmation that the occupying train or vehicles will not move towards the train entering the occupied track section.’;

- (47) Appendix C is amended as follows:

- (a) in Section C1, a new point 2.4 is added:

‘2.4. Glossary of Railway Terminology

When relevant, the railway undertaking shall produce a glossary of railway terminology for each network over which its trains operate. It shall supply the terms in regular use in the language chosen by the railway undertaking and in the ‘operating’ language of the infrastructure manager(s) whose infrastructure the railway undertaking operates on, based on the terminology used by the respective infrastructure manager.’;

- (b) in Section C1, point 3 is replaced by the following:

‘3. Communication rules

In order that safety-related communication is correctly understood, whatever the means of communication used, the following rules shall be used.’;

- (c) section C2 is amended as follows:

- (i) title and point 1 are replaced by the following:

‘C2. European Instructions

1. Introduction

Railway undertakings and infrastructure managers shall use European Instructions in the communication procedure in the following cases:

- (1) Authorisation to pass an End of Authority;
- (2) Authorisation to proceed after trip;
- (3) Obligation to remain at standstill;
- (4) Revocation of an instruction;
- (5) Obligation to run with speed restriction;
- (6) Obligation to run on sight;
- (7) Authorisation to start after preparing a movement;
- (8) Authorisation to pass defective level crossing(s);
- (9) Obligation to run with power supply restriction;
- (10-20) RESERVED

The numbers 1 to 20 are reserved for European Instructions.

The use of the European Instructions numbers 1-4 and 7 is mandatory for ETCS, in accordance with the rules of Appendix A.

Whenever the signaller needs to issue an operational instruction for which a European Instruction exists, the signaller shall use this European Instruction. If an operational instruction related to a class B system requires more information than the European Instructions, a national instruction may be used instead. In such a case, the infrastructure manager may set out these requirements in its national instructions.

If numbered, the national instructions drawn up by the individual infrastructure managers shall start from 21 onwards.

The national instructions shall contain at least the same content as that for a European Instruction.’;

- (ii) in point 2, ‘shunting movement’ is replaced by ‘shunting composition’ and the following fourth paragraph is added:

‘By way of derogation, a European Instruction 3 can also be revoked by a European Instruction 1, 2 or 7 without requiring a dedicated European Instruction 4.’;

- (iii) in point 3, ‘shunting movement’ is replaced by ‘shunting composition’ and the first paragraph is replaced by the following:

‘An operational instruction includes information delivered digitally, verbally, physically on paper or as verbal instructions to be written down by the train driver or by other safe methods of communication with the same level of information.’;

- (iv) points 6, 7 and 8 are replaced by the following:

‘6. European Instructions

Each tick box, field of information and option for input in a field contained in a European Instruction shall be given its own alphabetical or numerical identifier. Numbered identifiers that are part of more than one European Instruction shall be given an identifier starting with “x” instead of the number of the European Instruction. This “x” may only be replaced by the number of the European Instruction when transmitting this instruction digitally.

While the content and the identifiers must be used and the alphabetical and numerical order of the identifiers must be respected, the format itself shall be indicative.

If a specific tick box, field or option for input in a field is not to be used in a Member State or on the network of an infrastructure manager, there is no obligation to display this tick box, field or option for input in a field in the European Instruction.

No tick box, field or option for input in a field shall be added.

The scope of each individual field cannot extend beyond the scope of application of the European Instruction to which it belongs.

The infrastructure manager and the railway undertaking may add guidance on how to fill in and read the forms of the European Instructions, under the condition that this guidance is not part of the communication procedure.

A Train No Shunting composition No 	B Date
C Location of train Location of shunting composition 	D Location of issuer

1 European Instruction 1 – Authorisation to pass EOA

1

☐ **1.10** Is allowed to pass EOA

at
and at
and at

1.11.1 Km | 1.11.2 Signal
1.12.1 Km | 1.12.2 Signal
1.13.1 Km | 1.13.2 Signal

from
to

1.14.1 Location | 1.14.2 Km | 1.14.3 Signal
1.15.1 Location | 1.15.2 Km | 1.15.3 Signal

☐ **1.20** Proceed in SH							
☐ **x.25** Is exempted from running on sight							
☐ **x.30** Set SR speed to x.31.1 Km/h	x.31.2 Mph						
☐ **x.35** Set SR distance to x.36 Meter							
☐ **x.41** Do not exceed the speed of x.42.1 Km/h	x.42.2 Mph	between	in and x.43 Location x.44 Location on and x.45.1 Track	x.45.2 Line x.46.1 Track	x.46.2 Line from to x.47.1 Km	x.47.2 Signal x.48.1 Km	x.48.2 Signal
☐ **x.90** Examine the line for the following reason x.91 [free text]	and report findings to x.92 [free text]						
☐ **x.95** Additional instructions x.96 [free text]							

V ID of driver

W ID of issuer

Y Time

Z Unique identification

User instructions:

Mark with a cross the tick boxes that become valid, as follows:

X

In case of multiple options for the information, delete the non-valid options, as follows:

x.47.1 Km
~~x.47.2 Signal~~

In the valid fields, fill in the information on the dotted lines.

A Train No Shunting composition No 	B Date
C Location of train Location of shunting composition 	D Location of issuer
European Instruction 2 – Authorisation to proceed after trip 2	
☐ 2.10 If no MA is received, is allowed to proceed in SR ☐ 2.11 Is allowed to proceed in SH 	
☐ x.25 Is exempted from running on sight 	
☐ x.30 Set SR speed to x.31.1 Km/h x.31.2 Mph	
☐ x.35 Set SR distance to x.36 Meter	
☐ x.41 Do not exceed the speed of x.42.1 Km/h x.42.2 Mph	
between in	
☐ x.43 Location ☐ x.44 Location 	
on	
☐ x.45.1 Track x.45.2 Line ☐ x.46.1 Track x.46.2 Line 	
from	
☐ x.47.1 Km x.47.2 Signal ☐ x.48.1 Km x.48.2 Signal 	
☐ x.90 Examine the line for the following reason ☐ x.91 [free text]	
☐ x.95 Additional instructions ☐ x.96 [free text]	
V ID of driver 	W ID of issuer
Y Time 	Z Unique identification

A Train No Shunting composition No		B Date	
C Location of train Location of shunting composition		D Location of issuer	
European Instruction 3 – Obligation to remain at standstill			
3			
Remain at standstill at the current location 3.10			
Carry out End of Mission 3.15			
Delete the available MA 3.20			
Additional instructions x.95 x.96 [free text]			
V ID of driver		W ID of issuer	
Y Time		Z Unique identification	
User instructions: Mark with a cross the tick boxes that become valid, as follows: X In case of multiple options for the information, delete the non-valid options, as follows: x.47.1 Km ~~x.47.2 Signal~~ In the valid fields, fill in the information on the dotted lines.			

A Train No Shunting composition No		B Date	
C Location of train Location of shunting composition		D Location of issuer	
European Instruction 4 – Revocation of an instruction			
4			
Operational instruction 4.10	4.11 Unique identification	is revoked	
Additional instructions x.95	x.96 [free text]		
V ID of driver		W ID of issuer	
Y Time		Z Unique identification	
User instructions: Mark with a cross the tick boxes that become valid, as follows: X In case of multiple options for the information, delete the non-valid options, as follows: In the valid fields, fill in the information on the dotted lines. x.47.1 Km~~x.47.2 Signal~~			

 A Train No Shunting composition No 	 B Date
C Location of train Location of shunting composition 	D Location of issuer
European Instruction 5 – Obligation to run with speed restriction 5	
<input style="width: 20px; height: 20px; margin-right: 5px;" type="checkbox"/> Do not exceed the speed of x.41 between in and x.42.1 Km/h x.42.2 Mph on and x.43 Location x.44 Location x.45.1 Track x.45.2 Line x.46.1 Track x.46.2 Line from to x.47.1 Km x.47.2 Signal x.48.1 Km x.48.2 Signal	
Speed restriction indicated by lineside boards <input style="width: 20px; height: 20px; margin-right: 5px;" type="checkbox"/> Yes 5.67 [or] <input style="width: 20px; height: 20px; margin-right: 5px;" type="checkbox"/> No 5.68	
<input style="width: 20px; height: 20px; margin-right: 5px;" type="checkbox"/> Examine the line for the following reason x.90 and report findings to x.92 [free text] x.91 [free text]	
<input style="width: 20px; height: 20px; margin-right: 5px;" type="checkbox"/> Additional instructions x.95 x.96 [free text]	
 V ID of driver 	 W ID of issuer
Y Time 	Z Unique identification
User instructions: Mark with a cross the tick boxes that become valid, as follows: X In case of multiple options for the information, delete the non-valid options, as follows: x.47.1 Km ~~x.47.2 Signal~~ In the valid fields, fill in the information on the dotted lines.	

A Train No Shunting composition No C Location of train Location of shunting composition	B Date D Location of issuer
☐ European Instruction 6 – Obligation to run on sight 6	
☐ Run on sight 6.40 [and] ☐ Do not exceed the speed of x.41 x.42.1 Km/h x.42.2 Mph between in and x.43 Location x.44 Location on and x.45.1 Track x.45.2 Line x.46.1 Track x.46.2 Line from to x.47.1 Km x.47.2 Signal x.48.1 Km x.48.2 Signal	
☐ Examine the line for the following reason and report findings to x.90 x.91 [free text] x.92 [free text]	
☐ Additional instructions x.95 x.96 [free text]	
V ID of driver Y Time	W ID of issuer Z Unique identification
User instructions: Mark with a cross the tick boxes that become valid, as follows: X In case of multiple options for the information, delete the non-valid options, as follows: In the valid fields, fill in the information on the dotted lines. x.47.1 Km ~~x.47.2 Signal~~	

A Train No Shunting composition No 	B Date
C Location of train Location of shunting composition 	D Location of issuer

European Instruction 7 – Authorisation to start after preparing a movement
7

☐ Is allowed to start in SR
7.10
[or]
☐ Is allowed to start in SH
7.11
in the direction towards
7.12.1 Location | 7.12.2 Signal

☐ Is allowed to pass EOA at and at
7.20 7.21 Signal 7.22 Signal
[and]
☐ Is prohibited to use override
7.23

☐ Is exempted from running on sight
x.25

☐ Set SR speed to
x.30 x.31.1 Km/h | x.31.2 Mph

☐ Set SR distance to
x.35 x.36 Meter

☐ Do not exceed the speed of between | in and
x.41 x.42.1 Km/h | x.42.2 Mph x.43 Location x.44 Location
on and
x.45.1 Track | x.45.2 Line x.46.1 Track | x.46.2 Line
from to
x.47.1 Km | x.47.2 Signal x.48.1 Km | x.48.2 Signal

☐ Examine the line for the following reason and report findings to
x.90 x.91 [free text] x.92 [free text]

☐ Additional instructions
x.95 x.96 [free text]

V ID of driver 	W ID of issuer
Y Time 	Z Unique identification

User instructions:

Mark with a cross the tick boxes that become valid, as follows: ☒ In case of multiple options for the information, delete the non-valid options, as follows: ~~x.47.1 Km | x.47.2 Signal~~ In the valid fields, fill in the information on the dotted lines.

A Train No Shunting composition No	B Date
C Location of train Location of shunting composition	D Location of issuer

European Instruction 8 – Authorisation to pass defective level crossing(s)

8

☐ **Be advised of defective level crossing(s)**

8.40

[and / or]

☐ **Do not exceed the speed of**
 x.41 x.42.1 Km/h | x.42.2 Mph

between | in and
 x.43 Location x.44 Location

on and
 x.45.1 Track | x.45.2 Line x.46.1 Track | x.46.2 Line

from to
 x.47.1 Km | x.47.2 Signal x.48.1 Km | x.48.2 Signal

☐ **Defective level crossing(s)** (at) and and and
 8.50 8.51.1 Km | 8.51.2 ID 8.52.1 Km | 8.52.2 ID 8.53.1 Km | 8.53.2 ID 8.54.1 Km | 8.54.2 ID

and and and and
 8.55.1 Km | 8.55.2 ID 8.56.1 Km | 8.56.2 ID 8.57.1 Km | 8.57.2 ID 8.58.1 Km | 8.58.2 ID 8.59.1 Km | 8.59.2 ID

☐ **When approaching level crossing(s), do not exceed the speed of**
 8.60 8.61.1 Km/h | 8.61.2 Mph

☐ **Stop before level crossing(s)**

8.65

☐ **Examine level crossing(s)**

8.70

☐ **Activate level crossing(s) manually**

8.75

☐ **Activate audible warning device**

8.80

☐ **Is allowed to pass level crossing(s)**

8.85

☐ **Additional instructions**
 x.95 x.96 [free text]

V ID of driver	W ID of issuer
Y Time	Z Unique identification

User instructions:

Mark with a cross the tick boxes that become valid, as follows: **X** In case of multiple options for the information, delete the non-valid options, as follows: In the valid fields, fill in the information on the dotted lines.

x.47.1 Km | x.47.2 Signal

A Train No Shunting composition No C Location of train Location of shunting composition ☐ 9 European Instruction 9 – Obligation to run with power supply restriction ☐ 9.40 Power supply restriction between in x.43 Location and x.44 Location on x.45.1 Track x.45.2 Line and x.46.1 Track x.46.2 Line from x.47.1 Km x.47.2 Signal to x.48.1 Km x.48.2 Signal Power supply restriction indicated by lineside boards ☐ 9.67 Yes [or] ☐ 9.68 No ☐ 9.70 Run with lowered pantograph(s) ☐ 9.75 Run with 'main switch off' ☐ 9.80 Limit power consumption to 9.81.1 % 9.81.2 Amp. 9.81.3 kVA ☐ x.90 Examine the line for the following reason x.91 [free text] ☐ x.95 Additional instructions x.96 [free text]	B Date D Location of issuer
--	---

V ID of driver

Y Time

W ID of issuer

Z Unique identification

User instructions:

Mark with a cross the tick boxes that become valid, as follows:

X

In case of multiple options for the information, delete the non-valid options, as follows:

x.47.1 Km

x.47.2 Signal

In the valid fields, fill in the information on the dotted lines.

7. Communication of an operational instruction

The following terminology shall be used in the communication procedure by all the parties:

Situation	Terminology
Starting the delivery of an operational instruction	"Prepare procedure [identification of the procedure]"
Confirming that an operational instruction may be delivered	"Ready for procedure [identification of the procedure]"
Cancelling an operational instruction	"Cancel procedure. [identification of the procedure]"
If the message is subsequently to be resumed, the procedure shall be repeated from the start	"Error during transmission"
When a transmission error is discovered by the sender, the sender shall request cancellation	"Error (+ prepare new procedure [identification of the procedure])" Or "Error (+ I say again)"
Error during read back	"Error (+ I say again)"
Misunderstanding: if one of the parties does not fully understand a message, the message shall be repeated	"Say again (+ speak slowly)"

8. Book of European and national instructions

The infrastructure manager is responsible for drawing up the Book of European and national instructions in its operating languages.

All the forms of the national instructions and the European Instructions to be used shall be assembled in a document or a computer medium called the Book of European and national instructions.

This Book shall be used by both the driver and the staff authorising the movement of trains. The Book used by the driver and the Book used by the staff authorising the movement of trains shall be structured and numbered in the same way.

The Book shall comprise two parts.

The first part contains at least the following items:

- an index of the European Instructions as used by the infrastructure managers,
- an index of the national operational instructions,
- a list of situations to which each operational instruction applies,
- the way of delivering each operational instruction, including whether it is allowed to be written down by the driver while running,
- the table containing the international phonetic alphabet.

The second part contains, in the operating languages of the infrastructure manager, the forms of:

- the European Instructions,
- the national operational instructions.

These shall be collected by the railway undertaking and given to the driver. Railway undertakings operating in more than one infrastructure manager network shall provide to the driver:

- the generic forms of the European Instructions as defined in point 6 of Appendix C2, or
- reduced forms of the European Instructions that include at least the fields used by the infrastructure manager(s) on the network(s) of which the railway undertaking will operate.’;

(v) point 9 is deleted;

(48) Appendix D is amended as follows:

(a) Note n.3 is replaced by the following:

‘3. With a view to avoid duplication of testing, in relation to parameters “Traffic loads and load carrying capacity of infrastructure” and “Train detection systems”, the infrastructure managers shall provide through RINF parameters 1.1.1.5.1 or 1.1.1.5.2 the list of vehicle types or vehicles compatible with the route for which they have already verified route compatibility, where such information is available.’;

(b) in Section D1, the table is amended as follows:

(i) the first line “Traffic loads and load carrying capacity of infrastructure” is replaced by the following:

‘Traffic loads and load carrying capacity of infrastructure	Static axle loads and design and operational masses in the following load cases:	1.1.1.1.2.4	Load capability	x	x	The static compatibility checks for vehicles shall be performed according to Point 7 of EN 15528:2021 and additional procedure(s) or relevant information if provided by the infrastructure manager through RINF under parameter 1.1.1.1.2.4.4. For the United Kingdom in relation to Northern Ireland networks, the static compatibility checks for vehicles shall be performed according to relevant national rules in accordance with point 4.2.7.4 (4) in the Annex to Regulation (EU) No 1299/2014 (“TSI INF”). Any requirement set out by the infrastructure manager which relates to the passenger payload, to be considered during route compatibility checks for vehicles capable of carrying a payload of passengers, shall be included in the procedure(s) or relevant information provided by the infrastructure manager through RINF under parameter 1.1.1.1.2.4.4. Such procedure may take into account technical or operational measures which have an impact on the passenger payload on standing areas.
	— design mass as defined in Regulation (EU) 1302/2014:	1.1.1.1.2.4.1	National classification for load capability			
	— in working order,	1.1.1.1.2.4.2	Compliance of structures with the High Speed Load Model (HSLM)			
	— under normal payload,	1.1.1.1.2.4.3	Railway location of structures requiring specific checks			
	— under exceptional payload,	1.1.1.1.2.4.4	Document(s) with the procedure(s) for static and dynamic route compatibility checks			
	— Where relevant operational mass in accordance with EN 15663: 2017- A1 2018:					
	— in working order,					
	— under normal payload.					
	Maximum design speed					
	Vehicle length					
	The position of the axles along the unit (axle spacing)					
	EN line category					
	For vehicles capable of carrying a payload of passengers: EN line category for the standard value of payload in standing areas and – in case of application – for any particular value of payload in standing areas, according to Point 6.4 of EN 15528:2021.					

	Static compatibility check for wagons: Permissible payload for different line categories according to WAG TSI.				The dynamic compatibility checks for trains, when necessary in accordance with the information provided by the infrastructure manager, shall be performed according to the procedure(s) or relevant information provided by the infrastructure manager through RINF under parameter 1.1.1.1.2.4.4.'
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(ii) the following new line is inserted after the line 'Gauging':

'Specific check for Combined Transport	Wagon Compatibility Code, Wagon Correction Digit and ILU Technical Number (WCC + ILU Technical Number) combined with the freight Wagon Correction Digit = CT code	1.1.1.1.3.4	Standard combined transport profile number for swap bodies	X	Comparison in accordance with the specification defined in point 3.1 of the ERA Technical Document on codification of combined transport (ERA/TD/2023-01/CCT) version 1.0 of 6.3.2023.'
		1.1.1.1.3.9	Standard combined transport profile number for roller units		
		1.1.1.1.3.8	Standard combined transport profile number for container		
		1.1.1.1.3.5	Standard combined transport profile number for semi-trailers		
		(CT Line code)			

(iii) the line 'Train detection system' is replaced by the following:

Train detection systems	Information if the vehicle has electrical or electronic equipment on board creating interference current in the rail or if the vehicle has electrical or electronic equipment on board creating interference electromagnetic fields close to the axel counter Type of train detection systems for which the vehicle has been designed and assessed by tests performed in accordance with ERA/ERTMS/033281	1.1.1.3.7.1.1 Type of train detection system 1.1.1.3.7.1.2 Type of track circuits or axle counters to which specific checks are needed. 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 Specific to the French network: 1.1.1.3.7.1.4 Section with train detection limitation	X		Verification only needed if: — If 1.1.1.3.7.1.1 is “track circuit” then only for vehicles having electrical or electronic equipment on board creating interference current in the rail — If 1.1.1.3.7.1.1 is “axel counter” then only for vehicles having electrical or electronic equipment on board creating interference electromagnetic fields close to the axel counter — If 1.1.1.3.7.1.1 is “loop” then not needed. Comparison of the declared type of train detection system(s) between vehicle and the intended route. <i>Note:</i> At vehicle authorisation, based on TSIs and the documents specifying specific cases, that are referenced in RINF and based on ERA/ERTMS/033281, the technical compatibility is verified between the vehicle and all train detection system(s) of the network(s) in the area of use. In duly justified cases (e.g. problems of non-detection of the vehicle occurring during operation), tests and/or checks could be done after vehicle authorisation, involving the railway undertaking and infrastructure manager.
Train detection system	Possibility of preventing the use of the lubrication device	1.1.1.1.7.1 Use of flange lubrication	X		Verification if the use of flange lubrication is allowed in the intended route <i>Note:</i> The output of the check should be taken into account by the Safety Management System of the Railway Undertaking (e.g. preventing the use of flange lubrication in the section of line)

Train detection systems: influencing unit	From technical file of each vehicle of the train For each band of the frequency management defined in the specification referenced in Appendix J.2 index [A] of Loc&Pas TSI and in the specific cases or technical documents referred to in Article 13 of CCS TSI when they are available: — Maximum interference current (A) and applicable summation rule, — Maximum magnetic field (dBµA/m) both radiated field and field due to the return current and applicable summation rule, — Minimum Input Impedance (Ohm). Comparable parameters specified in the specific cases or in the technical documents referred to in Article 13 of TSI CCS when they are available.	1.1.1.3.4.2	Frequency bands for detection	X	Route compatibility check applicable to: — passenger trains consisting of locomotive(s) and coaches, — freight trains where one or several freight wagons have electrical or electronic equipment on board creating interference current in the rail or interference electromagnetic fields close to the axel counter. Compliance of the resulting emissions at “Influencing Unit” level (as defined in clause 3.2 Appendix A index 77 of CCS TSI) with maximum interference values (current level and magnetic field limit) and minimum impedance allowed, shall be checked. For each frequency band, the resulting emissions at “Influencing Unit” level shall be calculated based on summation rules specified in: — Clauses 3.2.1 and 3.2.2 of Appendix A index 77 of CCS TSI compliant train detection system, — Specific cases referring to technical documents as specified in Art. 13 of the CCS TSI for non TSI compliant train detection system. Pending the notification of specific cases referred to in article 13 of CCS TSI, the notified national rules apply.’
		1.1.1.3.4.2.1	Maximum interference current		
		1.1.1.3.4.2.2	Minimum Input impedance		
		1.1.1.3.4.2.3	Maximum magnetic field		

(iv) the line 'Voltages and frequencies' is replaced by the following:

'Voltages and frequencies'	Energy supply system: — Nominal voltage and frequency, — Type of contact line system	1.1.1.2.2.1.1	Type of contact line system	X		Comparison of the declared voltage between vehicle and the intended route of the traction supply system (nominal voltage and frequency) and type of contact line system. <i>Note:</i> For France, comparison of Highest non-permanent voltage (U _{max2}) between the vehicle and intended routes having U _{max2} not compliant with values in table 1 of EN 50163:2004'
		1.1.1.2.2.1.2	Energy supply system (Voltage and frequency)			
		1.1.1.2.2.1.3	Highest non-permanent voltage (U _{max2}) for France on lines not compliant with values in table 1 of EN 50163:2004			

(v) the line 'ETCS – Train Integrity' is replaced by the following:

'ETCS'	Managing information about the completeness of the train (not from driver)	1.1.1.3.2.8	Train integrity confirmation from on-board (not from driver) necessary for line access	X	X	Verification that vehicle/train is able to confirm (not from driver) the train integrity if required by trackside.'
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(vi) the following two new lines are inserted after the line 'ETCS-Train Integrity':

'ETCS'	Envelope of legally operated ETCS system versions	1.1.1.3.2.10	ETCS M_version	X		Verification that the ETCS M_VERSION value in RINF is in the range of the legally operated ETCS system versions supported by the vehicle.
ETCS	Safe consist length information from on-board necessary for access to the line and SIL level	1.1.1.3.2.11	Safe consist length information from on-board necessary for access to the line and SIL	X	X	Verification that vehicle/train is able to provide the safe consist length information with the minimum required level indicated in RINF.'

(vii) the line 'GSM-R -SIM Card GSM-R Home Network' is replaced by the following:

'GSM-R	GSM-R Voice SIM Card Home Network	1.1.1.3.3.5 GSM-R networks covered by a roaming agreement	X		Verification that the GSM-R SIM Card Home Network is in the list of GSM-R networks with roaming agreement for all Points in the route. This has to be performed for all SIM Cards in the vehicle.'
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(viii) the following new line is inserted after the line 'GSM-R-SIM Card GSM-R Home Network':

'GSM-R	GSM-R Data SIM Card Home Network	1.1.1.3.3.5 GSM-R networks covered by a roaming agreement	X		Verification that the GSM-R SIM Card Home Network is in the list of GSM-R networks with roaming agreement for all Points in the route. This has to be performed for all SIM cards in the vehicle.'
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(ix) the line 'GSM-R – SIM card support of group ID 555' is replaced by the following:

'GSM-R	GSM-R Voice SIM card support of group ID 555	1.1.1.3.3.4 GSM-R Use of Group 555	X		Verification that the Group ID 555 is used trackside. If this is not configured on-board, alternative operational procedures should be prior established with the infrastructure manager.'
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(c) Appendix D2 is replaced as follows:

'Appendix D2

Elements the infrastructure manager has to provide to the railway undertaking for the Route Book

Number	Route Book information	Route Book information in Register of Infrastructure (RINF)	Explanations
1	Generic information regarding the infrastructure manager		
1.1	infrastructure manager's code – IM's Code	1.1.0.0.0.1 – section of line 1.1.1.1.8.1 – section of line track tunnel 1.2.1.0.0.1 – operational point track 1.2.1.0.5.1 – operational point track tunnel 1.2.1.0.6.1 – platform 1.2.2.0.0.1 – siding	
2	Maps and Diagrams		
2.1	Map: schematic overview including		
2.1.1	Sections of line	1.1.1.0.1.1	The RINF elements are geo-located. A map of one section of line is provided by its geo location superposed on a mapping service A map of consecutive sections of line will result from a route calculation
2.1.2	(Principal) operational points	1.2.0.0.0.5	The RINF elements are geo-located. A map of one operational point is provided by its geo location superposed on a mapping service
2.2	Route diagram		A route is defined by a list of consecutive tracks of sections of line with their corresponding operational points, linking one operational point A from operational point B
2.2.1.1	Indication of running lines	1.1.0.0.0.2 1.1.1.0.0.1 1.1.1.0.0.2	National line identification is a property of each section of line The running track is given by the identification of the track and the running direction (N/O/B)

2.2.1.2	Indication of loops	1.2.0.0.0.4	
2.2.1.3	Indication of catch/trap points	1.2.0.0.0.4	
2.2.1.4	Indication of sidings	1.2.2.0.0.2	Sidings are defined as part of operational points (geo-localised)
2.2.2	Principal locations (stations, yards, junctions, freight terminals) and their position relative to the line	1.2.0.0.0.1 1.2.0.0.0.2 1.2.0.0.0.3 1.2.0.0.0.4 1.2.0.0.0.5 1.2.0.0.0.6	
2.2.3	Location, type and name of all fixed signals relevant for trains	1.1.1.3.14 – signal on the track 1.2.1.0.8 – signal in operational point	Signal to be referred in regards to track of section of line or operational point
2.3	Station/Yard/Depot diagrams		Station, yard, depot are defined in RINF as operational point types
2.3.1	Unique Operational Point ID (UOPID)	1.2.0.0.0.1 1.2.0.0.0.2 1.2.0.0.0.3	
2.3.2	Type of location passenger terminal, freight terminal, yard, depot	1.2.0.0.0.4	
2.3.3	Location, type and identification of fixed signals that protect danger points	1.2.1.0.8.1 1.2.1.0.8.2 1.2.1.0.8.3 1.2.1.0.8.4	Signal to be referred in regards to operational point
2.3.4	Identification and plan of tracks, including switches	1.2.1.0.0.2 1.2.0.0.0.7.1 1.2.0.0.0.7.2	Schematic overview parameters added
2.3.5	Identification of platforms	1.2.1.0.6.2	
2.3.6	Length of platforms	1.2.1.0.6.4	
2.3.7	Height of platforms	1.2.1.0.6.5	
2.3.8	Curvature of platforms	1.2.1.0.6.8	
2.3.9	Identification of loops	1.2.0.0.0.1 1.2.0.0.0.2 1.2.0.0.0.3 1.2.0.0.0.4	
2.3.10	Fixed installations for servicing trains (toilet discharge, cleaning facilities, water restocking, refuelling, sand restocking, electric shore supply)	1.2.2.0.4.1 1.2.2.0.4.2 1.2.2.0.4.3 1.2.2.0.4.4 1.2.2.0.4.5 1.2.2.0.4.6	

3	Specific section of line information		
3.1	General Characteristics		
3.1.1	Section of line extremity 1	1.1.0.0.0.3	
3.1.2	Section of line extremity 2	1.1.0.0.0.4	
3.1.3	Lineside indications of distance (frequency, appearance and positioning)	1.1.1.0.0.3	
3.1.4	Maximum permissible speed for each track	1.1.1.1.2.5	
3.1.5	Intentionally blank		
3.1.6	Intentionally blank		
3.1.7	Means of Communication with the traffic management/control centre in normal, degraded and emergency situation	1.1.1.3.3.1 – GSM-R version 1.1.1.3.6.1 – Other radio systems installed (Radio Legacy Systems) 1.1.1.3.3.3 – Optional GSM-R functions	
3.2	Specific Technical Characteristics		
3.2.1	Gradient profile	1.1.1.1.3.6	
3.2.2	Gradient location	1.1.1.1.3.6	
3.2.3	Tunnels: location, name, length, specific information such as the existence of walkways and evacuation and rescue points as well as the location of safe areas where evacuation of passengers may take place; fire safety categorisation	1.1.1.1.8.2 1.1.1.1.8.3 1.1.1.1.8.4 1.1.1.1.8.7 1.1.1.1.8.10 1.1.1.1.8.11 1.1.1.1.8.12 1.1.1.1.8.12.1 1.1.1.1.8.13 1.1.1.1.8.13.1	
3.2.4	Non-stopping areas: identification, location, type	1.1.1.3.14.1 1.1.1.3.14.2 1.1.1.3.14.3 1.1.1.3.14.5	Specific type of signal “non-stopping area” plus the length of the non-stopping area
3.2.5	Industrial risks – locations where it is dangerous for the driver to step out	1.1.0.0.1.1	
3.2.6	Intentionally blank		

3.2.7	Type of signalling system and corresponding operational regime (double track, reversible working, left or right hand running, etc.)	1.1.1.3.2.1 – ETCS level 1.1.1.3.2.2 – ETCS baseline 1.1.1.3.5.3 – Train protection legacy system 1.1.1.0.0.2 – Normal running direction 1.1.0.0.1.3 – Operational regime	Signalling systems already in RINF in accordance with Implementing Regulation (EU) 2019/777. Reversible working regime already defined in RINF at track level. Parameter for double track and left-right hand running regime defined at section of line level
3.2.8	Intentionally blank		
3.3	Energy subsystem		
3.3.1	Energy supply system (voltage and frequency)	1.1.1.2.2.1.2	
3.3.2	Maximum train current	1.1.1.2.2.2	
3.3.3	Restriction related to power consumption of specific electric traction unit(s)	1.1.1.2.5.1 1.1.1.2.5.4	Yes/No already in RINF in accordance with Implementing Regulation (EU) 2019/777. Parameter under “Rules and restrictions” group of parameters for a document describing the restriction
3.3.4	Restriction related to the position of Multiple Traction unit(s) to comply with contact line separation (position of pantograph)	1.1.1.2.5.5	Parameter under “Rules and restrictions” group of parameters
3.3.5	Location of neutral sections	1.1.1.2.4.1.2	
3.3.6	Location of areas that shall be passed with lowered pantographs.	1.1.1.2.4.1.2	
3.3.7	Conditions applying with regard to regenerative braking	1.1.1.2.2.4.1	
3.3.8	Maximum current at standstill per pantograph	1.1.1.2.2.3	
3.4	Control-Command and Signalling subsystem		
3.4.1	Need for more than one system active simultaneously	1.1.1.3.10.1 1.1.1.3.10.2 1.2.1.1.9.1 1.2.1.1.9.2	

3.4.2	Special conditions to switch over between different class B train protection, control and warning systems	1.1.1.3.8.1.1 1.2.1.1.7.1.1	
3.4.3	Special technical conditions required to switch over between ERTMS/ETCS and Class B systems, boundary locations between ERTMS/ETCS and Class B systems	1.1.1.3.8.3 1.2.1.1.7.3	The boundary location can be deduced from the track associated with ETCS and the adjacent track associated with Class B system
3.4.4	Radio network ID(s) used in the route and special instructions (location) to switch over between different radio systems	1.1.1.3.3.1 – GSM-R version 1.2.1.1.2.1 1.1.1.3.6.1 – Other radio systems installed (Radio Legacy Systems) 1.2.1.1.5.1 1.1.1.3.8.2 1.1.1.3.8.2.1 1.2.1.1.7.2 1.2.1.1.7.2.1	The location to switch over can be deduced from the track associated with one radio system and the adjacent track associated with another radio system
3.4.5	Permissibility to use eddy current brake	1.1.1.1.6.2 1.2.1.0.4.2	
3.4.6	Permissibility to use magnetic brake	1.1.1.1.6.3 1.2.1.0.4.3	
3.4.7	ID(s), phone number(s) and area(s) of authority (boundary locations) of ERTMS/ETCS Radio Block Centers covering the route	1.1.1.3.2.17 1.2.1.1.1.17	The area covered by RBC is defined by all the section of line tracks associated to the same ID or phone number
3.4.8	ATO Grade of Automation and system version installed lineside	1.1.1.3.13.1 1.1.1.3.13.2 1.2.1.1.10.1 1.2.1.1.10.2	RINF parameters associated to section of line track
3.4.9	ATO communication system supported from trackside	1.1.1.3.13.3 1.2.1.1.10.3	
3.4.10	Big Metal Mass	1.1.1.3.2.18 1.2.1.1.1.18	
3.4.11	Train integrity confirmed by on-board	1.1.1.3.2.8 1.2.1.1.1.8	
3.5	Operation and Traffic Management subsystem		
3.5.1	Operating language	1.1.0.0.1.2 1.2.0.0.0.8'	

(d) the following Section D3 is added:

‘Appendix D3

ERTMS trackside engineering information relevant to operation that the infrastructure manager shall provide to the railway undertaking

Notes:

1. The information provided herein is complementary to the route compatibility check, which is assumed to have already been performed for a train intended to operate on a route. It has to be provided by the infrastructure managers through RINF. Those parameters can be published in RINF Application by using the concept of “common characteristics subset” as defined in ERA vocabulary and RINF Implementing Regulation (EU) 2019/777 as amended by Implementing Regulation (EU) 2023/1694.
2. Most of the information listed below is not otherwise visible to the driver or can only be indirectly perceived under certain operational conditions, usually by observing the system behaviour in certain situations.
3. Item 1.5 lists the minimum set of ETCS National Values required to be made available to the railway undertakings. Infrastructure managers shall also provide upon request to a railway undertaking the complete set of National Values.
4. The ERTMS terms mentioned in the table are defined in the glossary and system requirements specification of the Control-command and Signalling TSI (under indexes 3 and 4 respectively of Appendix A).
5. The information provided in this Appendix will enhance drivers' knowledge of the operational conditions they need to consider when running under ERTMS in the infrastructure manager's network. It can be used in drivers' training and may be integrated under internal railway undertaking rules and procedures.

Number	Information	Explanation
1	ETCS specificities	
1.1	Whether the ETCS trackside is engineered to transmit Track Conditions and if yes, which ones	If the trackside does not provide Track Conditions, the driver will need to be informed about such conditions via alternative methods
1.2	Whether the ETCS trackside implements the Level Crossing (LX) 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
1.3	The cant deficiency used to determine the basic Static Speed Profile of the line and other cant deficiency train categories for which the ETCS trackside is configured to provide Static Speed Profiles	Essential information for drivers of trains with a worse (lower) tolerated cant deficiency than those for which the ETCS trackside provides Static Speed Profiles
1.4	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
1.5	ETCS National Values	Minimum set of parameters to be communicated to the railway undertakings

1.5.1	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
1.5.2	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
1.5.3	V_NVALLOWOVTRP	Maximum speed allowed when selecting "Override EOA"
1.5.4	V_NVSUPOVTRP	Permitted speed limit supervised when "Override EOA" is active
1.5.5	D_NVOVTRP	Maximum distance for overriding the train trip
1.5.6	T_NVOVTRP	Maximum time for overriding the train trip
1.5.7	D_NVPOTRP	Maximum distance allowed for reversing in Post Trip Mode
1.5.8	T_NVCONTACT	Maximum time without a safe message from Radio Block Center before train reacts
1.5.9	M_NVCONTACT	On-Board system reaction when T_NVCONTACT expires
1.5.10	M_NVDERUN	Qualifier determining whether ETCS on-board allows a driver ID to be changed while running or only at standstill
1.5.11	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
1.5.12	Q_NVSBTSMPerm	Permission to use service brake in target speed monitoring
1.5.13	National Values used for the brake model	Set of parameters for tweaking the braking curves calculated by the ETCS on-board system to match accuracy, performance and safety margins imposed by the infrastructure manager
2	GSM-R specificities	
2.1	Whether the 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

2.2	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'
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(49) Appendix F title is replaced as follows throughout the text:

'Elements relevant to professional qualification for the tasks associated with "accompanying trains";

(50) Appendix G title is replaced as follows throughout the text:

'Elements relevant to professional qualification for the task of preparing trains';

(51) letter (a) of point 1 of Appendix G is replaced as follows:

'(a) This Appendix, which shall be read in conjunction with point 4.6 and 4.7, gives a list of the elements that are deemed to be relevant to the task of preparing a train on the network.';

(52) letter (a) of point 3 of Appendix G is replaced as follows:

'(a) Application of train preparation rules, train composition rules, train braking rules, train loading rules etc. to ensure the train is in running order';

(53) Appendix I is replaced as follows:

Appendix I

List of areas for which national rules may continue to apply according to Article 8 of Directive (EU) 2016/798

1. AREAS FOR NATIONAL RULES

(a) Shunting

- Excluded are operating rules for Digital Automatic Coupling (DAC)
- National rules for ERTMS shunting are limited to the areas defined in Part C of Appendix A

(b) Signalling rules

- Rules related to the operational use of the national signalling system

(c) Maximum speeds in degraded mode including running on sight

(d) Running at caution

(e) Local operational rule

- Rules of a strictly local nature relating to specific local conditions, when not mentioned in RINF in accordance with Article 14(11) of Directive (EU) 2016/797

(f) Operation during works

(g) Safe operation of test trains

(h) Train visibility

- Front end (see point 4.2.2.1.2)
- Existing Non TSI conform vehicles

(i) Managing an emergency situation and emergency responses (see point 4.2.3.7)

- Role of local/national authorities and emergency services, and their contact details.
- Methods and procedures in emergency situation not covered by the requirement of this Regulation, including notification of accidents and incidents: national instructions on modalities for notifications to authorities.

- (j) Safety-related communications methodology
 - National operational instructions (see Appendix C2)
- (k) Requirements on route knowledge under the national transposition of Directive 2007/59/EC;

2. LIST OF OPEN POINTS

- (a) Exceptional transport
- (b) Specific requirements to operate combined transport trains exceeding the loading gauge but not exceeding the codification of the line
- (c) Train running information for drivers (see 4.2.1.2.3)
 - Additional information;
- (d) Recording of monitoring data outside the train (see 4.2.3.5.1)
 - Additional information
- (e) Recording of monitoring data on-board the train (see 4.2.3.5.2)
 - Additional information
- (f) Professional competences (see point 4.2.1.1 and 4.6)
 - Elements relevant to professional qualification for the tasks associated with despatching trains and authorising train movements.
 - Evidence of professional competences.
- (g) Health and safety conditions (see point 4.7)
 - Alcohol, drugs and psychotropic medication limits (see 4.7.1).
- (h) Common operational principles and rules (See 4.4 and Appendix B)
 - Sanding – automatic sanding equipment and report in case of use of the sanding equipment;
 - Failure of level crossing – additional information;
- (i) Safety-related communications methodology
 - Additional terms (see Appendix C1)
- (j) Operations in long tunnels (see 4.3.5)
 - Additional information;

(54) Appendix J is amended as follows:

(a) the first table is amended as follows:

(i) the following line is inserted after the line 'Authorising train movements':

'Combined transport train	A Combined Transport train is a freight train composed completely or partly of freight wagons loaded with intermodal loading unit(s) (e.g. swap bodies, semi-trailers, containers, roller units).'
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(ii) the line 'Emergency call' is replaced by the following:

'Emergency call	Call set up in some dangerous situations to warn all trains /shunting compositions in a defined area.'
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(iii) a new line is inserted after the line 'Emergency call':

'End Of Authority	Location up to which a train or a shunting composition is authorised to proceed.'
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- (iv) the line 'Safety-critical task' is replaced by the following:

'Safety-critical task'	Task, affecting railway safety, performed by staff preparing, operating, controlling or otherwise involved in the movement of trains.'
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- (v) a new line 'Shunting composition' is added after the line 'Scheduled stop':

'Shunting composition'	A traction unit coupled or not to a set of vehicles and intended to be moved under shunting conditions without train data.'
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- (vi) the line 'Signaller' is replaced by the following:

'Signaller'	Staff in charge of the route setting of trains /shunting compositions and of issuing instructions to drivers.'
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- (vii) the line 'Train' is replaced by the following:

'Train'	A train is defined as (a) traction unit(s) with or without coupled vehicles with train data available operating between two or more defined points according to an allocated train path and identified by means of a unique train running number.'
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- (viii) the following line is inserted after the line 'Train':

'Train composition'	Train composition is the sequence of vehicles in a train. This means both the formation of vehicles within a train and their specific vehicle characteristics.'
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- (ix) the line 'Train preparation' is replaced by the following:

'Train preparation'	Process for ensuring that a train is in a fit condition to enter service, that the train equipment is correctly deployed and the train composition matches the train's designated route(s). It includes the coupling or decoupling of vehicles, connecting or disconnecting of pipes, services, cabling and the indication of a rear end signal. Train preparation also includes brake configuration setting and the inspections, tests, and checks before departure. <i>Note:</i> The movement to get a vehicle in or out of the train composition is a shunting movement.'
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- (b) the second table is amended as follows:

- (i) the following line is inserted after the line 'COTIF':

'CT'	Combined Transport'
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- (ii) the following line is inserted after the line 'ENE':

'EOA'	End Of Authority'
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(iii) the following line is inserted after the line 'GSM-R':

'ILU	Intermodal Loading Unit'
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(iv) the following line is inserted after the line 'RU':

'SIL	Safety Integrity Level'
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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’
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- (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 GI1 and GI2.’;

(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’
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- (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.

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

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

$L_{TA} = V_{\max} \times 0,56$ ($V_{\max}$ 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⁾ $a = \left(\left(\frac{\text{Speed (km/h)}}{3,6} \right)^2 \right) / (2 \times (S - ((Te) \times (\text{Speed (km/h)} / 3,6))))$, 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 1 000 mm, 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.	-’
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(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_d), 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
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(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 $b_{q_{lim}}$.

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 ≥ 4m D2-100 and L < 4m D2-200 ⁽⁹⁾⁽¹⁰⁾⁽¹⁵⁾	L ≥ 4m C2-100 and L < 4m C2-200 ⁽⁹⁾⁽¹⁵⁾
P3b (≤ 160 km/h)	L ≥ 4m D2-100 and L < 4m D2-160 ⁽⁹⁾⁽¹¹⁾⁽¹⁵⁾	L ≥ 4m D2-100 and L < 4m D2-160 ⁽⁹⁾⁽¹⁵⁾
P4a (> 160 km/h)	L ≥ 4m D2-100 and L < 4m D2-200 ⁽⁹⁾⁽¹²⁾⁽¹⁵⁾	L ≥ 4m C2-100 and L < 4m C2-200 ⁽⁹⁾⁽¹⁵⁾
P4b (≤ 160 km/h)	L ≥ 4m D2-100 and L < 4m D2-160 ⁽⁹⁾⁽¹³⁾⁽¹⁵⁾	L ≥ 4m C2-100 and L < 4m C2-160 ⁽⁹⁾⁽¹⁵⁾
P5	C2-120	B1-120
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
<i>High speed and long distance trains</i>	160 ⁽¹⁾
<i>High speed and long distance trains</i> Reservation Obligatory	0
<i>Others</i> (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)

(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’
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(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:
$$\text{Reading distance in mm divided by 250} = \text{character height (for example: } 10\,000 \text{ mm}/250 = 40 \text{ mm).}';$$

(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 bq_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 $L_{A\text{Fmax}}$ 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:

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

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

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

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	– $f_{signal1} = 2200 \text{ Hz} \pm 100 \text{ Hz}$ – $f_{signal2} = 1760 \text{ Hz} \pm 100 \text{ Hz}$
Sound pressure level	Adaptive device — $L_S \geq L_N + 5 \text{ dB}$ — $L_{Smax} = 70 \text{ dB} (+ 6/- 0)$ – Non adaptive device — $L_S = 70 \text{ dB} (+ 6/- 0)$

G.2.2 Door closing signal

Characteristics	– A fast pulsed tone (6-10 pulses per second)
Frequency	– $f_{signal} = 1900 \text{ Hz} \pm 100 \text{ Hz}$
Sound pressure level	Adaptive device — $L_S \geq L_N + 5 \text{ dB}$ — $L_{Smax} = 70 \text{ dB} (+ 6/- 0)$ – Non adaptive device — $L_S = 70 \text{ dB} (+ 6/- 0)$

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 $\pm$ 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 $\pm$ 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 $\pm$ 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’
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(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’
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(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 Bern 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 139 I, 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 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(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 ('CPId') 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 $\sigma_{\max}$ 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 (dBµA/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 Resistance of new bridges to traffic loads	4.2.6.3 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	4.2.13.1
Public address system	4.2.5.2	Automatic voice and announcement	4.2.13.2'
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) A 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 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 ($\text{dB}_{\mu\text{A/m}}$) 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 ⁽¹⁾	No new authorisation required

	Second method of point 6.2.3.5(3)	Check ⁽¹⁾	Check ⁽¹⁾	Check ⁽¹⁾
	No CSM on RA applied	Not possible	Not possible	Not possible

⁽¹⁾ 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: — 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 HABD 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.

— $W_{TA} = 70 \text{ mm}$

— $Y_{TA} = 1\,092,5 \text{ mm}$

— $L_{TA} = V_{\max} \times 0,56$ ($V_{\max}$ 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

	$Y_{TA} \text{ [mm]}$	$W_{TA} \text{ [mm]}$	$L_{TA} \text{ [mm]}$	$Y_{PZ} \text{ [mm]}$	$W_{PZ} \text{ [mm]}$	$L_{PZ} \text{ [mm]}$
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

	$Y_{TA} \text{ [mm]}$	$W_{TA} \text{ [mm]}$	$L_{TA} \text{ [mm]}$	$Y_{PZ} \text{ [mm]}$	$W_{PZ} \text{ [mm]}$	$L_{PZ} \text{ [mm]}$
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:

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) $SR = AR + S_d, \text{ left} + S_d, \text{ right}$	$690 \leq D \leq 1\,016$	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_d) 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).

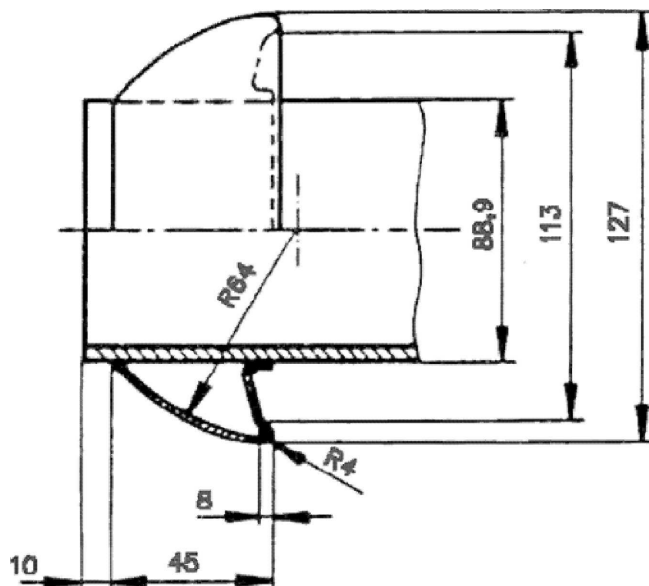
7.3.2.22. Interface for toilet discharge (4.2.11.3)

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

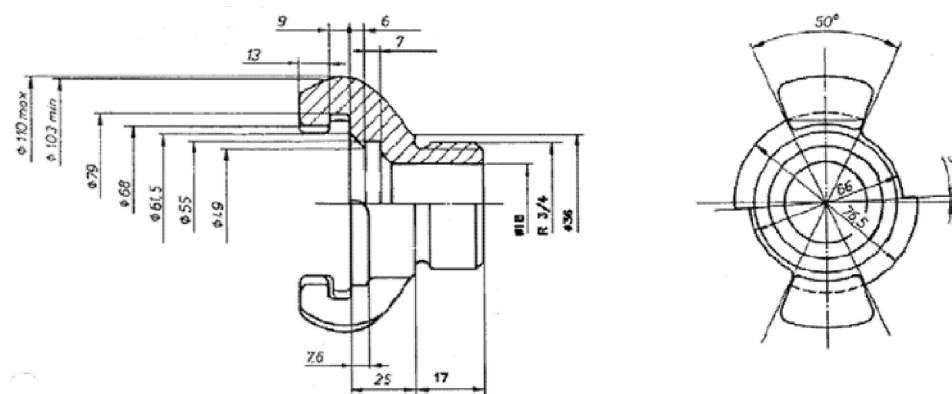
7.3.2.23. Interface for water refilling (4.2.11.5)

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 AII1.

Figure A II1

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	—		
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(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

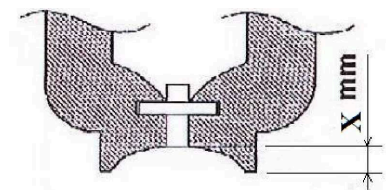
Type of switch	Velocity [km/h] direction			
				
0,08 – 0,12	15	15	15	15
0,08 – 0,12	120	40	120	40
0,034 – 0,056	15	15	15	15
0,034 – 0,056	120	80-100	120	80-100

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.

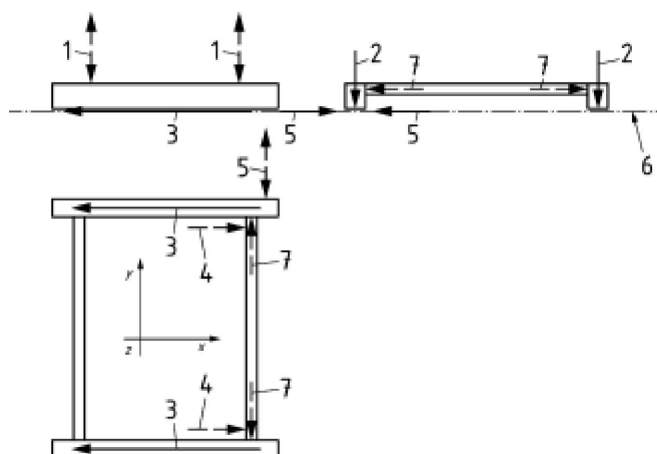
- No evidence of a contact at the lateral side of the MTB outside of 55 mm in the vertical direction from the top of rail.

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 F_Q 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 F_Q 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:

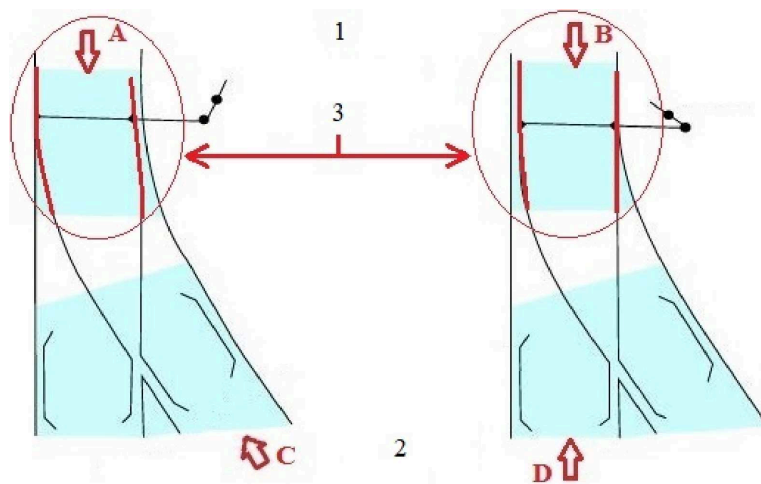
The switch is equipped with sensors for measuring the displacement of moving parts identified in red in Figure 3 below (zone toe).

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 points(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

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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 $L_{pAeq,Tp(V_{test})}$ 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):

$$L_{pAeq,Tp(80 \text{ km/h})} = L_{pAeq,Tp(V_{test})} - 30 * \log(v_{test}/80 \text{ km/h})$$

v_{test}	=	Actual speed during the measurement
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- (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 $L_{pAeq,Tp(V_{test})}$ 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 $L_{pAeq,Tp(V_{test})}$ 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):

$$L_{pAeq,Tp(250 \text{ km/h})} = L_{pAeq,Tp(V_{test})} - 50 * \log(v_{test}/250 \text{ km/h})$$

v_{test}	=	Actual speed during the measurement
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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 $L_{pAeq,Tp(V_{test})}$ shall be normalised to a reference APL of $0,225 \text{ m}^{-1}$ $L_{pAeq,Tp(APL_{ref})}$ 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 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 sub-system	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 ⁽³⁾ (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.

⁽³⁾ 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

1.1.1.1.1.2	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
1.1.1.1.2	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 dBµA/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 dBµA/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

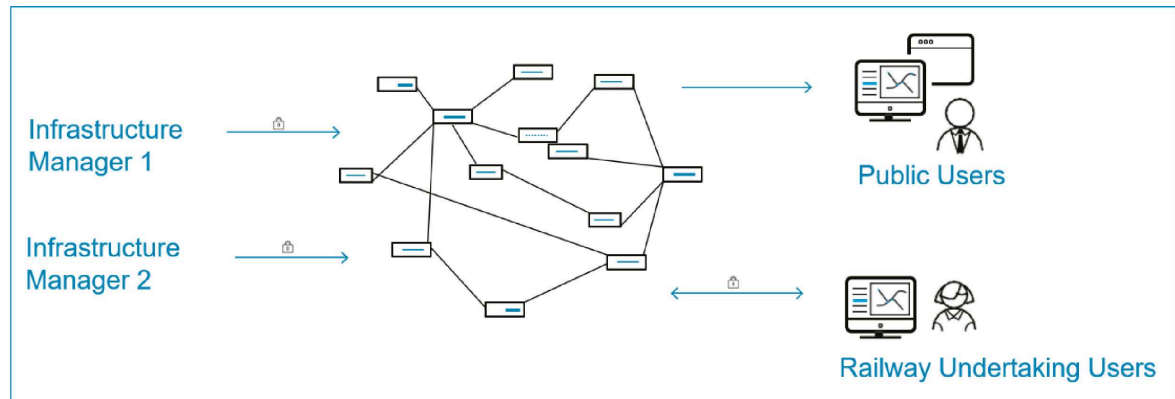
1.2.3	Rules and restrictions		
1.2.3.1	Existence of rules and restrictions of a strictly local nature	Existence of rules and restrictions of a strictly local nature	1 January 2021
1.2.3.2	Documents regarding the rules or restrictions of a strictly local nature available by the IM	Electronic document 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 Artcile 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'

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****(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) Commission Regulation (EU) 2016/919 ⁽²⁾ lays down the technical specification for interoperability (TSI) relating to the 'control-command and signalling' (CCS) subsystems.
- (2) Pursuant to Article 3(5), points (b) and (f) of Commission Delegated Decision (EU) 2017/1474 ⁽³⁾, 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.
- (3) On 24 January 2020, in accordance with Article 19(1) of Regulation (EU) 2016/796 of the European Parliament and of the Council ⁽⁴⁾, the Commission asked the European Union Agency for Railways (the 'Agency') to prepare recommendations implementing a selection of the specific objectives set out in Articles 3 and 7 of Delegated Decision (EU) 2017/1474.
- (4) On 30 June 2022, the Agency issued a recommendation relating to the CCS subsystems (ERA-REC-1175-1218-2022/REC). This Regulation is based on that recommendation.
- (5) The existing regulatory framework should be modernised in order to enable new functionalities associated with the digitalisation of railway networks. The efficiency and sustainability of rail freight should be improved through further harmonisation of the European Rail Traffic Management System (ERTMS) and a broader and more systematic deployment of the ERTMS across the Union, notably on trans-European transport network.
- (6) The new functionalities associated with digitalisation of railway networks and identified in the ERTMS Longer Term Perspective Report of the Agency required the update of the TSI on CCS subsystems. These new technologies requested by the railway sector, as well, were the Future Railway Mobile Communication System (FRMCS), automated train operations, advanced train positioning, and digital automatic couplers.
- (7) Therefore, this revision delivers both full specifications for automated train operations (Grade of Automation 2) and the interface to FRMCS, which were available. Full FRMCS, advanced train positioning, and digital automatic coupler specifications were not yet available due to the need for further development.

⁽¹⁾ OJ L 138, 26.5.2016, p. 44.

⁽²⁾ Commission Regulation (EU) 2016/919 of 27 May 2016 on the technical specification for interoperability relating to the 'control-command and signalling' subsystems of the rail system in the European Union (OJ L 158, 15.6.2016, p. 1).

⁽³⁾ 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).

⁽⁴⁾ Regulation (EU) 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).

- (8) In order to keep pace with technological progress, innovative solutions may be required, which do not comply with the specifications set out in the Annex I or for which the assessment methods set out in the Annex I cannot be applied. Such innovative solutions, especially those coming from the Europe's Rail Joint Undertaking (ERJU), should be promoted and their voluntary implementation should, under certain conditions, be allowed. For this purpose it is appropriate to provide a process harmonised for all Member States to validate such innovative solutions for voluntary implementation.
- (9) Commission Implementing Decision (EU) 2021/1730 ⁽⁵⁾ establishes the harmonised conditions for the availability and efficient use of radio spectrum for the Railway Mobile Radio (RMR). Member States are required to use these frequencies in order to plan the deployment of FRMCS.
- (10) The European Train Control System (ETCS) is the main signalling and control-command system used as part of the ERTMS. To adapt it to the updated needs of the rail sector, two new system versions of the ETCS (system version 2.2 and system version 3.0) are introduced in the latest update of ETCS, i.e. Baseline 4 and included in this revision. System version 2.2 is fully backwards compatible. System version 3.0 is not compatible because it includes functionalities, which are required on-board when implemented track-side.
- (11) In order to achieve further harmonisation of the ERTMS, this revision provides a new coherent transition and migration regime, ensures a robust procedure for correcting errors in specifications, reduces the scope for partial fulfilment, and phases out the need for compatibility checks.
- (12) The new transition and migration regime has been developed to provide a consistent framework for the deployment of new functionalities in relation to the CCS TSI on the rail network. The aim of this regime is to ensure a balance between the interests of railway stakeholders, in particular infrastructure managers and railway undertakings.
- (13) Considering the fact that the ERTMS is a complex software-based system requiring active specification maintenance, the Agency in its capacity of system authority for the ERTMS should support the correction of errors in ERTMS specifications. To ensure safety and interoperability, the procedure to implement these error corrections into the interoperability constituents and CCS subsystems should be specified.
- (14) Full TSI compliance ensures the achievement of the Single European Rail Area from a technical point of view. It ensures interoperable vehicles and increases their potential reuse value. Partial fulfilment was initially perceived as necessary to take into account some national constraints, but should be reduced significantly in scope in this regulation to reach the goal above.
- (15) Even a successful certification process cannot always prevent one of the subsystems repeatedly failing to function or perform as intended under certain conditions when an on-board CCS subsystem interacts with a trackside CCS subsystem. Therefore, checks should be carried out to demonstrate the technical compatibility of the CCS subsystems in the area of use for a vehicle.
- (16) These checks should be considered a temporary measure to increase confidence in the technical compatibility between the subsystems. The principles applicable to those checks should be transparent and prepare the ground for further harmonisation. The possibility of conducting those checks in a laboratory representing the trackside configuration to be made available by the infrastructure manager should be prioritised. To reduce the checks to a minimum, each Member State should promote harmonisation within its infrastructure.

⁽⁵⁾ Commission Implementing Decision (EU) 2021/1730 of 28 September 2021 on the harmonised use of the paired frequency bands 874,4-880,0 MHz and 919,4-925,0 MHz and of the unpaired frequency band 1 900-1 910 MHz for Railway Mobile Radio (OJ L 346, 30.9.2021, p. 1).

- (17) Consideration should be given to the steps required to increase, in the shortest possible time, confidence in the technical compatibility of on-board units with different trackside implementations of ERTMS and to reduce and eliminate the tests or checks needed to prove the technical compatibility of on-board units with different trackside implementations of ERTMS. Therefore, the Agency should assess the underlying technical divergences and decide on the necessary steps to eliminate the need for tests or checks to prove the technical compatibility of on-board units with different trackside implementations.
- (18) Analysing train detection systems aims at improving the interoperability and harmonisation of the European railway system, where economically feasible. Part of this analysis is the transparent identification of non TSI compliant train detection systems.
- (19) Regulation (EU) 2016/919 should therefore be repealed.
- (20) The measures provided for in this Regulation are in accordance with the opinion of the Committee established in accordance with Article 51(1) of Directive (EU) 2016/797,

HAS ADOPTED THIS REGULATION:

Article 1

Subject matter

This Regulation establishes the technical specification for interoperability (TSI) relating to the control-command and signalling (CCS) subsystems of the rail system in the Union.

Article 2

Scope

- 1. The TSI shall apply to new trackside CCS and on-board CCS subsystems of the rail system as defined in points 2.3 and 2.4 of Annex II to Directive (EU) 2016/797. Point 7.2.2 of Annex I to this Regulation shall apply to all changes to an existing on-board CCS subsystem.
- 2. The TSI shall not apply to existing trackside CCS and on-board CCS subsystems of the rail system already placed in service on all or part of any Member State's railway network by 28 September 2023.
- 3. However, the TSI shall apply to existing trackside and on-board CCS subsystems that have one of the following characteristics:
 - (a) the subsystem is subject to renewal or upgrading in accordance with Chapter 7 of Annex I to this Regulation;
 - (b) the area of use of a vehicle is extended in accordance with Article 54(3) of Directive (EU) 2016/797, in which case point 7.4.2.3 of the Annex I to this Regulation shall apply, unless no installation of ETCS is indicated in RINF for the subsequent five years in the new area of use and the area of use is limited to two Member States;
 - (c) the subsystem is subject to the specification maintenance requirements set out in point 7.2.10 of Annex I to this Regulation.
- 4. The technical and geographical scope of the TSI is set out in points 1.1 and 1.2 of Annex I.

Article 3

Open points

- 1. With regard to the aspects listed as 'open points' in Appendix F of Annex I to this Regulation, the conditions to be complied with for verifying the essential requirements set out in Annex III to Directive (EU) 2016/797 may be laid down by national rules in force in a Member State.

2. By 28 March 2024, each Member State shall submit to the Agency in accordance with the procedure under Article 25 of Regulation (EU) 2016/796 the following information, unless such information has already been communicated to either the Agency or Commission pursuant to previous version of this Regulation:

- (a) the national rules referred to in paragraph 1;
- (b) the conformity assessment and verification procedures to be carried out to apply the national rules referred to in paragraph 1;
- (c) the bodies designated to carry out the conformity assessment and verification procedures with respect to the open points.

Article 4

Specific cases

1. With regard to specific cases listed in point 7.7.2 of Annex I to this Regulation, the conditions to be met for the verification of the essential requirements set out in Annex III to Directive (EU) 2016/797 shall be those laid down in point 7.7.2 of Annex I or if justified, may be laid down by national rules in force in a Member State.

2. By 28 March 2024, each Member State shall submit to the Agency in accordance with the procedure under Article 25 of Regulation (EU) 2016/796 the following information, unless such information has already been communicated to either the Agency or Commission pursuant to previous version of this Regulation:

- (a) the national rules referred to in paragraph 1;
- (b) the conformity assessment and verification procedures to be carried out to apply the national rules referred to in paragraph 1;
- (c) the bodies designated to carry out the conformity assessment and verification procedures with respect to the specific cases.

Article 5

Implementation

1. Manufacturers and applicants for authorisation for placing in service of infrastructure or for placing on the market of vehicles shall ensure that subsystems referred to in Article 2 of this Regulation and intended to be used on the networks referred to in Article 2(1) of Directive (EU) 2016/797 comply with the TSI set out in Annex I of this Regulation.

2. Manufacturers and infrastructure managers, railway undertakings, or any other entity responsible for the rail vehicle or infrastructure, shall ensure that subsystems referred to in Article 2 comply with the specification maintenance requirements set out in point 7.2.10 of Annex I.

3. Notified bodies shall ensure that certificates based on Chapter 6 of Annex I of this Regulation are issued within their responsibilities for interoperability constituents or subsystems in accordance with Articles 10 or 15 of Directive (EU) 2016/797, respectively.

4. Member States shall notify their national implementation plan drawn up in accordance with point 7.4.4 of the Annex I to the Commission and the Agency by 15 June 2024.

Article 6

Availability of ETCS, ATO and FRMCS on-board products

1. The Agency shall prepare by 1 January 2025 a report to the Commission on

- (a) the availability of ETCS on-board products compliant with ETCS Baseline 4 specifications;
- (b) the availability of ATO on-board products compliant with ATO Baseline 1 specifications;

(c) the availability of FRMCS on-board prototypes based on draft release specifications.

2. The Commission shall present its report to the Committee referred to in Article 51 of Directive (EU) 2016/797 and take appropriate measures.

Article 7

Class-B systems

1. Member States shall ensure that the functionality, performance, and interfaces of the Class-B systems remain as specified in Annex II to this regulation, unless modifications are needed to mitigate safety-critical errors in those systems.

2. Member States shall notify the Commission and the Agency about the modifications referred to in paragraph 1 and request a technical opinion of compliance from the Agency based on Article 10(1) and (3) of the Regulation (EU) 2016/796.

Article 8

Union funded projects

1. Financial support from Union funds for CCS related expenditure is limited to eligible costs directly related to the installation or upgrade of track-side and on-board ERTMS or related to the preparation of a future implementation of ERTMS, including train detection systems compliant with this regulation and interlockings.

Financial support from Union funds may also cover on-going and future projects implementing the Recovery and Resilience Plans and ERTMS National Implementation Plans available at the entry into force of this regulation.

2. Vehicles subject to paragraph 1 that require Class B on-board systems to circulate on routes only equipped with Class-B systems may be granted Union funds, if using options indicated in the Annex I point 4.2.6.1 (1), (2), and (3).

Article 9

Error corrections

1. Pursuant to its role as system authority for ERTMS under Article 28 of Regulation (EU) 2016/796, the Agency shall analyse all requests made to it for changes to the system. It shall prioritise change requests that it categorises as errors that potentially prevent the normal service of the rail system.

2. The Agency shall regularly provide a maintenance release of the specifications at the request of the Commission according to the specification maintenance procedure set out in Annex I to this Regulation.

Article 10

Future Railway Mobile Communication System

Where the Agency has issued an opinion with the draft release specifications relating to the Future Railway Mobile Communication System (FRMCS), manufacturers and early implementers shall use those specifications in their pilots and shall inform the Commission and the Agency about each pilot at its beginning, and keep them informed of the subsequent progress of those pilots.

*Article 11***Innovative solutions**

1. For innovative solutions that technological progress requires and have been approved by the System Pillar of the Europe's Rail Joint Undertaking (ERJU), the ERJU shall submit innovative solutions to the Commission together with information on how these solutions deviate from or supplement the relevant provisions of this TSI.
2. The Commission shall request an opinion of the Agency on the innovative solution pursuant to Article 6 of Directive (EU) 2016/797.
3. The Agency, as system authority, shall deliver an opinion on the innovative solution. The Commission shall analyse the Agency's opinion and may ask the ERJU to provide the appropriate functional and interface specifications and the assessment method, all of which need to be included in the TSI in order to make possible the use of the innovative solution.
4. The Commission may ask the Agency to integrate the specifications and assessment methods in an ERA recommendation pursuant to Article 5 of Directive (EU) 2016/797. Pending the review of the TSI, the Commission may ask the Agency to issue an opinion with the draft release specifications and the assessment method of the innovative solution.

*Article 12***ERTMS compatibility and future revision**

By 28 March 2024, infrastructure managers shall submit to the Agency the definition of the checks for the compatibility of vehicles with the infrastructure regarding the ETCS system and the radio system for the existing lines equipped with ERTMS or GSM-R in operation. Member States shall repeal the related national rules by the same date. By 1 June 2024, the Agency shall provide the Commission with its analysis on how to phase out the checks to prove the technical compatibility of on-board units with different ERTMS trackside implementations and to achieve harmonisation of engineering and operational rules for the Single European Rail Area.

*Article 13***Train-detection compatibility**

1. By 31 December 2024, Member States whose infrastructure managers operate train-detection systems not compliant with this regulation must request a specific case and shall notify the Agency of these systems by informing it about:
 - (a) the interference current limits for track circuits including the evaluation methods and vehicle impedance in accordance with clause 3.2.2 of ERA/ERTMS/033281 rev 5.0;
 - (b) field limits for axle counters in X, Y, Z axis including the evaluation methods in accordance with clause 3.2.1 of ERA/ERTMS/033281 rev 5.0;
 - (c) the specific cases for train detection systems not compliant with this regulation using the template referred in Annex B.1 of ERA/ERTMS 033281 rev 5.0.
2. By 31 December 2024, Infrastructure Managers shall inform the Agency about the required interference current limits/ frequencies from the frequency management for TSI-compliant train-detection systems as specified in sections 3.2.2.1 to 3.2.2.6 ERA/ERTMS/033281 rev 5.0 for their relevant networks. These limits/ frequencies shall be published on the Agency's website.
3. Infrastructure Managers shall update accordingly the values of the relevant parameters of the Register of Infrastructure.
4. With the publication of Specific Cases under Article 13(1), latest by 31 December 2025, Member States shall repeal all national rules concerning compatibility with train-detection systems, except for cases covered by Article 13(2)(f) of Directive (EU) 2016/797.

5. By 31 December 2027, the train detection systems specific cases and the corresponding end dates shall be re-examined, with the aim to improve the interoperability and harmonisation of the European railway system, with respect to the economic feasibility.

Article 14

Repeal and transitional provisions

Regulation (EU) 2016/919 is repealed.

It shall however continue to apply to subsystems authorised in accordance with that Regulation that do not fall under the scope of this Regulation pursuant to Article 2.

The respective chapters/tables/documents of the repealed Regulation shall continue to apply to subsystems and interoperability constituents to the extent and for as long as a transition regime is provided for these chapters/tables/documents in accordance with Appendix B of Annex I.

Infrastructure Managers continue to be bound by the obligation to notify the definition of the checks for the compatibility of vehicles with the infrastructure regarding the ETCS system and the radio system for the existing lines with ERTMS or GSM-R in operation pursuant to point 6.1.2.4 of the Annex to Regulation (EU) 2016/919 by 16 January 2020. In respect to projects started after 16 January 2020 and before the entry into force of this regulation, infrastructure managers shall notify this information within 6 months after the entry into force of this regulation.

Article 15

Entry into force

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

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1. INTRODUCTION

1.1. Technical scope

This TSI concerns the Control Command and Signalling On-Board Subsystem and the Control-Command and Signalling Trackside Subsystem.

This TSI is applicable to control-command and signalling trackside Subsystems of the rail network defined in the point 1.2 (Geographical Scope) of this TSI and to the control-command and signalling on-board subsystems of vehicles which are (or are intended to be) operated on it. These vehicles are of one of the following types (as defined in point 2 of Annex I to Directive (EU) 2016/797):

- (1) locomotives and passenger rolling stock, including thermal or electric traction units, self-propelling thermal or electric passenger trains, and passenger coach, if equipped with a driving cab;
- (2) special vehicles, such as on-track machines, if equipped with a driving cab and intended to be used in running mode on its own wheels.

This list of vehicles shall include those which are specially designed to operate on the different types of high-speed lines described in point 1.2 (Geographical Scope).

1.2. Geographical Scope

The geographical scope of this TSI is the network of the whole rail system, as described in point 1 of Annex I to Directive (EU) 2016/797 and excludes the infrastructure cases referred to in Article 1(3) and (4) of Directive (EU) 2016/797.

The TSI shall apply to networks with 1 435 mm, 1 520 mm, 1 524 mm, 1 600 mm and 1 668 mm track gauges. However, it shall not apply to short border crossing lines with 1 520 mm track gauges that are connected to the network of third countries.

1.3. Content of this TSI

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

- (1) indicates its intended scope – Chapter 2 (Subsystem definition and scope);
- (2) lays down essential requirements for the Control-Command and Signalling Subsystems and their interfaces vis-à-vis other subsystems – Chapter 3 (The Essential Requirements for the Control-command and signalling Subsystems);
- (3) lays down the functional and technical specifications to be met by the Subsystems and their interfaces vis-à-vis other subsystems – Chapter 4 (Characterisation of the Subsystems);
- (4) determines the interoperability constituents and interfaces which must be covered by European specifications, including European standards, and which are necessary to achieve interoperability within the Union rail system – Chapter 5 (Interoperability Constituents);
- (5) states, in each case under consideration, which procedures are to be used to assess the conformity or the suitability for use of the interoperability constituents and for the 'EC' verification of the subsystems – Chapter 6 (Assessing the conformity and/or suitability for use of the constituents and verifying the subsystems);
- (6) indicates the strategy for implementing this TSI – Chapter 7 (Implementing the TSI Control-Command and Signalling);
- (7) indicates the professional competences and health and safety conditions at work required for the staff operating and maintaining these subsystems and implementing the TSI – Chapter 4 (Characterisation of the Subsystems);
- (8) indicates the provisions applicable to the existing subsystems, in particular in the event of upgrading and renewal and, in such cases, the modification work which requires an application for a new authorisation for the vehicle or trackside subsystem – Chapter 7 (Implementing the TSI Control-Command and Signalling);

- (9) indicates the parameters of the subsystems to be checked by the railway undertaking and the procedures to be applied to check those parameters after the delivery of the vehicle authorisation for placing on the market and before the first use of the vehicle to ensure compatibility between vehicles and the routes on which they are to be operated – Chapter 4 (Characterisation of the Subsystems).

In accordance with Article 4(5) of Directive (EU) 2016/797, provisions for specific cases are indicated in Chapter 7 (Implementing the TSI Control-Command and Signalling).

This TSI also sets out, in Chapter 4 (Characterisation of the Subsystems), the operating and maintenance rules which specifically apply to the scope indicated in paragraphs 1.1 and 1.2 above.

2. SUBSYSTEM DEFINITION AND SCOPE

2.1. Introduction

The Control-Command and Signalling Subsystems are defined in Annex II to Directive (EU) 2016/797 as:

- (1) Trackside control-command and signalling as ‘all the trackside equipment required to ensure safety and to command and control movements of trains authorised to travel on the network.’;
- (2) On-board control-command and signalling as ‘all the on-board equipment required to ensure safety and to command and control movements of trains authorised to travel on the network’.

The features of the Control-Command and Signalling Subsystems are:

- (1) the functions that are essential for the safe control of railway traffic, and that are essential for its operation, including those required for degraded modes ⁽¹⁾;
- (2) the interfaces;
- (3) the level of performance required to meet the essential requirements.

2.2. Scope

The Control-Command and Signalling Subsystem TSI specifies only those requirements which are necessary to assure the interoperability of the Union rail system and the compliance with the essential requirements ⁽²⁾.

The Control-Command and Signalling Subsystems include the following parts:

- (1) train protection;
- (2) voice radio communication;
- (3) data radio communication;
- (4) train detection;
- (5) automated train operation ⁽³⁾.

ERTMS (European Rail Traffic Management System) is composed of train protection (ETCS), radio communication (RMR) and automated train operation (ATO).

The Class A train protection system is ETCS (European Train Control System) ⁽⁴⁾ whilst the Class A radio system is RMR (Railway Mobile Radio system). In this TSI, RMR comprises two radio class A systems: GSM-R and FRMCS (Future Railway Mobile Communication System) that may be implemented both at the same time or each of them independently ⁽⁵⁾.

⁽¹⁾ Degraded modes are modes of operation designed to deal with faults. They have been taken into account when designing the Control-Command and Signalling Subsystems.

⁽²⁾ Currently the CCS TSI does not specify any interoperability requirement for the interlockings, level crossings and certain other elements of the CCS.

⁽³⁾ In this document the term ATO is referring to the ERTMS/ATO specifications which is the Class A automated train operation.

⁽⁴⁾ In some documents referenced in this TSI the term ‘ERTMS’ (European Rail Traffic Management System) is used to indicate a system including ETCS, RMR and ATO and ‘ETCS’ is indicated as ‘ERTMS/ETCS’.

⁽⁵⁾ When referring to both Class A systems, the term RMR system is used. When referring to specific one of these Class A systems, the terms GSM-R or FRMCS are used.

For train detection, this TSI specifies only the requirements for the interface with other subsystems.

The list of Class B systems is established in the Annex II to this Regulation.

The requirements for the Control-Command and Signalling On-board Subsystem are specified in relation to Class A radio mobiles, train protection and automated train operation.

The requirements for the Control-Command and Signalling Trackside Subsystem are specified in relation to:

- (1) the Class A radio network;
- (2) the Class A train protection;
- (3) the Class A automated train operation;
- (4) the interface requirements for train detection systems, to ensure their compatibility with rolling stock.

All Control-Command and Signalling Subsystems, even where not specified in this TSI, shall be assessed according with Commission Implementing Regulation (EU) No 402/2013 ⁽⁶⁾.

2.3. Trackside Application Levels (ETCS)

The interfaces specified by this TSI define the means of data transmission to, and (where appropriate) from trains. The ETCS specifications referenced by this TSI provide application levels from which a trackside implementation may choose the means of transmission that meet its requirements.

This TSI defines the requirements for all application levels. For the technical definition of the ETCS application levels see Appendix A, Table A.1, 4.1 c.

3. THE ESSENTIAL REQUIREMENTS FOR THE CONTROL-COMMAND AND SIGNALLING SUBSYSTEMS

3.1. General

Directive (EU) 2016/797 requires that the subsystems and the interoperability constituents including interfaces meet the essential requirements set out in general terms in Annex III to that Directive.

The essential requirements are:

- (1) Safety;
- (2) Reliability and Availability;
- (3) Health;
- (4) Environmental Protection;
- (5) Technical compatibility;
- (6) Accessibility.

The essential requirements for Class A systems are described in Table 3.1.

The requirements for Class B systems are the responsibility of the relevant Member State.

The following table indicates the essential requirements, as set out and numbered in Annex III to Directive (EU) 2016/797, taken into account by the basic parameters defined in Chapter 4 of this TSI.

⁽⁶⁾ Commission Implementing Regulation (EU) No 402/2013 of 30 April 2013 on the common safety method for risk evaluation and assessment and repealing Regulation (EC) No 352/2009 (OJ L 121, 3.5.2013, p. 8).

Table 3.1.

Relation between Essential Requirements and Basic Parameters

Basic Parameter Point	Basic Parameter Title	Safety	Reliability-Availability	Health	Environmental protection	Technical compatibility
4.2.1	Control-Command and Signalling reliability, availability and safety characteristics relevant to interoperability	1.1.1 1.1.3 2.3.1	1.2			
4.2.2	On-Board ETCS functionality	1.1.1				1.5 2.3.2
4.2.3	Trackside ETCS functionality	1.1.1				1.5 2.3.2
4.2.4	Mobile communication functions for railways RMR				1.4.3	1.5 2.3.2
4.2.5	RMR, ETCS and ATO air gap interfaces					1.5 2.3.2
4.2.6	On-Board Interfaces Internal to Control-Command and Signalling					1.5 2.3.2
4.2.7	Trackside Interfaces Internal to Control-Command and Signalling					1.5 2.3.2
4.2.8	Key Management					1.5 2.3.2
4.2.9	ETCS-ID Management					1.5 2.3.2
4.2.10	Trackside Train Detection Systems					1.5 2.3.2
4.2.11	Electromagnetic Compatibility between Rolling Stock and Control-Command and Signalling trackside equipment				1.4.3	1.5 2.3.2
4.2.12	ETCS DMI (Driver-Machine Interface)					1.5 2.3.2
4.2.13	RMR DMI (Driver-Machine Interface)					1.5 2.3.2
4.2.14	Interface to Data Recording for Regulatory Purposes	1.1.1				1.5 2.3.2
4.2.15	Trackside Control-Command and Signalling objects					1.5 2.3.2
4.2.16	Construction of equipment used in CCS subsystems	1.1.3 1.1.4		1.3.2	1.4.2	
4.2.17	ETCS and Radio System Compatibility					1.5 2.3.2
4.2.18	On-Board ATO functionality					1.5 2.3.2

4.2.19	Trackside ATO functionality					1.5 2.3.2
4.2.20	Technical documentation for Maintenance	1.1.5 1.1.1				

3.2. **Specific Aspects of the Control-Command and Signalling Subsystems**

3.2.1. *Safety*

Every Control-Command and Signalling Subsystems project shall take the measures necessary to ensure that the level of risk of an error occurring within the scope of the Control-Command and Signalling Subsystems, is not higher than the objective for the service.

To ensure that the measures taken to achieve safety do not jeopardise interoperability, the requirements of the basic parameter defined in point 4.2.1 (Control-Command and Signalling reliability, availability and safety characteristics relevant to interoperability) shall be respected.

For the ETCS Class A system the safety objective is apportioned between the Control-Command and Signalling On-board and Trackside Subsystems. The detailed requirements are specified in the basic parameter defined in point 4.2.1 (Control-Command and Signalling reliability, availability and safety characteristics relevant to interoperability). This safety requirement shall be met together with the availability requirements as defined in point 3.2.2 (Reliability and Availability).

3.2.2. *Reliability and Availability*

For the Class A system, the reliability and availability objectives are apportioned between the Control-Command and Signalling On-board and Trackside Subsystems. The detailed requirements are specified in the basic parameter defined in point 4.2.1 (Control-Command and Signalling reliability, availability and safety characteristics relevant to interoperability).

The level of risk caused by age and wear of constituents used within the subsystem shall be monitored. The requirements for maintenance stated in point 4.5 shall be respected.

3.2.3. *Technical Compatibility*

Technical compatibility includes the functions, interfaces and performances required to achieve interoperability.

The requirements of technical compatibility are subdivided in the following three categories:

- (1) The first category sets out the general engineering requirements for interoperability namely environmental conditions, internal electromagnetic compatibility (EMC) within the railway boundaries, and installation. These compatibility requirements are defined in this chapter.
- (2) The second category describes how the Control Command and Signalling Subsystems have to be applied technically and what functions they have to perform to ensure interoperability. This category is defined in Chapter 4.
- (3) The third category describes how the Control Command and Signalling Subsystems are interfaced with the Operation and Traffic Management Subsystem in order that operational interoperability is achieved. This category is described in Chapter 4.

3.2.3.1. *Engineering Compatibility*

3.2.3.1.1. *Physical environmental conditions*

Control Command and Signalling equipment shall be capable of operating under the climatic and physical conditions which characterise the area in which the relevant part of the Union rail system is located.

The requirements of basic parameter 4.2.16 (Construction of equipment used in CCS subsystems) shall be respected.

3.2.3.1.2. *Railway Internal Electromagnetic Compatibility*

The basic parameter related to electromagnetic compatibility between Rolling Stock and Control-Command and Signalling trackside equipment is described in point 4.2.11 (Electromagnetic Compatibility between Rolling Stock and Control-Command and Signalling trackside equipment).

3.3. **Essential requirements not directly covered by this TSI**

3.3.1. *Safety*

The essential requirement 1.1.2 in Annex III to Directive (EU) 2016/797 is not within the scope of this TSI.

The essential requirement 1.1.4 in Annex III to Directive (EU) 2016/797 for the Control-Command Signalling trackside subsystems is covered by the applicable European and national provisions in force.

3.3.2. *Health*

In accordance with Union legislation and with national legislation that is compatible with the Union legislation, care shall be taken to ensure that the materials used and the design of the Control-Command and Signalling Subsystems do not constitute a health hazard to persons having access to them. This is in relation with the essential requirement 1.3.1 in Annex III to Directive (EU) 2016/797. The essential requirement 1.3.2 in Annex III to Directive (EU) 2016/797 for the Control-Command Signalling trackside subsystems is covered by the applicable European and national provisions in force.

3.3.3. *Environmental Protection*

In accordance with Union legislation and with national legislation that is compatible with Union legislation:

- (1) the Control-Command and Signalling equipment, if subjected to excessive heat or fire, shall not exceed limits for the emission of fumes or gases which are harmful to the environment. This is in relation with the essential requirement 1.4.2 in Annex III to Directive (EU) 2016/797;
- (2) the Control-Command and Signalling equipment shall not contain substances which may abnormally contaminate the environment during their normal use. This is in relation with the essential requirement 1.4.1 in Annex III to Directive (EU) 2016/797;
- (3) the Control-Command and Signalling equipment shall be subject to the Union legislation in force controlling the limits to the emission of and the susceptibility to electromagnetic interference along the boundaries of railway property. This is in relation with the essential requirement 1.4.3 in Annex III to Directive (EU) 2016/797;
- (4) the Control-Command and Signalling equipment shall comply with existing regulations on noise pollution. This is in relation with the essential requirement 1.4.4 in Annex III to Directive (EU) 2016/797;
- (5) the Control-Command and Signalling equipment shall not give rise to any inadmissible level of vibration which could jeopardise the integrity of the infrastructure (when the infrastructure is in the correct state of maintenance). This is in relation with the essential requirement 1.4.5 in Annex III to Directive (EU) 2016/797.

3.3.4. *Technical Compatibility*

3.3.4.1. *Railway Internal Electromagnetic Compatibility*

In accordance with Union legislation and with national legislation that is compatible with the Union legislation, the Control Command and Signalling equipment shall neither interfere with nor be interfered with by other control-command and signalling equipment or other subsystems.

3.3.5. *Accessibility*

The essential requirement 1.6 in Annex III to Directive (EU) 2016/797 is not within the scope of this TSI.

4. CHARACTERISATION OF THE SUBSYSTEMS

4.1. **Introduction**

4.1.1. *Basic parameters*

In accordance with the relevant essential requirements, the Control-Command and Signalling Subsystems are characterised by the following basic parameters:

- (1) Control-Command and Signalling reliability, availability and safety characteristics relevant to interoperability (point 4.2.1);
- (2) On-Board ETCS functionality (point 4.2.2);
- (3) Trackside ETCS functionality (point 4.2.3);
- (4) Mobile communication functions for railways RMR (point 4.2.4);
- (5) RMR, ETCS and ATO air gap interfaces (point 4.2.5);
- (6) On-Board Interfaces Internal to Control-Command and Signalling (point 4.2.6);
- (7) Trackside Interfaces Internal to Control-Command and Signalling (point 4.2.7);
- (8) Key Management (point 4.2.8);
- (9) ETCS-ID Management (point 4.2.9);
- (10) Trackside Train Detection Systems (point 4.2.10);
- (11) Electromagnetic Compatibility between Rolling Stock and Control-Command and Signalling trackside equipment (point 4.2.11);
- (12) ETCS DMI (Driver-Machine Interface) (point 4.2.12);
- (13) RMR DMI (Driver-Machine Interface) (point 4.2.13);
- (14) Interface to Data Recording for Regulatory Purposes (point 4.2.14);
- (15) Trackside Control-Command and Signalling objects (point 4.2.15);
- (16) Construction of equipment used in CCS subsystems (point 4.2.16);
- (17) ETCS and Radio System Compatibility (point 4.2.17);
- (18) On-Board ATO functionality (point 4.2.18);
- (19) Trackside ATO functionality (point 4.2.19);
- (20) Technical documentation for Maintenance (point 4.2.20).

4.1.2. *Overview of the requirements*

All requirements in point 4.2 (Functional and technical specifications of the Subsystems) related to these basic parameters shall be applied to the Class A system.

Requirements for Class B systems and for STMs (which enable the Class A On-board system to operate on Class B infrastructure) are the responsibility of the relevant Member State.

This TSI is based on the principles of enabling the Control-Command and Signalling Trackside Subsystem to be compatible with TSI-compliant Control-Command and Signalling On-board Subsystems. To achieve this goal:

- (1) functions, interfaces and performance of the Control-Command and Signalling On-board Subsystem are standardised, ensuring that every train will react in a predictable way to data received from trackside;
- (2) for the Control-Command and Signalling Trackside Subsystem, track-to-train and train-to-track communication are fully standardised in this TSI. The specifications referenced in the points below allow Control-Command and Signalling trackside functionality to be applied in a flexible way, so that it can be optimally integrated into the railway system. This flexibility shall be exploited without limiting the movement of vehicles with TSI-compliant on-board subsystems.

The Control-Command and Signalling functions are classified in categories indicating whether they are optional or mandatory. The categories are defined in point 7.2.9 of this TSI and in specifications referred to in Appendix A and these texts also state how the functions are classified.

Appendix A, Table A.1, 4.1 c provides the Glossary of ETCS and ATO terms and definitions, which are used in the specifications referred to in Appendix A.

4.1.3. *Parts of Control-command and Signalling Subsystems*

According to point 2.2 (Scope) the Control-Command and Signalling Subsystems can be subdivided in parts.

The following table indicates which basic parameters are relevant for each subsystem and for each part.

Table 4.1.

Parts of Control Command and Signalling Subsystems

Subsystem	Part	Basic parameters
Control-Command and Signalling On-board	Train protection	4.2.1, 4.2.2, 4.2.5, 4.2.6, 4.2.8, 4.2.9, 4.2.12, 4.2.14, 4.2.16, 4.2.17, 4.2.20
	Voice radio communication	4.2.1.2, 4.2.4.1, 4.2.4.2, 4.2.5.1, 4.2.13, 4.2.16, 4.2.17, 4.2.20
	Data radio communication	4.2.1.2, 4.2.4.1, 4.2.4.3, 4.2.5.1, 4.2.6.2, 4.2.16, 4.2.17, 4.2.20
	Automated Train Operation	4.2.1.2, 4.2.5.1, 4.2.6, 4.2.12, 4.2.16, 4.2.18, 4.2.20
Control-Command and Signalling Trackside	Train protection	4.2.1, 4.2.3, 4.2.5, 4.2.7, 4.2.8, 4.2.9, 4.2.15, 4.2.16, 4.2.17, 4.2.20
	Voice radio communication	4.2.1.2, 4.2.4, 4.2.5.1, 4.2.7, 4.2.16, 4.2.17, 4.2.20
	Data radio communication	4.2.1.2, 4.2.4, 4.2.5.1, 4.2.7, 4.2.16, 4.2.17, 4.2.20
	Train detection	4.2.10, 4.2.11
	Automated Train Operation	4.2.1.2, 4.2.5.1, 4.2.7, 4.2.16, 4.2.19, 4.2.20

4.2. **Functional and technical specifications of the Subsystems**

4.2.1. *Control-Command and Signalling reliability, availability and safety characteristics relevant to interoperability*

This basic parameter describes the requirements for the Control-Command and Signalling On-board Subsystem and Trackside subsystem with reference to point 3.2.1 (Safety) and point 3.2.2 (Reliability and Availability).

In order to achieve interoperability, when implementing Control-Command and Signalling On-board and Trackside subsystems the following provisions shall be respected:

- (1) The design, implementation and use of a Control-Command and Signalling On-board or Trackside subsystem shall not export any requirements:
 - (a) across the interface between Control-Command and Signalling On-board and Trackside subsystems in addition to the requirements specified in this TSI;
 - (b) to any other subsystem in addition to the requirements specified in the corresponding TSIs.
- (2) The requirements set out in points 4.2.1.1 and 4.2.1.2 below shall be respected.

4.2.1.1. **Safety**

The Control-Command and Signalling On-board and Trackside subsystems shall respect the requirements for ETCS equipment and installations stated in this TSI.

For the hazard 'exceeding speed and/or distance limits advised to ETCS' the tolerable hazard rate (THR) shall be 10^{-9} h^{-1} for random failures of the on-board ETCS and 10^{-9} h^{-1} for random failures of the trackside ETCS. See Appendix A, Table A 1, 4.2.1 a.

To achieve interoperability, the on-board ETCS shall fully respect all requirements specified in Appendix A, Table A 1, 4.2.1. Nevertheless, less stringent safety requirements are acceptable for trackside ETCS provided that, in combination with TSI-compliant Control-Command and Signalling On-board subsystems, the safety level for the service is met.

For the ETCS Class A system:

- (1) the changes made by railway undertakings and infrastructure managers to implement preventive or corrective maintenance actions shall be managed in compliance with the processes and procedures of their safety management system according to Article 9 of Directive (EU) 2016/798 of the European Parliament and of the Council (Safety Directive) ⁽⁷⁾;
- (2) other types of changes made by railway undertaking and infrastructure managers (e.g. changes of the design or implementation of ETCS), as well as the changes made by other actors (e.g. manufacturers or other suppliers) shall be managed according to the risk management process set out in Annex I to the Implementing Regulation (EU) No 402/2013, as referred to in Article 6(1)(a) of Directive (EU) 2016/798.

Additionally, the correct application of the risk management process as set out in Annex I to Implementing Regulation (EU) No 402/2013, as well as the appropriateness of the results from this application, shall be independently assessed by a CSM assessment body according to Article 6 of that Regulation. There shall not be restrictions with respect to the type A, B or C of independence of the CSM assessment body permitted by Implementing Regulation (EU) No 402/2013. The appointed CSM assessment body shall be accredited or recognised according to the requirements in Annex II to Implementing Regulation (EU) No 402/2013 in the field of 'Control-Command and Signalling' sub-system, as listed in item 5 'classification' of ERADIS database entry for Assessment Bodies.

The accreditation, or recognition, in the field of 'Control-Command and Signalling' sub-system, covers the CSM assessment body competence to independently assess the 'safe integration' at the level of an ETCS subsystem, or an ETCS Interoperability Constituent. This includes the competence for:

- (1) the assessment of safe integration of all internal components and interfaces that form the architecture of the ETCS subsystem or ETCS Interoperability Constituent;
- (2) the assessment of safe integration of all external interfaces of the ETCS subsystem, or ETCS Interoperability Constituent, within its direct physical, functional, environmental, operational and maintenance context.

The application of the standards as referred to in Appendix A, Table A 3 is an appropriate means to fully comply to the risk management process as set out in Annex I to the Implementing Regulation (EU) No 402/2013 for design, implementation, production, installation and validation (incl. Safety acceptance) of interoperability constituents and subsystems. When different standards from the ones referred to in Appendix A, Table A 3 are applied, at least equivalence shall be proven.

Whenever for an ETCS subsystem or an ETCS Interoperability Constituent the specifications as referred to in Appendix A, Table A 3 are used as an appropriate means to fully comply to the risk management process as set out in Annex I to the Implementing Regulation (EU) No 402/2013, in order to avoid unnecessary duplication of independent assessment work, the independent safety assessment activities that are required by the specifications referred to in Appendix A, Table A 3 shall be carried out by a CSM assessment body accredited or recognized as specified in the point above instead of a CENELEC independent safety assessor.

4.2.1.2. Availability/Reliability

This point refers to the occurrence of failure modes not causing safety hazards but creating degraded situations, the management of which could decrease the overall safety of the system.

In the context of this parameter, 'failure' means the termination of the ability of an item to perform a required function with the required performance and 'failure mode' means the effect by which the failure is observed.

⁽⁷⁾ Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety (OJ L 138, 26.5.2016, p. 102).

To ensure that the relevant infrastructure managers and railway undertaking are given all the information they need to define appropriate procedures for managing degraded situations, the technical file accompanying the EC declaration of verification for an on-board or trackside CCS subsystem shall contain the calculated availability/reliability values related to failure modes having an impact on the capability of the CCS subsystem to supervise the safe movement of one or more vehicles or to establish radio voice communication between traffic control and the train drivers.

Compliance with the following calculated values shall be ensured:

- (1) Mean time of hours of operation between failures of a CCS on-board subsystem requiring the isolation of the train protection functions: (open point);
- (2) Mean time of hours of operation between failures of a CCS on-board subsystem preventing radio voice communication between traffic control and the train driver: (open point).

To allow the infrastructure managers and railway undertakings to monitor, during the life of the subsystems, the level of risk and the respect of the reliability/availability values used for the definition of procedures to manage degraded situations, the requirements for maintenance stated in point 4.2.20 (Technical documentation for Maintenance) shall be respected.

4.2.2. *On-Board ETCS functionality*

The basic parameter for ETCS on-board functionality describes all the functions needed to run a train in a safe way. The primary function is to provide automatic train protection and cab signalling:

- (1) setting the train characteristics (e.g. maximum train speed, braking performance);
- (2) selecting the supervision mode on the basis of information from trackside;
- (3) performing odometry functions;
- (4) locating the train in a coordinate system based on Eurobalise locations;
- (5) calculating the dynamic speed profile for its mission on the basis of train characteristics and of information from trackside;
- (6) supervising the dynamic speed profile during the mission;
- (7) providing the intervention function.

These functions shall be implemented in accordance with Appendix A, Table A 1, 4.2.2 b and their performance shall conform to Appendix A, Table A 1, 4.2.2 a.

The requirements for tests are specified in Appendix A, Table A 1, 4.2.2 c.

The main functionality is supported by other functions, to which Appendix A, Table A 1, 4.2.2 a and 4.2.2 b also apply, together with the additional specifications indicated below:

- (1) Communication with the Control-Command and Signalling Trackside Subsystem.
 - (a) Eurobalise data transmission. See point 4.2.5.2 (Eurobalise communication with the train for ERTMS applications).
 - (b) Euroloop data transmission. See point 4.2.5.3 (Euroloop communication with the train for ERTMS applications). This functionality is optional on-board unless required by specific cases in point 7.7, which shall only refer to the Appendix A specifications.
 - (c) Radio data transmission for radio infill. See Appendix A, Table A 1, 4.2.2 d, point 4.2.5.1 (RMR air gap interface), point 4.2.6.2 (Interface between RMR Data Communication and ETCS/ATO-applications) and point 4.2.8 (Key Management). This functionality is optional on-board unless required by specific cases in point 7.7. The implementation of this functionality, including for specific cases, shall be compliant to Appendix A specifications.
 - (d) Radio data transmission. See point 4.2.5.1 (RMR air gap interface), point 4.2.6.2 (Interface between RMR Data Communication and ETCS/ATO-applications) and point 4.2.8 (Key Management). This radio data transmission is optional unless operating on an ETCS level 2 (formerly ETCS level 2 or level 3) line.

- (2) Communicating with the driver. See Appendix A, Table A 1, 4.2.2 e, point 4.2.12 (ETCS DMI (Driver-Machine Interface)).
- (3) Communicating with the STM. See point 4.2.6.1 (ETCS and Class B train protection). This function includes:
 - (a) managing the STM output;
 - (b) providing data to be used by the STM;
 - (c) managing STM transitions.
- (4) Managing information about:
 - (a) completeness of the train – Supplying the train integrity and safe consist length information to the on-board subsystem, is optional unless it is required by trackside.
 - (b) cold movement detection – The ETCS on-board equipment shall be fitted with a Cold Movement Detection.
- (5) Equipment health monitoring and degraded mode support. This function includes:
 - (a) initialising the on-board ETCS functionality;
 - (b) providing degraded mode support;
 - (c) isolating the on-board ETCS functionality.
- (6) Support data recording for regulatory purposes. See point 4.2.14 (Interface to Data Recording for Regulatory Purposes).
- (7) Forwarding information/orders and receiving state information from rolling stock:
to/from the train interface unit. See Appendix A, Table A 1, 4.2.2 f.

Note: The ETCS on-board shall be compliant with the train FFFIS only on newly developed vehicle designs requiring a first authorisation as defined in Article 14 (1), point (a) of Commission Implementing Regulation (EU) 2018/545 ⁽⁸⁾.

- (8) Forwarding information/orders and receiving state information from ATO on-board. See Appendix A, Table A 1, 4.2.2 h.

4.2.3. *Trackside ETCS functionality*

This Basic parameter describes the ETCS trackside functionality. It contains all ETCS functionality to provide a safe path to a specific train.

The main functionalities are:

- (1) locating a specific train in a coordinate system based on Eurobalise locations (ETCS level 2);
- (2) translating the information from trackside signalling equipment into a standard format for the Control-Command and Signalling On-board Subsystem;
- (3) sending movement authorities including track description and orders assigned to a specific train.

These functions shall be implemented in accordance with Appendix A, Table A 1, 4.2.3 band their performance shall conform to Appendix A, Table A 1, 4.2.3 a.

The main functionality is supported by other functions, to which Appendix A, Table A 1, 4.2.3 a and 4.2.3 b also apply, together with the additional specifications indicated below:

- (1) communicating with the Control-Command and Signalling On-board Subsystem. This includes:
 - (a) Eurobalise data transmission. See point 4.2.5.2 (Eurobalise communication with the train for ERTMS applications) and point 4.2.7.4 (Eurobalise/LEU);

⁽⁸⁾ 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).

- (b) Euroloop data transmission. See point 4.2.5.3 (Euroloop communication with the train for ERTMS applications and point 4.2.7.5 (Euroloop/LEU). Euroloop is only relevant in level 1, in which it is optional;
 - (c) Radio data transmission for radio infill. See point 4.2.5.1.2.1 (GSM-R air gap interface for the ETCS application), point 4.2.7.3.1.1 (GSM-R/trackside ETCS) and point 4.2.8 (Key Management). Radio infill is only relevant in level 1, in which it is optional;
 - (d) Radio data transmission. See point 4.2.5.1 (RMR air gap interface), point 4.2.7.3 (RMR/trackside ETCS and RMR/trackside ATO) and point 4.2.8 (Key Management). Radio data transmission is only relevant to ETCS level 2;
- (2) generating information/orders to the on-board ETCS, e.g. information related to closing/opening the air flaps, lowering/raising the pantograph, opening/closing the main power switch, changing from traction system A to traction system B. Implementation of this functionality is optional for trackside; it can however be required by other applicable TSIs or national rules or the application of risk evaluation and assessment to ensure safe integration of subsystems;
 - (3) managing the transitions between areas supervised by different Radio Block Centres (RBCs) (only relevant for ETCS level 2). See point 4.2.7.1 (Functional interface between RBCs) and point 4.2.7.2 (RBC/RBC).

4.2.4. *Mobile communication functions for railways RMR*

This basic parameter describes the radio communication functions. Such functions shall be implemented in the Control-Command and Signalling On-board and Trackside subsystems, according to the specifications indicated below.

4.2.4.1. *Basic communication function*

4.2.4.1.1. *GSM-R Basic communication function*

The general requirements are specified in Appendix A, Table A 1, 4.2.4 a.

In addition, the following specifications shall be respected:

- (1) ASCI features; Appendix A, Table A 1, 4.2.4 b;
- (2) SIM card; Appendix A, Table A 1, 4.2.4 c;
- (3) location-dependent addressing; Appendix A, Table A 1, 4.2.4 e.

4.2.4.1.2. *FRMCS Basic communication function*

The general requirements are specified in Appendix A, Table A 1, 4.2.4 l

In addition, the following specifications shall be respected:

- (1) FRMCS Profile; Appendix A, Table A 1, 4.2.4 n;

4.2.4.2. *Voice and operational communication applications*

4.2.4.2.1. *GSM-R Voice and operational communication applications*

The general requirements are defined in Appendix A, Table A 1, 4.2.4 f.

The requirements for tests are specified in Appendix A, Table A 1, 4.2.4 g.

In addition, the following specifications shall be respected:

- (1) confirmation of high priority calls; Appendix A, Table A 1, 4.2.4 h;
- (2) functional addressing; Appendix A, Table A 1, 4.2.4 j;
- (3) presentation of functional numbers; Appendix A, Table A 1, 4.2.4 k;
- (4) User-to-User Signalling; Appendix A, Table A 1, 4.2.4 d.

4.2.4.2.2. *FRMCS Voice and operational communication applications*

The general requirements are defined in Appendix A, Table A 1, 4.2.4 m.

The requirements for tests are specified in Appendix A, Table A 1, 4.2.4 o.

4.2.4.3. *Data communication applications for ETCS and ATO*

4.2.4.3.1. *Data communication for ETCS*

The 'data radio communication' part of the On-board Control-command and Signalling Subsystem shall be able to support the establishment of at least two simultaneous communication sessions with ETCS.

4.2.4.3.1.1. *GSM-R data communication for ETCS*

The general requirements are defined in Appendix A, Table A 1, 4.2.4 f.

The requirements for tests are specified in Appendix A, Table A 1, 4.2.4 g.

This functionality is mandatory only in the case of ETCS level 2 and radio infill applications.

4.2.4.3.1.2. *FRMCS data communication for ETCS*

The general requirements are defined in Appendix A, Table A 1, 4.2.4 m.

The requirements for tests are specified in Appendix A, Table A 1, 4.2.4 o.

This functionality is mandatory in the case of ETCS level 2 applications.

4.2.4.3.2. *Data communication for ATO*

4.2.4.3.2.1. *GSM-R data communication for ATO*

The general requirements are defined in Appendix A, Table A 1, 4.2.4 f.

The requirements for tests are specified in Appendix A, Table A 1, 4.2.4 g.

4.2.4.3.2.2. *FRMCS data communication for ATO*

The general requirements are defined in Appendix A, Table A 1, 4.2.4 m.

The requirements for tests are specified in Appendix A, Table A 1, 4.2.4 o.

4.2.5. *RMR, ETCS and ATO air gap interfaces*

This basic parameter specifies the requirements for the air gap between Control-Command and Signalling Trackside and On-board subsystems and has to be taken into account in conjunction with the requirements for the interfaces between ETCS, ATO and RMR equipment, as specified in point 4.2.6 (On-Board Interfaces Internal to Control-Command and Signalling) and point 4.2.7 (Trackside Interfaces Internal to Control-Command and Signalling).

This basic parameter includes:

- (1) the physical, electrical and electromagnetic values to be respected to allow safe functioning;
- (2) the communication protocol to be used;
- (3) the availability of the communication channel.

The applicable specifications are listed below.

4.2.5.1. *RMR air gap interface*

4.2.5.1.1. *RMR general air gap interface*

4.2.5.1.1.1. GSM-R air gap interface

The air gap interface shall comply with the requirements specified in Appendix A, Table A 1, 4.2.5 a and 4.2.4 f.

Note 1: GSM-R radio communication interfaces shall operate in the frequency band specified in Appendix A, Table A 1, 4.2.5 a and 4.2.4 f.

Note 2: On-Board Control-command and Signalling Subsystems shall be protected against interference, fulfilling the requirements specified in Appendix A, Table A 1, 4.2.4 f.

4.2.5.1.1.2. FRMCS air gap interface

The air gap interface shall comply with the requirements specified in Appendix A, Table A 1, 4.2.5 f.

4.2.5.1.2. RMR air gap interface for ETCS application

4.2.5.1.2.1. GSM-R air gap interface for the ETCS application

The data communication protocols shall comply with Appendix A, Table A 1, 4.2.5 b.

Where radio infill is implemented, the requirements stated in Appendix A, Table A 1, 4.2.5 c shall be respected in addition.

4.2.5.1.2.2. FRMCS air gap interface for the ETCS application

The data communication protocols shall comply with Appendix A, Table A 1, 4.2.5 j.

4.2.5.1.3. RMR air gap interface for ATO application

4.2.5.1.3.1. GSM-R air gap interface for ATO application

Packet switch communication shall be used and the data communication protocols shall comply with the relevant requirements in Appendix A, Table A 1, 4.2.5 h.

The use of other wireless communication networks, e.g. operated by a public or private Mobile Network Operator, is allowed for the ATO application, however it is considered out of scope of this TSI.

The use of these networks shall not interfere with GSM-R voice and data communications.

4.2.5.1.3.2. FRMCS air gap interface for ATO application

The data communication protocols shall comply with Appendix A, Table A 1, 4.2.5 i.

4.2.5.2. Eurobalise communication with the train for ERTMS applications

Eurobalise communication interfaces shall comply with Appendix A, Table A 1, 4.2.5 d.

4.2.5.3. Euroloop communication with the train for ERTMS applications

Euroloop communication interfaces shall comply with Appendix A, Table A 1, 4.2.5 e.

4.2.6. On-Board Interfaces Internal to Control-Command and Signalling

This Basic Parameter consists of the following parts:

4.2.6.1. ETCS and Class B train protection

Where ETCS and Class B train protection functions are installed on-board, the integration and transitions between them shall be managed with one of the following:

- (1) a standardised interface (STM); or
- (2) a non-standardised interface; or

- (3) Class B and Class A integrated within the same equipment (e.g. 'bi-standards'); or
- (4) no direct interface between both equipment.

Where the integration of, and transitions between, ETCS and Class B systems are managed with the standardised interface (STM), it shall comply with requirements as specified in Appendix A, Table A 1, 4.2.6 a.

Appendix A, Table A 1, 4.2.6 b specifies the K interface (to allow certain STMs to read information from Class B balises through the ETCS on-board antenna) and Appendix A, Table A 1, 4.2.6 c the G interface (air gap between ETCS on-board antenna and Class B balises).

Implementation of Interface 'K' is optional, but if done it must be in accordance with Appendix A, Table A 1, 4.2.6 b.

Furthermore, if Interface 'K' is implemented, the on-board transmission channel functionality must be able to handle the properties of Appendix A, Table A 1, 4.2.6 c.

If the integration and transitions between ETCS and Class B train protection on-board are not managed using the standardised interface specified in Appendix A, Table A 1, 4.2.6 a, the method shall not impose any additional requirements on the Control-Command and Signalling Trackside Subsystem.

4.2.6.2. Interface between RMR Data Communication and ETCS/ATO-applications

4.2.6.2.1. *Interface between RMR Data Communication and ETCS*

4.2.6.2.1.1. Interface between GSM-R Data Communication and ETCS

The requirements for the interface between the on-board GSM-R and the on-board ETCS functionality are specified in Appendix A, Table A 1, 4.2.6 d.

Where radio infill is implemented, the requirements stated in Appendix A, Table A 1, 4.2.6 e shall be respected.

4.2.6.2.1.2. Interface between FRMCS Data Communication and ETCS

The requirements for the interface between on-board FRMCS and the on-board ETCS functionality are specified in Appendix A, Table A 1, 4.2.6 g.

4.2.6.2.2. *Interface between RMR Data Communication and ATO*

4.2.6.2.2.1. Interface between GSM-R Data Communication and ATO

The requirements for the interface between the on-board GSM-R and the on-board ATO functionality are specified in Appendix A, Table A 1, 4.2.6 j.

4.2.6.2.2.2. Interface between FRMCS Data Communication and ATO

The requirements for the interface between on-board FRMCS and the on-board ATO functionality are specified in Appendix A, Table A 1, 4.2.6 k.

4.2.6.2.3. *Interface between FRMCS on-board voice application and on-board FRMCS*

The requirements for the interface between FRMCS on-board voice application and on-board FRMCS are specified in Appendix A, Table A 1, 4.2.6 l.

4.2.6.3. Odometry

There are no specific requirements for the odometry interface.

4.2.6.4. Interface between ATO and ETCS

The requirements for the interface between the on-board ATO functionality and the on-board ETCS functionality are specified in Appendix A, Table A 1, 4.2.6 h.

4.2.6.5. Additional CCS On-Board Internal Interfaces

4.2.6.5.1. CCS Consist network communication layers

The interface between the end devices (e.g. ETCS on-board, ATO on-board and FRMCS on-board) and the Ethernet Consist Network shall comply with Appendix A, Table A 1, 4.2.6 i unless otherwise specified. This interface is only applicable on newly developed vehicle designs requiring a first authorisation as defined in Article 14 (1), point (a), of Implementing Regulation (EU) 2018/545.

4.2.7. Tracksides Interfaces Internal to Control-Command and Signalling

This Basic Parameter consists of five parts.

4.2.7.1. Functional interface between RBCs

This interface defines the data to be exchanged between neighbouring RBCs to allow the safe movement of a train from one RBC area to the next:

- (1) Information from the 'Handing Over' RBC to the 'Accepting' RBC.
- (2) Information from the 'Accepting' RBC to the 'Handing Over' RBC.
- (3) The requirements are specified in Appendix A, Table A 1, 4.2.7 a.

4.2.7.2. RBC/RBC

This is the technical interface between two RBCs. The requirements are specified in Appendix A, Table A 1, 4.2.7 b.

4.2.7.3. RMR/tracksides ETCS and RMR/tracksides ATO

4.2.7.3.1. RMR/tracksides ETCS

4.2.7.3.1.1. GSM-R/tracksides ETCS

The requirements for the interface between GSM-R and the tracksides ETCS functionality are specified in Appendix A, Table A 1, 4.2.7 c.

4.2.7.3.1.2. FRMCS/tracksides ETCS

The requirements for the interface between FRMCS and the tracksides ETCS functionality are specified in Appendix A, Table A 1, 4.2.7 f.

4.2.7.3.2. RMR/tracksides ATO

4.2.7.3.2.1. GSM-R/tracksides ATO

The requirements for the interface between GSM-R and the tracksides ATO functionality are specified in Appendix A, Table A 1, 4.2.7 g.

4.2.7.3.2.2. FRMCS/tracksides ATO

The requirements for the interface between FRMCS and the tracksides ATO functionality are specified in Appendix A, Table A 1, 4.2.7 h

4.2.7.4. Eurobalise/LEU

This is the interface between Eurobalise and the LEU. The requirements are specified in Appendix A, Table A 1, 4.2.7 d.

This interface contributes to this basic parameter only when Eurobalise and LEU are supplied as separate interoperability constituents (see point 5.2.2, Grouping of interoperability constituents).

4.2.7.5. Euroloop/LEU

This is the interface between Euroloop and the LEU. The requirements are specified in Appendix A, Table A 1, 4.2.7 e.

This interface contributes to this Basic Parameter only when Euroloop and LEU are supplied as separate interoperability constituents (see point 5.2.2, Grouping of interoperability constituents).

4.2.8. Key Management

This basic parameter specifies requirements for the management of cryptographic keys used for the protection of data transmitted via radio.

The requirements are specified in Appendix A, Table A 1, 4.2.8 a. Only requirements related to the interfaces of Control-Command and Signalling equipment fall within the scope of this TSI.

4.2.9. ETCS-ID Management

This basic parameter concerns the ETCS-identities (ETCS-IDs) for equipment in Control-Command and Signalling Trackside and On-board Subsystems.

The requirements are specified in Appendix A 4.2.9 a.

4.2.10. Trackside Train Detection Systems

This basic parameter specifies the interface requirements between the trackside train detection systems and rolling stock, related to vehicle design and operation.

The interface requirements to be respected by the train detection systems are specified in Appendix A, Table A 1, 4.2.10 a.

4.2.11. Electromagnetic Compatibility between Rolling Stock and Control-Command and Signalling trackside equipment

This basic parameter specifies the interface requirements for electromagnetic compatibility between rolling stock and trackside Control-Command and Signalling train detection equipment.

The interface requirements to be respected by the train detection system are specified in Appendix A, Table A 1, 4.2.11 a.

4.2.12. ETCS DMI (Driver-Machine Interface)

This basic parameter describes the information provided from ETCS and ATO to the driver and entered into the on-board by the driver. See Appendix A, Table A 1, 4.2.12 a.

It includes:

- (1) ergonomics (including visibility);
- (2) ETCS and ATO functions to be displayed;
- (3) ETCS and ATO functions triggered by driver input.

4.2.13. RMR DMI (Driver-Machine Interface)

This basic parameter describes the information provided from RMR to the driver and entered into the RMR on-board by the driver.

It includes:

- (1) ergonomics (including visibility);
- (2) RMR functions to be displayed;
- (3) call-related information outgoing;
- (4) call-related information incoming.

4.2.13.1. GSM-R DMI (Driver Machine Interface)

See Appendix A, Table A 1, 4.2.13 a for GSM-R.

4.2.13.2. FRMCS DMI (Driver Machine Interface)

See Appendix A, Table A 1, 4.2.13 b for FRMCS.

4.2.14. *Interface to Data Recording for Regulatory Purposes*

This basic parameter describes the data exchange between the on-board ETCS and the rolling stock recording device.

See Appendix A, Table A 1, 4.2.14 a.

4.2.15. *Trackside Control-Command and Signalling objects*

This basic parameter describes:

- (1) the characteristics of retro-reflecting signs to ensure correct visibility;
- (2) the characteristics of interoperable marker boards;
- (3) the positioning of interoperable marker boards to meet their intended operational purpose.

For (1) and (2) see Appendix A, Table A 1, 4.2.15 a.

For (3) see Appendix A, Table A 1, 4.2.15 b.

In addition, the installation of trackside Control-Command and Signalling objects shall be compatible with the driver's field of view and the infrastructure requirements.

4.2.16. *Construction of equipment used in CCS subsystems*

The environmental conditions specified in the documents listed in Appendix A, Table A 2 of this TSI shall be respected.

Requirements for materials referred to in Commission Regulation (EU) No 1302/2014 ⁽⁹⁾ (LOC&PAS TSI) (e.g. related to fire protection) shall be respected by Control-command and signalling On-board Interoperability Constituents and Subsystems.

4.2.17. *ETCS and Radio System Compatibility*

Due to the different possible implementations and the status of the migration to fully compliant CCS Subsystems, checks shall be performed in order to demonstrate the technical compatibility between the on-board and trackside CCS Subsystems. The necessity of these checks shall be considered as a measure to increase the confidence on the technical compatibility between the CCS subsystems. It is expected that these checks will be reduced until the principle stated in 6.1.2.1 is achieved.

4.2.17.1. ETCS System Compatibility

ETCS System Compatibility (ESC) is the recording of technical compatibility between ETCS on-board and the trackside parts ETCS of the CCS subsystems within an area of use.

Each ESC Type identifies the set of ESC checks (e.g. document check, lab or track test, ...) applicable for a section or group of sections within an area of use. It is possible to use the same ESC type for cross border infrastructure and for different national infrastructures.

The results of the ESC checks for an on-board unit on the Interoperability Constituent level or subsystem level, including findings and conditions arising, are recorded in the ESC Check Report.

⁽⁹⁾ 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).

'Representative configuration' means a configuration on the basis of which test results can be achieved, which are valid for various configurations of the same certified ETCS on-board interoperability constituent or of a certified on-board subsystem. These results shall also be equivalent for various configurations of a certified ETCS trackside subsystem.

For ESC checks at ETCS on-board Interoperability Constituent level the following is to be observed:

- (1) The ESC Interoperability Constituent Statement records the ESC results of the ETCS On-board Interoperability Constituent to the ESC Type(s) that is valid regardless of the specific configuration of the ETCS on-board Interoperability Constituent. This document shall be produced by the on-board supplier. The template provided in Appendix C.2 or C.6 shall be used.
- (2) The ESC Interoperability Constituent Statement shall include the summary of the findings and conditions of the ESC Check Report(s) on the results of the ESC checks passed (defined in one or more ESC Type), which are valid independently from the specific configuration parameters of the on-board Interoperability Constituent and can therefore be used in every applicable specific on-board CCS subsystem level.
- (3) The ESC Interoperability Constituent Statement shall include the list of ESC checks performed for the ESC Type(s).
- (4) The ESC Interoperability Constituent Statement shall include the reference to the NoBo assessment Report according to 6.2.4.3 (ETCS and radio system compatibility checks for Interoperability Constituent).

The ESC of the specific on-board CCS subsystem with respect to one or more ESC Type(s) is laid down in the ESC Statement. The template provided in Appendix C.1 or C.5 shall be used.

At subsystem level, the ESC Statement shall also include the summary of the ESC Check Report and shall demonstrate the fulfilment of the required ESC checks (for each ESC Type included in the Statement) published in the Agency ESC/RSC technical document in addition to already provided ESC interoperability constituent statements.

The ESC Statement shall also include the full list of ESC Interoperability Constituent statements taken into account in the assessment (if any), the conditions (if any) with respect to the different ESC Types and the NoBo Assessment Report according to 6.3.3.1 (ETCS and radio system compatibility checks).

4.2.17.2. Requirements for ETCS System Compatibility

The Infrastructure Manager is responsible for defining the ESC type(s). All sections of the Union network which require the same set of checks for the demonstration of ESC shall have the same ESC type.

The list of ESC Types is published and maintained by the European Union Agency for Railways in the technical document 'ESC/RSC technical document, TD/011REC1028'. See Appendix A, Table A 1, 4.2.17 a. The Agency shall assess the checks unless they have been assessed by a NoBo as required in Table 6.3 row 10. The assessment by the Agency shall be done within 2 months of receipt thereof, unless a longer period is agreed between the Agency and the Infrastructure Manager but not exceeding 4 months in total. The technical document will be updated within 10 working days after positive assessment.

The ESC Types shall only be used when published with status 'Valid' in the Agency Technical document referred above.

Infrastructure Managers, with the support of the ETCS suppliers for their network, shall submit to the Agency the definition of the necessary checks for each ESC type on their network. The minimum information that shall be included:

- (1) Definition of each check to be performed.
- (2) Criteria to pass each check.
- (3) If a check is only required for trains compatible with a specific M_VERSION functionality and a given TSI release.

- (4) If checks are to be performed in laboratories or on the track. In case of track, it shall be indicated if a specific location is required.
- (5) Contact details in order to request the performance of each check.
- (6) Description of the representative configuration of a check whenever defined by the relevant IM to be performed in a laboratory.
- (7) Proposal of the transition period between the new version of ESC Types definition and prior version, or the national procedure. It shall also be indicated the validity of the previous ESC Types. The final transition period shall be agreed with the Agency. In the absence of agreement it will be 6 months.

Infrastructure Managers shall classify the ETCS lines according to ESC Types and register the ESC Types in RINF. If no ESC definition is published in the ESC/RSC Technical Document or received by the Agency for existing lines equipped with ETCS, it shall be considered that no ESC checks are required for the concerned lines.

Infrastructure Manager shall provide the necessary means, laboratory or access to the infrastructure, to perform the checks, as required by Article 6 of Implementing Regulation (EU) 2018/545.

Infrastructure Managers shall submit to the Agency any changes on the referred checks for their network.

The ESC types are valid indefinitely unless modified or withdrawn by the Infrastructure Manager. In case of changes, the provisions on 7.2.3.4 (Impact on the technical compatibility between on-board and trackside parts of the CCS subsystems) shall be respected. If an on-board needs to be rechecked, only the new/updated ESC checks need to be done, applying the principle that already passed checks remain valid, if the vehicle is not modified.

When ESC checks are published or updated by the Agency in the technical document 'ESC/RSC technical document, TD/011REC1028', the corresponding existing National Rules for ETCS compatibility testing shall be withdrawn and only ESC checks shall be performed to demonstrate technical compatibility between subsystems. The IM shall indicate the equivalence (none, partial or complete) of the ESC with the previous national procedure, if existing. In such a case, Interoperability Constituent or subsystems which have demonstrated technical compatibility with the previous national procedure, may reuse that as evidence for the demonstration of compliance with the equivalent part of the new ESC without the need to execute the checks again. If not fully equivalent, the IM shall indicate a transition period as mentioned in point (7) above.

The Entity in charge of ESC demonstration shall define a representative configuration of the ETCS on-board subsystem.

The ESC Statement shall be produced by the Entity applying for ESC Demonstration.

The Entity applying for ESC Demonstration shall have the ESC check report for the Interoperability Constituent or Subsystem assessed by a Notified Body according with points 6.2.4.3 (ETCS and radio system compatibility checks for Interoperability Constituent) or 6.3.3.1 (ETCS and radio system compatibility checks).

If a Check Report or an ESC Interoperability Constituent Statement referred to in the ESC Statement contains Conditions, all Conditions shall be recorded, reflecting the status and if agreed how they are managed by the affected party (e.g. RU willing to demonstrate the compatibility with a route), and this responsibility shall be recorded in the ESC Statement.

4.2.17.3. Radio System Compatibility

Radio System Compatibility (RSC) is the recording of technical compatibility between voice or data radio on-board and the trackside parts of RMR of the CCS subsystems within an area of use.

Each RSC Type identifies the set of RSC checks (e.g. document check, lab or track test) applicable for a section or group of sections within an area of use. It is possible to use the same RSC type for cross border infrastructure and for different national infrastructures.

The results of the RSC checks for an on-board voice or data radio part on the Interoperability Constituent level or subsystem level, including findings and conditions arising, are recorded in the RSC Check Report.

Representative Configuration means a configuration on the basis of which test results can be achieved, which are valid for various configurations of the same certified Interoperability Constituent or of a certified on-board subsystem. These results shall also be equivalent for various configurations of a certified RMR trackside subsystem.

For RSC checks at Interoperability Constituent level the following is to be observed:

- (1) The RSC Interoperability Constituent Statement records the RSC results of the Interoperability Constituent (e.g. Cab Radio or EDOR) to the RSC Type(s) that is valid regardless of the specific configuration of the Interoperability Constituents. This document shall be produced by the supplier. The template provided in Appendix C.4 or C.6 shall be used.
- (2) The RSC Interoperability Constituent Statement shall include the summary of the findings and conditions of RSC Check Report(s) on the results of the RSC checks passed (defined in one or more RSC Type), which are valid independently from the specific configuration parameters of the on-board Interoperability Constituent and can therefore be used in every applicable on-board CCS subsystem level.
- (3) The RSC Interoperability Constituent Statement shall include the list of RSC checks performed for the RSC Type(s).
- (4) The RSC Interoperability Constituent Statement shall include the reference to the NoBo assessment Report according to 6.2.4.3 (ETCS and radio system compatibility checks for Interoperability Constituent).

The RSC of the specific on-board CCS subsystem with respect to one or more RSC Type(s) is laid down in the RSC Statement. The template provided in Appendix C.3 or C.5 shall be used.

At subsystem level, the RSC Statement shall also include the summary of the Check Report and shall demonstrate the fulfilment of the required RSC checks (for each RSC Type included in the Statement) published in the Agency ESC/RSC technical document in addition to already provided RSC interoperability constituent statements.

The RSC Statement shall also include the full list of RSC Interoperability Constituent statements taken into account in the assessment (if any), the conditions (if any) with respect to the different RSC Types and the NoBo Assessment Report according to 6.3.3.1 (ETCS and radio system compatibility checks).

4.2.17.4. Requirements for Radio System Compatibility

The Infrastructure Manager is responsible for defining the RSC type(s). All sections of the Union network which require the same set of checks for the demonstration of RSC shall have the same RSC type.

The list of RSC Types is published and maintained by the European Union Agency for Railways in the technical document 'ESC/RSC technical document, TD/011REC1028'. See Appendix A, Table A 1, 4.2.17 a. The Agency shall assess the checks unless they have been assessed by a NoBo as required in Table 6.3 row 10. The assessment by the Agency shall be done within 2 months of receipt thereof, unless a longer period is agreed between the Agency and the Infrastructure Manager but not exceeding 4 months in total. The technical document will be updated within 10 working days after positive assessment.

The RSC Types shall only be used when published with status 'Valid' in the Agency Technical document referred above.

Infrastructure Managers, with the support of the RMR suppliers for their network, shall submit to the Agency the definition of the necessary checks for each RSC type on their network. The minimum information that shall be included:

- (1) Definition of each check to be performed
- (2) Criteria to pass each check
- (3) If a check is only required for trains equipped with a specific RMR GSM-R/FRMCS baseline and a given TSI release.
- (4) If checks are to be performed in laboratories or on the track. In case of track, it shall be indicated if a specific location is required.

- (5) Contact details in order to request the performance of each check
- (6) Description of the representative configuration of a check whenever defined by the relevant IM to be performed in a laboratory
- (7) Proposal of the transition period between the new version of RSC Types definition and prior version, or the national procedure. It shall also be indicated the validity of the previous RSC Types. The final transition period shall be agreed with the Agency. In the absence of agreement it will be 6 months.

Infrastructure Managers shall classify their lines according to RSC Types for voice and, if applicable, ETCS data. This RSC type classification shall be registered in RINF. If no RSC definition is published in the ESC/RSC Technical Document or received by the Agency for existing lines equipped with RMR GSM-R, it shall be considered that no RSC checks are required for the concerned lines.

Infrastructure Manager shall provide the necessary means, laboratory or access to the infrastructure, to perform the checks, as required by Article 6 of the Implementing Regulation (EU) 2018/545.

Infrastructure Managers shall submit to the Agency any changes on the referred checks for their network.

The RSC types are valid indefinitely unless modified or withdrawn by the Infrastructure Manager. In case of changes, the provisions on 7.2.3.4 (Impact on the technical compatibility between on-board and trackside parts of the CCS subsystems) shall be respected. If an on-board needs to be rechecked, only the new/updated RSC checks need to be done, applying the principle that already passed checks remain valid, if the vehicle is not modified.

When RSC checks are published or updated by the Agency in the technical document 'ESC/RSC technical document, TD/011REC1028', the corresponding existing National Rules for Radio compatibility testing shall be withdrawn and only RSC checks shall be performed to demonstrate technical compatibility between subsystems. The IM shall indicate the equivalence (none, partial or complete) of the RSC with the previous national procedure, if existing. In such a case, Interoperability Constituent or subsystems which have demonstrated technical compatibility with the previous national procedure, may reuse that as evidence for the RSC without the need to execute the checks again.

Entity in charge of RSC demonstration shall define a representative configuration of the Radio on-board subsystem.

The RSC Statement shall be produced by the Entity applying for RSC Demonstration.

The Entity applying for RSC Demonstration shall have the check report for the Interoperability Constituent or Subsystem assessed by a Notified Body according with points 6.2.4.3 (ETCS and radio system compatibility checks for Interoperability Constituent) or 6.3.3.1 (ETCS and radio system compatibility checks).

If a Check Report or an RSC Interoperability Constituent Statement referred to in the RSC Statement contains Conditions, all Conditions shall be recorded, reflecting the status and if agreed how they are managed by the affected party (e.g. RU willing to demonstrate the compatibility with a route), and this responsibility shall be recorded in the RSC Statement.

4.2.18. On-Board ATO functionality

This basic parameter describes the ATO on-board functionality needed to operate a train up to Grade of Automation 2 with ETCS providing the automatic train protection functionality to enable it. The functions shall be implemented according to Appendix A, Table A 1, 4.2.18 a in addition to those required in point 4.2.2 (On-Board ETCS functionality).

The ATO functionality is supported by the additional specifications indicated below:

- (1) Communication with the Control-Command and Signalling Trackside Subsystem for radio data transmission. See point 4.2.5.1 (RMR air gap interface), point 4.2.6.2 (Interface between RMR Data Communication and ETCS/ATO-applications).
- (2) Communicating with the driver. See Appendix A, Table A 1, 4.2.2 e and 4.2.12 a (ETCS DMI).

- (3) Forwarding information/orders and receiving state information from rolling stock. See Appendix A, Table A 1, 4.2.18 c.
- (4) Forwarding information/orders and receiving state information from on-board ETCS. See Appendix A, Table A 1, 4.2.18 d.

The requirements for tests are specified in Appendix A, Table A 1, 4.2.18 b.

4.2.19. *Trackside ATO functionality*

This basic parameter describes the ATO trackside functionality needed to operate a train up to Grade of Automation 2 with ETCS providing the automatic train protection functionality to enable it.

In addition to those required in point 4.2.3 (Trackside ETCS functionality), the functions shall be implemented according to Appendix A, Table A 1, 4.2.19 a.

The ATO functionality is supported with the additional specifications for communicating with the Control-Command and Signalling On-board Subsystem based on radio data transmission. See Appendix A, point 4.2.5.1 (RMR air gap interface) and point 4.2.7.3 (RMR/trackside ETCS and RMR/trackside ATO).

The requirements for tests are specified in Appendix A, Table A 1, 4.2.19 b.

4.2.20. *Technical documentation for Maintenance*

This basic parameter describes the necessary requirements in relation to the technical documentation for maintenance to be fulfilled by the manufacturers of equipment and the applicant for subsystem verification.

4.2.20.1. *Responsibility of the manufacturer of equipment*

The manufacturer of equipment incorporated in the subsystem shall specify:

- (1) all maintenance requirements and procedures (including health monitoring, diagnosis of events, test methods and tools and also the required professional competence) necessary for achieving essential requirements and values quoted in the mandatory requirements of this TSI throughout the equipment life-cycle (transport and storage before installation, normal operation, failures and effects of failures, repair work, checking and maintenance, decommissioning, etc.). For further details on error corrections see points 6.5 (Management of errors) and 7.2.10 (Specifications maintenance (error corrections));
- (2) all requirements and procedures (test methods and tools, the required professional competence and the evaluation of the impact of the updated Interoperability Constituent on the subsystem) necessary to implement updated Interoperability Constituents due to specification error corrections throughout the equipment life-cycle (specifications maintenance). This includes the definition of the necessary procedures for updates of approved system modules and processes, during all life cycle phases, when there are error corrections according to Article 9 of this Regulation applicable to the subsystems;
- (3) the health and safety risks that may affect the public and the maintenance staff;
- (4) the conditions for first line maintenance, i.e. the definition of Line Replaceable Units (LRUs), the definition of approved compatible versions of hardware and software, the procedures for replacing failed LRUs, the conditions for storing LRUs and for repairing failed LRUs;
- (5) the checks to be carried out if equipment is subject to exceptional stress (e.g. adverse environmental conditions or abnormal shocks);
- (6) the checks to be carried out when maintaining equipment other than Control-Command and Signalling equipment and which influences the Control-Command and Signalling Subsystems (e.g. changing the wheel diameter).

4.2.20.2. *Responsibility of the applicant for subsystem verification*

The applicant shall:

- (1) ensure that the maintenance requirements as described in point 4.2.20.1 (Responsibility of the manufacturer of equipment) are defined for all components within the scope of this TSI regardless of whether or not they are interoperability constituents;

- (2) complete the above requirements in point 4.2.20.1 taking into account the risks arising from interactions between different components of the subsystem and interfaces to other subsystems.
- (3) define procedures for the roll-out of updated interoperability constituents due to specification error corrections (specifications maintenance) according to the relevant documentation of the interoperability constituent, where applicable. The applicant shall provide a configuration management system to identify the impact on the subsystem. The applicant shall ensure the availability of the documentation regarding the version of the interoperability constituents included in its subsystems.

4.2.20.3. System identifier

The ERTMS (ETCS, RMR, ATO) functionality of an Interoperability Constituent or a subsystem shall be described with a 'system identifier', which is a numbering scheme to identify the system version and distinguish between a functional and a realisation identifier. The 'functional identifier' is part of the system identifier and means a figure or a number of figures defined by the individual configuration management, which represents a reference of the functionality for CCS implemented in a CCS subsystem or Interoperability Constituent. The 'Realisation identifier' is part of the system identifier and means a figure or a number of figures defined by the individual configuration management of a supplier, which represents a specific configuration (e.g. HW and SW) of a CCS subsystem or Interoperability Constituent. The 'system identifier', 'functional identifier' and 'realisation identifier' shall be defined by each supplier.

4.3. Functional and technical specifications of the interfaces to other Subsystems

4.3.1. Interface to the Operation and Traffic Management Subsystem

Interface with Operation and Traffic Management TSI			
Reference CCS TSI		Reference Operation and Traffic Management TSI ⁽¹⁾	
Parameter	Point	Parameter	Point
Operating rules List of harmonised text indications and messages displayed on the ETCS Driver Machine Interface	4.4 Appendix E	Driver's Rule book Operating rules ERTMS trackside engineering information relevant to operation	4.2.1.2.1 4.4 Appendix D3
Trackside Control-Command and Signalling objects	4.2.15	Requirements for signal and line-side marker sighting	4.2.2.8
Train braking performance and characteristics	4.2.2	Train braking	4.2.2.6
Use of sanding equipment On-board flange lubrication Use of composite brake blocks	4.2.10	Driver's Rule book	4.2.1.2.1
Interface to Data Recording for Regulatory Purposes	4.2.14	Data recording	4.2.3.5
ETCS DMI (Driver-Machine Interface)	4.2.12	Format of train running number	4.2.3.2.1
RMR DMI (Driver-Machine Interface)	4.2.13	Format of train running number	4.2.3.2.1

Key Management	4.2.8	Ensuring that the train is in running order	4.2.2.7
Route compatibility checks before the use of authorised vehicles	4.9	Parameters for the vehicle and train compatibility over the route intended for operation	Appendix D1

(¹) In accordance with 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).

4.3.2. *Interface to the Rolling Stock Subsystem*

Interface with Rolling Stock TSIs				
Reference CCS TSI		Reference Rolling Stock TSIs		
Parameter	Point	Parameter		Point
Compatibility with trackside train detection systems: vehicle design	4.2.10	Rolling stock characteristics to be compatible with train detection systems based on track circuits	LOC & PAS TSI	4.2.3.3.1.1
			Wagon TSI (¹)	4.2.3.2
		Rolling stock characteristics to be compatible with train detection systems based on axle counters	LOC & PAS TSI	4.2.3.3.1.2
			Wagon TSI	4.2.3.3
		Rolling stock characteristics to be compatible with loop equipment	LOC & PAS TSI	4.2.3.3.1.3
			Wagon TSI	4.2.3.3
Electromagnetic Compatibility between Rolling Stock and Control-Command and Signalling trackside equipment	4.2.11	Rolling stock characteristics to be compatible with train detection systems based on track circuits	LOC & PAS TSI	4.2.3.3.1.1
			Wagon TSI	4.2.3.3
		Rolling stock characteristics to be compatible with train detection systems based on axle counters	LOC & PAS TSI	4.2.3.3.1.2
			Wagon TSI	4.2.3.3
Train braking performance and characteristics	4.2.2 4.2.18	Braking performance	LOC & PAS TSI Emergency braking	4.2.4.5.2
			LOC & PAS TSI Service braking	4.2.4.5.3
			Wagon TSI	4.2.4.1.2
Position of Control-Command and Signalling on-board antennas	4.2.2	Kinematic gauge	LOC & PAS TSI	4.2.3.1
			Wagon TSI	None

Isolation of on-board ETCS functionality	4.2.2	Operating rules	LOC & PAS TSI	4.2.12.3
			Wagon TSI	None
Trackside Control-Command and Signalling objects	4.2.15	External visibility Head lights	LOC & PAS TSI	4.2.7.1.1
			Wagon TSI	None
		Driver's external field of view	LOC & PAS TSI Line of sight	4.2.9.1.3.1
			LOC & PAS TSI Windscreen	4.2.9.2
			Wagon TSI	None
Interface to Data Recording for Regulatory Purposes	4.2.14	Recording device	LOC & PAS TSI	4.2.9.6
			Wagon TSI	None
ETCS on-board: Forwarding information/orders and receiving state information from rolling stock	4.2.2	Separation sections	LOC & PAS TSI	4.2.8.2.9.8
			Wagon TSI	None
		Dynamic braking command	LOC&PAS TSI	4.2.4.4.4
			Wagon TSI	None
		Magnetic track brake	LOC&PAS TSI	4.2.4.8.2
			Wagon TSI	None
		Eddy current track brake	LOC&PAS TSI	4.2.4.8.3
			Wagon TSI	None
		Maximum power and current from the overhead contact line	LOC&PAS TSI	4.2.8.2.4
			Wagon TSI	None
		Door opening	LOC&PAS TSI	4.2.5.5.6
			Wagon TSI	None
		Requirements on performance	LOC&PAS TSI	4.2.8.1.2
			Wagon TSI	None
		Smoke control	LOC&PAS TSI	4.2.10.4.2
			Wagon TSI	None

		Radio Remote control function by staff for shunting operation	LOC&PAS TSI	4.2.9.3.6
			Wagon TSI	None
		Driver's desk – Ergonomics	LOC&PAS TSI	4.2.9.1.6
			Wagon TSI	None
		Requirements for management of ETCS modes: sleeping mode	LOC&PAS TSI	4.2.9.3.7.1
			Wagon TSI	None
		Requirements for management of ETCS modes: passive shunting	LOC&PAS TSI	4.2.9.3.7.2
			Wagon TSI	None
		Requirements for management of ETCS modes: non leading	LOC&PAS TSI	4.2.9.3.7.3
			Wagon TSI	None
		Type of brake system	LOC&PAS TSI	4.2.4.3
			Wagon TSI	None
ATO on-board: Forwarding information/orders and receiving state information from rolling stock	4.2.18	Interface requirements with Automated Train Operation onboard	LOC & PAS TSI	4.2.13
			Wagon TSI	None
Emergency braking command	4.2.2	Emergency braking command	LOC & PAS TSI	4.2.4.4.1
			Wagon TSI	None
Construction of equipment used in CCS subsystems	4.2.16	Material requirements	LOC&PAS TSI	4.2.10.2.1
			Wagon TSI	None
Service braking command	4.2.2	Service braking command	LOC & PAS TSI	4.2.4.4.2
			Wagon TSI	None

(¹) In accordance with 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).

4.3.3. *Interfaces to Infrastructure Subsystem*

Interface with Infrastructure TSI				
Reference CCS TSI		Reference Infrastructure TSI		
Parameter	Point	Parameter		Point
Eurobalise communication (space for installation)	4.2.5.2	Structure gauge	INF TSI ⁽¹⁾	4.2.3.1
Euroloop communication (space for installation)	4.2.5.3	Structure gauge	INF TSI	4.2.3.1
Trackside Control-Command and Signalling objects	4.2.15	Structure gauge	INF TSI	4.2.3.1

⁽¹⁾ INF TSI is 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).

4.3.4. *Interfaces to Energy Subsystem*

Interface with Energy TSI				
Reference CCS TSI		Reference Energy TSI		
Parameter	Point	Parameter		Point
Commands to rolling stock equipment	4.2.2	Phase separation sections	ENE TSI ⁽¹⁾	4.2.15
	4.2.3	System separation sections		4.2.16

⁽¹⁾ ENE TSI is 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).

4.4. **Operating rules**

The rules for operating a railway service with ETCS, ATO and RMR are specified in the Operation and Traffic Management TSI.

The harmonised text indications and messages displayed on the ETCS Driver Machine Interface are listed under Appendix E.

4.5. **Maintenance rules**

The maintenance rules of the subsystems covered by this TSI shall ensure that the values quoted in the basic parameters indicated in Chapter 4 are maintained within the required limits throughout the lifetime of the subsystems. However, during preventative or corrective maintenance, the subsystem may not be able to respect the values quoted in the basic parameters; the maintenance rules shall ensure that safety is not prejudiced during these activities.

The entity in charge of the Control-Command and Signalling Subsystems shall set up maintenance rules to achieve the above objectives. The preparation of these rules shall be done with the assistance of the requirements in 4.2.20 (Technical documentation for Maintenance).

4.6. **Professional competences**

The manufacturers of the equipment and of the subsystem shall provide information sufficient to define the professional competences required for the installation, final inspection and maintenance of the Control-Command and Signalling Subsystems. See point 4.5 (Maintenance rules).

4.7. **Health and safety conditions**

Care shall be taken to ensure health and safety for maintenance and operations staff, in accordance with Union legislation and the national legislation that is compatible with the Union legislation.

Manufacturers shall indicate the risks for health and safety that arise from using and maintaining their equipment and subsystems. See point 4.4 (Operating rules) and point 4.5 (Maintenance rules).

4.8. **Registers**

The data to be provided for the registers provided for in Articles 48 and 49 of Directive (EU) 2016/797 are those indicated in Commission Implementing Decision 2011/665/EU ⁽¹⁰⁾ and Commission Implementing Regulation (EU) 2019/777 ⁽¹¹⁾.

4.9. **Route compatibility checks before the use of authorised vehicles**

The parameters of the on-board CCS subsystem to be used by the railway undertaking, for the purpose of route compatibility check, are described in Appendix D1 of Implementing Regulation (EU) 2019/773.

5. INTEROPERABILITY CONSTITUENTS

5.1. **Definition**

In accordance with Article 2(7) of Directive (EU) 2016/797, interoperability constituents means any elementary component, group of components, subassembly or complete assembly of equipment incorporated or intended to be incorporated into a subsystem, upon which the interoperability of the rail system depends directly or indirectly, including both tangible objects and intangible objects.

5.2. **List of interoperability constituents**

5.2.1. *Basic interoperability constituents*

The basic interoperability constituents in the Control-Command and Signalling Subsystems are defined in:

- (1) Table 5.1. for the Control-Command and Signalling On-board Subsystem;
- (2) Table 5.2. for the Control-Command and Signalling Trackside Subsystem.

5.2.2. *Grouping of interoperability constituents*

- 5.2.2.1. The functions of basic interoperability constituents may be combined to form a group. This group is then defined by those functions and by its remaining external interfaces. If a group is formed in this way, it shall be considered as an interoperability constituent.

Compliance of interfaces internal to the group of Interoperability Constituents to basic parameters of Chapter 4 does not have to be verified. Compliance of interfaces external to the group of Interoperability Constituents has to be verified to demonstrate conformity with the basic parameters related to the requirements of these external interfaces.

- 5.2.2.2. When interoperability constituents are grouped, the grouped functions and their addressing must be configurable in such a way that the grouped functions of the ATO, ETCS and the radio ICs can be replaced during the life cycle of the CCS subsystem by an external ATO, ETCS or Radio ICs. Therefore, the following interfaces in a grouped Interoperability Constituent shall be made externally accessible on the CCS Consist network communication layers as specified in Appendix A, Table A 1, 4.2.6 i:

⁽¹⁰⁾ Commission Implementing Decision 2011/665/EU of 4 October 2011 on the European register of authorised types of railway vehicles (OJ L 264, 8.10.2011, p. 32).

⁽¹¹⁾ Commission Implementing Regulation (EU) 2019/777 of 16 May 2019 on the common specifications for the register of railway infrastructure and repealing Decision 2014/880/EU (OJ L 139 I, 27.5.2019, p. 312).

- (1) Interface between ATO On-Board and ETCS On-Board as specified in Appendix A, Table A 1, 4.2.6 h;
- (2) Interface between ATO On-Board and GSM-R data radio On-Board as specified in Appendix A, Table A 1, 4.2.6 j;
- (3) Interface between On-board FRMCS and the CCS applications (ETCS in Appendix A, Table A 1, 4.2.6 g and ATO in Appendix A, Table A 1, 4.2.6 k);

5.3. Constituents' performance and specifications

For each basic interoperability constituent or group of interoperability constituents, the tables in Chapter 5 describe:

- (1) in column 3, the functions and interfaces. Note that some interoperability constituents have functions and/or interfaces that are optional;
- (2) in column 4, the mandatory specifications for the conformity assessment of each function or interface (where applicable) by reference to the relevant section of Chapter 4.

Table 5.1.

Basic interoperability constituents in the Control-Command and Signalling On-board Subsystem

No	Interoperability constituent (IC)	Characteristics	Specific requirements to be assessed by reference to Chapter 4
1	ETCS on-board	Reliability, Availability, Maintainability, Safety (RAMS): Safety Availability/Reliability Maintainability	4.2.1.1 4.2.1.2 4.2.20.1
		On-board ETCS functionality (excluding odometry) System identifier	4.2.2 4.2.20.3
		ETCS air gap interfaces RBC (Radio data transmission optional) Radio infill unit (functionality optional) Eurobalise air gap Euroloop air gap (functionality optional)	4.2.5 4.2.5.1.2 4.2.5.1.2.1 4.2.5.2 4.2.5.3
		Interfaces STM (implementation of interface K optional) GSM-R data radio On-Board FRMCS Key management ETCS-ID Management ETCS Driver-Machine Interface Train interface (see note below) On-board recording device ATO interface	4.2.6.1 4.2.6.2.1.1 4.2.6.2.1.2 4.2.8 4.2.9 4.2.12 4.2.2 4.2.14 4.2.6.4 4.2.6.5.1

		CCS Consist network communication layers. <i>Note for train interface:</i> The implementation of all functions described in Appendix A Index 7 document is mandatory at Interoperability Constituent level.	
		Construction of equipment	4.2.16
		ETCS System Compatibility (ESC) (optional)	4.2.17.1 4.2.17.2
2	Odometry equipment	Reliability, Availability, Maintainability, Safety (RAMS): Safety Availability/Reliability Maintainability	4.2.1.1 4.2.1.2 4.2.20.1
		On-board ETCS functionality: only Odometry	4.2.2
		Construction of equipment	4.2.16
3	Standardised interface STM	Interfaces On-board ETCS	4.2.6.1
4	GSM-R voice cab radio <i>Note:</i> SIM card, antenna, connecting cables and filters are not part of this interoperability constituent	Reliability, Availability, Maintainability (RAM): Availability/Reliability Maintainability	4.2.1.2 4.2.20.1
		Basic communication functions	4.2.4.1.1
		Voice and operational communication applications System identifier	4.2.4.2.1 4.2.20.3
		Interfaces GSM-R air gap GSM-R Driver-Machine Interface	4.2.5.1.1.1 4.2.13.1
		Construction of equipment	4.2.16
		Radio System Compatibility (RSC) (optional)	4.2.17.3 4.2.17.4
5	GSM-R data radio <i>Note:</i> SIM card, antenna, connecting cables and filters are not part of this interoperability constituent	Reliability, Availability, Maintainability (RAM): Availability/Reliability Maintainability	4.2.1.2 4.2.20.1
		Basic communication functions	4.2.4.1.1

		ETCS data communication applications System identifier	4.2.4.3.1.1 4.2.20.3
		Interfaces On-board ETCS On-board ATO GSM-R air gap GSM-R air gap for ETCS GSM-R air gap for ATO	4.2.6.2.1.1 4.2.6.2.2.1 4.2.5.1.1.1 4.2.5.1.2.1 4.2.5.1.3.1
		Construction of equipment	4.2.16
		Radio System Compatibility (RSC) (optional)	4.2.17.3 4.2.17.4
6	GSM-R SIM card <i>Note:</i> It is the responsibility of the GSM-R network operator to deliver to railway undertakings the SIM cards to be inserted in GSM-R terminal equipment.	Basic communication functions System identifier	4.2.4.1.1 4.2.20.3
		Construction of equipment	4.2.16
		Radio System Compatibility (RSC) (optional)	4.2.17.3 4.2.17.4
7	ATO On-Board	Reliability, Availability, Maintainability (RAM): Availability/Reliability Maintainability	4.2.1.2 4.2.20.1
		On-board ATO functionality (excluding communication) System identifier	4.2.18 4.2.20.3
		ATO air gap interfaces	4.2.5.1.3
		Interfaces GSM-R data radio On-Board FRMCS Train interface ETCS interface CCS Consist network communication layers	4.2.6.2.2.1 4.2.6.2.2.2 4.2.18 4.2.6.4 4.2.6.5.1
		Construction of equipment	4.2.16
8	FRMCS On-Board voice application	Reliability, Availability, Maintainability (RAM): Availability/Reliability Maintainability	4.2.1.2 4.2.20.1
		Basic communication functions	4.2.4.1.2
		Voice and operational communication applications System identifier	4.2.4.2.2 4.2.20.3

		Interfaces On-board FRMCS FRMCS Driver-Machine Interface	4.2.6.2.3 4.2.13.2
		Construction of equipment	4.2.16
		Radio System Compatibility (RSC) (optional)	4.2.17.3 4.2.17.4
9	On-board FRMCS	Reliability, Availability, Maintainability (RAM): Availability/Reliability Maintainability	4.2.1.2 4.2.20.1
		Basic communication functions System identifier	4.2.4.1.2 4.2.20.3
		Interfaces FRMCS on-board voice application FRMCS air gap FRMCS air gap for ETCS application FRMCS air gap for ATO application On-board ETCS On-board ATO CCS Consist network communication layers	4.2.6.2.3 4.2.5.1.1.2 4.2.5.1.2.2 4.2.5.1.3.2 4.2.6.2.1.2 4.2.6.2.2.2 4.2.6.5.1
		Construction of equipment	4.2.16
		Radio System Compatibility (RSC) (optional)	4.2.17.3 4.2.17.4
10	FRMCS Profile <i>Note:</i> It is the responsibility of the FRMCS network operator to ensure that the FRMCS profile is made available to the subscribers.	Basic communication functions System identifier	4.2.4.1.2 4.2.20.3
		Construction of equipment	4.2.16
		Radio System Compatibility (RSC) (optional)	4.2.17.3 4.2.17.4

Table 5.2.

Basic interoperability constituents in the Control-Command and Signalling Trackside Subsystem

1	2	3	4
No	Interoperability Constituent (IC)	Characteristics	Specific requirements to be assessed by reference to Chapter 4
1	RBC	Reliability, Availability, Maintainability, Safety (RAMS): Safety Availability/Reliability Maintainability	4.2.1.1 4.2.1.2 4.2.20.1

		Trackside ETCS functionality (excluding communication via Eurobalises, radio infill and Euroloop) System identifier	4.2.3 4.2.20.3
		RMR, ETCS and ATO air gap interfaces: only radio communication with train GSM-R air gap interface for ETCS FRMCS air gap interface for ETCS	4.2.5.1.2.1 4.2.5.1.2.2
		Interfaces Neighbouring RBC GSM-R Data radio communication FRMCS Trackside Key management ETCS-ID Management	4.2.7.1, 4.2.7.2 4.2.7.3.1.1 4.2.7.3.1.2 4.2.8 4.2.9
		Construction of equipment	4.2.16
2	Radio infill unit	Reliability, Availability, Maintainability, Safety (RAMS): Safety Availability/Reliability Maintainability	4.2.1.1 4.2.1.2 4.2.20.1
		Trackside ETCS functionality (excluding communication via Eurobalises, Euroloop and level 2 functionality) System identifier	4.2.3 4.2.20.3
		RMR, ETCS and ATO air gap interfaces: only radio communication with train GSM-R air gap interface for ETCS	4.2.5.1.2.1
		Interfaces GSM-R Data radio communication Key management ETCS-ID Management Interlocking and LEU	4.2.7.3 4.2.8 4.2.9 4.2.3
		Construction of equipment	4.2.16
3	Eurobalise	Reliability, Availability, Maintainability, Safety (RAMS): Safety Availability/Reliability Maintainability	4.2.1.1 4.2.1.2 4.2.20.1
		ETCS and RMR air gap interfaces: only Eurobalise communication with train System identifier	4.2.5.2 4.2.20.3

		Interfaces LEU – Eurobalise	4.2.7.4
		Construction of equipment	4.2.16
4	Euroloop	Reliability, Availability, Maintainability, Safety (RAMS): Safety Availability/Reliability Maintainability	4.2.1.1 4.2.1.2 4.2.20.1
		ETCS and RMR air gap interfaces: only Euroloop communication with train System identifier	4.2.5.3 4.2.20.3
		Interfaces LEU – Euroloop	4.2.7.5
		Construction of equipment	4.2.16
5	LEU Eurobalise	Reliability, Availability, Maintainability, Safety (RAMS): Safety Availability/Reliability Maintainability	4.2.1.1 4.2.1.2 4.2.20.1
		Trackside ETCS functionality (excluding communication via radio infill, Euroloop and level 2 functionality) System identifier	4.2.3 4.2.20.3
		Interfaces LEU – Eurobalise	4.2.7.4
		Construction of equipment	4.2.16
6	LEU Euroloop	Reliability, Availability, Maintainability, Safety (RAMS): Safety Availability/Reliability Maintainability	4.2.1.1 4.2.1.2 4.2.20.1
		Trackside ETCS functionality (excluding communication via radio infill, Eurobalise and level 2 functionality) System identifier	4.2.3 4.2.20.3
		Interfaces LEU – Euroloop	4.2.7.5
		Construction of equipment	4.2.16
7	Axle Counter	Trackside train detection systems (only parameters relevant for axle counters)	4.2.10
		Electromagnetic compatibility (only parameters relevant for axle counters)	4.2.11

8	Marker Board	Trackside Control-Command and Signalling objects (only points 1 and 2)	4.2.15
		Construction of equipment	4.2.16
9	ATO Trackside	Reliability, Availability, Maintainability (RAM): Availability/Reliability Maintainability	4.2.1.2 4.2.20.1
		Trackside ATO functionality System identifier	4.2.19 4.2.20.3
		RMR, ETCS and ATO air gap interfaces: only radio communication with train GSM-R air gap interface for ATO FRMCS air gap interface for ATO	4.2.5.1.3.1 4.2.5.1.3.2
		Interfaces: GSM-R Data radio communication FRMCS Trackside	4.2.7.3.2.1 4.2.7.3.2.2
		Construction of equipment	4.2.16

6. ASSESSING THE CONFORMITY AND/OR SUITABILITY FOR USE OF THE CONSTITUENTS AND VERIFYING THE SUBSYSTEMS

6.1. Introduction

6.1.1. General principles

6.1.1.1. Compliance with basic parameters

Fulfilment of the essential requirements set out in Chapter 3 of this TSI shall be ensured through compliance with the basic parameters specified in Chapter 4.

This compliance shall be demonstrated by:

- (1) assessing the conformity of the interoperability constituents specified in Chapter 5 (see points 6.2.1, 6.2.2, 6.2.3, 6.2.4);
- (2) verifying the subsystems (see point 6.3 and point 6.4).

In case of changes to existing subsystems, the requirements in 7.2.2 for on-board subsystems and 7.2.3 for trackside subsystems shall be considered in the assessment.

6.1.1.2. Partial fulfilment of TSI requirements

An on-board subsystem may, if fulfilling both conditions below, not implement all mandatory functionalities specified in this TSI:

- (1) the functionalities are listed in Appendix G;
- (2) the Infrastructure Manager (with the support of the Member State) has indicated in RINF that the partial fulfilment of the listed requirement does not prevent an optimal and safe operation on its network.

Where a control-command and signalling interoperability constituent or subsystem does not implement all functionalities specified in this TSI, the relevant conditions for use shall reflect it in accordance with provisions of points 6.5.1 and 6.5.2.

6.1.2. *Principles for testing ETCS, ATO and RMR*

6.1.2.1. Principle

The principle is that a Control-Command and Signalling On-board Subsystem covered by an 'EC' declaration of verification is able to run on every Control-Command and Signalling Trackside Subsystem covered by an 'EC' Declaration of verification, under the conditions specified in this TSI, with no additional verifications.

Achievement of this principle is facilitated by:

- (1) rules for the design and installation of the Control-Command and Signalling On-board and the Trackside subsystems;
- (2) test specifications to prove that the Control-Command and Signalling On-board and Trackside Subsystems comply with the requirements of this TSI and are mutually compatible.

6.1.2.2. Operational test scenarios

For the purpose of this TSI, an 'operational test scenario' means a sequence of trackside and on-board events related to or influencing the Control-command and Signalling subsystems (e.g. sending/receiving messages, exceeding a speed limit, actions of operators) and the specified timing between them in order to test the intended railway system operation in situations relevant for ETCS, ATO and RMR (e.g. entry of a train into an equipped area, awakening of a train, overriding a signal at stop).

The operational tests scenarios are based on the engineering rules adopted for the project.

Check of compliance of a real implementation with an operational test scenario shall be possible gathering information through easily accessible interfaces (preferably the standard interfaces specified in this TSI).

6.1.2.3. Requirements for Operational test scenarios

The set of engineering rules for the trackside parts of ETCS, ATO and RMR and related operational test scenarios for the Trackside Control-command and Signalling Subsystem shall be sufficient to describe all intended system operations relevant for the Trackside Control-command and Signalling Subsystem in normal and identified degraded situations, and:

- (1) shall be consistent with the specifications referenced in this TSI;
- (2) shall assume that functions, interfaces and performance of the Control-command and Signalling On-board Subsystems interacting with the Trackside Subsystem are compliant with the requirements of this TSI;
- (3) shall be the ones used in the EC Verification of the Trackside Control-command and Signalling Subsystem, to check that the implemented functions, interfaces and performance are able to ensure that the intended system operation in combination with the relevant modes and transitions between levels and modes of the Control-command and Signalling On-board Subsystems are respected.

6.2. **Interoperability constituents**

6.2.1. *Assessment procedures for Control-Command and Signalling Interoperability Constituents*

Before placing on the market an interoperability constituent and/or groups of interoperability constituents the manufacturer or his authorised representative established within the European Union shall draw up an 'EC' declaration of conformity in accordance with Article 9(2) and Article 10(1) of Directive (EU) 2016/797.

The assessment procedure shall be carried out using one of the modules specified in point 6.2.2 (Modules for Control-Command and Signalling Interoperability Constituents).

An 'EC' declaration of suitability for use is not required for Control-Command and Signalling interoperability constituents. Compliance with relevant basic parameters, as demonstrated by the 'EC' Declaration of conformity, is sufficient for placing the interoperability constituents on the market ⁽¹²⁾.

6.2.2. *Modules for Control-Command and Signalling Interoperability Constituents*

For assessing interoperability constituents within the Control-Command and Signalling Subsystems, the manufacturer or his authorised representative established within the European Union, may choose:

- (1) either the type-examination procedure (Module CB) for the design and development phase in combination with the production quality management system procedure (Module CD) for the production phase; or
- (2) the type-examination procedure (Module CB) for the design and development phase in combination with the product verification procedure (Module CF); or
- (3) the full quality management system with design examination procedure (Module CH1).

In addition, for checking the SIM card and Marker Board Interoperability Constituent, the manufacturer or his representative may choose Module CA.

The modules are described in detail in the Commission Decision 2010/713/EU ⁽¹³⁾.

The following clarifications apply to the use of some of the modules:

- (1) with reference to Chapter 2 of the 'Module CB', 'EC'-type examination shall be carried out through a combination of production type and design type;
- (2) with reference to Chapter 3 of the 'Module CF' (product verification) statistical verification is not allowed, i.e. all interoperability constituents shall be individually examined.

6.2.3. *Assessment requirements*

Independently of the selected module:

- (1) the requirements stated in point 6.2.4.1 of this TSI shall be respected for the 'On-board ETCS' interoperability constituent;
- (2) the activities shown in Table 6.1.1 shall be carried out when assessing the conformity of an interoperability constituent or a group of interoperability constituents as defined in Chapter 5 of this TSI. All verifications shall be carried out by reference to the applicable table in Chapter 5 and the basic parameters indicated there.
- (3) The manufacturer of the equipment shall inform a Notified Body about all changes affecting the conformity of the Interoperability Constituent due to the requirements of the applicable TSI release. The manufacturer shall also demonstrate if these specifications of error corrections require new checks, in accordance with Table 6.1.1 and by application of modules for the EC Conformity according to 6.2.2. This information shall be provided by the manufacturer with corresponding references to the technical documentation relating to the existing EC certificate. The manufacturer shall justify and document that applicable requirements are met at interoperability constituent level, which shall be assessed by a Notified Body.

The manufacturer shall inform the impacted entities about changes, e.g. regarding operation and maintenance, if they affect existing and already implemented products/components.

⁽¹²⁾ Checking that an Interoperability Constituent is used appropriately is part of the overall EC verification of Control-Command and Signalling On-board and Track-side Subsystems, as explained in 6.3.3 and 6.3.4.

⁽¹³⁾ Commission Decision 2010/713/EU of 9 November 2010 on modules for the procedures for assessment of conformity, suitability for use and 'EC' verification to be used in the technical specifications for interoperability adopted under Directive 2008/57/EC of the European Parliament and of the Council (OJ L 319, 4.12.2010, p. 1).

Table 6.1.1.

Conformity assessment requirements of an interoperability constituent or a group of interoperability constituents

No	Aspect	What to assess	Supporting evidence
1a	Functions, interfaces and performances	Check that all mandatory functions, interfaces and performances as described in the basic parameters referenced in the relevant table of Chapter 5 are implemented and that they comply with the requirements of this TSI.	Design documentation and running of test cases and test sequences, as described in the basic parameters referenced in the relevant table of Chapter 5.
1b		Check which optional functions and interfaces as described in the basic parameters referenced in the relevant table of Chapter 5 are implemented and that they comply with the requirements of this TSI.	Design documentation and running of test cases and test sequences, as described in the basic parameters referenced in the relevant table of Chapter 5.
1c		Check which additional functions and interfaces (not specified in this TSI) are implemented and that they do not lead to conflicts with implemented functions specified in this TSI.	Impact analysis.
2a	Construction of equipment	Check compliance with mandatory conditions, where specified in the basic parameters referenced in the relevant table of Chapter 5.	Documentation on material used and, where necessary, tests to ensure that the requirements of the basic parameters referenced in the relevant table of Chapter 5 are satisfied.
2b		In addition, check that the interoperability constituent functions correctly in the environmental conditions for which it is designed.	Tests according to the applicant's specifications.
3	Reliability, Availability, Maintainability, Safety (RAMS)	Check compliance with the safety requirements where specified in the basic parameters referenced in the relevant table of Chapter 5, i.e. - respect for quantitative Tolerable Hazard Rates (THRs) caused by random failures; - the development process is able to detect and eliminate systematic failures.	- Calculations for the THRs caused by random failures, supported by reliability data. 2.1. The manufacturer's quality and safety management throughout design, manufacturing and testing conforms to a recognised standard (see Note).

			2.2. The software development life-cycle, the hardware development life-cycle and the integration of hardware and software have each been undertaken in accordance with a recognised standard (see Note). 2.3. The safety verification and validation process has been undertaken in accordance with a recognised standard (see Note) and respects the safety requirements described in the basic parameters referenced in the relevant table of Chapter 5. 2.4. The functional and technical safety requirements (correct operation under fault-free conditions, effects of faults and of external influences) are verified in accordance with a recognised standard (see Note). <i>Note:</i> The standard shall satisfy at least the following requirements: (1) be compliant with the requirements for code of practice, as stated in Annex I, point 2.3.2, of Regulation (EU) No 402/2013; (2) be widely acknowledged in the railway domain. If this is not the case, the standard will have to be justified and be acceptable to the Notified Body; (3) be relevant for the control of the considered hazards in the system under assessment; (4) be publicly available for all actors who want to use it.
4		Check that the quantitative reliability target (related to random failures) indicated by the applicant is met.	Calculations

5		Elimination of systematic failures.	Tests of equipment (full Interoperability Constituent or separately for subassemblies) in operational conditions, with repair when defects are detected. Documentation accompanying the certificate which indicates which kind of verifications have been performed, which standards have been applied and criteria adopted to consider these tests completed (according to decisions of the applicant).
6	Technical documentation for maintenance	Check compliance with maintenance requirements – point 4.2.20.1.	Document check

6.2.4. *Special issues*

6.2.4.1. Mandatory tests for the on-board ETCS

Particular attention shall be given to assessing the conformity of the on-board ETCS interoperability constituent, since it is complex and plays a key role in achieving interoperability.

Regardless of whether module CB or CH1 is chosen, the Notified Body shall check that:

- (1) a representative specimen of the interoperability constituent has been submitted to a full set of test sequences including all test cases necessary to check the functions referenced in point 4.2.2 (On-Board ETCS functionality). The applicant is responsible to define the test cases and their organisation in sequences, if this is not included in specifications referenced in this TSI;
- (2) these tests were carried out in a laboratory accredited in accordance with Regulation (EC) No 765/2008 of the European Parliament and of the Council ⁽¹⁴⁾ and the standards referred to in Appendix A, Table A 4 to carry out tests with the use of the test architecture and the procedures specified in Appendix A, Table A 1:
 - (a) For on-board ETCS supporting up to system version 2.1: 4.2.2 c.
 - (b) For on-board ETCS supporting up to system version 2.2 and 3.0: not included, see previous point (1).

The laboratory shall provide a full report clearly indicating the results of the tests cases and sequences used. The Notified Body is responsible to assess the suitability of test cases and sequences to check compliance with all relevant requirements and to evaluate the results of tests in view of the certification of the Interoperability Constituent.

6.2.4.2. Class B interfaces

Each Member State shall be responsible for verifying that Class B systems and their interfaces to the ETCS on-board Interoperability Constituent conform to its national requirements.

The verification of the standardised STM interface to the on-board ETCS requires a conformity assessment carried out by a Notified Body.

⁽¹⁴⁾ Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing Regulation (EEC) No 339/93 (OJ L 218, 13.8.2008, p. 30).

6.2.4.3. ETCS and radio system compatibility checks for Interoperability Constituent

Since the ESC/RSC checks are not required in Table 6.1.1, they are not required for issuing an interoperability constituent certificate.

If ESC/RSC checks are executed at Interoperability Constituent level, the task of the NoBo with regards to the ESC/RSC Interoperability Constituent statement(s) and associated report is to verify the correctness and completeness of the ESC/RSC check report for the Interoperability Constituent, according to the requirements in this point.

In line with the Directive (EU) 2016/797 the Notified Body performing this assessment may be a different one from the Notified Body performing the EC conformity or suitability procedure for the interoperability constituent.

Table 6.1.2.

NoBo assessment of the ETCS or Radio System Compatibility Check for Interoperability Constituents

No	Aspect	What to assess	Supporting evidence
1	Availability of the results	Assess that the check report gives reference to the checks according to the definition of the ESC/RSC types in the technical document published by ERA ⁽¹⁾ . Assess that the Interoperability Constituent check report clearly indicates which checks have been verified for the ESC/RSC Type.	Evaluation of the ESC/RSC Check Report.
2	Availability of the results	Assess that ESC/RSC results indicate for every ESC/RSC Check whether the ESC/RSC Check was passed as specified or not.	Evaluation of the ESC/RSC Check Report.
3	Incompatibilities and errors reported	Assess that for every ESC/RSC Check which was not passed as specified, the incompatibilities and errors reported during ESC/RSC Checks are stated.	Evaluation of the ESC/RSC Check Report.
4	Impact analysis	Assess that for every ESC/RSC Check which was not passed as specified, an impact analysis of the effects on ESC/RSC has been performed and recorded using the template provided in the Appendix D.	Evaluation of the ESC/RSC Check Report.

⁽¹⁾ This includes the documents referred to in the Agency ESC/RSC Technical Document.

6.3. Control-Command and Signalling Subsystems

6.3.1. Assessment procedures for Control-Command and Signalling Subsystems

This Chapter deals with the 'EC' declaration of verification for the Control-Command and Signalling On-board Subsystem and the 'EC' declaration of verification for the Control-Command and Signalling Trackside Subsystem.

At the request of the applicant the Notified Body shall carry out an 'EC' verification of a Control-Command and Signalling On-board or Trackside Subsystem in accordance with Annex IV to Directive (EU) 2016/797.

The applicant shall draw up the 'EC' declaration of verification for the Control-Command and Signalling On-board or Trackside Subsystem in accordance with Article 15(1) and (9) of Directive (EU) 2016/797.

The content of the 'EC' declaration of verification shall conform to Article 15(9) of Directive (EU) 2016/797.

The assessment procedure shall be carried out using the modules specified in point 6.3.2 (Modules for Control-Command and Signalling Subsystems).

The 'EC' declarations of verification for a Control-Command and Signalling On-board Subsystem and of a Control-Command and Signalling Trackside Subsystem, together with the certificates of conformity, shall be deemed sufficient to ensure that the subsystems are compatible under the conditions specified in this TSI.

6.3.2. *Modules for Control-Command and Signalling Subsystems*

All modules indicated below are specified in the Decision 2010/713/EU.

6.3.2.1. *On-board Subsystem*

For verifying the Control-Command and Signalling On-board Subsystem, the applicant may choose either:

- (1) the type-examination procedure (Module SB) for the design and development phase in combination with the production quality management system procedure (Module SD) for the production phase; or
- (2) the type-examination procedure (Module SB) for the design and development phase in combination with the product verification procedure (Module SF); or
- (3) the full quality management system with design examination procedure (Module SH1).

6.3.2.2. *Trackside Subsystem*

For verifying the Control-Command and Signalling Trackside Subsystem, the applicant may choose either:

- (1) the unit verification procedure (Module SG); or
- (2) the type-examination procedure (Module SB) for the design and development phase in combination with the production quality management system procedure (Module SD) for the production phase; or
- (3) the type-examination procedure (Module SB) for the design and development phase in combination with the product verification procedure (Module SF); or
- (4) the full quality management system with design examination procedure (Module SH1).

6.3.2.3. *Conditions for using modules for On-board and Trackside Subsystems*

With reference to point 4.2 of Module SB (type-examination), design review is requested.

With reference to point 4.2 of Module SH1 (full quality management system with design examination), an additional type test is required.

6.3.3. *Assessment requirements for an On-board Subsystem*

Table 6.2.1 shows the checks that must be carried out when verifying a Control-Command and Signalling On-board Subsystem and the basic parameters that must be respected.

Independently of the module chosen:

- (1) verification shall demonstrate that the Control-Command and Signalling On-board Subsystem complies with basic parameters when it is integrated into the vehicle;
- (2) the functionality and performances of interoperability constituents already covered by their EC Declaration of conformity do not require additional verifications;
- (3) the update due to specifications maintenance of an already integrated Interoperability Constituent will not require additional verification by a subsystem Notified Body if the Interoperability Constituent Notified Body confirms that the impact of the update to be assessed is limited to the Interoperability Constituent and if no impact at subsystem level is identified by the CSM assessment body assessing the subsystem integration of the update.

Table 6.2.1.

Conformity assessment requirements for an On-board Subsystem or for groups of Parts

No	Aspect	What to assess	Supporting evidence
1a	Use of interoperability constituents	Check whether the interoperability constituents to be integrated into the subsystem are all covered by an 'EC' Declaration of conformity and a corresponding certificate. The Subsystem needs to be checked with a SIM card compliant with the requirements of this TSI. Changing the SIM card with another one compliant with the TSI is not a modification of the Subsystem.	Existence and content of documents.
1b		Check conditions and limits of use on the use of Interoperability Constituents against the characteristics of the subsystem and of the environment	Analysis by document check.
1c		For interoperability constituents that have been certified against a version of the CCS TSI, which is different from the version applied for the 'EC' Verification of the subsystem and/or against a set of specifications which is different from the set of specifications applied for the 'EC' Verification of the subsystem, check that the certificate still ensures subsystem compliance with the requirements of the TSI currently in force.	Impact analysis by document checks.
2a	Integration of interoperability constituents in the subsystem	Check the correct installation and functioning of the internal interfaces of the subsystem – Basic parameter 4.2.6.	Checks according to specifications.
2b		Check that additional functions (not specified in this TSI) do not impact the mandatory ones.	Impact analysis.
2c		Check that the values of ETCS IDs are within the allowed range and, if required by this TSI, have unique values – Basic parameter 4.2.9.	Check of design specifications.

2d		Check that there is a system identifier for ETCS part of the subsystem. In case of modification of the functional or realisation part of the system identifier, that the modification corresponds to the definition – Basic Parameter 4.2.20.3.	Document check.
3	Integration of parts in the subsystem	Check the interfaces and integration between the different parts of the subsystem – Table 4.1 and Basic parameter 4.2.6.	Impact analysis by document checks.
4a	Integration with rolling stock	Check the correct installation of equipment – Basic Parameters 4.2.2, 4.2.4, 4.2.14, 4.2.18 and conditions for installation of equipment, as specified by the manufacturer.	Results of checks (according to specifications referenced in the Basic Parameters and the manufacturer's installation rules).
4b		Check that the Control-Command and Signalling On-board Subsystem is compatible with the rolling stock environment – Basic parameter 4.2.16.	Document check (certificates of interoperability constituents and possible integration methods checked against characteristics of rolling stock).
4c		Check that parameters (e.g. braking parameters) are correctly configured and that they are within the allowed range.	Document check (values of parameters checked against characteristics of rolling stock).
5a	Integration with Class B, depending on ETCS on-board and Class B interface	Check that the standardised interface STM is connected to on-board ETCS with TSI-compliant interfaces.	Nothing to test: there is a standard interface already tested at interoperability constituent level. Its functioning has already been tested when checking the integration of interoperability constituents in the subsystem.
5b		Check that Class B functions implemented in the on-board ETCS – Basic parameter 4.2.6.1 – create no additional requirements for the Control-Command and Signalling Trackside Subsystem due to transitions.	Nothing to test: everything has already been tested at interoperability constituent level.

5c		Check that separate Class B equipment which is not connected to the on-board ETCS – Basic Parameter 4.2.6.1 – creates no additional requirements for Control-Command and Signalling Trackside Subsystem due to transitions.	Nothing to test: no interface (¹).
5d		Check that separate Class B equipment connected on-board ETCS using (partly) non TSI compliant interfaces – basic parameter 4.2.6.1 – creates no additional requirements for the Control-Command and Signalling Trackside Subsystem due to transitions. Also check that ETCS functions are not affected.	Impact analysis by document check and integration tests report.
6a	Integration with Control-Command and Signalling Trackside Subsystems	Check that Eurobalise telegrams can be read (scope of this test is limited to checking that the antenna has been appropriately installed. The tests already carried out at Interoperability Constituent level shall not be repeated) – Basic Parameter 4.2.5.	Test using a certified Eurobalise: the ability to read correctly the telegram is the supporting evidence.
6b		Check that Euroloop telegrams (if applicable) can be read – Basic Parameter 4.2.5.	Test using a certified Euroloop: the ability to read correctly the telegram is the supporting evidence.
6c		Check that the equipment can handle a RMR call for voice and data (if applicable) – Basic Parameter 4.2.5.	Test with a certified RMR network. The ability to set up, maintain and disconnect a connection is the supporting evidence.
7a	Reliability, Availability, Maintainability, Safety (RAMS)	Check that the equipment complies with safety requirements – Basic Parameter 4.2.1.	Application of procedures specified in the Common Safety Method for Risk Evaluation and Assessment.
7b		Check that the quantitative reliability target is met – Basic Parameter 4.2.1.	Calculations.
7c		Check the compliance with requirements about maintenance – point 4.2.20.2.	Documents check.

8	Integration with Control-Command and Signalling Trackside Subsystems and other subsystems: tests under conditions representing the intended operation.	Test the behaviour of the subsystem under as many different conditions as reasonably possible representing the intended operation (e.g. line gradient, train speed, vibrations, traction power, weather conditions, design of Control-Command and Signalling trackside functionality). The test must be able to verify: (1) that odometry functions are correctly performed – basic parameter 4.2.2; (2) that the on-board Control-Command and Signalling Subsystem is compatible with the rolling stock environment – basic parameter 4.2.16. These tests must also be such as to increase confidence that there will be no systematic failures. The scope of these tests excludes tests already carried out at different stages: tests performed on the interoperability constituents and tests performed on the subsystem in a simulated environment shall be taken into account. Tests under environmental conditions are not necessary for on-board RMR voice equipment. <i>Note:</i> Indicate in the certificate which conditions have been tested and which standards have been applied.	Reports of test runs.
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(¹) In this case, the assessment of the management of transitions shall be according to national specifications.

6.3.3.1. ETCS and radio system compatibility checks

The task of the NoBo with regards to the ESC/RSC check report is to verify the correctness and completeness of the ESC/RSC check report for the subsystem, according to the requirements in this point.

Since the ESC/RSC checks are not required in Table 6.2.1, they are not needed for issuing an on-board subsystem certificate. Such an on-board subsystem therefore will only be considered compatible with Class A infrastructures where no specific ESC/RSC check is required to demonstrate technical compatibility (i.e. identified by the IM as ESC-EU-0 or RSC-EU-0 in RINF).

Table 6.2.2.

NoBo assessment of the ETCS or Radio System Compatibility Check for On-Board Subsystems

No	Aspect	What to assess	Supporting evidence
1	Availability of the results	Assess that the check report gives reference to the checks according to the definition of the ESC/RSC types in the technical document published by ERA ⁽¹⁾ . Assess that all required ESC/RSC checks of that ESC/RSC type have been evaluated.	Evaluation of the ESC/RSC Check Report.
2	Availability of the results	Assess that ESC/RSC results indicate for every ESC/RSC Check whether the ESC/RSC Check was passed as specified or not.	Evaluation of the ESC/RSC Check Report.
3	Incompatibilities and errors reported	Assess that for every ESC/RSC Check which was not passed as specified, the incompatibilities and errors reported during ESC/RSC Checks are stated.	Evaluation of the ESC/RSC Check Report.
4	Impact analysis	Assess that for every ESC/RSC Check which was not passed as specified, an impact analysis of the effects on ESC/RSC has been performed and recorded using the template provided in the Appendix D.	Evaluation of the ESC/RSC Check Report.
5	Conditions	Assess that all conditions are referred to in the check report.	Evaluation of the ESC/RSC Check Report.
6	Integration of ESC/RSC Interoperability Constituent Statements	Assess that if the ESC/RSC statement is based on ESC/RSC Interoperability Constituent statements, the results from ESC/RSC Interoperability Constituent Statement are applicable to the concerned subsystem.	Evaluation of the ESC/RSC Check Report.

⁽¹⁾ This includes the documents referred to in the Agency ESC/RSC Technical Document.

The Notified Body shall not check again any aspect covered during the already performed EC Verification procedure for the on-board subsystem or already covered in the ESC/RSC Interoperability Constituent Statement.

In line with the Directive (EU) 2016/797, the Notified Body performing this assessment may be a different one from the Notified Body performing the EC Verification procedure for the on-board subsystem or from the Notified Body performing the assessment on the ESC/RSC Interoperability Constituents check report.

6.3.4. Assessment requirements for a Trackside Subsystem

The purpose of assessments carried out within the scope of this TSI is to verify that the equipment complies with the requirements stated in Chapter 4.

However, for the design of the ETCS part of the Control-Command and Signalling Trackside Subsystem, application-specific information is needed. This shall include:

- (1) line characteristics such as gradients, distances, positions of route elements and Eurobalises/Euroloops, locations to be protected, etc.;
- (2) the signalling data and rules to be handled by the ETCS system.

This TSI does not cover checks to assess whether the application-specific information is correct.

Regardless of the module chosen:

- (1) Table 6.3 shows the checks that shall be carried out to verify a Control-Command and Signalling Trackside Subsystem and the basic parameters that shall be respected;
- (2) functionality and performance that have already been checked at the level of the interoperability constituents do not require additional verification;
- (3) the update due to specifications maintenance of an already integrated Interoperability Constituent will not require additional verification by a subsystem Notified Body if the Interoperability Constituent Notified Body confirms that the impact of the update to be assessed is limited to the Interoperability Constituent and if no impact at subsystem level is identified by the CSM assessment body assessing the subsystem integration of the update.

Table 6.3.

Conformity assessment requirements for a Trackside Subsystem

No	Aspect	What to assess	Supporting evidence
1a	Use of interoperability constituents	Check that all interoperability constituents to be integrated into the subsystem are covered by an EC declaration of conformity and the corresponding certificate.	Existence and content of documents.
1b		Check conditions and limits of use on the use of interoperability constituents against the characteristics of the subsystem and of the environment.	Impact analysis by documents check.
1c		For interoperability constituents that have been certified against a version of the Control-Command and Signalling TSI, which is different from the version applied for the 'EC' Verification of the subsystem and/or against a set of specifications which is different from the set of specifications applied for the 'EC' Verification of the subsystem, check that the certificate still ensures compliance with the requirements of the TSI currently in force.	Impact analysis by comparison of specifications referenced in the TSI and certificates of the interoperability constituents.
2a	Integration of interoperability constituents in the subsystem Note: Only those with a specific assessment at subsystem level.	Check that the internal interfaces of the subsystem have been installed properly and function properly – Basic parameters 4.2.5, 4.2.7 and conditions specified by the manufacturer. (N/A for Interoperability Constituent axle counter and Marker Boards)	Checks according to specifications.

2b		Check that additional functions (not specified in this TSI) do not impact the mandatory ones. (N/A for Interoperability Constituent axle counter and Marker Boards)	Impact analysis.
2c		Check that the values of ETCS IDs are within the allowed range and, if required by this TSI, have unique values – Basic Parameter 4.2.9. (N/A for Interoperability Constituent axle counter and Marker Boards)	Check of design specifications.
2d		For Interoperability Constituent axle counters (only): The integration of the Interoperability Constituent in the subsystem has to be verified: Check index 77 document Chapter 4, table 16 ‘conformity assessment’. Check the correct installation of equipment and conditions specified by the manufacturer and/or the infrastructure manager.	Document check.
2e		Check that there is a system identifier for the ETCS part of the subsystem. In case of modification of the functional or realisation part of the system identifier, that the modification corresponds to the definition – Basic Parameter 4.2.20.3.	Document check.
3	Trackside Control-Command objects	Check that requirements for marker boards specified in this TSI are fulfilled (characteristics, compatibility with the infrastructure requirements (gauge, ...), compatibility with the driver's field of view, the positioning of interoperable marker boards to meet their intended operational purpose) – Basic parameter 4.2.15.	Design documentation, results of tests or test runs with TSI compliant rolling stock.

4a	Integration infrastructure with	Check that the ETCS, RMR and ATO equipment has been properly installed – Basic parameters 4.2.3, 4.2.4, 4.2.19 and conditions for installation specified by the manufacturer.	Results of checks (according to specifications referenced in the basic parameters and manufacturer's installation rules).
4b		Check that the Control-Command and Signalling Trackside subsystem equipment is compatible with the trackside environment – Basic parameter 4.2.16.	Document check (certificates of interoperability constituents and possible methods of integration checked against trackside characteristics).
5a	Integration with trackside signalling (not applicable for train detection part)	Check that all functions required by the application are implemented in accordance with specifications referenced in this TSI – Basic parameter 4.2.3.	Document check (applicant's design specification and certificates of interoperability constituents).
5b		Check the correct configuration of parameters (Eurobalise telegrams, RBC messages, marker boards positions, etc.).	Document check (values of parameters checked against characteristics of trackside and of signalling).
5c		Check that the interfaces are correctly installed and function properly.	Design verification and tests according to information supplied by the applicant.
5d		Check that the Control-Command and Signalling Trackside subsystem operates correctly according to information at the interfaces with trackside signalling (e.g. appropriate generation of Eurobalise telegrams by a LEU or of message by RBC).	Design verification and tests according to the information supplied by the applicant.
6a	Integration with Control-Command and Signalling On-board Subsystems	Check the RMR coverage – Basic Parameter 4.2.4.	On site measurements.
6b		Check that all functions required by the application are implemented in accordance with specifications referenced in this TSI – basic parameters 4.2.3, 4.2.4 and 4.2.5.	Reports of the operational test scenarios specified in point 6.1.2 with at least two certified Control-Command and Signalling On-board Subsystems from different suppliers. The report shall indicate which operational test scenarios have been tested, which on-board equipment has been used and whether tests have been performed in laboratories, test lines or real implementation.

7	Compatibility of train detection systems (Excluding axle counters)	Check that the train detection systems comply with the requirements of this TSI – Basic parameters 4.2.10 and 4.2.11. Check index 77 document Chapter 4. Check the correct installation of equipment and conditions specified by the manufacturer and/or the infrastructure manager.	Evidence of compatibility of equipment from existing installations (for systems already in use); perform tests according to standards for new types. On-site measurements to prove correctness of installation. Document check of correct installation of equipment.
8a	Reliability, Availability, Maintainability, Safety (RAMS)	Check compliance with safety requirements – Basic Parameter 4.2.1.1.	Application of procedures specified in the Common Safety Method for Risk Evaluation and Assessment.
8b	(excluding train detection)	Check that quantitative reliability targets are respected – Basic Parameter 4.2.1.2.	Calculations.
8c		Check the compliance with requirements about maintenance – point 4.2.20.2.	Document check.
9	Integration with Control-Command and Signalling On-board Subsystems and rolling stock: tests under conditions representing the intended operation.	Test the behaviour of the subsystem under many different conditions as reasonably feasible representing the intended operation (e.g. train speed, number of trains on the line, weather conditions). The test must be able to verify: (1) the performance of train detection systems – Basic parameters 4.2.10, 4.2.11; (2) that the Control-Command and Signalling Trackside subsystem is compatible with trackside environment – Basic parameter 4.2.16. These tests will also increase confidence in the absence of systematic failures. The scope of these tests excludes tests already done in different steps: tests performed at the level of interoperability constituents and tests performed on the subsystem in a simulated environment shall be taken into account. <i>Note:</i> Indicate in the certificate which conditions have been tested and which standards have been applied.	Reports of test runs.

10	ETCS and radio System Compatibility	The proposed ESC and RSC checks are only covering TSI requirements and are in line with the specifications – Basic Parameter 4.2.17.	Document check of the envisaged ESC/RSC types in case they are new or modified. OR The technical compatibility checks for ESC and RSC Type(s) are published as 'Valid' in the Agency ESC/RSC technical document, if they remain unchanged.
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6.4. Provisions in case of the partial assessment of TSI requirements

6.4.1. *Assessment of parts of control-command and signalling subsystems*

Pursuant to Article 15(7) of Directive (EU) 2016/797, the Notified Body may issue EC certificates of verification for certain parts of a subsystem, if allowed to do so under the relevant TSI.

As pointed out in point 2.2 (Scope) of this TSI, the trackside and on-board control-command and signalling subsystems contain parts, as specified in point 4.1 (Introduction), and this section only relates to those defined parts.

An EC certificate of verification may be issued for each part or for a combination of parts specified in this TSI.

Regardless of which module is chosen, the Notified Body shall check that the requirements (all relevant requirements as specified in Table 6.2.1) are fulfilled for:

- (1) the part in question; and
- (2) its interfaces to the unchanged parts of the subsystem; and
- (3) the integration with the unchanged parts of the subsystem.

For the CCS on-board subsystem: In any case of assessment of parts the EC certificate(s) of verification issued by the Notified Body(ies) shall consider one of the following options:

- (1) An EC certificate of verification of the CCS on-board subsystem covering all parts; or
- (2) An EC certificate of verification for each of the following groups of parts:
 - (a) Train protection, data radio communication and automated train operation parts; and
 - (b) Voice radio communication part.

The EC certificate of verification shall state and provide evidence on the fulfilment of all requirements in Table 6.2.1, and on possible interfaces between parts or absence thereof, in one of the following ways:

- (1) the absence of interfaces with the other part/group of parts; or
- (2) in case of interfaces with the other part/group of parts, the absence of the conditions and limits of use of the other part/group of parts.

In case of interfaces that require conditions and limits of use in line with the requirements specified in the Table 6.2.1 of this TSI and that export constraints to the other part/group of parts, there shall be an EC subsystem certificate; or

- (3) in case the subsystem consists of only one part/group of parts, no additional assessment on subsystem level is necessary if the assessment of the part/group of parts covers all TSI requirements for that part/group of parts. In this case the EC certificate of verification for the part replaces the subsystem EC certificate of verification.

6.4.2. *Intermediate Statement of Verification*

If conformity is assessed for subsystems specified by the applicant and different from the parts allowed in Table 4.1, and the assessment process is different from the process described in point 6.4.1 (Assessment of parts of control-command and signalling subsystems) of this TSI, or if only certain stages of the verification procedure have been performed, only an intermediate statement of verification may be issued.

6.5. **Management of errors**

Where deviations from intended functions and/or performance are detected during the tests or during the operational life of a subsystem, the applicants and/or operators shall inform without delay the Agency and the authorising entity that issued the authorisations for the concerned trackside subsystems or vehicles, to initiate the procedures set out in Article 16 of Directive (EU) 2016/797. As a result of the application of Article 16(3) of that Directive:

- (1) if the deviation is due to incorrect application of this TSI or to errors in design or installation of equipment, the applicant for the relevant certificates shall take the necessary corrective actions and the certificates affected and/or the corresponding technical files (for interoperability constituents and/or subsystems), together with the corresponding EC Declarations, shall be updated;
- (2) if the deviation is due to errors in this TSI or in specifications referenced therein, the procedure set out in Article 6 of the Directive (EU) 2016/797 shall be initiated.

The applicants and/or suppliers may be applying their own solution to the identified error once the error related change request has been validated by the Change Control Management (CCM) procedure according to Article 28(2) of Regulation (EU) 2016/796. This validation shall be done within 3 months after the complete information has been submitted.

Any such temporary solution to the identified error, that does not export constraints to the other subsystem, may be applied until the agreed error correction is adopted in a new version of CCS TSI. Once a solution to the identified error is adopted in a new TSI version the applicants and/or suppliers shall apply the adopted solution to the existing vehicles according to the earlier of the following conditions:

- (a) if implementation of error correction does not require authorization: at the next occasion when error correction is mandatory by virtue of table B1.1 row 1 and in any case not before 1.1.2026;
- (b) if implementation of error correction requires authorization: at the next reauthorisation resulting from another change to the vehicle train protection (ETCS) system;
- (c) at the next upgrade to a higher system version of the vehicle train protection part.

Note: For Interoperability constituents for which the result of the information to be provided as described in point 7.2.10.1 indicates that there is no impact regarding safety, operation and interoperability, an update is not required.

Error corrections might impact the CCS trackside and CCS on-board subsystems. The Agency shall organise an efficient processing of all the information received in order to facilitate the Change Control Management process for improvement and further development of the specifications, including the test specifications.

6.5.1. *Content of EC certificates*

As per Commission Implementing Regulation (EU) 2019/250 ⁽¹⁵⁾ the notified bodies shall describe the restrictions and conditions for use of interoperability constituents and subsystems in the relevant EC certificates.

Notified bodies shall coordinate with the Agency the way in which errors, restrictions and conditions for use of interoperability constituents and subsystems are managed in the relevant EC certificates for verification and their accompanying technical files in the working group set up under Article 29 of Regulation (EU) 2016/796.

⁽¹⁵⁾ 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).

In the accompanying technical file issued by the NoBo the template of Appendix D shall be used.

6.5.2. *Content of EC declarations*

As per Implementing Regulation (EU) 2019/250 the interoperability constituent's manufacturer or the subsystem applicant shall describe in the EC declaration of conformity or verification the restrictions and conditions for use.

In the accompanying technical files the template of Appendix D shall be used.

7. IMPLEMENTING THE TSI CONTROL-COMMAND AND SIGNALLING

7.1. **Introduction**

This Chapter outlines the technical measures for implementing the TSI, and in particular the conditions for migrating to Class A systems.

Account must be taken of the fact that the implementation of a TSI occasionally has to be coordinated with the implementation of other TSIs.

7.2. **Generally applicable rules**

7.2.1. *Upgrading or renewing the Control-Command Subsystems or parts of them*

Upgrading or renewing the Control-Command and Signalling Subsystems may concern any or all of the parts constituting them, as specified in point 2.2 (Scope).

The different parts of the Control-Command and Signalling Subsystems may therefore be upgraded or renewed separately, if interoperability is not jeopardised.

See point 4.1 (Introduction) for the definition of the basic parameters for each part.

7.2.2. *Changes to an existing On-Board subsystem*

This point defines the principles to be applied by the entities managing the change and authorising entities in line with the EC verification procedure described in Articles 15(9) and 21(12) and Annex IV of Directive (EU) 2016/797. This procedure is further developed in Articles 13, 15 and 16 of Implementing Regulation (EU) 2018/545 and in Decision 2010/713/EU.

This point applies in case of any change(s) to an existing on-board subsystem or on-board subsystem type, including renewal or upgrade. It does not apply in case of changes covered by Article 15(1), point (a) of Implementing Regulation (EU) 2018/545.

7.2.2.1. Rules to manage changes in on-board CCS subsystems

- (1) Parts, as defined in Table 4.1 of this TSI, and basic parameters of the on-board subsystem that are not affected by the change(s) are exempt from conformity assessment against the provisions in this TSI. The list of parts and basic parameters affected by the change is to be provided by the entity managing the change.
- (2) The entity managing the change shall inform a Notified Body of all changes affecting the conformity of the subsystem with the requirements of the relevant TSI(s) requiring new checks, 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 Article 15(5) of Directive (EU) 2016/797. This information shall be provided by the entity managing the change with corresponding references to the technical documentation relating to the existing EC certificate.
- (3) The entity managing the change has to justify and document that applicable requirements remain consistent at subsystem level, and this has to be assessed by a Notified Body.

(4) The changes impacting the Basic Design Characteristics of the on-board subsystem are defined in Table 7.1 (Basic Design Characteristics) and shall be classified as Article 15(1), points (c) or (d) of Implementing Regulation (EU) 2018/545, and in accordance with Table 7.1 (Basic Design Characteristics) changes not impacting but related to the Basic Design Characteristics shall be classified by the entity managing the change as Article 15(1), point (b) of Implementing Regulation (EU) 2018/545.

(5) Changes not covered by point 7.2.2.1(4) above are deemed not to have any impact on the basic design characteristics. They will be classified by the entity managing the change as Article 15(1), points (a) or (b) of Implementing Regulation (EU) 2018/545.

Note: The classification of the changes set out in points 7.2.2.1(4) and this point above is performed by the entity managing the change without prejudice of the safety judgement mandated in Article 21(12), point (b) of Directive (EU) 2016/797.

(6) All changes shall remain compliant with the applicable TSIs ⁽¹⁶⁾ regardless its classification.

Table 7.1.

Basic Design Characteristics

1. TSI Point	2. Related basic design characteristic(s)	3. Changes not impacting the basic design characteristics according to 15(1)(b) of Implementing Regulation (EU) 2018/545	4. Changes impacting the basic design characteristic but inside the acceptable range of parameters therefore to be classified as Art 15.1(c) of Implementing Regulation (EU) 2018/545	5. Changes impacting the basic design characteristic and outside the acceptable range of parameters therefore to be classified as Art 15.1(d) of Implementing Regulation (EU) 2018/545
4.2.2 On-Board ETCS functionality	ETCS equipment on-board and the set of specification of CCS TSI Appendix A	Not applicable	Not applicable	Use another Appendix A set of specifications.
	Envelope of legally operated ETCS system versions	Not applicable	Not applicable	Installation or start the operational use of ETCS; Modification of the envelope of legally operated ETCS system versions from set of specifications in Appendix A.

⁽¹⁶⁾ According to Agency's Advice 2017/3, if after a modification there is no need for new authorisation the applicable TSI corresponds to the one used for the original certification. In case there is a need for new authorisation, applicable TSI corresponds to the latest TSI.

	ETCS On-board implementation	Fulfilling all the conditions in point 7.2.2.2 (change of realisation identifier)	Not applicable	Not fulfilling all the conditions in point 7.2.2.2 (change of functional identifier)
	Managing information about the completeness of the train (not from driver)	Not applicable	Adding or removing train integrity supervision	Not applicable
	Safe consist length information from on-board necessary to access the line and SIL	Not applicable	Adding or removing safe consist length information	Not applicable
4.2.17.1 ETCS System Compatibility	ETCS System Compatibility	Not applicable	Adding or removing an ESC statement fulfilling all the conditions in point 7.2.2.4.	Adding or removing an ESC statement not fulfilling all the conditions in point 7.2.2.4.
4.2.4 Mobile communication functions for railways RMR 4.2.4.2.1 GSM-R Voice and operational communication applications	GSM-R Radio voice on board and its Baseline	Usage of another Baseline fulfilling all the conditions in point 7.2.2.3	Not applicable	Installation or start the operational use of GSM-R cab radio; Usage of another Baseline not fulfilling all the conditions in point 7.2.2.3.
	GSM-R Voice and operational communication implementation	Fulfilling all the conditions in point 7.2.2.3 (change of realisation identifier)	Not applicable	Not fulfilling all the conditions in point 7.2.2.3 (change of functional identifier)
	GSM-R Voice SIM Card support of Group ID 555	Not applicable	Change the SIM Card support of Group ID 555	Not applicable
4.2.17.3 ETCS and Radio System Compatibility	Radio Voice System Compatibility	Not applicable	Adding or removing an RSC statement fulfilling all the conditions in point 7.2.2.4.	Adding or removing an RSC statement not fulfilling all the conditions in point 7.2.2.4.

4.2.4 Mobile communication functions for railways RMR	GSM-R Radio Data communication on board and its Baseline	Usage of another Baseline fulfilling all the conditions in point 7.2.2.3.	Not applicable	Installation or start the operational use of GSM-R EDOR; Usage another Baseline not fulfilling all the conditions in point 7.2.2.3.
4.2.4.3.1.1 GSM-R data communication for ETCS				
4.2.4.3.2.1 GSM-R data communication for ATO	GSM-R Data communication for ETCS and ATO implementation	Fulfilling all the conditions in point 7.2.2.3 (change of realisation identifier)	Not applicable	Not fulfilling all the conditions in point 7.2.2.3 (change of functional identifier)
4.2.17.3 ETCS and Radio System Compatibility	Radio Data System Compatibility	Not applicable	Adding or removing an RSC statement fulfilling all the conditions in point 7.2.2.4.	Adding or removing an RSC statement not fulfilling all the conditions in point 7.2.2.4.
4.2.4 Mobile communication functions for railways RMR	Voice SIM Card GSM-R Home Network	Not applicable	Replacement of a TSI compliant GSM-R SIM Card by another TSI compliant GSM-R SIM Card with a different GSM-R Home Network	Not applicable
4.2.4.1.1 GSM-R Basic communication function				
	Data SIM Card GSM-R Home Network	Not applicable	Replacement of a TSI compliant GSM-R SIM Card by another TSI compliant GSM-R SIM Card with a different GSM-R Home Network	Not applicable
4.2.18 On-Board ATO functionality	On-board ATO system version	Not applicable	Change of the ATO system version fulfilling all the conditions in point 7.2.2.3.	Add or remove the ATO part of the CCS on-board subsystem; Start the operational use of ATO. Or change of the ATO system version not fulfilling all the conditions in point 7.2.2.3.

	On-board ATO implementation	Fulfilling all the conditions in point 7.2.2.3 (change of realisation identifier)	Not applicable	Not fulfilling all the conditions in point 7.2.2.3 (change of functional identifier)
7.2.5 Legacy systems	Class B or other train protection, control and warning legacy systems installed (system and, if applicable, version)	The requirements for Class B system are the responsibility of the relevant Member State.	The requirements for Class B system are the responsibility of the relevant Member State.	Add or remove Class B train protection systems. The requirements for Class B system are the responsibility of the relevant Member State.
	Class B or other radio legacy systems installed (system and, if applicable, version)	The requirements for Class B system are the responsibility of the relevant Member State.	The requirements for Class B system are the responsibility of the relevant Member State.	Add or remove Class B radio legacy systems. The requirements for Class B system are the responsibility of the relevant Member State.

- (7) In order to establish the EC certificate of verification, the Notified Body may refer to:
- (a) the original EC certificate of verification 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;
 - (b) amendments to the original EC certificate of verification for modified parts of the design that affect the conformity of the subsystem with the applicable TSI version used for the EC verification.
- (8) In any case, the entity managing the change shall ensure that the technical documentation which is relating to the EC certificate is updated accordingly.
- (9) The updated technical documentation, related to the EC certificate is referred to in the technical file accompanying the EC declaration of verification issued by the entity managing the change for on-board subsystem declared as conformant to the modified type.
- 7.2.2.2. Conditions for a change in the On-board ETCS functionality that does not impact the basic design characteristics
- (1) The target functionality ⁽¹⁷⁾ remains unchanged or is set to the state already expected during the original certification or authorisation. Target functionality is considered unchanged when applying the specification maintenance (error correction) process described in point 7.2.10 which includes the implementation of error corrections or the implementation of mitigation measures.

⁽¹⁷⁾ Target functionality refers to the ETCS functionality that has been evaluated in the subsystem EC certificate. The Technical Opinions published by the Agency that correct errors in the TSI are considered to define the functionality state already expected during the original certification or authorisation.

- (2) The interfaces relevant for safety & technical compatibility remain unchanged or are set to the state already expected during the original certification or authorisation.
- (3) The result of the safety judgement (e.g. safety case according to EN 50126) remains unchanged.
- (4) No new safety related application conditions (SRAC) or interoperability constraints have been added due to the change.
- (5) A CSM assessment body (CSM RA) as specified in point 4.2.1 has independently assessed the applicant's risk assessment and within it the demonstration that the change does not adversely affect safety. The applicant's demonstration shall include the evidence that the change actually corrects the causes of the initial deviation of the functionality.
- (6) Depending on the type of change:
 - (a) in the case where the change is made due to a product error: The change is performed under a quality management system approved by a notified body. For other modules it shall be justified that the verification performed remains valid ⁽¹⁸⁾;
 - (b) in the case where the change is made due to the specification maintenance process (there are updated specifications in Appendix A Table A 2 with the descriptions of the error correction): an updated EC design examination or EC type examination certificate for the Interoperability Constituents or Subsystem with the implementation of error corrections is needed. In this case the provisions of point 6.3.3 (3) apply.
- (7) The individual configuration management defines a 'system identifier' (as defined in 4.2.20.3) and the 'functional identifier' of the 'system identifier' has not been changed after the change.
- (8) The change shall be part of the configuration management required by Article 5 of Implementing Regulation (EU) 2018/545.

7.2.2.3. Conditions for a change in the on-board mobile communication functions for railways or in the ATO on-board functionality that does not impact the basic design characteristics

- (1) The target functionality ⁽¹⁹⁾ remains unchanged or is set to the state already expected during the original certification or authorisation. Target functionality is considered unchanged when applying the specification maintenance (error correction) process described in point 7.2.10, which includes either the implementation of error corrections or the implementation of mitigation measures.
- (2) The interfaces relevant for technical compatibility remain unchanged or are set to the state already expected during the original certification or authorisation.
- (3) Depending on the type of change:
 - (a) in the case where the change is made due to a product error: The change is performed under a quality management system approved by a notified body. For other modules it shall be justified that the verification performed remains valid ⁽²⁰⁾;

⁽¹⁸⁾ All activities required for a modification which are performed outside a quality management system approved by a notified body might require additional examinations or tests by the notified body.

⁽¹⁹⁾ Target functionality refers to the mobile communication functionality that has been evaluated in the subsystem EC certificate. The Technical Opinions published by the Agency and error corrections inside specification releases that correct errors in the TSI are considered to define the functionality state already expected during the original certification or authorisation.

⁽²⁰⁾ All activities required for a modification which are performed outside a quality management system approved by a notified body might require additional examinations or tests by the notified body.

(b) in the case where the change is made due to the specification maintenance process (there are updated specifications in Appendix A Table A 2 with the descriptions of the error correction): an updated EC design examination or EC type examination certificate for the Interoperability Constituents or Subsystem with the implementation of error corrections is needed. In this case the provisions of point 6.3.3(3) apply.

(4) The change shall be part of the configuration management required by Article 5 of Implementing Regulation (EU) 2018/545.

7.2.2.4. Conditions for a change in the on-board subsystem regarding ETCS or Radio system compatibility that does not impact the basic design characteristics

(1) No safety related application conditions (SRAC) or interoperability constraints related to the technical compatibility with the network have been added or removed due to the addition or removal of an ESC or RSC statement.

(2) No interoperability constraints (restrictions or conditions for use) related to the technical compatibility with the network have been added or removed due to the ESC or RSC statement.

7.2.3. *Upgrade or renewal of existing trackside subsystem*

This point defines the principles to be applied by the entities managing the change and authorising entities in line with the EC verification procedure described in Articles 15(9) and 18(6) of Directive (EU) 2016/797 and in Decision 2010/713/EU.

7.2.3.1. Rules to manage upgrade or renewal of existing trackside CCS subsystems

In the event of upgrading or renewing the Control-Command and Signalling Subsystems bearing EC certificate of verification the following rules apply:

(1) The changes require new authorisation if they impact basic parameters as defined in Table 7.2.

Table 7.2.

Trackside basic parameters modifications which requires a new authorisation

Basic Parameter		Modification which requires a new authorisation
4.2.3	Trackside ETCS functionality	Not fulfilling all the conditions in point 7.2.3.2
4.2.4	Mobile communication functions for railways RMR	Not fulfilling all the conditions in point 7.2.3.3
4.2.4.2	Voice and operational communication applications	
4.2.4	Mobile communication functions for railways RMR	Not fulfilling all the conditions in point 7.2.3.3
4.2.4.3	Data communication applications for ETCS and ATO	
4.2.19	Trackside ATO functionality	Not fulfilling all the conditions in point 7.2.3.3

(2) The changes are permitted to be dealt with by only re-assessing those modifications that affect the conformity of the subsystem with the applicable TSIs version used for the EC verification. The entity managing the change has to justify and document that applicable requirements remain consistent at subsystem level, and this has to be assessed by a Notified Body.

- (3) The entity managing the change shall inform the Notified Body of all changes that may affect the conformity of the subsystem with the requirements of the relevant TSI(s) or the conditions for validity of the certificate.

This information shall be provided by the entity managing the change with corresponding references to the technical documentation relating to the existing EC certificate.

- (4) An EC-Certificate reflecting the changes that affect the conformity to the TSI shall be established by a NoBo. In order to establish the EC certificate, the Notified Body may refer to:

- (a) the original EC 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;
- (b) additional EC certificate (amending the original certificate) for modified parts of the design that affect the conformity of the subsystem with the applicable TSI version used for the EC verification.

- (5) In any case, the entity managing the change shall ensure that the technical documentation which is relating to the EC certificate is updated accordingly.

- (6) 'Configuration management' means a systematic organisational, technical and administrative process put in place throughout the lifecycle of a CCS subsystem to ensure that the consistency of the documentation and the traceability of the changes are established and maintained so that:

- (a) requirements from relevant Union law and national rules are met;
- (b) changes are controlled and documented either in the technical files or in the file accompanying the issued authorisation;
- (c) information and data is kept current and accurate;
- (d) relevant parties are informed of changes, as required.

7.2.3.2. Conditions for an upgrade or renewal in the trackside ETCS functionality that, if not fulfilled, requires new authorisation for placing in service

- (1) The target functionality ⁽²¹⁾ of the basic parameter 4.2.3 remains unchanged or is set to the state already expected during the original certification or authorisation. Target functionality is considered unchanged when applying the specification maintenance (error correction) process described in point 7.2.10, which includes the implementation of error corrections or the implementation of mitigation measures.
- (2) The interfaces of the basic parameter 4.2.3 relevant for safety & technical compatibility remain unchanged or are set to the state already expected during the original certification or authorisation.
- (3) The result of the safety judgement (e.g. safety case according to EN 50126) remains unchanged.
- (4) No new safety related application conditions (SRAC) or interoperability constraints have been added due to the change.
- (5) When required in point 4.2.1, a CSM assessment body (CSM RA) has independently assessed the applicant's risk assessment and within it the demonstration that the change does not adversely affect safety. In the case where the change is due to product error, the applicant's demonstration shall include the evidence that the change actually corrects the causes of the product error.

⁽²¹⁾ Target functionality refers to the ETCS functionality that has been evaluated in the subsystem EC certificate. The Technical Opinions published by the Agency and error corrections inside specification releases that correct errors in the TSI are considered to define the functionality state already expected during the original certification or authorisation.

- (6) Depending on the type of change:
 - (a) in the case where the change is made due to a product error: The change is performed under a quality management system approved by a notified body. For other modules it shall be justified that the verification performed remains valid ⁽²²⁾;
 - (b) in the case where the change is made due to the specification maintenance process (there are updated specifications in Appendix A Table A 2 with the descriptions of the error correction solution): an updated EC certificate for the Interoperability Constituents or Subsystem with the implementation of error corrections is needed. In this case the provisions of point 6.3.4 (3) apply.
- (7) The individual configuration management defines a 'system identifier' (as defined in 4.2.20.3) and the 'functional identifier' of the 'system identifier' has not been changed after the change.
- (8) The change shall be part of the configuration management as defined in 7.2.1b.1.7.

7.2.3.3. Conditions for an upgrade or renewal in the trackside mobile communication for railways or trackside ATO functionality that, if not fulfilled, requires a new authorisation for placing in service

- (1) The target functionality ⁽²³⁾ of basic parameters 4.2.4.2, 4.2.4.3 and 4.2.19 remain unchanged or is set to the state already expected during the original certification or authorisation. Target functionality is considered unchanged when applying the specification maintenance (error correction) process described in point 7.2.10, which includes either the implementation of error corrections or the implementation of mitigation measures.
- (2) The interfaces of basic parameters 4.2.4.2, 4.2.4.3 and 4.2.19 relevant for technical compatibility remain unchanged or are set to the state already expected during the original certification or authorisation.
- (3) Depending on the type of change:
 - (a) in the case where the change is made due to a product error: The change is performed under a quality management system approved by a notified body (e.g. according to modules CH1, SH1, CD, SD). For other modules (e.g. CF, SF, SG) it shall be justified that the verification performed remains valid ⁽²⁴⁾;
 - (b) in the case where the change is made due to the specification maintenance process (there are updated specifications in Appendix A Table A 2 with the descriptions of the error correction solution): an updated EC certificate for the Interoperability Constituents or Subsystem with the implementation of error corrections is needed. In this case the provisions of point 6.3.4 (3) apply.
- (4) The change shall be part of the configuration management as defined in 7.2.3.1 (6)

7.2.3.4. Impact on the technical compatibility between on-board and trackside parts of the CCS subsystems

Infrastructure managers shall ensure that changes to an existing trackside subsystem allow the continuation of the operation of TSI compliant ⁽²⁵⁾ on-board subsystems in operation on the lines concerned by the changes.

⁽²²⁾ All activities required for a modification which are performed outside a quality management system approved by a notified body might require additional examinations or tests by the notified body, as described in Decision 2010/713/EU.

⁽²³⁾ Target functionality refers to the mobile communication functionality that has been evaluated in the subsystem EC certificate. The Technical Opinions published by the Agency that correct errors in the TSI are considered to define the functionality state already expected during the original certification or authorisation.

⁽²⁴⁾ All activities required for a modification which are performed outside a quality management system approved by a notified body might require additional examinations or tests by the notified body.

⁽²⁵⁾ On-Board subsystems with conditions and restrictions of use or non-detected deficiencies are not considered compliant regarding this clause.

This requirement is not applicable when the changes are due to the implementation of a new level application trackside, by requirements defined in 7.2.9.1 (1) and (4), or by requirements of an incompatible application (e.g. change to a new X of M_VERSION as defined in 7.4.2.4).

7.2.4. EC type or design examination certificates

7.2.4.1. CCS On-Board Subsystem

7.2.4.1.1. Definitions

(1) Initial assessment framework for CCS On-Board Subsystem

The initial assessment framework is the CCS TSI applicable at the beginning of the design phase when the notified body for the CCS on-board Subsystem is contracted by the applicant.

(2) Certification framework for CCS On-Board Subsystem

The certification framework is the CCS TSI 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, and applicable as per the transition regime described in Appendix B.

(3) Design phase for CCS On-Board Subsystem

The design phase for the CCS subsystem 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 covers the CCS subsystem integrated in a vehicle 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 for CCS On-Board Subsystem

The production phase is the period during which the CCS on-board subsystem 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) Vehicle in operation

The vehicle is in operation when it is registered with 'Valid' registration code '00', in the National Vehicle Register in accordance with Commission Decision 2007/756/EC ⁽²⁶⁾ or in the European Vehicle Register in accordance with Commission Implementing Decision (EU) 2018/1614 ⁽²⁷⁾ and maintained in a safe state of running in accordance with Commission Implementing Regulation (EU) 2019/779 ⁽²⁸⁾.

7.2.4.1.2. 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 comes into force during the design phase, the notified body shall issue the EC type or design examination certificate according to the following rules:

⁽²⁶⁾ Commission Decision 2007/756/EC of 9 November 2007 adopting a common specification of the national vehicle register provided for under Articles 14(4) and (5) of Directives 96/48/EC and 2001/16/EC (OJ L 305, 23.11.2007, p. 30).

⁽²⁷⁾ 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 (OJ L 268, 26.10.2018, p. 53).

⁽²⁸⁾ 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 139 I, 27.5.2019, p. 360).

For changes in the TSIs that are not referenced in Appendix B, 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 B, their application is mandatory according to the transition regime defined in this Appendix B. 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 (from Table B1.1) assessed according to the initial assessment framework.

- (3) When several revisions of this TSI come into force during the design phase, the paragraph (2) above 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.

7.2.4.1.3. *Validity of the EC type or design examination certificate*

When a revision of this TSI 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 as defined in Appendix B of this TSI.

7.2.4.2. *CCS Trackside Subsystem*

According to Article 4, point (2) of Directive (EU) 2016/797, the CCS Trackside Subsystem shall comply with the TSI in force at the time of the request for authorisation of placing in service.

When a revision of this TSI 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 transition regime of a TSI change as defined in Appendix B (Table B2) of this TSI.

7.2.4.3. *Interoperability constituents*

EC design or type certificates of interoperability constituents already placed on the market based on a previous version of this TSI remain valid even if a revision of this TSI comes into force, unless a requirement is applicable at CCS subsystem level which impacts the interoperability constituent (as specified in Table B1.1 or Table B2 of Appendix B) or unless explicitly otherwise specified in the revision of this TSI within Table B3 of Appendix B.

During this time, these interoperability constituents are permitted to be placed on the market without a new design or type examination.

7.2.5. *Legacy systems*

Member States shall ensure that the functionality of the legacy systems and their interfaces remains unchanged, except where modifications are needed to mitigate safety-related flaws in these systems ⁽²⁹⁾.

7.2.6. *Availability of Specific Transmission Modules and interfaces to Class B on-board*

If trackside that fall within the scope of this TSI are not equipped with the Class A train protection system, the Member State shall ensure the availability of a Specific Transmission Module (STM) or products and/or specifications that would allow the integration of its legacy Class B train protection system with the Class A on-board system. For lines equipped with more than one Class B system, the requirement applies to at least one of these Class B systems.

⁽²⁹⁾ Extension of functionality is not recognised as a mitigation for a safety related flaw.

The Member State shall notify within one year of the entry into force of the TSI, the Class B system (s) for which the requirement is met.

The Class B on-board and its interface, for existing products that have already demonstrated integration with Class A TSI compliant products, shall correspond to any of the technical possibilities defined in point 4.2.6.1. In the case where there is no system available that has already demonstrated integration with Class A TSI compliant on-board system, the solution made available shall be with standardised interface (STM).

The Member State shall notify the specifications of the interfaces between class A and class B on-board train protection systems within 1 year after entry into force of the TSI.

If for a particular class B system, the only solution available in the market is Class B and Class A integrated within the same equipment, the holders of the Class B specifications (e.g. supplier, railway undertaking, infrastructure manager) shall provide the specifications, for the parts they hold, necessary for integration of this Class B system with a compliant ETCS on-board. Any relevant intellectual property they hold shall be made available on a FRAND (fair, reasonable and non-discriminatory) terms basis. The holders of the specifications shall ensure the information provided is sufficient to allow other manufacturers to integrate class B with any ETCS on-board in existing rolling stock.

In this context, due regard is to be given to ensuring an open market for Class B and STM under fair commercial conditions. If, for technical or economic reasons, including applicable intellectual property rights, the availability of an STM or a Class B with its complete interface specifications to a class A system cannot be ensured, the Member States concerned shall inform the Committee referred to in Article 51(1) of Directive (EU) 2016/797 of the underlying reasons for the problem and of the mitigation measures that it intends to put into place in order to allow operators – and in particular foreign operators – access to its infrastructure.

7.2.7. *Additional Class B equipment on a line equipped with Class A*

On a line equipped with ETCS and/or RMR, additional Class B trackside equipment may be installed in order to allow the operation of rolling stock not compatible yet with Class A during the on-board Class A deployment phase.

Each Infrastructure Manager shall be responsible for verifying that the trackside design supports transitions between Class A and Class B and does not impose any additional requirements to the CCS Class A on-board, thus the Control-Command and Signalling Trackside Subsystem shall be designed as if Control-Command and Signalling Class A on-board is using standardised interface (STM) between Class A and Class B systems.

7.2.8. *Vehicle with Class A and Class B equipment*

Vehicle may be equipped with both Class A and Class B systems to enable operation on several lines.

The Member State concerned may restrict the use of an on-board Class B system on lines where the Class B system is not installed trackside.

A vehicle equipped with both class A and class B shall demonstrate technical compatibility with trackside Class A on lines double equipped with Class A in parallel with Class B. Being equipped with a Class B system in addition to Class A shall not be a requirement for the compatibility of a vehicle with lines where Class B is installed in parallel with Class A.

For vehicle equipped with class A, class B train protection systems may be implemented according to requirements defined in point 4.2.6.1 and following the requirements in point 7.2.6.

7.2.9. *Conditions for mandatory and optional functions*

The applicant for EC verification of a Control-command and Signalling Trackside subsystem shall check whether Control-command and Signalling Trackside functions, which are defined 'optional' in this TSI, are required by other TSIs, national rules or by the application of risk evaluation and assessment to ensure safe integration of subsystems.

The trackside implementation of national or optional functions shall be technically compatible and not prevent the use of that infrastructure by a train that complies only with the mandatory requirements of the On-board Class A system except as required for the following on-board optional functions in point 7.2.9.1 and 7.2.9.3. The trackside implementation of one of these optional functions which leads to a new mandatory on-board requirement on specific lines shall be notified minimum 5 years before the function can become a mandatory on-board requirement. The notification of a new mandatory on-board requirement shall be done within the RINF and these changes in RINF shall be listed in the Network Statement according to Article 27 of the Directive 2012/34/EU of the European Parliament and of the Council ⁽³⁰⁾. A notification period shorter than 5 years is only allowed if this is agreed between the IM and RU's who run services or intent to run services (at the time of establishing the agreement) on these lines. This agreement on shortening the notification period shall be notified to the European Commission.

An on-board subsystem which incorporates a KER STM, may make it necessary to implement the K-interface.

7.2.9.1. ETCS

- (1) An ETCS Level 2 Trackside application with no or reduced train detection (formerly ETCS level 3) relies on on-board information to determine track occupation and requires that the on-board is able to fulfil the requirements for confirmed train length information as specified in Appendix A, Table A 2, index 27.
- (2) An ETCS Level 1 Trackside application with infill requires that the on-board is equipped with the corresponding in-fill data transmission (Euroloop or radio) if the release speed is set to zero for safety reasons (e.g. protection of danger points).
- (3) When ETCS needs data transmission by radio, the data radio communication part as specified in this TSI is required.
- (4) When ETCS trackside needs a specific ETCS system version, the on-board shall be equipped according to the implementation requirements listed in 7.4.2.4.2.

7.2.9.2. ATO

- (1) ATO Trackside: the trackside implementation of ATO is an optional function for interoperability which does technically not prevent the use of that infrastructure by a train that is not equipped with ATO on-board. Where ATO GoA1/2 functionality is implemented over ETCS trackside, the specifications of ATO in Appendix A of this TSI shall be applied.

Note: Where ATO GoA1/2 functionality is implemented over Class B trackside, the specifications of ATO trackside in Appendix A of this TSI should be applied in order to facilitate the future migration to ATO on lines to be equipped with ETCS.

- (2) ATO on-board: the fitting of ATO in a CCS on-board Subsystem is mandatory ⁽³¹⁾ when implementing ETCS for the first time into the vehicle and the vehicle is also intended for use on a line including at least one section equipped with ATO where the IM has notified in RINF the services requiring mandatory ATO on-board implementation.

⁽³⁰⁾ Directive 2012/34/EU of the European Parliament and of the Council of 21 November 2012 establishing a single European railway area (recast) (OJ L 343, 14.12.2012, p. 32).

⁽³¹⁾ The mandatory ATO on-board implementation requirement is not linked to technical compatibility, however linked to the regulatory need that no specific incentive mechanism for ATO on-board implementation shall be developed by Member States or Infrastructure Manager for vehicles implementing ETCS for the first time.

Note: Where ATO GoA1/2 functionality is implemented over Class B trackside, the ATO on-board implementation is based on contractual agreements between the IM and RUs and as such there are no mandatory ATO GoA1/2 implementation requirements until ATO trackside and Class B trackside lines are migrated to a fully compliant ETCS including ATO trackside specifications in Appendix A of this TSI.

7.2.9.3. RMR

GSM-R and/or FRMCS shall be implemented according to the implementation requirements listed in point 7.3.2.

7.2.10. *Specifications maintenance (error corrections)*

7.2.10.1. Responsibilities during the Change Control Management process

During the Change Control Management (CCM) process of the ERTMS specifications and before the entry into force of the next legal release of this TSI, errors are classified as preventing normal service or as not preventing normal service.

For the errors preventing normal service, on-board manufacturers, operators, e.g. providing input on the occurrence of the error during normal service, and infrastructure managers with the necessary input from the trackside manufacturers shall describe their products and system implementations with respect to the situation identified by answering to the ERA questionnaires (which include the resolutions of the errors and the mitigation measures).

The answers on these ERA questionnaires shall be provided within 3 months after publication of the questionnaires, in particular the Infrastructure Manager shall evaluate within the ERA questionnaire if:

- (1) the impact of the error is acceptable, as regards safety and network operation;
- (2) the impact of the error is acceptable for interoperability, this either means that:
 - (a) the non-implementation of the trackside error correction would allow any ERTMS vehicle complying with the latest TSI release to provide normal service in the network;or
 - (b) the non-implementation of the on-board error correction would allow that ERTMS vehicle to provide normal service in the TSI compliant network.

The Agency shall publish the results of the ERA questionnaires in a transparent manner.

7.2.10.2. On-board and Trackside Manufacturer responsibilities

After the publication of the error corrections in a legal release, manufacturers shall update their Interoperability Constituents accordingly and are responsible for maintaining the Interoperability Constituents as requested in point 4.2.20.1 (including maintaining the associated EC Certificates) and according to the transition requirements in Appendix B (Table B3). These updated Interoperability Constituents (including the associated EC Certificates) shall be made available for integration in the concerned subsystems according to Appendix B (Table B3).

Note: For Interoperability constituents for which the information previously provided as described in point 7.2.10.1 indicates that there is no impact regarding safety, operation and interoperability, an update is not required.

7.2.10.3. Infrastructure Manager and Railway Undertaking responsibilities

7.2.10.3.1. Infrastructure Manager responsibilities

In case the impact of one of the errors as described in point 7.2.10.1 is identified as unacceptable on the Infrastructure Manager's network, the Infrastructure Manager, based on the information previously provided by on-board manufacturers within the ERA questionnaires, shall identify the ERTMS vehicles authorised to run on its network or being authorised to run on its network that have not implemented a solution which mitigates the interoperability or safety problem caused by the specification error. In case of significant impact on existing vehicles running on its network reported by on-board manufacturers (with the support of operators), the Infrastructure Manager can voluntarily decide to evaluate the implementation of temporary trackside mitigation measures in order to facilitate existing vehicles to continue their services until on-board error corrections are implemented.

The Infrastructure Manager shall register in the related RINF ⁽³²⁾ parameter which error corrections are applicable (i.e. the errors preventing normal service in the network) for the on-board. This shall be registered at the latest 12 months after the entry into force of the TSI or shall be registered in case of new or upgrade trackside implementation within its network.

For impacted ERTMS trackside subsystems, Infrastructure Managers shall implement the relevant trackside error corrections enabling a TSI compliant CCS on-board (including on-board error correction implementation) to provide a normal service, in accordance with appendix B (Table B2) of this CCS TSI.

This Infrastructure Manager shall update -if applicable- the existing ETCS and radio system compatibility checks type (ESC/RSC) (i.e. this shall not lead to the creation of a new ESC/RSC type).

7.2.10.3.2. Railway Undertakings responsibilities

The Railway Undertakings shall compare the error corrections registered in RINF for the area of use of the vehicle with the information previously provided as described in point 7.2.10.1 to identify the necessary error corrections to be implemented in the vehicles.

For impacted ERTMS on-board subsystems, Railway Undertakings with support of the on-board manufacturers shall implement the necessary error corrections in the CCS on-board subsystems in accordance with appendix B (Table B1.1) of this CCS TSI.

7.3. RMR specific implementation rules

7.3.1. Trackside installations

7.3.1.1. The fitting of GSM-R or FRMCS is mandatory when:

- (1) installing for the first time the radio communication part of a Control-Command and Signalling Trackside Subsystem; When FRMCS is the first class A radio system on a line, conditions in 7.3.1.3 shall be respected.
- (2) upgrading the radio communication part of a Control-Command and Signalling Trackside Subsystem already in service in such a way that it changes the functions or the performance of the subsystem. This does not include the modifications deemed necessary to mitigate safety-related defects in the legacy installation;
- (3) Implementation of ETCS level 2 needs data radio communication.
- (4) Implementation of ETCS level 1 with radio infill needs GSM-R data radio communication.

⁽³²⁾ The Network Statement can be used as tool in case RINF is not upgraded yet to notify this change.

7.3.1.2. GSM-R may only be taken out of operation when the following conditions are fulfilled:

- Condition 1: minimum notification period of 5 years where GSM-R services shall be stopped. This notification shall only be done when FRMCS on-board Interoperability Constituents' specifications, as listed in Table 5.1 and Appendix A, are completed and published with an amendment of this CCS TSI which allows the tendering of the complete FRMCS on-board equipment. This notification shall be done within the RINF and these changes in RINF shall be listed in the Network Statement as part of Article 27 of Directive 2012/34/EU;

and

- Condition 2: FRMCS is in service;

A shorter period is allowed if this is agreed between the IM and the RU's who run services or intent to run services (at the time of establishing the agreement) on these lines. This agreement on shorter notification period shall be notified to the European Commission.

7.3.1.3. The trackside implementation of FRMCS only, without pre-existing GSM-R, is allowed if the following condition is fulfilled:

Minimum notification period of 5 years where FRMCS services shall be in operation. This notification can only be done when FRMCS on-board Interoperability Constituents' specifications, as listed in Table 5.1 and Appendix A, are completed and published with an amendment of this CCS TSI which allows the tendering of the complete FRMCS on-board equipment. This notification shall be done within the RINF and these changes in RINF shall be listed in the Network Statement as part of Article 27 of Directive 2012/34/EU.

A shorter period is allowed if this is agreed between the IM and the RU's who run services or intent to run services (at the time of establishing the agreement) on these lines. This agreement shall be notified to the Commission.

7.3.2. *On-board installations*

7.3.2.1. The fitting of GSM-R in rolling stock intended for use on a line including at least one section equipped with GSM-R and not equipped with FRMCS or on a line including at least one RBC not supporting FRMCS (even if superimposed to a legacy radio communication system), is mandatory when:

- (1) installing for the first time the voice radio communication part of a Control-Command and Signalling On-board Subsystem;
- (2) upgrading the voice radio communication part of a Control-Command and Signalling On-board Subsystem already on the market (Class B) in such a way that it changes the functions or the performance of the subsystem. This does not apply to modifications deemed necessary to mitigate safety-related defects in the legacy installation;
- (3) implementation of ETCS level 2 or level 1 with radio infill need data radio communication.

7.3.2.2. The fitting of FRMCS in rolling stock is mandatory for vehicles intended to operate on a line where the IM has notified the FRMCS trackside implementation:

- (1) installing for the first time the voice radio communication part of a Control-Command and Signalling On-board Subsystem;
- (2) upgrading the voice radio communication part of a Control-Command and Signalling On-board Subsystem already on the market (Class B or GSM-R) in such a way that it changes the functions or the performance of the subsystem. This does not apply to modifications deemed necessary to mitigate safety-related defects in the legacy installation;
- (3) implementation of ETCS level 2 need data radio communication.

7.4. ETCS specific implementation rules

7.4.1. *Trackside installations*

Articles 1 and 2 and Annex I to Commission Implementing Regulation (EU) 2017/6 ⁽³³⁾ shall apply as referred to in Article 47 of Regulation (EU) No 1315/2013 of the European Parliament and of the Council ⁽³⁴⁾ and any update to this Regulation.

Euroloop and radio infill data transmission shall not be installed, nor operated, except at lines/trackside areas which are listed as specific case in point 7.7.

The trackside installations shall comply with the harmonised engineering rules referenced under index 13 (subset 40) and shall be operated without restriction under the operating rules set out in the Appendix A of Implementing Regulation (EU) 2019/773. The Agency when issuing trackside approvals in accordance with Article 19 of Directive (EU) 2016/797 and the NSA when authorising the placing in service of fixed installations, shall confirm compliance.

Infrastructure Manager shall communicate through RINF to operators the time and date when authorised ERTMS trackside installations will be put in operation.

7.4.1.1. High-speed network

It is mandatory to fit ETCS trackside when:

- (1) installing for the first time the train protection part of a Control-Command and Signalling Trackside Subsystem (with or without a Class B system); or
- (2) upgrading the existing train protection part of a Control-Command and Signalling Trackside Subsystem, where this would change the functions, performance and/or interoperability-relevant interfaces (air gaps) of the existing legacy system. This does not apply to modifications deemed necessary to mitigate safety-related defects in the legacy installation.

7.4.1.2. Set of specifications from previous versions of the CCS TSI.

Networks that implement and operate ETCS lines according to former set #1 as in Annex A, Table A2.1 of previous versions of this TSI before the entry into force of this TSI and with more than 1 000 km or 25% in operation or under construction in the Core Network Corridors before 31 December 2020, can exceptionally continue to use those ETCS specifications for the placing into service for 7 year after publication of this TSI for new projects and for 10 years after entry into force of this TSI for upgraded or renewal projects in the network under the following conditions:

- (1) Notification of the intention to deploy former set of specifications #1 and the intended scope and plan has been sent to the European Commission within 2 years after the publication date of this TSI.
- (2) Infrastructure Manager shall ensure that those lines will include the implementation of all the relevant error correction measures enabling an ETCS On-board compliant with this TSI (including on-board error correction implementation) to provide a normal service.
- (3) The Infrastructure Manager shall implement the relevant error corrections and the harmonised or equivalent mitigation measures in Agency Opinions or published releases of the specifications, according to point 7.2.10.
- (4) In addition, any modification performed in infrastructure compliant with former set of specifications #1 shall ensure that the previous conditions (2) and (3) are also preserved.

⁽³³⁾ Commission Implementing Regulation (EU) 2017/6 of 5 January 2017 on the European Rail Traffic Management System European deployment plan (OJ L 3, 6.1.2017, p. 6).

⁽³⁴⁾ Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU (OJ L 348, 20.12.2013, p. 1).

Networks that implement and operate ETCS lines according to former set #2 and set #3 as in Annex A, Table A2.2 and Table A2.3 of previous versions of this TSI before the entry into force of this TSI, can exceptionally continue to use those specifications for the placing into service for 7 years after publication of this TSI for new projects and for 10 years after entry into force of this TSI for upgraded or renewal projects in the network under the following conditions:

- (1) Infrastructure Manager shall ensure that those lines will include the implementation of all the relevant error correction measures enabling an ETCS On-board compliant with this TSI (including on-board error correction implementation) to provide a normal service.
- (2) The Infrastructure Manager shall implement the relevant error corrections and the harmonised or equivalent mitigation measures in Agency Opinions or published releases of the specifications, according to point 7.2.10.
- (3) In addition, any modification performed in infrastructure compliant with former set of specifications #2 and #3 shall ensure that the previous conditions (1) and (2) are also preserved.

7.4.1.3. ETCS System Version implementation rules

The trackside implementation can select which ETCS-functions shall be implemented from the set of specifications in Appendix A. The specifications in Appendix A contain functions from the following system versions: 1.0, 1.1, 2.0, 2.1, 2.2, 2.3 and 3.0. In accordance with the process defined in 7.4.4, the IM shall notify which lines make use of which system version. This notification shall be done within the RINF and these changes in RINF shall be listed in the Network Statement as part of Article 27 of Directive 2012/34/EU.

The trackside implementation leading to ETCS on-board system version 3.0 is allowed if the following condition is fulfilled:

Minimum notification period of 5 years for the lines where ETCS system version 3.0 is a mandatory on-board requirement for the vehicles operating on its network. The notification of lines for which ETCS on-board system version 3.0 is required both for vehicles being authorised and for vehicles operating on its network can only become mandatory applicable after an amendment of this CCS TSI ⁽³⁵⁾ (see Table B1.1). A shorter period is allowed if this is agreed between the IM and the RU's who run or intent to run (at the time of establishing the agreement) services on these lines. This agreement shall be notified to the Commission.

7.4.2. On-board installations

7.4.2.1. Newly built vehicles

In order to be placed on the market in accordance with Article 21 of Directive (EU) 2016/797, newly built vehicles shall be equipped and ready for operation with ETCS in accordance with this TSI.

7.4.2.2. Existing vehicles

When authorising existing vehicles in accordance with Article 21 of Directive (EU) 2016/797, they shall be equipped and ready for operation with ETCS (Class A train protection system) in accordance with this TSI if installing any new Class B train protection system in a control-command and signalling on-board subsystem.

It is mandatory to fulfil points 7.4.2.4.1 and 7.4.2.4.2 if upgrading the existing ETCS on-board part within a vehicle.

It is not needed to fulfil points 7.4.2.4.1 and 7.4.2.4.2 if correcting the existing ETCS on-board functionality within a vehicle.

7.4.2.3. Rules for the extension of the area of use for existing vehicle

The following rules apply to existing vehicles in operation and registered 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, when requesting an extension of the area of use:

⁽³⁵⁾ This amendment includes the publication of FRMCS On-Board specifications or includes trackside engineering and operational rules linked to the supervised manoeuvre functionality.

- (1) Vehicles shall comply with relevant special provisions applicable in the specific cases referred to in point 7.7 of this Annex and with relevant national rules referred to in points (a), (c) and (d) of Article 13(2) of Directive (EU) 2016/797 notified in accordance with Article 14 of that Directive.
- (2) Vehicles already equipped with ETCS, GSM-R or FRMCS do not need to be upgraded, except where required for technical compatibility with ETCS, GSM-R or FRMCS.
- (3) Vehicles that are not equipped with ETCS shall install ETCS and comply with sets of specifications referred to in Table A 2 of Appendix A. It is mandatory to fulfil points 7.4.2.4.1 and 7.4.2.4.2.
- (4) When the vehicle is intended for use on a network where at least one section is equipped with Class A RMR, vehicles that are not yet equipped with a Class A RMR voice radio shall install a Class A RMR voice cab radio which is technically compatible with the radio network, except if this network is superimposed to a legacy Class B radio communication system compatible with the class B already installed in the vehicle. In such a case, the Class A RMR voice radio shall comply with the specifications referred to in Table A 2. of Appendix A.
- (5) When the vehicle is required to install ETCS in accordance with point (3) and it is intended to operate in a network in the extended area of use that is equipped with ETCS Level 2, vehicles that are not yet equipped with the Class A RMR data communication, shall install at least one of the Class A RMR data radio which is technical compatible with the radio network. In such case, the Class A RMR data radio shall comply with the specifications referred to in Table A 2 of Appendix A.
- (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 with Article 7 of Directive (EU) 2016/797.
- (7) When the request for extending the area of use is combined with a request for new authorisation upgrading the existing CCS on-board subsystem train protection part, it is mandatory to fulfil point 7.4.2.4.1 and 7.4.2.4.2.

7.4.2.4. ETCS System Version implementation rules

7.4.2.4.1. The ETCS on-board Interoperability Constituent placed on the market shall implement one of the following envelopes:

- (1) envelope of legally operated ETCS system versions from 1.0 to 2.1 inclusive;
- (2) envelope of legally operated ETCS system versions from 1.0 to 2.2 inclusive;
- (3) envelope of legally operated ETCS system versions from 1.0 to 3.0 inclusive.

7.4.2.4.2. A vehicle type shall integrate the appropriate ETCS on-board Interoperability Constituent with the required envelope of legally operated ETCS system versions as defined in 7.4.2.4.1 ⁽³⁶⁾. The required envelope of legally operated ETCS system versions shall be defined based on the notified system versions in RINF ⁽³⁷⁾ for the intended area of use of the vehicle type specified in its authorisation. The vehicle type shall implement the ETCS system version which complies as a minimum to the notified ETCS system version which become applicable in the next 5 years according to the timeframe in Appendix B, when:

- (1) installing for the first time the ETCS part of a Control-Command and Signalling On-board Subsystem;

or

- (2) upgrading the ETCS part of a Control-Command and Signalling On-board Subsystem already on the market in such a way that it changes the functions of the subsystem. This does not apply to modifications deemed necessary to implement error corrections as stated in 7.2.10;

⁽³⁶⁾ If set of specification #1 is used based on clause 7.4.2.3 point 3 (b) from Regulation (EU) 2016/919, the requirement remains applicable to enforce compliance with set specifications #2 or #3 within a period of time not exceeding 1 July 2023.

⁽³⁷⁾ The changes of the notified system versions in RINF shall be listed in the Network Statement according to Article 27 of Directive 2012/34/EU.

7.4.3. *National requirements*

- 7.4.3.1. Member States may introduce additional requirements at national level, in particular with a view to allowing only ETCS-equipped vehicles to access ETCS-equipped lines, so that existing national systems can be decommissioned; This shall be notified a minimum 5 years before the decommissioning. A shorter period is allowed if this is agreed between the IM and the RU's who run or intend to run (at the time of establishing the agreement) services on these lines. This notification shall be done within the RINF and these changes in RINF shall be listed in the Network Statement as part of Article 27 of Directive 2012/34/EU ⁽³⁸⁾. The 5-years notification period does not apply to those requirements allowing only ETCS-equipped vehicles to access ETCS-equipped lines, which were announced in the Network Statement before the entry into force of this Regulation.
- 7.4.3.2. Member States may decide to exclude special vehicles as defined in point 2.2.2 (C) of the LOC&PAS TSI, including road-rail vehicles, from the obligation to equip them with ETCS, RMR or ATO on a specific area of use if the operation of these vehicles does not prevent the Class B decommissioning. This shall be notified and shall be listed in the Network Statement as part of Article 27 of Directive 2012/34/EU.
- 7.4.3.3. Member States may decide to exclude from the obligation to equip with ETCS passenger trains reserved to a strictly local use in accordance with Article 1.4 b) of Directive (EU) 2016/797 and shunting locomotives in service for more than 20 years that operate exclusively on a part of the national network where no ETCS exists and no ETCS deployment is planned for the next 5 years.

7.4.4. *National Implementation Plans*

Member States shall develop a national plan for the implementation of this TSI in coordination with the Infrastructure Managers and Railway Undertakings concerned, considering the coherence of the entire rail system of the European Union taking into account the economic viability, interoperability and safety of the rail system. Member States shall consult the neighbouring countries for a coherent planning of the railway cross-border sections. This plan shall include all lines in scope of the TSI including TEN-T lines and the nodes and last mile connections.

Member States shall coordinate the process between all stakeholders concerned to set up the technical and indicative financial migration strategy required for the overall ERTMS deployment of this national implementation plan.

Member States shall include the assessment of the needs expressed by the railway undertakings and the infrastructure managers for the CCS subsystem related to the conditions for mandatory and optional functions listed in 7.2.9 in the National Implementation Plan.

Member States shall decide on the migration strategy describing the expected overall impact for the railway system (taking a Union perspective) and how the impact is balanced in a non-discriminatory way between the stakeholders concerned based on the above assessment. The output of this coordination process shall be the definition of the technical and the financial migration strategy being implemented.

The national implementation plan shall provide information on all new, renewed and upgraded lines in relation to mandatory and optional functions listed in 7.2.9 ensuring that notifications to RUs are provided at least 5 years in advance in case there will be new mandatory on-board requirements for operating on the network. This shall be notified within the RINF ⁽³⁹⁾ and these changes in RINF shall be listed in the Network Statement as part of Article 27 of Directive 2012/34/EU. The 5-years notification period does not apply to any requirements, which were announced in the Network Statement before the entry into force of this CCS TSI.

The national implementation plans shall cover a period of at least 20 years and shall be updated regularly, at least every five years. The plans shall follow the template provided in the Appendix H

⁽³⁸⁾ The Network Statement can be used as tool in case RINF is not upgraded yet to notify this change.

⁽³⁹⁾ The Network Statement can be used as tool in case RINF is not upgraded yet to notify this change.

for the first five years of the period covered. For the subsequent period of fifteen years, the plan shall follow this template to the extent possible with a less detailed approach.

The Commission shall publish the national implementation plans on its website and inform Member States about them through the Committee referred to in Article 51(1) of Directive (EU) 2016/797.

The Commission shall draw up an analysis of the national implementation plans that shall encompass among others comparison of the plans and identification of needs for additional coordination measures.

The national implementation plan shall at least include the following information ⁽⁴⁰⁾:

- (1) General migration strategy as described above, including the assessment of the needs expressed by the railway undertakings and the infrastructure managers.
- (2) Context description of the current status, including:
 - (a) facts and figures on installed train protection, ATO radio and train detection systems, including details on the benefits they provide for capacity, safety, reliability and performance aspects and including the legal references to the CCS on-board requirements;
 - (b) Class B systems and their remaining economic lifetime including a description of the measures taken to ensure open market conditions for its legacy Class B train protection and radio systems as set out in point 7.2.6;
 - (c) on-board CCS subsystems, based on the available information.
- (3) Definition of the migration strategy (future status).

The technical migration strategy shall include information and planning of:

- (1) ETCS part: ETCS Level and System version required per line and per network, with detailed information on cross border sections and nodes. If applicable, information on the baseline and levels update strategy;
- (2) Radio part: information on radio systems (e.g. radio circuit switching, packet switching, radio infill options for ETCS);
- (3) ATO part: information on the need for deployment of ATO;
- (4) Train detection part: information on the migration to the TSI compliant train detection system;
- (5) Specific cases: information on the phasing out of specific cases;
- (6) On-board CCS subsystems;
- (7) Trackside and on-board financial information.

Planning (network maps) providing an overview of changes in the next 20 years related to:

- (1) Train protection part:
 - (a) Network map with dates when ETCS is put into service; detailed information on cross-border lines and nodes;
 - (b) If applicable, network map with dates when Class B operation is not allowed anymore or when ETCS operation only is mandatory; and if not similar, network map with dates where Class B system is taken out of service;
- (2) Radio part:
 - (a) Network map with dates when GSM-R is put into service; detailed information on cross-border lines and nodes;
 - (b) If applicable, network map with dates when Class B Radio operation is not allowed anymore; and if not similar, network map with dates where Class B Radio system is taken out of service;

⁽⁴⁰⁾ The complete template for the National Implementation Plan is provided in Appendix H.

- (c) Network map with dates when FRMCS is put into service;
- (d) If applicable, network map with dates when GSM-R operation is not allowed anymore; and if not similar, network map with dates where GSM-R system is taken out of service;
- (3) ATO part:
 - (a) If applicable, network map with dates when ATO is put into service; detailed information on cross-border lines and nodes.
- (4) Train Detection Part:
 - (a) Network map with dates when TSI compliant train detection system is put into service; detailed information on cross-border lines and nodes;
- (5) On-board CCS subsystems, with optional information on cross-border vehicles.

7.5. **ETCS and radio system compatibility checks implementation rules**

Existing vehicles, and their corresponding vehicle type, equipped with ETCS and RMR shall be deemed compatible with the ETCS and radio system compatibility types of the networks on which they are operating with ETCS and RMR by 16 January 2020 without any further checks, maintaining the existing restrictions or conditions for use.

Any subsequent modification of the vehicle, their corresponding vehicle type or the infrastructure regarding the technical or route compatibility shall be managed according to the requirements specified for ETCS and Radio system compatibility in this TSI.

7.6. **Train detection systems specific implementation rules**

In the context of this TSI, train detection system means the equipment installed trackside, which detects the presence or absence of vehicles either on an entire line of route or on a local section of it.

Trackside systems (e.g. interlocking or level crossing control systems) which use information from detection equipment are not considered parts of the train detection system.

This TSI specifies the requirements for the interface with rolling stock only to the extent necessary to ensure compatibility between TSI-compliant rolling stock and the Control-command and Signalling Trackside.

Implementing a train detection system that is compliant with the requirements of this TSI can be done independently of the installation of ETCS or GSM-R.

The requirements of this TSI relating to train detection systems shall be respected when:

- (1) upgrading the train detection system;
- (2) renewing the train detection system, provided that respecting the requirements of this TSI does not imply unwanted modifications or upgrades of other trackside or on-board systems;
- (3) renewing the train detection system, where this is required by the upgrade or renewal of trackside systems that use information from the train detection system;
- (4) removing Class B train protection systems where the train detection and train protection systems are integrated.

In the migration phase care shall be taken to ensure that installing a TSI-compliant train detection system has a minimal negative impact on the existing non-TSI-compliant rolling stock.

To achieve this, it is recommended that the Infrastructure Manager selects a TSI-compliant train detection system that, at the same time, is compatible with the non-TSI-compliant rolling stock already operating on that infrastructure.

7.7. **Specific cases**

7.7.1. *Introduction*

The following special provisions are permitted in the specific cases below.

These specific cases belong to two categories: the provisions apply either permanently (case 'P') or temporarily, to be removed before 2040 (case 'T') or a date to be specified after the re-examination process defined in Article 13(5) of this Regulation (case 'T2').

The specific cases set out in points below shall be read in conjunction with the relevant points of Chapter 4 and/or specifications referenced there.

The specific cases replace the corresponding requirements set out in Chapter 4.

Where the requirements set out in the relevant point of Chapter 4 are not subject to a specific case, those requirements have not been duplicated in points below and continue to apply unmodified.

The assessment of the specific cases related to basic parameters 4.2.10 and 4.2.11 where indicated in the Notes column as 'applicable to vehicles' shall be assessed by Rolling Stock subsystem Notified Body.

All specific cases and their relevant dates shall be re-examined in the course of future revisions of the TSI with a view to limiting their technical and geographical scope based on an assessment of their impact on safety, interoperability, cross border services, TEN-T corridors, and the practical and economic impacts of retaining or eliminating them. Special account shall be given to availability of EU funding. The train detection systems and corresponding end dates shall be re-examined following Article 13(5) of this Regulation.

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

7.7.2. List of specific cases

7.7.2.1. Belgium

Specific case	Category	Notes
4.2.10. Trackside Train Detection Systems Index 77, point 3.1.2.3: The distance between first and last axle L - (b1 + b2) (Fig.1) is at least 16 000 mm.	T	Applicable on HS L1 Applicable on vehicles This Specific Case is linked with the use of TVM.
4.2.10. Trackside Train Detection Systems Index 77, point 3.1.7: The weight of an isolated vehicle or a trainset is at least 40 t. If the weight of an isolated vehicle or a trainset is inferior to 90 t, the vehicle shall have a system ensuring the shunting which has an electrical basis superior or equal to 16 000 mm.	T	Applicable on HS L1, L2, L3, L4 Applicable on vehicles This Specific Case is linked with the use of TVM.

7.7.2.2. UK for Northern Ireland

Specific case	Category	Notes
4.2.10. Trackside Train Detection Systems Index 77, point 3.1.3.1: The minimum wheel rim width (B_R) for 1 600 mm track gauge network is 127 mm.	T	Applicable in Northern Ireland
4.2.10. Trackside Train Detection Systems Index 77, point 3.1.3.3: The minimum flange thickness (S_d) for 1 600 mm track gauge network is 24 mm.	T	Applicable in Northern Ireland

4.2.10. Trackside Train Detection Systems Index 77, point 3.1.4.1: In addition to the requirements in point 3.1.4.1, sanding for traction purposes on multiple units: (a) is not permitted ahead of the leading axle below 40 km/h; and (b) is only permitted where it can be demonstrated that at least a further six axles of the multiple unit are beyond the laying position.	T	
4.2.12. ETCS DMI (Driver-Machine Interface) Index 6: It is permissible to use an alphanumeric keyboard to enter the train running number if support for alphanumeric train running numbers is required by the technical rule notified for this purpose.	T	There is no impact on interoperability.
4.2.12. ETCS DMI (Driver-Machine Interface) Index 6: It is permissible for the ETCS DMI to display dynamic train speed information in miles per hour (and indicate 'mph') when operating on parts of the GB mainline network.	T	There is no impact on interoperability.

7.7.2.3. France

Specific case	Category	Notes
4.2.10. Trackside Train Detection Systems Index 77, point 3.1.2.3: The distance between first and last axle $L - (b1 + b2)$ (Fig.1) is at least 16 000 mm	T2	Applicable on infrastructure Applicable on vehicles This Specific Case is linked with the use of track circuits using electrical joints.
4.2.10. Trackside Train Detection Systems Index 77, point 3.1.9: The electrical resistance between the running surfaces of the opposite wheels of a wheelset does not exceed 0,05 Ohm, measured by a voltage between 1,8 VDC and 2,0 VDC (open circuit). In addition, for non-conventional wheelset ('conventional wheelset' has to be understood as two monobloc wheels set on a metallic axle), the electrical reactance between the running surfaces of the opposite wheels of a wheelset does not exceed $f/100$ mOhm when f is between 500 Hz and 40 kHz, under a measuring current of at least 10 ARMS and open voltage of 2 VRMS.	T2	Applicable on infrastructure Applicable on vehicles This specific case may be revised when the open point related to the frequency management for track circuits is closed.

4.2.10. Trackside Train Detection Systems Index 77, point 3.1.7: The weight of an isolated vehicle or a trainset is at least 40 t. If the weight of an isolated vehicle or a trainset is inferior to 90 t, this vehicle shall have a system ensuring the shunting which has a distance between following axles, as defined in ERA/ERTMS/033281, superior or equal to 16 000 mm.	T	Applicable on infrastructure Applicable on vehicles This Specific Case is linked with the use of TVM.
4.2.10. Trackside Train Detection Systems Index 77, point 3.1.3.2: Dimension D (figure 2) is not less than: 450 mm independently of the speed.	T	Applicable on infrastructure Applicable on vehicles.
4.2.10. Trackside Train Detection Systems Index 77, point 3.1.4.1. In addition to the TSI requirements, the allowed maximum amount of sand per unit and per rail within 30 s is: 750 g.	T2	This specific case is linked to the use of track circuits with a higher sensitivity regarding the isolation layer between wheels and rails due to sanding on the French Network.

7.7.2.4. Poland

Specific case	Category	Notes
4.2.10. Trackside Train Detection Systems Index 77, point 3.1.9: The electrical resistance between the running surfaces of the opposite wheels of a wheelset does not exceed 0,05 Ohm, measured by a voltage between 1,8 VDC and 2,0 VDC (open circuit). In addition, the electrical reactance between the running surfaces of the opposite wheels of a wheelset does not exceed $f/100$ mOhm when f is between 500 Hz and 40 kHz, under a measuring current of at least 10 ARMS and open voltage of 2 VRMS.	T	Applicable on infrastructure Applicable on vehicles This specific case may be revised when the open point related to the frequency management for track circuits is closed.

7.7.2.5. Lithuania, Latvia and Estonia

Specific case	Category	Notes
4.2.10. Trackside Train Detection Systems Index 77, point 3.1.3.3: The minimum flange thickness (S_d) for 1 520 mm track gauge network is 20 mm.	T	Applicable on infrastructure Applicable on vehicles This specific case is needed as long as ČME locomotives operate on 1 520 mm network.

4.2.10. Trackside Train Detection Systems Index 77, point 3.1.3.4: The minimum flange height (S_h) for 1 520 mm track gauge network is 26,25 mm.		T	Applicable on infrastructure Applicable on vehicles This specific case is needed as long as ČME locomotives operate on 1 520 mm network.
4.2.11. Electromagnetic Compatibility between Rolling Stock and Control-Command and Signalling trackside equipment Index 77, point 3.2.2.4: The limits and associated parameters for the evaluation of rolling stock emissions are provided in the following table:		T	Applicable on vehicles This specific case is linked with the use of ALSN on the 1 520 mm network.
Frequency range	Interference current limit [rms value]		
15 — 21 Hz	4,1 A		
21 — 29 Hz	1,0 A		
29 — 35 Hz	4,1 A		
65 — 85 Hz	4,1 A		
167 — 184 Hz	0,4 A		
408 — 432 Hz	0,35 A		
468 — 492 Hz	0,35 A		
568 — 592 Hz	0,35 A		
708 — 732 Hz	0,35 A		
768 — 792 Hz	0,35 A		
4 462,5 — 4 537,5 Hz	0,2 A		
4 507,5 — 4 582,5 Hz	0,2 A		
4 962,5 — 5 037,5 Hz	0,2 A		
5 462,5 — 5 537,5 Hz	0,2 A		
5 517,5 — 5 592,5 Hz	0,2 A		
4.2.11. Electromagnetic Compatibility between Rolling Stock and Control-Command and Signalling trackside equipment Index 77, point 3.2.2.6: The limits and associated parameters for the evaluation of rolling stock emissions are provided in the following table:		T	Applicable on vehicles This specific case is linked with the use of ALSN on the 1 520 mm network
Frequency range	Interference current limit [rms value]		
19 — 21 Hz	11,6 A		
21 — 29 Hz	1,0 A		
29 — 31 Hz	11,6 A		
40 — 46 Hz	5,0 A		
46 — 54 Hz	1,3 A		
54 — 60 Hz	5,0 A		
167 — 184 Hz	0,4 A		
408 — 432 Hz	0,35 A		
468 — 492 Hz	0,35 A		
568 — 592 Hz	0,35 A		
708 — 732 Hz	0,35 A		
768 — 792 Hz	0,35 A		
4 507,5 — 4 582,5 Hz	0,2 A		
4 962,5 — 5 037,5 Hz	0,2 A		
5 517,5 — 5 592,5 Hz	0,2 A		

7.7.2.6. Sweden

Specific case	Category	Notes
4.2.4. Mobile communication functions for railways RMR Index 33, point 4.2.3: It is permissible to put on the market on-board Control-Command and Signalling Subsystems including 2 Watt GSM-R voice cab radios. The subsystems shall be able to operate in networks with -82 dBm.	P	No impact on interoperability
4.2.10. Trackside Train Detection Systems Index 77, point 3.1.2.1: Maximum axle distance between two axles $\leq 17,5$ m ai in Fig. 1, point 3.1.2.1.	P	Applicable on vehicles
4.2.10. Trackside Train Detection Systems Index 77, point 3.1.2.3: Minimum axle distance between first and last axle $\geq 4,5$ m L-b1-b2 in Fig. 1, point 3.1.2.3.	P	Applicable on vehicles
4.2.11. Electromagnetic Compatibility between Rolling Stock and Control-Command and Signalling trackside equipment Index 77, point 3.2.2.5: Frequency range: 0,0-2,0 Hz Interference current limit [rms value]: 25,0 A Evaluation method: Low-Pass filter Evaluation parameters: (Down sampling to 1 kHz, followed by) 2,0 Hz 4th order Butterworth low-pass filter, followed by an ideal rectifier to give the absolute value. The maximum interference current for a rail vehicle must not exceed 25,0 A in the frequency range 0,0-2,0 Hz. Inrush current may exceed 45,0 A for less than 1,5 seconds and 25 A for less than 2,5 seconds.	P	Applicable on infrastructure Applicable on vehicles

7.7.2.7. Luxembourg

Specific case	Category	Notes
4.2.10. Trackside Train Detection Systems Index 77, point 3.1.4.1: (1) The output of the sanding devices fitted to the vehicle shall not exceed 0,3 l per minute per rail. (2) The sanding in the stations identified in the infrastructure register is prohibited.	T	

(3) The Sanding in the area of switches is prohibited. (4) For emergency braking, no restrictions shall apply.		
4.2.11. Electromagnetic Compatibility between Rolling Stock and Control-Command and Signalling trackside equipment Index 77, point 3.2.2.3: The measurement and evaluation of rolling stock with individual track circuits shall be done according to the document GL.II.STC-VF (parameters A1, A4, V2 and D1).	T	Applicable on vehicles This specific case is needed as long as track circuits (operating frequency 83,3 Hz) are used. Document GL.II.STC.VF is available on the website of the NSA LU ⁽¹⁾ .
4.2.11. Electromagnetic Compatibility between Rolling Stock and Control-Command and Signalling trackside equipment Index 77, point 3.2.2.3: The measurement and evaluation of rolling stock with individual track circuits shall be done according to the document GL.II.STC-VF (parameters A5, V2 and D2).	T	Applicable on vehicles This specific case is needed as long as track circuits (operating frequency 125 Hz) are used. Document GL.II.STC.VF is available on the website of the NSA LU.

(1) 'NSA LU' stands for 'National Safety Authority of Luxembourg': Administration des Chemins de Fer (ACF), www.railinfra.lu (website).

7.7.2.8. Germany

Specific case	Category	Notes
4.2.10. Trackside Train Detection Systems Index 77, point 3.1.7.1: The minimum axle load of vehicles to run on specific lines indicated in the register of infrastructure is 5 t. This specific case only applies to vehicles; it does not modify the technical requirements for train detection systems specified in Index 77 and the provisions of point 7.2.8 related to their implementation.	T	Applicable on vehicles This specific case is needed as long as track circuits type WSSB are used.
4.2.10. Trackside Train Detection Systems Index 77, point 3.1.2.2: For speed not higher than 140 km/h, the distance a_i (Fig 1) between two consecutive axles (concerning the first 5 axles of the consist or the whole set of axles if the total number of axles is lower than 5) is in no case less than 1 000 mm. This specific case only applies to vehicles; it does not modify the technical requirements for train detection systems specified in Index 77 and the provisions of point 7.2.8 related to their implementation.	T	Applicable on vehicles This specific case is needed as long as EBUET 80 type of level crossing protection is used.

4.2.11. Electromagnetic Compatibility between Rolling Stock and Control-Command and Signalling trackside equipment Index 77, point 3.2.2.5: Frequency range: 93 - 110 Hz Interference current limit [rms value]: 2,8 A (for influencing unit) 2 A (for one traction unit) Evaluation method: Band Pass Filters Evaluation parameters: — BP filter characteristics: Centre frequencies: 95, 96, 98, 100, 102, 104, 106 and 108 Hz 3dB-Bandwidth: 4 Hz Butterworth, 6th order — RMS calculation: Integration time: 0,5 s Time overlap: 50 %	T	Applicable on infrastructure Applicable on vehicles This specific case is needed because these track circuits may be modified by shifting the centre frequency from 100 Hz to 106,7 Hz. This would make obsolete a vehicle related National Technical Rule requiring a 100 Hz monitoring system.
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7.7.2.9. Italy

Specific case	Category	Notes
4.2.10. Trackside Train Detection Systems Index 77, point 3.1.4.1: In addition to the TSI requirements, following criteria shall be respected. The allowed maximum amount of sand per sanding device within 30 s is: (1) For speed $v \leq 140$ km/h; 400 g + 100 g (2) For speed $v > 140$ km/h; 650 g + 150 g	T	The national values for dispensing sand will remain valid until harmonized test specifications (currently non-existent) are available for demonstrating that different modes for dispensing sand are safety-acceptable for train detection systems operating in Italy.
4.2.10. Trackside Train Detection Systems Index 77, point 3.1.4.2 In addition to the TSI requirements, following criteria shall be respected. <i>Granulometry</i> $\geq 85\%$ of the sand mixture, with grains' diameters between 0,1 mm and 0,6 mm; and in particular: 0,07 mm ÷ 0,1 mm $\leq 3\%$ of the sand mixture; 0,1 mm ÷ 0,15 mm $\leq 5\%$ of the sand mixture; 0,15 mm ÷ 0,2 mm $\leq 25\%$ of the sand mixture; 0,2 mm ÷ 0,3 mm till 100 % of the sand mixture; 0,3 mm ÷ 0,4 mm till 100 % of the sand mixture;	T	The national values of sand mixture will remain valid until harmonized test specifications (currently non-existent) are available for demonstrating that different kinds of sand mixture are safety-acceptable for train detection systems operating in Italy.

0,4 mm ÷ 0,6 mm ≤ 65 % of the sand mixture; 0,6 mm ÷ 1,5 mm ≤ 4 % of the sand mixture. Composition Siliceous sand; Percentage of clay in the mixture: ≤ 2 %; Percentage of humidity in the mixture: ≤ 0,5 %.		
4.2.11. Electromagnetic Compatibility between Rolling Stock and Control-Command and Signalling trackside equipment Index 77, point 3.2.2.4 and point 3.2.2.6: Frequency range: 82 - 86 Hz Interference current limit [rms value]: 1 125 mA (per influencing unit) Evaluation method: Fast Fourier Transformation Evaluation parameters: Time window 1s, Hanning window, 50 % overlap, average on 6 consecutive windows	T2	Applicable on infrastructure Applicable on vehicles
4.2.2. On-Board ETCS functionality 4.2.3. Trackside ETCS functionality An ETCS Level 1 Trackside application with infill requires that the on-board is equipped with the corresponding radio infill data transmission if the release speed is set to zero for safety reasons.	P	This is applicable for the projects notified to the European Commission by 30 June 2020.

7.7.2.10. Czech Republic

Specific case	Category	Notes
4.2.11. Electromagnetic Compatibility between Rolling Stock and Control-Command and Signalling trackside equipment Index 77, point 3.2.2.4 and point 3.2.2.6: Frequency range: 70,5 – 79,5 Hz Interference current limit [rms value]: 1 A Evaluation method: Band Pass Filters Evaluation parameters: — BP filter characteristics: - Centre frequencies: 73, 75, 77 Hz (continuous band) 3dB-Bandwidth: 5 Hz - Butterworth, order 2*4 — RMS calculation: - Integration time: 0,5 s - Time overlap: min 75 %	T	Applicable on infrastructure Applicable on vehicles This specific case is needed as long as track circuits type EFCP are used.

Frequency range: 271,5 - 278,5 Hz Interference current limit [rms value]: 0,5 A Evaluation method: Band Pass Filters Evaluation parameters: — BP filter characteristics: - Centre frequencies: 274, 276 Hz (continuous band) 3dB-Bandwidth: 5 Hz - Butterworth, order 2*4 — RMS calculation: - Integration time: 0,5 s - Time overlap: min 75 %		
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7.7.2.11. The Netherlands

Specific case	Category	Notes
4.2.1.1. Electromagnetic Compatibility between Rolling Stock and Control-Command and Signalling trackside equipment Index 77, point 3.2.2.6: Frequency range: 65-85 Hz (ATBEG limit) Interference current limit [rms value]: 0,5 A Evaluation method: Band Pass Filters Evaluation parameters: — BP filter characteristics: - Centre frequency: 75 Hz 3dB-Bandwidth: 20 Hz 20dB-Bandwidth: 40 Hz — RMS calculation: - Integration time: 5 s - Time overlap: 80 % Transient shorter than 1s only exceeding the ATBEG limit and not the GRS limit may be ignored. Frequency range: 65-85 Hz (GRS TC limit) Interference current limit [rms value]: 1,7 A Evaluation method: Band Pass Filters Evaluation parameters: — BP filter characteristics - Centre frequency: 75 Hz 3dB-Bandwidth: 20 Hz 20dB-Bandwidth: 40 Hz	P	Applicable on infrastructure Applicable on vehicles This Specific Case is needed in the context of the Class-B system ATBEG. Alternative demonstration, leading to presumption of conformity, is permissible by compliance with the national rules related to rail return current notified for this purpose.

— RMS calculation: Integration time: 1,8 s Time overlap: 80 %		
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7.7.2.12. Ireland

Specific case	Category	Notes
4.2.10. Trackside Train Detection Systems Index 77, point 3.1.4: A train's leading axle shall not be sanded.	T	This specific case is linked with the IE Class B system and certain train detection systems that require the first axle of a train having a good electric contact with the track.
4.2.13.1. GSM-R DMI (Driver Machine Interface) Index 32 and 33: The GSM-R user interfaces (including keyboard and display facilities) as well as any other GSM-R functions shall facilitate the employment of alphanumeric train running numbers as defined in the national rule notified for this purpose.	T	This augments but does not replace the other TSI requirements for management of train running numbers, so that all new equipment shall remain also fully compatible with the interoperability requirements. A transition to pure numeric train numbers shall thus become possible and is envisaged as soon as the train management systems in Ireland are all equipped for pure numeric train running numbers.
4.2.12. ETCS DMI (Driver-Machine Interface) Index 6: The ETCS DMI shall be configurable so that it can show the speed in mph in addition to the standard km/h display. The configurable options shall be as follows: — Display the speed dial in both km/h and mph in the figure below, as indicated as an example for the 180km/h configuration:  — Display the speed dial in km/h only.	T	This augments but does not replace the other TSI requirements for management of the driver interface, so that all new equipment shall remain also fully compatible with the interoperability requirements. A transition to the pure km/h speed dial shall thus become possible and is envisaged as soon as the Irish network is fully fitted with ETCS, or all lineside speed restriction signs can be changed to km/h (i.e. all existing trains present a km/h speedometer).

7.7.2.13. Bulgaria

Specific case	Category	Notes
4.2.10. Trackside Train Detection Systems Index 77, point 3.1.2.5: The distance b_x (Figure 1) does not exceed 3 000 mm.	T	Applicable on vehicles

7.7.2.14. Austria

Specific case	Category	Notes
4.2.2. On-Board ETCS functionality 4.2.3. Trackside ETCS functionality An ETCS Level 1 Trackside application with infill requires that the on-board is equipped with the corresponding Euroloop infill data transmission if the release speed is set to zero for safety reasons.	T	This is applicable for the projects notified to the European Commission by 30 June 2020.
4.2.10. Trackside Train Detection Systems Index 77, point 3.1.7.1: The minimum permissible axle load for unrestricted use on the network is 2,0 t for lowfloor wagons. This specific case only applies to lowfloor wagons; it does not modify the technical requirements for train detection systems specified in Index 77 and the provisions of point 7.2.8 related to their implementation.	T2	Applicable to lowfloor Wagon

Appendix A ⁽⁴¹⁾**References**

For each reference made in the basic parameters (point 4 of this TSI) the following table indicates the corresponding mandatory specifications, via the Index in Table A 2.

Table A 1

References between basic parameters and mandatory specifications

Reference in Chapter 4	Index number (see Table A 2)
4.1	
4.1 a	Intentionally deleted
4.1 b	Intentionally deleted
4.1 c	3, 102
4.2.1	
4.2.1 a	27
4.2.2	
4.2.2 a	14
4.2.2 b	4, 13, 60, 104
4.2.2 c	31, 37 b, 37 c, 37 d
4.2.2 d	20
4.2.2 e	6
4.2.2 f	7, 81, 82
4.2.2 g	Intentionally deleted
4.2.2 h	87
4.2.3	
4.2.3 a	14
4.2.3 b	4, 13, 60
4.2.4	
4.2.4 a	64, 65
4.2.4 b	66
4.2.4 c	67
4.2.4 d	68
4.2.4 e	73, 74
4.2.4 f	32, 33
4.2.4 g	48
4.2.4 h	69, 70
4.2.4 i	Intentionally deleted
4.2.4 j	71, 72
4.2.4 k	75, 76

⁽⁴¹⁾ In former versions of the TSI this was named Annex A. In some of the documents of Table A-2 the references to CCS TSI Annex A shall be read as CCS TSI Appendix A.

4.2.4 l	93, 94, 95, 99
4.2.4 m	93, 94, 95
4.2.4 n	96
4.2.4 o	97
4.2.5	
4.2.5 a	64, 65
4.2.5 b	10a, 10b, 10d, 34, 39, 40
4.2.5 c	19, 20
4.2.5 d	9, 43
4.2.5 e	16, 50
4.2.5 f	93, 94, 95
4.2.5 g	Intentionally deleted
4.2.5 h	86, 10a, 10d, 33, 34
4.2.5 i	86, 10a, 10c, 10d, 92, 94, 95
4.2.5 j	10a, 10b, 10c, 10d, 39, 40, 92, 94, 95
4.2.6	
4.2.6 a	8, 25, 26, 36 c, 49, 52
4.2.6 b	29, 45
4.2.6 c	46
4.2.6 d	10a, 10b, 10d, 34
4.2.6 e	10a, 20
4.2.6 f	Intentionally deleted
4.2.6 g	92, 10a, 10b, 10c, 10d
4.2.6 h	87, 89
4.2.6 i	90
4.2.6 j	10a, 10d, 34
4.2.6 k	92, 10a, 10c, 10d
4.2.6 l	92, 93, 99, 94, 95
4.2.7	
4.2.7 a	12
4.2.7 b	63
4.2.7 c	34, 10a, 10b, 10d
4.2.7 d	9
4.2.7 e	16
4.2.7 f	92, 10a, 10b, 10c, 10d
4.2.7 g	34, 10a, 10d
4.2.7 h	92, 10a, 10c, 10d

4.2.8	
4.2.8 a	10d, 11, 79, 83
4.2.9	
4.2.9 a	23
4.2.10	
4.2.10 a	77 (point 3.1)
4.2.11	
4.2.11 a	77 (point 3.2)
4.2.12	
4.2.12 a	6
4.2.13	
4.2.13 a	32, 33
4.2.13 b	93, 94
4.2.14	
4.2.14 a	5
4.2.15	
4.2.15 a	38
4.2.15 b	101
4.2.17	
4.2.17 a	103
4.2.18	
4.2.18 a	84, 85
4.2.18 b	98
4.2.18 c	88
4.2.18 d	87
4.2.19	
4.2.19 a	84, 85
4.2.19 b	98

Specifications

When a document listed in Table A 2 incorporates, by copying or by reference to, a clearly identified point of another document, this point, and only this, shall be considered a part of the document listed in Table A 2.

For the purposes of this TSI, when a document listed in Table A 2 makes a 'mandatory' or 'normative' reference to a document not listed in Table A 2, the referenced document shall always be understood as an acceptable means of compliance with basic parameters (that can be used for certification of Interoperability Constituents and Subsystems and not requiring future revisions of the TSI) and not as a mandatory specification.

Note: specifications indicated as 'Reserved' in Table A 2 are also listed as open points in Appendix F when there is a need for notification of national rules to close the corresponding open points. Reserved documents not listed as open points are intended as improvements to the system.

Table A 2

List of mandatory specifications

Index No	ETCS Baseline 4 Release 1; RMR: GSM-R Baseline 1 Maintenance Release 1 + FRMCS Baseline 0; ATO Baseline 1 Release 1			
	Reference	Name of Specification	Version	Notes
1	Intentionally deleted			
2	Intentionally deleted			
3	SUBSET-023	Glossary of Terms and Abbreviations	4.0.0	
4	SUBSET-026	System Requirements Specification	4.0.0	
5	SUBSET-027	FIS Juridical Recording	4.0.0	
6	ERA_ERTMS_015560	ETCS Driver Machine interface	4.0.0	
7	SUBSET-034	Train Interface FIS	4.0.0	
8	SUBSET-035	Specific Transmission Module FFFIS	4.0.0	
9	SUBSET-036	FFFIS for Eurobalise	4.0.0	
10a	SUBSET-037-1	EuroRadio FIS GSM-R – Part 1 [Communication layer and coordination function]	4.0.0	
10b	SUBSET-037-2	EuroRadio FIS – Part 2 [Safety layer]	4.0.0	
10c	SUBSET-037-3	EuroRadio FIS – Part 3 [FRMCS interface]	4.0.0	
10d	SUBSET-146	ERTMS End-to-End Security	4.0.0	
11	SUBSET-038	Offline key management FIS	4.0.0	
12	SUBSET-039	FIS for the RBC/RBC handover	4.0.0	
13	SUBSET-040	Dimensioning and Engineering rules	4.0.0	
14	SUBSET-041	Performance Requirements for Interoperability	4.0.0	
15	Intentionally deleted			
16	SUBSET-044	FFFIS for Euroloop	2.4.0	
17	Intentionally deleted			
18	Intentionally deleted			
19	SUBSET-047	Trackside-Trainborne FIS for Radio infill	4.0.0	
20	SUBSET-048	Trainborne FFFIS for Radio infill	3.0.0	

21	Intentionally deleted			
22	Intentionally deleted			
23	SUBSET-054	Responsibilities and rules for the assignment of values to ETCS variables	4.0.0	
24	Intentionally deleted			
25	SUBSET-056	STM FFFIS Safe time layer	3.0.0	
26	SUBSET-057	STM FFFIS Safe link layer	3.1.0	
27	SUBSET-091	Safety Requirements for the Technical Interoperability of ETCS	4.0.0	
28	Intentionally deleted			
29	SUBSET-102	Test specification for interface 'K'	2.0.0	
30	Intentionally deleted			
31	SUBSET-094	Functional requirements for an on-board reference test facility	3.1.0	
32	EIRENE FRS	GSM-R Functional requirements specification	8.1.0	Note 7
33	EIRENE SRS	GSM-R System requirements specification	16.1.0	Note 7
34	A11T6001	(MORANE) Radio Transmission FFFIS for EuroRadio	14.0.0	
35	Intentionally deleted			
36a	Intentionally deleted			
36b	Intentionally deleted			
36c	SUBSET-074-2	FFFIS STM Test cases document	4.0.0	
37a	Intentionally deleted			
37b	SUBSET-076-5-2	Test cases related to features	3.3.0	
37c	SUBSET-076-6-3	Test sequences	3.2.0	
37d	SUBSET-076-7	Scope of the test specifications	3.3.0	
37e	Intentionally deleted			
38	EN 16494	Railway applications. Requirements for ERTMS Trackside Boards	2015	
39	SUBSET-092-1	ERTMS EuroRadio Conformance Requirements	4.0.0	
40	SUBSET-092-2	ERTMS EuroRadio test cases safety layer	4.0.0	

41	Intentionally deleted			
42	Intentionally deleted			
43	SUBSET-085	Test specification for Eurobalise FFFIS	4.0.0	
44	Intentionally deleted			
45	SUBSET-101	Interface 'K' Specification	2.0.0	
46	SUBSET-100	Interface 'G' Specification	2.0.0	
47	Intentionally deleted			
48	Reserved	Test specification for mobile equipment GSM-R		Note 3
49	SUBSET-059	Performance requirements for STM	4.0.0	
50	SUBSET-103	Test specification for Euroloop	1.1.0	
51	Intentionally deleted			
52	SUBSET-058	FFIS STM Application layer	4.0.0	
53	Intentionally deleted			
54	Intentionally deleted			
55	Intentionally deleted			
56	Intentionally deleted			
57	Intentionally deleted			
58	Intentionally deleted			
59	Intentionally deleted			
60	SUBSET-104	ETCS System Version Management	4.0.0	
61	Intentionally deleted			
62	Intentionally deleted			
63	SUBSET-098	RBC-RBC Safe Communication Interface	4.0.0	
64	EN 301 515	Global System for Mobile Communication (GSM); Requirements for GSM operation on railways	3.0.0	Note 1
65	TS 102 281	Detailed requirements for GSM operation on railways	3.1.1	Note 2
66	TS 103 169	ASCI Options for Interoperability	1.1.1	

67	(MORANE) P 38 T 9001	FFIS for GSM-R SIM Cards	6.0.0	Note 7
68	ETSI TS 102 610	Railway Telecommunication; GSM; Usage of the UUIE for GSM operation on railways	1.3.0	
69	(MORANE) F 10 T 6002	FFFS for Confirmation of High Priority Calls	5	
70	(MORANE) F 12 T 6002	FIS for Confirmation of High Priority Calls	5	
71	(MORANE) E 10 T 6001	FFFS for Functional Addressing	4.1	
72	(MORANE) E 12 T 6001	FIS for Functional Addressing	5.1	
73	(MORANE) F 10 T 6001	FFFS for Location Dependent Addressing	4	
74	(MORANE) F 12 T 6001	FIS for Location Dependent Addressing	3	
75	(MORANE) F 10 T 6003	FFFS for Presentation of Functional Numbers to Called and Calling Parties	4	
76	(MORANE) F 12 T 6003	FIS for Presentation of Functional Numbers to Called and Calling Parties	4	
77	ERA/ERTMS/033281	Interfaces between CCS trackside and other subsystems	5.0	Note 6
78	Intentionally deleted			Note 5
79	SUBSET-114	KMC-ETCS Entity Off-line KM FIS	4.0.0	
80	Intentionally deleted			Note 4
81	SUBSET-119	Train Interface FFFIS	4.0.0	
82	SUBSET-120	Train Interface – Safety requirements	4.0.0	
83	SUBSET-137	On-line Key Management FFFIS	4.0.0	
84	SUBSET-125	ERTMS/ATO System Requirement Specification	1.0.0	
85	SUBSET-126	ATO-OB/ATO-TS FFFIS Application Layer	1.0.0	
86	SUBSET-148	ATO-OB/ATO-TS FFFIS Transport and Security Layers	1.0.0	
87	SUBSET-130	ATO-OB/ETCS-OB FFFIS Application Layer	1.0.0	

88	SUBSET-139	ATO OB/Rolling Stock FFFIS Application Layer	1.0.0	
89	SUBSET-143	Interface Specification Communication Layers for On-board Communication	1.0.0	
90	SUBSET-147	CCS Consist network communication Layers FFFIS	1.0.0	
91	Intentionally deleted			
92	FFFIS-7950	FRMCS FFFIS	1.0.0	Note 8
93	FU-7120	FRMCS FRS	1.0.0	Note 9
94	AT-7800	FRMCS SRS	1.0.0	Note 9
95	FIS-7970	FRMCS FIS	1.0.0	Note 8
96	Reserved	[FFFIS for FRMCS profile placeholder]		
97	Reserved	[FRMCS Test specifications placeholder]		
98	SUBSET-151	ATO-OB/ATO-TS Test Specifications	Reserved	
99	TOBA-7510	On-board FRMCS TOBA FRS	1.0.0	Note 9
100	Intentionally deleted			
101	21E089	Engineering rules for harmonised marker boards	1-	
102	13E154	ERTMS/ATO Glossary	2-	
103	TD/011REC1028	ESC/RSC technical document	Version published in ERA website	
104	SUBSET-153	Exceptions for on-board reduced envelopes of system versions	Reserved	

Note 1: The points of the specifications listed in point 2.1 of EN 301 515 which are referenced in Index 32 and Index 33 as 'MI' are mandatory.

Note 2: The change requests (CRs) listed in table 1 and 2 of TS 102 281 which affect points referenced in Index 32 and Index 33 as 'MI' are mandatory.

Note 3: Index 48 refers only to test cases for GSM-R mobile equipment. It is kept 'reserved' for the time being. When agreed in a future revision of the TSI, the catalogue of available harmonised test cases for the assessment of mobile equipment and networks, according to the steps indicated in point 6.1.2 of this TSI, will be introduced in these tables.

Note 4: The products which are on the market are already tailored to the needs of the RU related to GSM-R Driver Machine Interface and fully interoperable so there is no need for a standard in the TSI CCS.

Note 5: Information that was intended for index 78 is now incorporated in Index 27 (SUBSET-091).

Note 6: This document is ETCS, RMR and ATO baseline independent.

Note 7: Only the (MI) requirements are mandated by TSI CCS.

Note 8: These specifications, as regards to ETCS and ATO on board equipment, shall be fully implemented.

Note 9: These specifications, in their current version, as regards to FRMCS on-board equipment, are not considered complete for the purpose of tendering the on-board equipment.

Table A 3

List of standards

The application of the version of the standards listed in the table below, and their subsequent amendments when published as harmonised standard in the certification process is an appropriate means to fully comply to the risk management process as set out in Annex I to the Implementing Regulation (EU) No 402/2013, without prejudice to the points 4 and 6 of this TSI.

No	Reference	Document name and comments	Version	Note
A1	EN 50126-1	Railway applications – The specification and demonstration of reliability, availability, maintainability and safety (RAMS) – Part 1: Generic RAMS Process	2017	1
A2	EN 50128	Railway applications – Communication, signalling and processing systems – Software for railway control and protection systems	2011 +A2:2020	
A3	EN 50129	Railway applications – Communication, signalling and processing systems – Safety related electronic systems for signalling	2018 +AC:2019	1
A4	EN 50159	Railway applications – Communication, signalling and processing systems	2010 +A1:2020	1
A5	EN 50126-2	Railway Applications – The specification and demonstration of reliability, availability, maintainability and safety (RAMS) – Part 2: Systems Approach to Safety	2017	1, 2

Note 1: This standard is harmonised, see 'Commission Communication in the framework of the implementation of Directive 2008/57/EC of the European Parliament and of the Council of 17 June 2008 on the interoperability of the rail system within the Community (recast)' ⁽⁴²⁾ and 'Commission Implementing Decision (EU) 2020/453 of 27 March 2020 on the harmonised standards for railway products drafted in support of Directive 2008/57/EC of the European Parliament and of the Council on the interoperability of the rail system within the Community' ⁽⁴³⁾, where also published editorial corrigenda are indicated.

Note 2: To be used in combination with EN 50126-1:2017.

Table A 4

List of mandatory standards for accredited laboratories

No	Reference	Document name and comments	Version	Note
A6	ISO/IEC 17025	General requirements for the competence of testing and calibration laboratories	2017	

⁽⁴²⁾ OJ C 282, 10.8.2018, p. 6.

⁽⁴³⁾ OJ L 95, 30.3.2020, p. 1.

B1. Changes of requirements and transition regimes for On-Board Subsystems

Table B1.1

Transition Regime ⁽⁴⁴⁾ for CCS On-Board Subsystem

No	TSI point(s)	TSI point(s) in previous version	Explanation on TSI change	Transition regime			
				Design phase started after TSI enters into force	Design phase started before TSI enters into force	Production phase	Vehicle in operation
CCS On-Board Error corrections							
1	Appendix A + point 7.2.10.3	No mandatory implementation of error corrections published in technical opinions	CCS Subsystems with mandatory implementation of registered error corrections for functionality ETCS up to system version 2.1 and GSM-R.	For legal releases (with maintenance of specifications) published before 1 January 2026: If one or more registered errors are identified for the area of use for which a new authorisation is required: the CCS subsystem integrated into a vehicle type shall implement the necessary error corrections at the latest 6 months after the update of the concerned interoperability constituents. <i>Note:</i> If one or more registered errors are identified for the area of use for which no new authorisation is required, the CCS subsystem integrated into a vehicle type is considered compliant with the update of the concerned interoperability constituents (as defined in Table B3).	For legal releases (with maintenance of specifications) published before 1 January 2026: If one or more registered errors are identified for the area of use: the CCS subsystem integrated into a vehicle shall implement the necessary error corrections the latest — 1 year after the update of the concerned interoperability constituents (as defined in Table B3) in the case no new authorisation is required; or — 1 year after the update of the vehicle type in the case a new authorisation is required;		

⁽⁴⁴⁾ Definition of phases provided in point 7.2.4.1.1.

				For legal releases (with maintenance of specifications) published after 1 January 2026: If one or more registered errors are identified for the area of use for which a new authorisation is required: the CCS subsystem integrated into a vehicle type shall implement the full maintenance package of error corrections at the latest 6 months after the update of the concerned interoperability constituents. <i>Note:</i> If one or more registered errors are identified for the area of use for which no new authorisation is required, the CCS subsystem integrated into a vehicle type is considered compliant with the update of the concerned interoperability constituents (as defined in Table B3).	For legal releases (with maintenance of specifications) published after 1 January 2026: If one or more registered errors are identified for the area of use: the CCS subsystem integrated into a vehicle shall implement the full maintenance package of error corrections the latest — 1 year after the update of the concerned interoperability constituents (as defined in Table B3) in the case no new authorisation is required; or — 1 year after the update of the vehicle type in the case a new authorisation is required;
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ETCS On-Board implementation

2	Points 7.4.2.1, and 7.4.3	7.4.2.1.2. and 7.4.3(2) grants exemptions for new vehicles to be equipped with ETCS	7.4.2.1.2. and point 7.4.3(2) deleted. All newly built vehicles shall be equipped with ETCS.	Directly applicable <i>Note:</i> Design phase started after TSI enters into force here relates to 'RST design phase' for vehicles without ETCS. For special vehicles applicable from 1 January 2026 with respect to 7.4.3.2.	Applicable from 1 January 2028 <i>Note:</i> Design phase started before TSI enters into force here relates to 'RST design phase' for vehicles without ETCS. For special vehicles applicable from 1 January 2030 with respect to 7.4.3.2.	Applicable from 1 January 2030 <i>Note:</i> Production phase here relates to 'RST production phase' for vehicles without ETCS.	Not applicable
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3	Point 7.4.2.2	7.4.2.2 only applicable to upgrade of existing high-speed vehicles	7.4.2.2 applicable to vehicle type and/or vehicles requiring a new authorisation	Directly applicable For special vehicles applicable from 1 January 2026.	Applicable from 1 January 2028 <i>Note:</i> Remains directly applicable to high-speed vehicles according to previous CCS TSI. For special vehicles applicable from 1 January 2030.	Not applicable	Not applicable
4	Point 7.4.2.3 (3)	7.4.2.4 extension area of use: exemptions to install ETCS in point (3)	7.4.2.4 extension area of use: exemptions deleted in point (3)	Not applicable	Not applicable	Not applicable	Applicable from 1 January 2030
<i>ETCS system versions</i>							
5	Appendix A – 7.4.2.4.1 and 7.4.2.4.2 for envelope of legally operated ETCS system versions from 1.0 up to 2.1 inclusive.	The minimum reduced on-board envelope is the envelope up to ETCS system version 2.0.	The minimum reduced on-board envelope is the envelope up to ETCS system version 2.1.	Applicable 3 years after entry into force of the TSI	Applicable from 1 January 2030	Applicable on newly built vehicles from 1 January 2030	Not applicable

6	Appendix A – 7.4.2.4.1 and 7.4.2.4.2 for envelope of legally operated ETCS system versions from 1.0 up to 2.2 inclusive.	Not applicable	On-board implementation of notified ETCS functions from system version 2.2.	Design phase started after notification from IM and notification is done after 1 January 2025: the ETCS system version 2.2 is directly applicable.	The ETCS system version 2.2 is applicable if the design phase is not ended within the latest date between following dates: — 1 January 2030; — 5 years after the notification date from the IM.	Not applicable	Not applicable
				Design phase started before notification from IM or notification is done before 1 January 2025: the ETCS system version 2.2 is applicable if the design phase is not ended within the latest date between following dates: — 1 January 2030; — 5 years after the notification date from the IM.			

7	Appendix A – 7.4.2.4.1, 7.4.2.4.2 and 7.4.1.3 for envelope of legally operated ETCS system versions from 1.0 up to 3.0 inclusive.	Not applicable	On-board implementation of notified ETCS functions from system version 3.0 ⁽¹⁾ .	Not applicable. <i>Note:</i> Transition regime after entry into force of amendment ⁽²⁾: Design phase started after notification from IM and notification is done after 2 years of the CCS TSI amendment: the ETCS system version 3.0 is directly applicable.	Not applicable. <i>Note:</i> Transition regime after entry into force of CCS TSI amendment ⁽¹⁾: The ETCS system version 3.0 is applicable if the design phase has not ended within the latest date between following dates: — 5 years after the CCS TSI amendment; — 5 years after the notification date from the IM	Not applicable. <i>Note:</i> Transition regime after entry into force of CCS TSI amendment ⁽¹⁾: the notified ETCS system version 3.0 is mandatory when required for compatibility with the ETCS trackside implementation of ETCS TS 3.0	Not applicable. <i>Note:</i> Transition regime after entry into force of CCS TSI amendment ⁽²⁾: the notified ETCS system version 3.0 is mandatory when required for compatibility with the ETCS trackside implementation of ETCS TS 3.0
				Design phase started before notification from IM or notification is done before entry into force of CCS TSI amendment: see transition regime in column 'Design phase started before TSI set into force'.			

8	Appendix A – 7.4.2.3 (7)	Mandatory use of system version 2.0 or higher in case of extension of area of use	Legal enforcement to mandate usage of system version 2.1 or higher in case of extension of area of use only when the extending area of use is combined with a request for new authorisation	Directly applicable	Directly applicable	Not applicable	Not applicable
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Former sets of specifications #2 and #3

9	Appendix A – Table A 2	Appendix A – Table A 2 2 – Set of specification #2	The specifications in Appendix A – Table A 2 does not include ETCS system version 2.0, since the minimum reduced on-board envelope is the envelope up to ETCS system version 2.1.	Applicable 3 years after entry into force of the TSI In any case the error correction provisions in point 7.2.10 shall be respected with its corresponding transition period. No constraint shall be exported to the other subsystem.	Applicable from 1 January 2030 In any case the error correction provisions in point 7.2.10 shall be respected with its corresponding transition period. No constraint shall be exported to the other subsystem.	Applicable on newly built vehicles from 1 January 2030 In any case the error correction provisions in point 7.2.10 shall be respected with its corresponding transition period. No constraint shall be exported to the other subsystem.	Not applicable In any case the error correction provisions in point 7.2.10 shall be respected with its corresponding transition period. No constraint shall be exported to the other subsystem.
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10	Appendix A – Table A 2	Appendix A – Table A 2 3 – Set of specification #3	The specifications in Appendix A – Table A 2 have the agreed error corrected version of former set #3	Applicable 3 years after entry into force of the TSI In any case the error correction provisions in point 7.2.10 shall be respected with its corresponding transition period. No constraint shall be exported to the other subsystem.	Applicable from 1 January 2030 In any case the error correction provisions in point 7.2.10 shall be respected with its corresponding transition period. No constraint shall be exported to the other subsystem.	Applicable on newly built vehicles from 1 January 2032 In any case the error correction provisions in point 7.2.10 shall be respected with its corresponding transition period. No constraint shall be exported to the other subsystem.	Not applicable In any case the error correction provisions in point 7.2.10 shall be respected with its corresponding transition period. No constraint shall be exported to the other subsystem.
CMD							
11	4.2.2 (b) – Cold Movement Detection	CMD Optional	CMD Mandatory	Directly applicable when ETCS is installed for the first time into a vehicle design.	Applicable from 1 January 2028 when ETCS is installed for the first time into a vehicle design.	Applicable on newly built vehicles placed on the market from 1 January 2030.	Not applicable

ATO On-Board Implementation

12	4.2.18 + Point 7.2.9.2	Not applicable	ATO on-board specification and implementation requirements	Design phase started after notification from IM and notification is done after 1 January 2025: ATO on-board requirements are directly applicable. Design phase started before notification from IM or notification is done before 1 January 2025: ATO On-board requirements are applicable if the design phase is not ended within the latest date between following dates: — 1 January 2030; — 5 years after the notification date from the IM.	ATO on-board requirements are applicable if the design phase is not ended within the latest date between following dates: — 1 January 2030; — 5 years after the notification date from the IM.	Not applicable	Not applicable
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CCS On-Board Modularity

13	Index 90 + point 5.2.2.2	Not applicable	Mandatory implementation of Ethernet based platform New requirement in case of grouping of Interoperability Constituents defined in table 5.1	Applicable 2 years after entry into force of the TSI on newly developed vehicle designs requiring first authorisation	Applicable 7 years after entry into force of the TSI on newly developed vehicle designs requiring first authorisation	Not applicable	Not applicable
14	Appendix A – CCS and RST interfaces Indexes 81, 82, 88, 90	Not applicable	Mandatory implementation of on-board interfaces between CCS subsystem and RST subsystem	Applicable 2 years after entry into force of the TSI on newly developed vehicle designs requiring first authorisation	Applicable 7 years after entry into force of the TSI on newly developed vehicle designs requiring first authorisation	Not applicable	Not applicable

FRMCS On-Board implementation

15	Point 7.3.2.2	Not applicable	FRMCS on-board implementation ⁽³⁾	Not applicable. <i>Note:</i> Transition regime after TSI amendment: Design phase started after notification from IM and notification is done after 2 years of the entry into force of CCS TSI amendment: FRMCS on-board implementation is directly applicable.	Not applicable. <i>Note:</i> Transition regime after TSI amendment: FRMCS on-board is applicable if the design phase is not ended within the latest date between following dates: — 5 years after the CCS TSI amendment; — 5 years after the notification date from the IM.	Not applicable. <i>Note:</i> The FRMCS on-board implementation is mandatory when required for compatibility with FRMCS only trackside implementation	Not applicable. <i>Note:</i> The FRMCS on-board implementation is mandatory when required for compatibility with FRMCS only trackside implementation
				Design phase started before notification from IM: see transition regime in column 'Design phase started before TSI set into force'.			
Partial fulfilment							

16	Point 6.1.1.2	Points 6.1.1.3 and 6.4.3 are deleted.	With respect to 6.1.1.2 it is no longer possible to exclude mandatory functionalities, interfaces or performance except if listed in Appendix G.	3 years after the entry into force of the TSI. If partial fulfilment is used, a condition for use shall be included in their authorisation for placing on the market enforcing compliance at the next upgrade of the vehicle train protection part.	7 years after the entry into force of the TSI.	Not applicable	Not applicable
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DMI indication translation

17	Appendix E	No mandatory harmonised translation of DMI indications	Harmonised translation of DMI indications.	Directly applicable	7 years after the entry into force of the TSI.	Not applicable	Not applicable
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- ⁽¹⁾ *Note:* If the Member State has agreed with the stakeholders to implement the new ETCS system version 3.0 (see clause 7.4.4), the IM shall notify the dates when the ETCS on-board system version 3.0 shall be a mandatory on-board requirement according to clause 7.4.1.3. All vehicles using these lines shall need to implement the ETCS on-board system version 3.0.
- ⁽²⁾ This concerns CCS TSI new legal release with full FRMCS and DAC readiness specifications.
- ⁽³⁾ *Note:* If the Member State has agreed with the stakeholders to implement FRMCS (see clause 7.4.4), the IM shall notify the dates when the FRMCS on-board system shall be a mandatory on-board requirement according to clause 7.3.1. All vehicles using these lines shall need to implement the FRMCS on-board system.

Table B1.2

Transition Regime ⁽⁴⁵⁾ for RST Subsystem

No	TSI point(s)	TSI point(s) in previous version	Explanation on TSI change	Transition regime			
				Design phase started after TSI enters into force	Design phase started before TSI enters into force	Production phase	Vehicle in operation
1	Index 77	V4 – Frequency management not fully defined for the vehicle	V5 – Frequency management fully defined for the vehicle	Directly applicable with the exception of point 3.2.2. This point is applicable 2 years after the entry into force of the TSI on newly developed vehicle designs requiring a first authorisation as defined in Article 14 point 1(a) of Commission Implementing Regulation (EU) 2018/545; Applicable 7 years after the entry into force of the TSI on modified vehicles designs requiring a new authorisation as defined in Article 14 point 1(d) of Commission Implementing Regulation (EU) 2018/545;	Applicable 7 years after the entry into force of the TSI	Not applicable	Not applicable

⁽⁴⁵⁾ Definition of phases provided in point 7.2.4.1.1.

B2. Changes of requirements and transition regimes for CCS Trackside Subsystem

Table B2

Transition regime for CCS Trackside Subsystem

No	TSI point(s)	TSI point(s) in previous version	Explanation on TSI change	Transition Regime
<i>CCS Trackside Error Corrections</i>				
1	Appendix A + Points 7.4.1.2 and 7.2.10.3	Set 1, 2 and 3 of specifications without error corrections	Table A2 includes the maintenance of the functions into 1 set of specifications.	CCS Trackside Subsystems, which are in advanced stage of development or in operation, shall implement the identified set of corrections for the unacceptable errors as described in point 7.2.10.1 within: — 2 years after the publication of the IM decision in the case no new authorisation is required; — 2 years and 6 months after the publication of the IM decision in the case a new authorisation is required. CCS Trackside Subsystems placed into service after the entry into force of this TSI, which are not in advanced stage of development, shall directly comply with the maintained set of specifications of this TSI.
<i>CCS Trackside Enhancements</i>				
2	ETCS: Appendix A; + point 7.4.1.3	Not applicable	New ETCS functions from system version 2.2 to 3.0	If implemented (optional trackside function), directly applicable for ETCS equipped lines
3	ETCS: Appendix A; Table A.2 – Index 38, 101	Marker-board definition based on 06E068	EN 16494 and engineering rules for harmonised marker boards	Directly applicable if: — Marker Boards are installed for the first time in a line being equipped with ERTMS (which are not in advanced stage of development), even when a Class B system is also installed at the same time; or — Marker Boards are installed during renewal or upgrading (which are not in advanced stage of development) of the infrastructure subsystem in a line equipped with ERTMS. Detailed provisions for applicable requirements for fitting the harmonised Marker Boards are stated in the Appendix A – Table A.2 – Index 101 document.

4	4.2.19	No specifications	ATO Trackside Implementation	If implemented (optional trackside function), directly applicable for ATO GoA1/2 implementation on ETCS equipped lines.
5	FRMCS radio system	No specifications	New set of FRMCS specifications	If implemented (optional trackside function), directly applicable for FRMCS projects when FRMCS specifications are completed and published with an amendment of this CCS TSI.
<i>Partial fulfilment</i>				
6	Not applicable	Points 6.1.1.3 and 6.4.3 are deleted.	When implemented, all functions, performance and interfaces or performance shall comply with the Chapter 4 (including the specifications referred to in Appendix A).	7 years after the entry into force of the TSI.
<i>Former set of specifications set #1, #2 and #3</i>				
7	Appendix A — Table A 2	Appendix A – Table A 2 1 – Set of specification #1, Table A 2 2 – Set of specification #2 Table A 2 3 – Set of specification #3	Table A 2 includes the maintenance of the functions into 1 set of specifications.	Requirements and deadlines defined in point 7.4.1.2.

Table B3

Transition regime for CCS Interoperability Constituents

According to point 7.2.4.3 Interoperability constituents transition periods defined for CCS Subsystems are applicable for the Interoperability Constituents unless specified in this table.

No	TSI point(s)	TSI point(s) in previous version	Explanation on TSI change	Transition Regime
1	Appendix A + point 4.2.20.1 + point 7.2.10.2	Technical opinions on Art. 10 errors are not legally binding	Implementation of error corrections into ERTMS on-board Interoperability Constituents for existing CCS subsystems for functionality ETCS up to system version 2.1 and GSM-R.	If one or more registered errors are identified for the area of use specified in the authorisation of the vehicle: (a) for legal releases (with error correction specifications) published before 1 January 2026: ERTMS on-board Interoperability Constituents integrated into a vehicle shall implement the necessary error corrections within the area of use specified in the authorisation, the latest 18 months after the publication of the IM-decision; (b) for legal releases (with error correction specifications) published after 1 January 2026 onwards: ERTMS on-board Interoperability Constituents integrated into a vehicle shall comply with the maintained set of specifications of this TSI 18 months after the publication of the IM-decision. This transition regime can be handled flexibly in agreement with the applicant for the EC verification of the on-board subsystem and the railway undertaking as long as the overall transition regime (as per Table B1.1 plus as per Table B3) is met. <i>Note:</i> If no errors are registered for the concerned area of use, error corrections will be mandatory implemented according to the transition regime linked to the point of partial fulfilment.

2	Appendix A + point 4.2.20.1 + point 7.2.10.2	Technical opinions on Art. 10 errors are not legally binding	Implementation of error corrections into ERTMS Trackside Interoperability Constituents for new CCS trackside projects for functionality, ETCS up to system version 2.1 and GSM-R.	ERTMS Trackside Interoperability Constituents, integrated into a CCS Trackside Subsystem for which the project is not in advanced stage of development, shall directly comply with the maintained set of specifications of this TSI.
3	Appendix A + point 4.2.20.1 + point 7.2.10.2	Technical opinions on Art. 10 errors are not legally binding	Implementation of error corrections into ERTMS Trackside Interoperability Constituents for existing CCS trackside projects (i.e. trackside subsystem in advanced stage of deployment or in operations)	ERTMS Trackside Interoperability Constituents, integrated into a CCS Trackside Subsystem for which the project is in advanced stage of development or being integrated in a CCS Trackside Subsystem in operation, shall implement the identified set of corrections for the unacceptable trackside errors for the area of use specified in the authorisation within 18 months year after the publication of the IM-decision.
4	Appendix A, Table A.2 Index 90, 92 + 5.2.2.2	N/A	Implementation of Ethernet based communication for integration with ATO On-Board IC and FRMCS On-Board IC	New ETCS On-Board Interoperability Constituents placed on the market within 2 years after entry into force of the TSI shall implement the Ethernet based connections required for ATO and FRMCS interfacing as specified in Index 90 (points 3.1.1.2 and 3.1.1.3) and as specified in Index 92 (point 7.2)

Appendix C

In this appendix the templates for the different ESC/RSC (Interoperability Constituent) Statement are provided.

Appendix C.1: ESC Statement template

TEMPLATE FOR ETCS SYSTEM COMPATIBILITY STATEMENT

ETCS SYSTEM COMPATIBILITY STATEMENT

ETCS System Compatibility Statement document [Document number] ⁽⁴⁶⁾

We, Applicant:

[Business name]

[Complete postal Address]

Declare under our sole responsibility that the following subsystem ⁽⁴⁷⁾:

[Name/short description of the subsystem, relevant configuration, unique identification of the subsystem]

to which this statement refers has been subject to the relevant verifications that corresponds to the following ESC Type(s):

[Reference to: ESC Type Identifiers as published in the Agency Technical Document]

has been assessed by the following Notified body:

[Business name]

[Registration number]

[Full address]

In accordance with the following report(s):

[Report(s) number(s), date(s) of issue]

The following conditions of use and other restrictions apply ⁽⁴⁸⁾ ⁽⁴⁹⁾:

[Reference to document with the list of conditions of use and other restrictions]

The following ESC Interoperability Constituent Statements has been considered:

[Indicate use of ESC Interoperability Constituent Statements]

Reference to former ETCS System Compatibility Statement (where applicable)

[Yes/No]

Done on:

[date DD/MM/YYYY]

Signature of Applicant:

[First Name, Surname]

⁽⁴⁶⁾ The information in square brackets [] is provided to support the user in correctly and exhaustively compiling the template.

⁽⁴⁷⁾ The description of the subsystem shall enable unique identification and allow for traceability.

⁽⁴⁸⁾ When a reference to a list of conditions of use and other restrictions is made, such list shall be accessible to the authorising entity.

⁽⁴⁹⁾ Template for restrictions and added functionality in the CCS TSI Appendix D shall be used.

Appendix C.2: ESC Interoperability Constituent Statement template

TEMPLATE FOR ESC STATEMENT FOR INTEROPERABILITY CONSTITUENT

ESC STATEMENT FOR INTEROPERABILITY CONSTITUENTETCS System Compatibility Statement document for the Interoperability Constituent [Document number] ⁽⁵⁰⁾

We, Applicant:

[Business name]

[Complete postal Address]

Declare under our sole responsibility that the following Interoperability Constituent ⁽⁵¹⁾:

[Name/short description of the interoperability constituent, relevant configuration, unique identification of the interoperability constituent]

to which this statement refers has been subject to the relevant verifications that corresponds to the following ESC Type(s):

[Reference to: ESC Type Identifiers as published in the Agency Technical Document]

has been assessed by the following Notified body:

[Business name]

[Registration number]

[Full address]

In accordance with the following report(s):

[Report(s) number(s), date(s) of issue]

The following conditions of use and other restrictions apply ⁽⁵²⁾ ⁽⁵³⁾:

[Reference to document with the list of conditions of use and other restrictions]

Reference to former ETCS Interoperability Constituent System Compatibility Statement (where applicable)

[Yes/No]

Done on:

[date DD/MM/YYYY]

Signature of Applicant:

[First Name, Surname]

⁽⁵⁰⁾ The information in square brackets [] is provided to support the user in correctly and exhaustively compiling the template.⁽⁵¹⁾ The description of the interoperability constituent shall enable unique identification and allow for traceability.⁽⁵²⁾ When a reference to a list of conditions of use and other restrictions is made, such list shall be accessible to the authorising entity.⁽⁵³⁾ Template for restrictions and added functionality in the CCS TSI Appendix D shall be used.

Appendix C.3: RSC Statement template

TEMPLATE FOR RADIO SYSTEM COMPATIBILITY STATEMENT

RADIO SYSTEM COMPATIBILITY STATEMENT

Radio System Compatibility Statement document [*Document number*] ⁽⁵⁴⁾

We, Applicant:

[*Business name*]

[*Complete postal Address*]

Declare under our sole responsibility that the following subsystem ⁽⁵⁵⁾:

[*Name/short description of the subsystem, relevant configuration, unique identification of the subsystem*]

to which this statement refers has been subject to the relevant verifications that corresponds to the following RSC Type(s):

[*Reference to: RSC Type Identifiers as published in the Agency Technical Document*]

has been assessed by the following Notified body:

[*Business name*]

[*Registration number*]

[*Full address*]

In accordance with the following report(s):

[*Report(s) number(s), date(s) of issue*]

The following conditions of use and other restrictions apply ⁽⁵⁶⁾ ⁽⁵⁷⁾:

[*Reference to document with the list of conditions of use and other restrictions*]

The following RSC Interoperability Constituent Statements has been considered:

[*Indicate use of RSC Interoperability Constituent Statements*]

Reference to former Radio System Compatibility Statement (where applicable)

[*Yes/No*]

Done on:

[*date DD/MM/YYYY*]

Signature of Applicant:

[*First Name, Surname*]

⁽⁵⁴⁾ The information in square brackets [] is provided to support the user in correctly and exhaustively compiling the template.

⁽⁵⁵⁾ The description of the subsystem shall enable unique identification and allow for traceability.

⁽⁵⁶⁾ When a reference to a list of conditions of use and other restrictions is made, such list shall be accessible to the authorising entity.

⁽⁵⁷⁾ Template for restrictions and added functionality in the CCS TSI Appendix D shall be used.

Appendix C.4: RSC Statement for Interoperability Constituent template

TEMPLATE FOR RSC STATEMENT FOR INTEROPERABILITY CONSTITUENT

RSC STATEMENT FOR INTEROPERABILITY CONSTITUENT

Radio System Compatibility Statement document for the Interoperability Constituent [Document number] ⁽⁵⁸⁾

We, Applicant:

[Business name]

[Complete postal Address]

Declare under our sole responsibility that the following Interoperability Constituent ⁽⁵⁹⁾:

[Name/short description of the interoperability constituent, relevant configuration, unique identification of the interoperability constituent]

to which this statement refers has been subject to the relevant verifications that corresponds to the following RSC Type(s):

[Reference to: RSC Type Identifiers as published in the Agency Technical Document]

has been assessed by the following Notified body:

[Business name]

[Registration number]

[Full address]

In accordance with the following report(s):

[Report(s) number(s), date(s) of issue]

The following conditions of use and other restrictions apply ⁽⁶⁰⁾ ⁽⁶¹⁾:

[Reference to document with the list of conditions of use and other restrictions]

Reference to former Radio Interoperability Constituent System Compatibility Statement (where applicable)

[Yes/No]

Done on:

[date DD/MM/YYYY]

Signature of Applicant:

[First Name, Surname]

⁽⁵⁸⁾ The information in square brackets [] is provided to support the user in correctly and exhaustively compiling the template.

⁽⁵⁹⁾ The description of the interoperability constituent shall enable unique identification and allow for traceability.

⁽⁶⁰⁾ When a reference to a list of conditions of use and other restrictions is made, such list shall be accessible to the authorising entity.

⁽⁶¹⁾ Template for restrictions and added functionality in the CCS TSI Appendix D shall be used.

Appendix C.5: Combined ESC/RSC Statement template

TEMPLATE FOR ETCS AND RADIO SYSTEM COMPATIBILITY STATEMENT

ETCS AND RADIO SYSTEM COMPATIBILITY STATEMENTETCS and RSC System Compatibility Statement document [Document number] ⁽⁶²⁾

We, Applicant:

[Business name]

[Complete postal Address]

Declare under our sole responsibility that the following subsystem ⁽²⁾ ⁽⁶³⁾:

[Name/short description of the subsystem, relevant configuration, unique identification of the subsystem]

to which this statement refers has been subject to the relevant verifications that corresponds to the following ESC and RSC Types:

[Reference to: ESC Type and RSC Type identifiers as published in the Agency Technical Document]

has been assessed by the following Notified body:

[Business name]

[Registration number]

[Full address]

In accordance with the following report(s):

[Report(s) number(s), date(s) of issue]

The following conditions of use and other restrictions apply ⁽⁶⁴⁾ ⁽⁶⁵⁾:

[Reference to document with the list of conditions of use and other restrictions]

The following ESC and RSC Interoperability Constituent Statements has been considered:

[Indicate use of ESC and RSC Interoperability Constituent Statements]

Reference to former ETCS and RSC System Compatibility Statement (where applicable)

[Yes/No]

Done on:

[date DD/MM/YYYY]

Signature of Applicant:

[First Name, Surname]

⁽⁶²⁾ The information in square brackets [] is provided to support the user in correctly and exhaustively compiling the template.⁽⁶³⁾ The description of the subsystem shall enable unique identification and allow for traceability.⁽⁶⁴⁾ When a reference to a list of conditions of use and other restrictions is made, such list shall be accessible to the authorising entity.⁽⁶⁵⁾ Template for restrictions and added functionality in the CCS TSI Appendix D shall be used.

Appendix C.6: Combined ESC/RSC Interoperability Constituent Statement template

TEMPLATE FOR COMBINED ESC AND RSC STATEMENT FOR INTEROPERABILITY CONSTITUENT

COMBINED ESC AND RSC STATEMENT FOR INTEROPERABILITY CONSTITUENTETCS and Radio System Compatibility Statement document for Interoperability Constituent [Document number] ⁽⁶⁶⁾

We, Applicant:

*[Business name]**[Complete postal Address]*Declare under our sole responsibility that the following Interoperability Constituent ⁽⁶⁷⁾:*[Name/short description of the interoperability constituent, relevant configuration, unique identification of the interoperability constituent]*

to which this statement refers has been subject to the relevant verifications that corresponds to the following ESC and RSC Type:

[Reference to: ESC Type and RSC Type Identifiers as published in the Agency Technical Document]

has been assessed by the following Notified body:

*[Business name]**[Registration number]**[Full address]*

In accordance with the following report(s):

*[Report(s) number(s), date(s) of issue]*The following conditions of use and other restrictions apply ⁽⁶⁸⁾ ⁽⁶⁹⁾:*[Reference to document with the list of conditions of use and other restrictions]*

Reference to former ESC and Radio Interoperability Constituent System Compatibility Statement (where applicable)

[Yes/No]

Done on:

[date DD/MM/YYYY]

Signature of Applicant:

[First Name, Surname]

⁽⁶⁶⁾ The information in square brackets [] is provided to support the user in correctly and exhaustively compiling the template.⁽⁶⁷⁾ The description of the interoperability constituent shall enable unique identification and allow for traceability.⁽⁶⁸⁾ When a reference to a list of conditions of use and other restrictions is made, such list shall be accessible to the authorising entity.⁽⁶⁹⁾ Template for restrictions and added functionality in the CCS TSI Appendix D shall be used.

Appendix D

In this appendix the template for description of conditions, restrictions and added functions is provided.

The document describing the template and its use is in the Agency Web page in the ERTMS section.

Appendix E

List of harmonised text indications and messages displayed on the ETCS Driver Machine Interface

Table E1

List of harmonised text indications and messages displayed on the ETCS Driver Machine Interface

Id. Number	Text indication/message
1	Ack(nowledgement)
2	Adhesion
3	Airtight
4	ATO data
5	ATO data entry complete?
6	ATO data view
7	ATO needs data
8	ATO selector
9	Axle load category
10	Balise read error
11	BMM reaction inhibition
12	Brake percentage
13	Brightness
14	Communication error
15	Contact last RBC
16	Continue in SM
17	Data
18	Data view
19	Del(ete)
20	Driver ID
21	Emergency stop
22	End of data entry
23	Enter data
24	Enter RBC data
25	Entering FS
26	Entering OS
27	Entering SM
28	Exit Shunting
29	Exit SM

30	Initiate SM
31	Language
32	Length (m)
33	Level
34	Level crossing not protected
35	Loading gauge
36	Main
37	Maintain Shunting
38	Max(imum) speed
39	NL no longer permitted
40	No
41	No MA received at level transition
42	No track description
43	Non slippery rail
44	Non-Leading
45	Odometer impaired
46	On
47	Operated system version
48	Out of GC
49	Override
50	PT distance exceeded
51	Radio data
52	Radio network ID
53	Radio network registration failed
54	RBC data
55	RBC data entry complete?
56	RBC ID
57	RBC phone number
58	Revoke BMM reaction inhibition
59	Remove VBC
60	Remove VBC entry complete?
61	Route unsuitable – axle load category
62	Route unsuitable – loading gauge
63	Route unsuitable – traction system
64	Runaway movement

65	RV distance exceeded
66	Safe consist length no longer available
67	Select type
68	Set VBC
69	Set VBC entry complete?
70	Settings
71	SH refused
72	SH request failed
73	SH stop order
74	Shunting
75	Slippery rail
76	SM refused
77	SM request failed
78	Spec(ial)
79	Specific data entry selection
80	SR distance exceeded
81	SR speed/distance
82	SR speed/distance entry complete?
83	SR stop order
84	Stand-by
85	Start
86	System version
87	Trackside malfunction
88	Trackside not compatible
89	Train category
90	Train data
91	Train data changed
92	Train data entry complete?
93	Train integrity
94	Train is rejected
95	Train running number
96	Train type
97	Unauthorized passing of EOA/LOA
98	Use short number

99	Validate ATO data
100	Validate [name of NTC] data
101	Validate remove VBC
102	Validate set VBC
103	Validate train data
104	VBC[n] set code
105	VBC code
106	Volume
107	Yes
108	[name of NTC] brake demand
109	[name of NTC] data entry complete?
110	[name of NTC] failed
111	[name of NTC] is not available
112	[name of NTC] needs data

*Appendix F ⁽⁷⁰⁾***Open Points**

Open Point	Notes
Reliability/availability requirements	Frequent occurrences of degraded situations caused by failures of control-command and signalling equipment will decrease the system safety. See point 4.2.1.2

⁽⁷⁰⁾ In former versions of the TSI this was named Annex G. References to CCS TSI Annex G shall be read as CCS TSI Appendix F.

Appendix G

Partial Fulfilment

Notwithstanding the options allowed in this TSI, e.g. under point 7.3.2 or in subset 34, it is possible to deviate from this TSI provided that compliance with provisions of point 6.1.1.2 and the deviation fulfils one of the categories below and limited to the defined cases in the table underneath:

- (1) Functions requiring upgrades of existing installations which would compromise the economic viability of a project regarding upgrades of already authorized hardware installed in the vehicles.
- (2) Functions included in system version 2.2 and 3.0 temporarily not implemented as long as the missing functions are not required for the intended area of use – provided such functions would be implemented at the earlier of the following conditions:
 - (a) If implementation of the missing function does not require authorization: at the next occasion when error correction is mandatory by virtue of table B1.1 row 1 and in any case not before 1.1.2026.
 - (b) If implementation of the missing function requires authorization: at the next reauthorisation resulting from another change to the vehicle train protection (ETCS) system.
 - (c) At the next upgrade to a higher system version of the ETCS train protection part.

Until the implementation of full functionalities of system versions 2.2 and 3.0 these vehicles shall be declared as system version 2.1 and 2.2 respectively.

- (3) Subset 34 options at interoperability constituent level: if functionally relevant to exclude certain signals or functions

Partial fulfilment of TSI Requirement	Conditions and mitigation measures	Scope of application of partial fulfilment
SUBSET-091: safety requirements leading to DMI SIL 2 may not be implemented.	The associated hazards linked to the safety requirements leading to DMI SIL 2 shall be mitigated by appropriate measures.	Only allowed in case of upgrading an existing ETCS part (with DMI SIL 0).
Some new functionalities included in this TSI are excluded from the on-board envelopes up to 2.1 and 2.2. These reduced envelopes will be specified in SUBSET-153.	Note: Individual CR solutions which are excluded are published on the ERA website to temporarily develop the on-board envelopes up to 2.1 and up to 2.2. After the publication of the SUBSET-153, the vehicle shall update its products if not compliant to the consolidated specifications according to the transition clause on partial fulfilment listed in Table B.1.	The following on-board functionalities impacting the ETCS on-board system version are excluded in the reduced on-board envelope up to 2.1: CR968;CR988; CR1238;CR1244; CR1302; CR1344;CR1346;CR1350; CR1359;CR1363;CR1367; CR1374; CR1375;CR1379; CR1397. The following on-board functionalities impacting the ETCS on-board system version are excluded in the reduced on-board envelope up to 2.2: CR968;CR988; CR1244;CR1302; CR1344; CR1346;CR1350;CR1359; CR1363;CR1367;CR1374; CR1375; CR1379;CR1397.

Subset 34: options available at subsystem level are also available at interoperability constituent level.	The functionality will not be required for the fully interoperable operations of the vehicle.	Interoperability constituents are not required to include functionalities related to electrical traction if these interoperability constituents are designed for vehicles equipped with catenary independent engines.
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Appendix H

In this appendix the template for the National Implementation Plan is provided.

ISSUANCE YEAR

NATIONAL IMPLEMENTATION PLAN

[MEMBER STATE]

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1. GENERAL MIGRATION STRATEGY INTRODUCTION

[This section is open for the Member State to describe the general strategy for the deployment.]

2. GENERAL CONTEXT DESCRIPTION OF THE CURRENT STATUS

2.1. **Context description of the Class A systems, ATO and train detection part**

2.1.1. *Current status of deployment for Class A systems, ATO and train detection part*

[This section shall include facts and figures on the current status of installed Class A (both train protection and radio), ATO and train detection systems.

This information should be provided including a map and a table of relevant information with the current deployment situation for each of the systems.

The template to be filled in to provide the information in this section is given below.]

— **Current status of deployment for Class A train protection system**

[If relevant, include here an explanatory text in relation to the current status of ETCS deployment.]

Figure 1

Current status of ETCS deployment

[Include in this gap the map that shows the current status of ETCS deployment. The map include shall clearly identified whether the ETCS is already in operation or only installed but not yet in operation.

Even if only those lines that are at least already installing ETCS are outlined on the map, the map shall show all network lines in scope of the TSI including the nodes and last mile connections. The map and its key legend shall be clearly visible.]

Table 1
Current status of ETCS deployment

ID	Line	Current status of deployment		Mandatory deadline of ETCS application	Additional information			Note
		Current status	Date when ETCS was placed in service		Length	Level(s)	Baseline and system version	
[Include here the line identification number]	[Include here the name of the line]	[Include here the current status of the ETCS deployment on the line. ETCS in operation/ETCS installed]	[For lines with ETCS already in operation. Include here the date when ETCS was placed in service]	[Include here the latest deadline for equipment of the line with ETCS established by EU regulations]	[Include here the total length of the line]	[Include here the ETCS level(s) implemented]	[Include here the baseline and the system version of the ETCS implemented]	[If relevant, include here additional comments]

— **Current status of deployment for ATO system**

[This point is only mandatory in case the ATO deployment has already started]

[If relevant, include here an explanatory text in relation to ATO deployment.]

Figure 2

Current status of ATO deployment

[Include in this gap the map that shows the current status of ATO deployment. The map include shall clearly identified whether the ATO is already in operation or only installed but not yet in operation.

Even if only those lines that are at least already installing ATO are outlined on the map, the map shall show all network lines in scope of the TSI including the nodes and last mile connections. The map and its key legend shall be clearly visible.]

Table 2
Current status of ATO deployment

ID	Line	Current status of ATO deployment		Additional information			Note
		Current status	Date when ATO was placed in service	Length	Baseline	Other relevant aspects for ATO deployments (For example GoA)	
[Include here the line identification number]	[Include here the name of the line]	[Include here the current status of the ATO deployment on the line. ATO in operation/ATO installed]	[For lines with ATO already in operation. Include here the date when ATO was placed in service]	[Include here the total length of the line]	[Include here the baseline of the ATO implemented]	[Include here ...]	[If relevant, include here additional comments]

— **Current status of deployment for Class A radio system**

[If relevant, include here an explanatory text in relation to the current status of Class A radio system.]

Figure 3

Current status of GSM-R deployment

[Include in this gap the map that shows the current status GSM-R deployment. The map include shall clearly identified whether the GSM-R is already in service or only installed but not yet in service.

Even if only those lines that are at least already installing GSM-R are outlined on the map, the map shall show all network lines in scope of the TSI including the nodes and last mile connections. The map and its key legend shall be clearly visible.]

Figure 4

Current status of FRMCS deployment

[Include in this gap the map that shows the current status of FRMCS deployment. The map include shall clearly identified whether the FRMCS is already in service or only installed but not yet in service.

Even if only those lines that are at least already installing FRMCS are outlined on the map, the map shall show all network lines in scope of the TSI including the nodes and last mile connections. The map and its key legend shall be clearly visible.

Including this map is only mandatory in case the FRMCS deployment has already started.]

Table 3
Current status of GSM-R deployment

ID	Line	Current status of GSM-R deployment		Additional information			Note
		Current status	Date when GSM-R was placed in service	Length	GSM-R voice/GSM-R data	Baseline	
[Include here the line identification number]	[Include here the name of the line]	[Include here the current status of GSM-R deployment on the line. GSM-R in service/GSM-R installed]	[For lines with GSM-R radio system already in operation. Include here the date when Class A radio system was placed in service]	[Include here the total length of the line]	[Specify here whether GSM-R voice or data is installed]	[Include here the baseline of the GSM-R implemented]	[If relevant, include here additional comments]

Table 4
Current status of FRMCS deployment

ID	Line	Current status of FRMCS deployment		Additional information			Note
		Current status	Date when FRMCS was placed in service	Length	GSM-R condition	Baseline	
[Include here the line identification number]	[Include here the name of the line]	[Include here the current status of FRMCS deployment on the line. FRMCS in service/FRMCS installed]	[For lines with FRMCS radio system already in operation. Include here the date when Class A radio system was placed in service]	[Include here the total length of the line]	[Specify here the condition of the line in relation to GSM-R. GSM-R in service/GSM-R not in service]	[Include here the baseline of the FRMCS implemented]	[If relevant, include here additional comments]

[Including Table 4 Current status of FRMCS deployment is only mandatory in case the FRMCS deployment has already started.]

— **Current status of deployment for TSI compliant train detection system**

[If relevant, include here an explanatory text in relation to TSI compliant train detection deployment.]

Figure 5

Current status of TSI COMPLIANT TRAIN DETECTION deployment

[Include in this gap the map that shows the current status of TSI compliant train detection deployment. The map include shall clearly identified whether the TSI compliant train detection is already in service, only installed but not yet in service.

Even if only those lines that are at least already installing TSI compliant train detection are outlined on the map, the map shall show all network lines in scope of the TSI including the nodes and last mile connections. The map and its key legend shall be clearly visible.]

Table 5

Current status of TSI compliant train detection deployment

ID	Line	Current status of TSI compliant train detection deployment		Additional information		Note
		Current status	Date when TSI compliant train detection was placed in service	Length	[Other relevant aspects for TSI Compliant train detection deployments]	
[Include here the line identification number]	[Include here the name of the line]	[Include here the current status of the TSI compliant train detection deployment on the line. TSI compliant train detection in service/TSI compliant train detection installed]	[For lines with TSI compliant train detection already in service. Include here the date when TSI compliant train detection was placed in service]	[Include here the total length of the line]	[Include here ...]	[If relevant, include here additional comments]

2.1.2. Benefit for capacity, safety, reliability and performance aspects

[This section shall include information of the benefits provided by TSI compliant Class A (both train protection and radio), ATO and train detection systems in relation to capacity, safety, reliability and performance.

For completeness, the section shall include both the method used to measure the benefits and the facts and figures of the impact.

The template to be filled in to provide the information in this section is given below.]

[Include here the description of the methods/indicators used to measure benefits in capacity, safety, reliability and performance.]

Table 6

Expected benefits in capacity, safety, reliability and performance

Benefits in:	System impact	Social impact	Stakeholder
Capacity	[Include here the indicators of the impact in the system regarding capacity. For example: % driving time reduction per train, % interval time reduction...]	[Include here the indicators of the social impact regarding capacity. For example: hours of travel time in a year saved by all passengers]	[Include here the stakeholder expressing the need and agreements made within the MS for the expressed needs]
Safety	[Include here the indicators of the impact in the system regarding safety. For example: % decrease SPAD]	[Include here the indicators of the social impact regarding safety. For example: Reduction of number of fatalities per year]	[Include here the stakeholder expressing the need and agreements made within the MS for the expressed needs]
Reliability	[Include here the indicators of the impact in the system regarding reliability. For example: % reduction of train delay due to malfunctions]	[Include here the indicators of the social impact regarding reliability. For example: reduction of expected number of passengers lost hours]	[Include here the stakeholder expressing the need and agreements made within the MS for the expressed needs]
Performance	[Include here the indicators of the impact in the system regarding performance]	[Include here the indicators of the social impact regarding performance]	[Include here the stakeholder expressing the need and agreements made within the MS for the expressed needs]
...	...	...	

[The list of benefits and impacts can be adapted depending on the analysis realized by the MS.]

2.1.3. Current mandatory onboard requirements

[This section shall include the current legal national reference to the CCS onboard requirements. In case these requirements differ between the different lines of the network, it has to be clearly defined which requirements are applicable in each case.

The template to be filled in to provide the information in this section is given below.]

[If relevant, include here an explanatory text in relation to the current legal national reference to the CCS onboard requirements.]

Table 7

Investment plan information

Year	Stakeholder	Action
[Include here the year when the investment will be done]	[Include here which stakeholder(s) will realise the investment]	[Include here which are the action(s) foreseen with this investment]

Table 8

Current CCS on-board requirements

Geographical scope	Legal national reference to the CCS onboard requirements
[Include here the geographical scope in which the specific requirements are currently applicable. For example: Complete network or specific lines]	[Include here the legal reference to the CCS on-board requirements or specify here the applicable requirement]

2.1.4. Current status of deployment for on-board CCS subsystems

[This section shall include facts and figures on the current status of on-board CCS subsystems based on available information.]

2.1.5. information on the ESC/RSC Type linked with lines and activities for trackside/on-board integration

[This section shall include the current status of the ESC/RSC types as long as they exists.]

2.1.6. Information on cross-border lines

[This section shall provide the current status on cross-border lines.]

2.1.7. Information on nodes

[This section shall provide the current status on nodes.]

2.2. Context description of Class B systems

[This section will not be mandatory in those Member States that have already completed Class B decommissioning.]

2.2.1. Current status for Class B systems

[This section shall include a context description of Class B systems current status and their economic lifetime. For completeness, it shall include at least:

- Context description of installed Class B systems;
- Remaining economic lifetime of existing Class B systems.

The information of the Class B system currently installed in each line shall be provided including a map and a table of relevant information.

The template to be filled in to provide the information in this section is given below.]

— **Current status for Class B train protection system**

[Include here explanatory text of the different Class B train protection systems currently installed and the remaining economic lifetime of each of them.]

Figure 6

Class B train protection system installed

[Include in this gap the map that shows which lines currently remain with Class B train protection system installed.

The map include shall clearly identified whether the Class B train protection system is still in operation, installed but not in operation or already being decommissioned. If there is more than one existing Class B train protection system, the map shall also identify the Class B installed in each line.

Even if only those lines that still have a Class B train protection system installed are outlined on the map, the map shall show all network lines in scope of the TSI including the nodes and last mile connections. The map and its key legend shall be clearly visible.]

Table 9

Class B train protection systems installed

ID	Line	Current status	Length	Class B train protection system installed	Note
<i>[Include here the line identification number]</i>	<i>[Include here the name of the line]</i>	<i>[Include here the current status of the Class B train protection system on the line. In operation/Installed but not in operation/Being decommissioned]</i>	<i>[Include here the total length of the line]</i>	<i>[Include here the Class B train protection system installed]</i>	<i>[If relevant, include here additional comments]</i>

— **Current status for Class B radio system**

[Include here explanatory text of the different Class B radio systems currently installed and the remaining economic lifetime of each of them.]

Figure 7

Class B radio systems installed

[Include in this gap the map that shows which lines currently remain with Class B radio system installed.]

The map include shall clearly identified whether the Class B radio system is still in service, installed but not in service or already being decommissioned. If there is more than one existing Class B radio system, the map shall also identify the Class B installed in each line.

Even if only those lines that still have a Class B radio system installed are outlined on the map, the map shall show all network lines in scope of the TSI including the nodes and last mile connections. The map and its key legend shall be clearly visible.]

Table 10

Class B radio systems installed

ID	Line	Current status	Length	Class B radio system installed	Note
<i>[Include here the line identification number]</i>	<i>[Include here the name of the line]</i>	<i>[Include here the current status of the Class B radio system on the line. In operation/Installed but not in operation/Being decommissioned]</i>	<i>[Include here the total length of the line]</i>	<i>[Include here the Class B radio system installed]</i>	<i>[If relevant, include here additional comments]</i>

2.2.2. Measures taken to ensure open market conditions

[This section shall include the description of the measure taken to ensure open market conditions for its legacy Class B systems as set out in paragraph 7.2.3.]

The template to be filled in to provide the information in this section is given below]

[Include here the specific measures taken to ensure open market conditions for the legacy Class B systems installed in the network as set out in paragraph 7.2.3. In the information provided it shall be clearly defined the specific measure for each of the Class B systems installed, i.e. at least the following information shall be included:

- Type of Class B product and/or specifications that are openly available for integration with any ETCS onboard in existing rolling stock.*
- Measure taken to ensure availability of the Class B product and/or specification.*
- Confirmation of availability of functional and interface specifications. Including link to the specifications.*
- If for technical or commercial reasons the availability cannot be ensured, specify the mitigation measures.]*

3. TECHNICAL MIGRATION STRATEGY

3.1. Technical migration strategy for ETCS part

[This section shall include information and planning of technical migration strategy of ETCS part, including ETCS Level and system version required per line and per network.]

For completeness at least the following information shall be included:

- Reasons for the decision on the ETCS level and system version in each line or type of line.*
- Deployment strategy. Overlay on-board or overlay at trackside.*
- Table which includes for each line the planning dates of deployment, ETCS level, System version, planning dates for Class B decommissioning on the line and other relevant information. The table shall provide the complete information of changes in the following 20 years.*

The lines included in this table together with the lines included in Table 1: Current status of ETCS deployment shall cover all network lines in scope of the TSI including the nodes and last mile connections.

The template to be filled in to provide the information in this section is given below.]

— Description of the solution implemented

[Include here the different solutions implemented and the specific reasons for selecting this solution for the network or for each type of line.]

— **Deployment strategy for the implementation of ETCS**

[Include here the details of the migration strategy for the implementation of ETCS.

For example: Overlay onboard or overlay at trackside, foreseen dates when ETCS only equipped vehicles operation will be allowed...]

— **Planning for ETCS deployment and Class B decommissioning**

[If relevant, include here an explanatory text in relation to planning of ETCS deployment and Class B decommissioning.]

Table 11

Planning for ETCS deployment and Class B train protection decommissioning

ID	Line	Planning for ETCS deployment			Planning for Class B train protection decommissioning			Additional deployment information				Note
		Current status	Date when ETCS will be placed in service	Mandatory deadline of ETCS application	Dates when ETCS-only equipped vehicles are allowed to run	Dates when Class B operation is not allowed any more	Dates when Class B is taken out of service	Length	Level(s)	Baseline and system version	Type of action	
[Include here the line identification number]	[Include here the name of the line]	[Include here the current status of the ETCS deployment on the line. Under construction/not yet under construction]	[Include here the date when ETCS will be placed in service]	[Include here the latest deadline for equipment of the line with ETCS established by EU regulations]	[include when the vehicles with ETCS only are allowed to run on the line]	[If the line is equipped with a Class B train protection system, include here the date when Class B operation is not allowed anymore.]	[If not similar to the previous column, include here the date when Class B system is taken out of service]	[Include here the total length of the line]	[Include here the ETCS level(s) that will be implemented]	[Include here the baseline and the system version of the ETCS that will be implemented]	[Include here the type of ETCS action. New/renew/upgrade]	[If relevant, include here additional comments]

3.1.1. Baseline and levels update strategy

[If applicable, this section shall include information and planning of technical migration strategy for ETCS Baselines, for example from Baseline 2 to Baseline 3 and/or from Level 1 to Level 2.]

3.2. Technical migration strategy for Radio part

[This section shall include information and planning of the technical migration strategy for Radio part, including information on radio systems (e.g radio circuit switching or packet switching, radio infill options for ETCS).

For completeness at least the following information shall be included:

- *Strategy for the introduction of GSM-R. Overlay on-board or overlay at trackside for Class A radio part introduction.*
- *Strategy for the introduction of the next generation communication system(s).*
- *Table which includes for each line the planning dates of GSM-R deployment and Class B radio part decommissioning, radio circuit switching implemented or only packet switching and other relevant information. The table shall provide the complete information of changes in the following 20 years.*
- *Table which includes for each line the planning dates of FRMCS deployment, if applicable radio infill options, planning for GSM-R decommissioning and other relevant information. The table shall provide the complete information of changes in the following 20 years.*

The lines included in these tables together with the lines included in Table 3: Current status of GSM-R deployment and Table 4: Current status of FRMCS deployment shall cover all network lines in scope of the TSI including the nodes and last mile connections.

The template to be filled in to provide the information in this section is given below.]

— Strategy for the introduction of GSM-R

[Include here the information of the strategy followed for the introduction of GSM-R.

For example: Migration strategy (overlay onboard or at trackside) in relation to the Class B radio part, radio circuit switching implementation or only packet switching...]

— Strategy for the introduction of the next generation communication system(s).

[Include here the details of the migration strategy for the introduction of the next generation of communication systems.]

— Planning for GSM-R deployment and Class B radio system decommissioning

[If relevant, include here an explanatory text in relation to planning of GSM-R deployment and Class B radio part decommissioning.]

Table 12

Planning for GSM-R deployment and Class B radio part decommissioning

ID	Line	Planning for GSM-R deployment			Planning for Class B radio decommissioning		Additional information					Note
		Current status	Realization	Date when GSM-R is placed in service	Dates when Class B operation is not allowed any more	Dates when Class B is taken out of service	Length	GSM-R voice/GSM-R data	Baseline	Circuit switching/Packet switching	Type of action	
[Include here the line identification number]	[Include here the name of the line]	[Include here the current status of the GSM-R deployment on the line. Under construction/not yet under construction]	[Include here the date when the construction started or is expected to start]	[Include here the date when GSM-R will be placed in service]	[If the line is equipped with a Class B radio system, include here the date when Class B operation is not allowed anymore]	[If not similar to the previous column, include here the date when Class B system is taken out of service]	[Include here the total length of the line]	[Specify here whether GSM-R voice or data is installed]	[Include here the baseline of the GSM-R to be implemented]	[Include here if radio circuit switching is implemented or only packet switching]	[Include here the type of Radio part action. New/renew/upgrade]	[If relevant, include here additional comments]

— **Planning for FRMCS deployment and GSM-R decommissioning**

[If relevant, include here an explanatory text in relation to planning of FRMCS deployment and GSM-R decommissioning.]

Table 13

Planning for FRMCS deployment and GSM-R decommissioning

ID	Line	Planning for FRMCS deployment			Planning for GSM-R decommissioning		Additional information				Note
		Current status	Realization	Date when FRMCS is placed in service	Dates when GSM-R operation is not allowed any more	Dates when GSM-R is taken out of service	Length	Baseline	Pre-existing GSM-R condition	Type of action	
[Include here the line identification number]	[Include here the name of the line]	[Include here the current status of the FRMCS deployment on the line. Under construction/not yet under construction]	[Include here the date when the construction started or is expected to start]	[Include here the date when FRMCS will be placed in service]	[If the line is equipped with GSM-R system, include here the date when GSM-R operation is not allowed anymore]	[If not similar to the previous column, include here the date when GSM-R system is taken out of service]	[Include here the total length of the line]	[Include here the baseline of the FRMCS to be implemented]	[Specify here the condition of the line in relation to GSM-R. GSM-R in service/GSM-R will be in service before FRMCS/Pre-existing GSM-R not foreseen]	[Include here the type of Radio part action. New/renew/upgrade]	[If relevant, include here additional comments]

3.3. Technical migration strategy for ATO part

[This section shall include information and planning of technical migration strategy of ATO part, including information on the need for deployment of ATO.]

For completeness at least the following information shall be included:

- *Deployment strategy. Reason for deployment of ATO.*
- *Table which includes for each line the planning dates of ATO deployment and other relevant information. The table shall provide the complete information of changes in the following 20 years. Including this table is only mandatory if the ATO is expected to be implemented in the next 20 years.*

The template to be filled in to provide the information in this section is given below.]

— Deployment strategy for ATO

[Include here the details of the deployment strategy of ATO, including information on the reason for deployment.]

— Planning for ATO deployment

[If relevant, include here an explanatory text in relation to planning of ATO deployment.]

Table 14

Planning for ATO deployment

ID	Line	Planning for ATO deployment		Additional information			Note
		Current status	Date when ATO is placed in service	Length	Baseline	Other relevant aspects for ATO deployments (For example GoA)	
[Include here the line identification number]	[Include here the name of the line]	[Include here the current status of the ATO deployment on the line. Under construction/not yet under construction]	[Include here the date when ATO will be placed in service]	[Include here the total length of the line]	[Include here the baseline of the ATO to be implemented]	[Include here ...]	[If relevant, include here additional comments]

3.4. Technical migration strategy for Train Detection part

[This section shall include information and planning of the technical migration strategy of TSI compliant train detection part.

For completeness at least the following information shall be included:

- Deployment strategy. Information on the migration to the TSI compliant train detection system.
- Table which includes for each line the planning dates of TSI compliant train detection system deployment and other relevant information. The table shall provide the complete information of changes in the following 20 years.

The template to be filled in to provide the information in this section is given below.]

— Deployment strategy for TSI compliant train detection system

[Include here the details of the migration strategy to the TSI compliant train detection system.]

— Planning for TSI compliant train detection system deployment

[If relevant, include here an explanatory text in relation to planning of the TSI compliant train detection system deployment.]

Table 15

Planning for TSI compliant train detection deployment

ID	Line	Planning for TSI compliant train detection deployment		Additional information			Note
		Current status	Date when TSI compliant train detection is placed in service	Length	Type of action	[Other relevant aspects for TSI Compliant train detection deployments]	
[Include here the line identification number]	[Include here the name of the line]	[Include here the current status of the TSI compliant train detection deployment on the line. Under construction/not yet under construction]	[Include here the date when TSI compliant train detection will be placed in service]	[Include here the total length of the line]	[Include here the type of train detection part action. New/renew/upgrade]	[Include here ...]	[If relevant, include here additional comments]

3.5. Migration strategy of specific cases

[This section shall include information and planning of the technical migration strategy for specific cases state on section 7.7 of the CCS TSI.]

The template to be filled in to provide the information in this section is given below.]

[Include here the details of the migration strategy of the specific cases stated on section 7.7 of CCS TSI.]

It shall be clearly defined in the information provided to which specific route or networks are each specific case limited to and if applicable, the relevant dates for the migration.]

3.6. Technical migration strategy for on-board CCS subsystems

[This section shall include information and planning of the technical migration strategy for on-board CCS subsystems.]

4. TRACKSIDE AND ON-BOARD FINANCIAL INFORMATION

[This section shall provide information about available funds, sources of financing and necessary financial needs.]

5. PLANNING

[For all the network maps to be included in this section, the map shall provide a planning overview of changes in the next 20 years.]

5.1. Planning for train protection part

5.1.1. Dates when ETCS is placed in service

[This section shall include a network map providing an overview with dates when ETCS is placed in service.]

This section is not mandatory for those Member States which have already completed the ETCS deployment in all lines in scope of the TSI including the nodes and last mile connections and do not foreseen any upgrade, renew or new line in the next 20 years.

The template to be filled in to provide the information in this section is given below.]

Figure 8

Network map. dates when ETCS is placed in service

[Include in this gap the network map providing the overview of dates when ETCS is placed in service in the next 20 years. The map include shall clearly identified the dates when ECTS is placed in service, the level and the system version.]

Even if only those lines on which new, upgraded or renewed ETCS implementation of ETCS is foreseen are outlined on the map, the map shall show all network lines in scope of the TSI including the nodes and last mile connections. The map and its key legend shall be clearly visible.]

5.1.2. Decommissioning of Class B train protection systems

[This section shall include a network map providing an overview with dates when Class B operation is not allowed anymore. If not similar, this section shall also include a network map providing and overview with dates where Class B system is taken out of service.]

This section is not mandatory for those Member States which have already completed the decommissioning of its Class B protection systems or which have never used a Class B train protection system.

The template to be filled in to provide the information in this section is given below.]

Figure 9

Network map. dates when Class B operation is not allowed anymore

[Include in this gap the network map providing the overview of dates when Class B operation is not allowed anymore in the next 20 years.

Even if only those lines on which is planned to not allow Class B operation anymore are outlined on the map, the map shall show all network lines in scope of the TSI including the nodes and last mile connections. The map and its key legend shall be clearly visible.]

Figure 10

Network map. Dates where Class B train protection system is taken out of service

[Include in this gap the network map providing the overview of dates where Class B system is taken out of service in the next 20 years.

Even if only those lines on which is planned to take out of service Class B train protection are outlined on the map, the map shall show all network lines in scope of the TSI including the nodes and last mile connections. The map and its key legend shall be clearly visible.

Including this map is not mandatory if similar to the previous one – Figure 9: Network map. dates when Class B operation is not allowed anymore.]

5.1.3. Information on cross-border lines

[This section shall provide detailed information on the planning on cross-border lines.]

5.1.4. Information on nodes

[This section shall provide detailed information on the planning on nodes.]

5.2. Planning for radio part

5.2.1. Dates when GSM-R is placed in service

[This section shall include a network map providing an overview with dates when GSM-R is placed in service.

This section is not mandatory for those Member States that have already completed the GSM-R deployment in all lines in scope of the TSI including the nodes and last mile connections.

The template to be filled in to provide the information in this section is given below.]

Figure 11

Network map. Dates when GSM-R is placed in service

[Include in this gap the network map providing an overview with dates when GSM-R is placed in service in the next 20 years. The map include shall clearly identified the dates when GSM-R is placed in service and if GSM-R voice or data is implemented.]

Even if only those lines on which GSM-R implementation is foreseen are outlined on the map, the map shall show all network lines in scope of the TSI including the nodes and last mile connections. The map and its key legend shall be clearly visible.]

5.2.2. Decommissioning of Class B radio systems

[This section shall include a network map providing an overview with dates when Class B radio operation is not allowed anymore. If not similar, this section shall also include a network map providing and overview with dates where Class B radio system is taken out of service.]

This section is not mandatory for those Member States which have already completed the decommissioning of its Class B radio systems.

The template to be filled in to provide the information in this section is given below.]

Figure 12

Network map. Dates when Class B radio operation is not allowed anymore

[Include in this gap the network map providing an overview with dates when Class B radio operation is not allowed anymore in the next 20 years.]

Even if only those lines on which is planned to not allow Class B radio operation anymore are outlined on the map, the map shall show all network lines in scope of the TSI including the nodes and last mile connections. The map and its key legend shall be clearly visible.]

Figure 13

Network map. Dates where Class B radio system is taken out of service

[Include in this gap the network map providing and overview with dates where Class B radio system is taken out of service in the next 20 years.]

Even if only those lines on which is planned to take out of service Class B radio are outlined on the map, the map shall show all network lines in scope of the TSI including the nodes and last mile connections. The map and its key legend shall be clearly visible.]

Including this map is not mandatory if similar to the previous one – Figure 12: Network map. Dates when Class B radio operation is not allowed anymore.]

5.2.3. Dates when FRMCS is placed in service

[This section shall include a network map providing an overview with dates when FRMCS is placed in service.]

This section is not mandatory for those Member States that do not foresee FRMCS implementation in the next 20 years.

The template to be filled in to provide the information in this section is given below.]

Figure 14

Network map. Dates when FRMCS is placed in service

[Include in this gap the network map providing an overview with dates when FRMCS is placed in service in the next 20 years. The map include shall clearly identified the dates when FRMCS is placed in service.]

Even if only those lines on which FRMCS implementation is foreseen are outlined on the map, the map shall show all network lines in scope of the TSI including the nodes and last mile connections. The map and its key legend shall be clearly visible.]

5.2.4. Decommissioning of GSM-R

[This section shall include a network map providing an overview with dates when GSM-R radio operation is not allowed anymore. If not similar, this section shall also include a network map providing an overview with dates where GSM-R system is taken out of service.]

This section is not mandatory for those Member States which do not foresee GSM-R decommissioning in the next 20 years.

The template to be filled in to provide the information in this section is given below.]

Figure 15

Network map. Dates when GSM-R radio operation is not allowed anymore

[Include in this gap the network map providing an overview with dates when GSM-R radio operation is not allowed anymore in the next 20 years.]

Even if only those lines on which is planned to not allow GSM-R operation anymore are outlined on the map, the map shall show all network lines in scope of the TSI including the nodes and last mile connections. The map and its key legend shall be clearly visible.]

Figure 16

Network map. Dates where GSM-R system is taken out of service

[Include in this gap the network map providing an overview with dates where GSM-R system is taken out of service in the next 20 years.]

Even if only those lines on which is planned to take out of service GSM-R radio are outlined on the map, the map shall show all network lines in scope of the TSI including the nodes and last mile connections. The map and its key legend shall be clearly visible.]

Including this map is not mandatory if similar to the previous one – Figure 15: Network map. Dates when GSM-R radio operation is not allowed anymore.]

5.2.5. Information on cross-border lines

[This section shall provide detailed information on the planning on cross-border lines.]

5.2.6. Information on nodes

[This section shall provide detailed information on the planning on nodes.]

5.3. Planning for ATO part

[This section shall include a network map providing an overview with dates when ATO is placed in service.

This section is not mandatory for those Member States that do not foresee to put ATO into service in the next 20 years.]

The template to be filled in to provide the information in this section is given below.]

Figure 17

Network map. Dates when ATO is placed in service

[Include in this gap the network map providing an overview with dates when ATO is placed in service in the next 20 years. The map include shall clearly identified the dates when ATO is placed in service.

Even if only those lines on which ATO implementation is foreseen are outlined on the map, the map shall show all network lines in scope of the TSI including the nodes and last mile connections. The map and its key legend shall be clearly visible.]

5.3.1. Information on cross-border lines

[This section shall provide detailed information on the planning on cross-border lines.]

5.3.2. Information on nodes

[This section shall provide detailed information on the planning on nodes.]

5.4. Planning for train detection part

[This section shall include a network map providing an overview with dates when TSI compliant train detection system is placed in service.

The template to be filled in to provide the information in this section is given below.]

Figure 18

Network map. Dates when TSI compliant train detection system is placed in service

[Include in this gap the network map providing an overview with dates when TSI compliant train detection system is placed in service in the next 20 years. The map include shall clearly identified the dates when TSI compliant train detection system is placed in service.

Even if only those lines on which TSI compliant train detection system implementation is foreseen are outlined on the map, the map shall show all network lines in scope of the TSI including the nodes and last mile connections. The map and its key legend shall be clearly visible.]

5.4.1. Information on cross-border lines

[This section shall provide detailed information on the planning on cross-border lines.]

5.4.2. Information on nodes

[This section shall provide detailed information on the planning on nodes.]

5.5. Planning for on-board CCS subsystems

[This section shall include a description of the planning and dates for the installation of the on-board CCS subsystems.]

5.5.1. Information on cross-border vehicles

[This section is optional and should provide detailed information on the planning on cross-border vehicles.]

6. NEW MANDATORY ON-BOARD REQUIREMENTS

[This section shall include information of new mandatory onboard requirements that will be required for operating on the network, ensuring that notifications to RUs are provided at least 5 years in advance.

The template to be filled in to provide the information in this section is given below.]

[If relevant, include here an explanatory text in relation to new mandatory onboard requirements that will be required for operating on the network.]

Table 16

New mandatory on-board requirements

Geographical scope	New CCS on-board requirements	Date of application
[Include here the geographical scope in which the specific requirements will be applicable. For example: Complete network or specific lines]	[Include here the legal reference to the new CCS on-board requirements or specify here the new CCS onboard requirements]	[Include here date of application of the new CCS on-board requirement. At the earliest, a 5-year period is required]

ANNEX II

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1. INTRODUCTION

This Annex contains the list of train protection and voice radio legacy systems referred in the Control-Command and Signalling TSI.

2. ABBREVIATIONS, ACRONYMS

The acronyms used as names of legacy systems are explained in the tables in sections 3.3 and 3.4.

RDD: Reference Document Database (<https://rdd.era.europa.eu/RDD/>).

3. CLASS B SYSTEMS

3.1. Conditions for Class B systems

Class B systems for the trans-European rail system network are a limited set of train protection and voice radio legacy systems that were already in use in the trans-European rail network before 20 April 2001.

Class B systems for other parts of the network of the rail system in the European Union are a limited set of train protection and voice radio legacy systems that were already in use in those part of the network before 1 July 2015.

3.2. Use of this Annex

This is an Annex based on information received from Member States, Norway, Switzerland and United Kingdom, and in accordance with the provisions of this TSI.

As stated in point 3.1 of the Annex I of this Regulation, 'The requirements for Class B systems are the responsibility of the relevant Member State'. Details on the technical specifications can be found in the RDD.

3.3. List of Class B train protection systems

Member State	Name of the legacy system ⁽¹⁾	Scope	Version identification	Date of latest authorisation to placing into service
Austria	INDUS I 60 ⁽²⁾ PZB 90 ⁽³⁾ LZB (LZB L72, LZB L72 CE I and LZB L72 CE II)	Whole network Whole network Whole network	AT/DE	
Belgium	Crocodile TBL 1 TBL 2 TVM 430 TBL1+ KVB	Whole network Whole network Whole network Whole network Off-TEN only Access to high speed line 1		
Bulgaria	EBICAB 700	Whole network	BU	
Croatia	INDUS I 60 ⁽²⁾	Whole network		
Czechia	LS	Whole network		
Denmark	ZUB 123	Whole network	SW02A (version 1.37 edition 04)	2.2.2004
Estonia	ALSN	Whole network		

Finland	ATP-VR/RHK	Whole network		
France	Crocodile	Whole network		
	KVB	Whole network		
	TVM 300	High speed lines		
	TVM 430	High speed lines		
	KVBP	(sub)urban area of Paris		
	KCVP	(sub)urban area of Paris		
	KCVB	(sub)urban area of Paris		
	NEXTEO	(sub)urban area of Paris		
	DAAT	Whole network		
Germany	PZB 90	Whole network	AT/DE	
	LZB (LZB L72, LZB L72 CE I and LZB L72 CE II) ⁽⁴⁾	Whole network		
	GNT (Geschwindigkeitsüberwachung für NeiTech-Züge) ⁽⁵⁾	Whole network (routes with higher lateral acceleration for tilting trains)		
Hungary	EVM	Whole network		
Ireland	CAWS	Whole network		
	ATP	Whole network		
Italy	SCMT + RSC	Whole network		
	SCMT	Whole network		
	SSC	Off-TEN only		
Latvia	ALSN	Whole network		
Lithuania	ALSN	Whole network		
Norway ⁽⁶⁾	ATC ⁽⁷⁾	Whole network	2	1993
Poland	SHP	Whole network		
	PKP radio system with Radiostop function	Whole network		
Portugal	INDUS I 60	Cascais line Off-TEN	PT	
	EBICAB 700 (CONVEL)	Whole network		
Romania	INDUS I 60 ⁽⁸⁾	Whole network		
Slovak Republic	LS	Whole network	LS04, LS05, LS06	

Slovenia	INDUS I 60 ⁽²⁾	All main lines and also 3 regional lines		
Spain	ASFA	Whole network		
	EBICAB 900	Mediterranean Corridor. Section 'La Encina – Barcelona Sants'	ES	
	LZB	High Speed Line 'Madrid – Sevilla/Toledo/Málaga' C5 Commuter Line (Madrid). Section 'Humanes – Mostoles el Soto'	ES	
Sweden	ATC ⁽⁷⁾	Whole network except Linköping-Västervik/Kisa	2	
		Linköping-Västervik/Kisa	R	
Switzerland ⁽⁶⁾	EuroSIGNUM ⁽⁸⁾	Whole network		
	EuroZUB ⁽⁶⁾	Whole network		
The Netherlands	ATB First generation	Whole network		
	ATB new generation	Whole network		
UK for Northern Ireland	GW ATP	limited to specific routes only		
	RETB	limited to specific routes only		
	TPWS/AWS	Whole network		
	Chiltern-ATP	limited to specific routes only		
	Mechanical Trainstops	limited to specific routes only		

⁽¹⁾ The fact that two or more Member States use the same system does not imply that they are compatible: the versions shall be taken into account.

⁽²⁾ Rolling stock equipped with higher versions (eg PZB 90) is accepted.

⁽³⁾ All new authorised vehicles must be equipped with PZB 90.

⁽⁴⁾ Leading vehicles for operation on LZB lines have to be equipped with an onboard system which can connect at least to L72 and CE I.

⁽⁵⁾ GNT can only work in connection with PZB 90.

⁽⁶⁾ For information.

⁽⁷⁾ Formerly referred as 'EBICAB 700'.

⁽⁸⁾ Rolling stock equipped with higher versions (eg PZB 90) is accepted.

3.4. List of Class B voice radio systems ⁽¹⁾

Member State	Name of the legacy system ⁽¹⁾	Scope	Version identification	Date of latest authorisation to placing into service
Austria	UIC Radio Chapter 1-4+6			
Bulgaria	UIC Radio Chapter Bulgaria			
Croatia	Analogue railway radio system (RDU) – in compliance with UIC 751-3			
Czechia	SRD			
Estonia	The Estonian Railways train communication network	Whole network		
Germany	Analogue Radio Germany - in compliance with UIC 751-3 (all chapters): — TGL 43886 März 1987, UKW-Verkehrsfunktechnik, Zugfunksystem — functional requirement specification radio for low frequency traffic routes (Lastenheft Zugfunk auf Strecken mit einfachen betrieblichen Verhältnissen), detailed standard for an open simplex mode	Lines of the former GDR installed before 1990 Low frequency traffic routes		

⁽¹⁾ This list is based on the information in Commission Decision 2006/860/EC of 7 November 2006 concerning a technical specification for interoperability relating to the control-command and signalling subsystem of the trans-European high speed rail system and modifying Annex A to Decision 2006/679/EC concerning the technical specification for interoperability relating to the control-command and signalling subsystem of the trans-European conventional rail system (OJ L 342, 7.12.2006, p. 1) and in Commission Decision 2006/679/EC of 28 March 2006 concerning the technical specification for interoperability relating to the control-command and signalling subsystem of the trans-European conventional rail system (OJ L 284, 16.10.2006, p. 1).

	— functional requirement specification for dual mode user interface for digital and analogue cab radio and digital shunting radio – part 2 (Lastenheft Dualmode Bedienteil für digitalen und analogen Zugfunk digitalen Rangierfunk – Teil 2 – Funktionale Anforderungen), detailed standard for the DMI for cab radio with the function to switch between GSM-R and analogue train radio, used in the migration period	Routes not covered by the GSM-R network		
Greece	CH — Greek Railways radio system (VHF)	Whole network except Kiato-Athens airport section and Egio-Kiato (open line).		
Hungary	UIC Radio Chapter 1-4 UIC Radio Chapter 1- 4 + 6 (Irish system)			
Ireland	UIC Radio Chapter 1- 4 + 6 (Irish system)			
Italy	GSM-P	On lines not covered with GSM-R		
Latvia	LDZ radio system DMR	Whole network		
Lithuania	The Lithuanian Railways train radio system Shunting Radio Communication System	All line sections between stations in border areas Whole network (for manoeuvring)		
Poland	PKP radio system	Whole network		
Portugal	UIC Radio Chapter 1-4 (TTT radio system installed at Cascais line) TTT radio system CP_N (RSC – Rádio Solo-Comboio)	Cascais line Off TEN Whole network		

Romania	Radio Network of CFR			
Slovakia	450 Mhz UIC (Channel C) Multikom (160 MHz and 450 MHz) BOSCH (160 MHz) OMEGA (160 MHz) SRO (160 MHz)	1. Local track radio network (stations Vrutky, Presov, Plavec, Kysak) 2. Local track radio network (the area of lines Bratislava – Zilina, Bratislava – Dunajska Streda – Komarno, Trnava – Kutý) 3. Local track radio network (the area of line Nove Mesto nad Vahom – Myjava) 4. Internal radio network of ZSR (ZSR's departments in the area of Zvolen, Zilina and Trnava) 5. Track radio network SRO for local lines		
Slovenia	Analogue railway radio system called RDZ – in compliance with UIC 751-3	All main lines and 5 regional lines		
Spain	UIC Radio Chapter 1-4+6			
UK for Northern Ireland	RETB (voice)	RETB lines only		

(¹) The fact that two or more Member States use the same system does not imply that they are compatible: the versions shall be taken into account.

DECISIONS

COMMISSION IMPLEMENTING DECISION (EU) 2023/1696

of 10 August 2023

amending Implementing Decision 2011/665/EU as regards the specification for the European register of authorised types of vehicles referred to in Article 48 of Directive (EU) 2016/797 of the European Parliament and of the Council

(notified under document C(2023) 5020)

(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) and Article 48(2) thereof,

Whereas:

- (1) Railways are being called on to play a key role in a decarbonised transport system, as planned in the European Green Deal and the sustainable and smart mobility strategy, and in the light of developments in this field, a revision of the current Technical Specifications for Interoperability (TSIs) is required.
- (2) On 24 January 2020, in accordance with Article 19(1) of Regulation (EU) 2016/796 of the European Parliament and of the Council ⁽²⁾, the Commission requested the European Union Agency for Railways (the Agency) to prepare recommendations supporting selected specific objectives set out in Commission Delegated Decision (EU) 2017/1474 ⁽³⁾ in order to integrate them in the TSIs to improve interoperability. This would also make it possible to facilitate, improve and develop rail transport services in the Union and with third countries and contribute to completing the single European railway area and the progressive achievement of the internal market.
- (3) On 30 June 2022, the Agency issued Recommendation ERA 1175-1218 ⁽⁴⁾ on several TSIs relating to implementing specific objectives under Articles 4 to 6 and 8 to 10 of Delegated Decision (EU) 2017/1474.
- (4) As a result of the Agency Recommendation, the Commission is amending several TSIs, including TSI CCS ⁽⁵⁾, TSI LOC&PAS ⁽⁶⁾ and TSI WAG ⁽⁷⁾ which are relevant for the European register of authorised types of railway vehicles (ERATV).

⁽¹⁾ OJ L 138, 26.5.2016, p. 44.

⁽²⁾ Regulation (EU) 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).

⁽³⁾ 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).

⁽⁴⁾ Recommendation ERA 1175-1218 of the European Union Agency for Railways on the TSI revision package 2022 – Digital Rail and Green Freight.

⁽⁵⁾ Commission Regulation (EU) 2016/919 of 27 May 2016 on the technical specification for interoperability relating to the ‘control-command and signalling’ subsystems of the rail system in the European Union. (OJ L 158, 15.6.2016, p. 1).

⁽⁶⁾ 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).

⁽⁷⁾ 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).

- (5) A revision of the ERATV parameters is therefore needed to align them with the revision of the relevant TSIs.
- (6) The measures provided for in this Decision are in accordance with the opinion of the Railway Interoperability and Safety Committee, pursuant to Article 51 of Directive (EU) 2016/797,

HAS ADOPTED THIS DECISION:

Article 1

Annexes II and III to Implementing Decision 2011/665/EU are amended in accordance with the Annex to this Decision.

Article 2

This Decision is addressed to the European Union Agency for Railways and to the Member States.

Done at Brussels, 10 August 2023.

For the Commission
Adina-Ioana VĂLEAN
Member of the Commission

ANNEX

Section 1

Annex II to Implementing Decision 2011/665/EU is amended as follows:

- (1) in Table 2, row 4.5.1 is replaced by the following:

'4.5.1	Permissible payload for different line categories	[number] t for line category [character string]	N	N	Y	N	Y'
--------	---	---	---	---	---	---	----

- (2) in Table 2 the following row 4.5.1.1 is added:

'4.5.1.1	EN line category(ies)	[character string] from a predefined list (more than one option possible)	Y	Y	N	Y	Y'
----------	-----------------------	---	---	---	---	---	----

- (3) in Table 2, in row 4.5.2, second column 'Design mass' is replaced by 'Design and operational mass'

- (4) in Table 2, the following rows 4.5.2.4 and 4.5.2.5 are added:

'4.5.2.4	Operational mass in working order	[number] kg	Y	Y	N	N	Y
4.5.2.5	Operational mass under normal payload	[number] kg	Y	Y	N	N	Y'

- (5) in Table 2, the following rows 4.9.3.1, 4.9.3.2 are added:

'4.9.3.1	Flange lubrication fitted	(Y/N)	Y	Y	N	Y	Y
4.9.3.2	Possibility of preventing the use of the lubrication device (only if fitted with flange lubrication)	(Y/N)	Y	Y	N	Y	Y'

- (6) in Table 2, the following row 4.10.16 is added:

'4.10.16	Vehicle equipped with electric energy storage for traction purposes and with the function of charging with OCL at standstill	[Boolean] Y/N	Y	N	N	Y	Y'
----------	--	---------------	---	---	---	---	----

(7) in Table 2, rows 4.13.1.1 to 4.13.1.9 are replaced by the following:

4.13.1.1	ETCS equipment on-board and the set of specifications from CCS TSI Appendix A	[Character string] From a predefined list	Y	Y	N	Y	N
4.13.1.5	Class B or other train protection, control and warning legacy systems installed (system and, if applicable, version)	[Character string] From a predefined list (more than one option possible)	Y	Y	N	Y	Y
4.13.1.7	ETCS on-board implementation	[Character string]	Y	Y	N	Y	N
4.13.1.8	ETCS System Compatibility	[Character string] From a predefined list (more than one option possible)	Y	Y	N	Y	Y
4.13.1.9	Managing information about the completeness of the train (not from driver)	[Boolean] Y/N	Y	Y	N	Y	Y

(8) in Table 2 the following rows 4.13.1.10 and 4.13.1.11 are added:

4.13.1.10	Safe consist length information from on-board necessary to access the line and corresponding SIL	[Character string] From a predefined list	Y	Y	N	Y	Y
4.13.1.11	Envelope of legally operated ETCS system versions	[Character string] From a predefined list	Y	Y	N	Y	Y

(9) in Table 2 rows 4.13.2.1 to 4.13.2.12 are replaced by the following:

4.13.2.1	GSM-R Radio voice on board and its Baseline	[Character string] From a predefined list	Y	Y	N	Y	N
4.13.2.3	Class B or other radio legacy systems installed (system and, if applicable, version)	[Character string] From a predefined list (more than one option possible)	Y	Y	N	Y	Y

4.13.2.5	Radio Voice System Compatibility	[Character string] From a predefined list (more than one option possible)	Y	Y	N	Y	Y
4.13.2.6	GSM-R Voice and operational communication implementation	[Character string]	Y	Y	N	Y	N
4.13.2.7	GSM-R Radio Data communication on board and its Baseline	[Character string] From a predefined list	Y	Y	N	Y	N
4.13.2.8	Radio Data System Compatibility	[Character string] From a predefined list (more than one option possible)	Y	Y	N	Y	Y
4.13.2.9	GSM-R Data communication application for ETCS and ATO implementation	[Character string]	Y	Y	N	Y	N
4.13.2.10	Voice SIM Card GSM-R Home Network	[Character string] From a predefined list	Y	Y	N	Y	Y
4.13.2.11	Data SIM Card GSM-R Home Network	[Character string] From a predefined list	Y	Y	N	Y	Y
4.13.2.12	GSM-R Voice SIM Card support of Group ID 555	[Boolean] Y/N	Y	Y	N	Y	Y'

(10) in Table 2, the following rows 4.13.3 to 4.13.3.2 are added:

'4.13.3	ATO	Heading (no data)					
4.13.3.1	On-board ATO system version	[Character string] From a predefined list	Y	Y	N	Y	N
4.13.3.2	On-board ATO implementation	[Character string]	Y	Y	N	Y	N'

(11) in Table 2, the following rows 4.15, to 4.15.3 are added:

'4.15	Derailment detection and prevention functions	Heading (no data)					
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4.15.1	Presence and type of derailment detection and prevention function(s)	[Character string] From a predefined list (more than one option possible)	N	N	Y	N	N
4.15.2	Presence of derailment prevention and detection function	[Boolean] Y/N	Y	N	N	N	N
4.15.3	Presence of derailment prevention and detection signal processing	[Boolean] Y/N	Y	N	N	N	N'

(12) in Annex III, the introductory phrase above the second table and the second table are replaced by the following:

‘Where:

Field 1 (digits 1 and 2) is assigned according to category and subcategory of the vehicle type in accordance with the following table:

Code	Category	Subcategory
11	Traction vehicles	Locomotive
12		Power Unit (or power car)
13		Self-propelled passenger trainset
14		Reserved
15		Reserved
16		Railcar
17		Shunter
18		Tram-Train
19		Other (see Article 1(4) of directive (EU) 2016/797
31	Hauled passenger vehicles	Coach
32		Reserved
33		Van
34		Reserved
35		Car carrier
36		Driving Coach
37		Reserved
38		Driving Van
39		Fixed rake of coaches
40		Reserved
41		Other
42-49		Reserved

Code	Category	Subcategory
51	Freight wagons (hailed)	Freight wagon
52		Reserved
53		Fixed rake of freight wagons
54		Separate rail bogies connected to compatible road vehicle(s)
55-59		Reserved
71	Special vehicles	Self-propelled special vehicle. <i>This code shall not to be used after the date of adoption of this Decision</i>
72		On track Machines (OTMs)
73		Hauled special vehicle <i>This code shall not to be used after the date of adoption of this Decision</i>
74		Infrastructure inspection vehicles
75		Environment vehicles
76		Emergency vehicles
77		Road-Rail vehicles
78		Reserved
79		Reserved'

ISSN 1977-0677 (electronic edition)
ISSN 1725-2555 (paper edition)



Publications Office
of the European Union
L-2985 Luxembourg
LUXEMBOURG

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