

Annex to the Railway Vehicle Regulations

Requirements relating to vehicle authorisation

1 General documentation

This chapter applies to all vehicles.

1.1 General documentation

Technical documentation shall be prepared for all systems, parts and components and interfaces. The documentation must be able to confirm that systems, parts, components and interfaces are in accordance with the TSIs and standards used as the basis for the design and use of the vehicle. The documentation shall describe the preconditions and limitations associated with the design of the vehicle. Updated risk assessments based on operation and maintenance experience must be available for older vehicles.

1.2 Maintenance instructions and requirements

1.2.1 Maintenance instructions

The documentation shall describe how systems, parts and components are to be maintained in accordance with the national and international standards used as the basis for the vehicle. The maintenance documentation shall insure that no safety-critical systems, parts or components deteriorate to such an extent that they fail in their function. Wear limits shall be specified for components exposed to wear. Intervals shall have been specified for maintenance and replacement for all components.

It must be possible to present records of maintenance and any alterations to the vehicle.

TSI LOC & PAS clause 4.2.12.3 shall apply correspondingly.

1.2.2 The maintenance design justification file

The documentation shall be able to justify the maintenance instructions and requirements.

TSI LOC & PAS clause 4.2.12.3.1 shall apply correspondingly.

1.3 Instructions and documentation for operation

1.3.1 Instructions for operation in normal and degraded modes for the vehicle

Documentation and instructions for operation must be provided for vehicle functions during operation in normal and degraded mode, including during emergency situations, evacuation, rescue and towing. Such documentation must be in a language that the user understands.

1.4 On-track testing of the vehicle

The documentation requirements in section 12 of the main part of this regulation apply correspondingly.

Documentation must be available validating the concept and confirming that the vehicle has been tested on the track so that it is able to withstand the operational and climate loads to which it will be exposed to during operation, including anti-derailment safety, satisfactory running properties in the speed class for which the rolling stock is designed and braking action.

The following standard shall be complied with: EN 50215 (2009).

2 Structure and mechanical parts

This chapter applies to all vehicles.

2.1 Vehicle structure

2.1.1 Strength and integrity

The vehicle must have sufficient mechanical strength and integrity to withstand the forces to which it will be exposed in all expected modes of operation over its service life.

The requirements in TSI LOC & PAS clause 4.2.2.4 apply correspondingly.

The requirements in TSI WAG clause 4.2.2.3 apply correspondingly.

The following standards are accepted: EN 12663, UIC 566, UIC 660, UIC 617, UIC 625, UIC 651, ERRI B 12 RP 17, ERRI B 12 RP 60 and ERRI B 12 DT 135.

Traction vehicles must be fitted with a snow plough if they are to operate during those periods of the year when snow can be expected. The snow plough can be replaced by rail guards as mentioned in clause 3.3.7 in this annex. The requirements in TSI LOC & PAS clause 4.2.6.1.5 apply correspondingly.

2.1.2 Load capability

2.1.2.1 Load conditions and weighted mass

The requirements in TSI LOC & PAS clause 4.2.2.10 apply correspondingly.

The requirements in TSI WAG clause 4.2.2.3.2, 4.2.2.3.3 and 4.2.2.3.4 apply correspondingly.

The following standards are accepted: EN 50215, EN 15528 (2008) and EN 15663 (2009).

2.1.2.2 Axel load and wheel load

The requirements in TSI LOC & PAS clause 4.2.3.2 Axle load and wheel load apply correspondingly.

The requirements in TSI WAG clause 4.2.3.2 apply correspondingly.

Additional risk analyses, calculations and verifications are required for axle loads over 22,5 tons.

The following standards are accepted: EN 15551, EN 15566, UIC 527, UIC 528 and UIC 526.

2.2.5 Buffer marking

The following standards are accepted for marking buffers: UIC 527, UIC 528, UIC 526 and UIC 520.

2.2.6 Draw hook

The following standards are accepted for the use of draw hooks: EN 15566, EN15551, UIC 527, UIC 528, UIC 526, UIC 520 and UIC 825.

2.2.7 Gangways

The requirements in TSI LOC & PAS clauses 4.2.2.3 and 4.2.5.8 apply correspondingly.

The following standards are accepted: EN 16286, EN 12561, UIC 561, UIC 527, UIC 528 and UIC 520.

2.3 *Passive safety*

The requirements in TSI LOC & PAS clause 4.2.2.5 apply correspondingly to newer vehicles.

The following standards are accepted: EN 15227 and UIC 566.

3 Track interaction and gauging

The requirements in this chapter apply to all vehicles.

3.1 *Vehicle gauge*

The vehicle must be in accordance with the NO1 envelope as described in the infrastructure manager's network statement. Some types of vehicles may be accepted with other envelopes as mentioned in the network statement.

3.1.1 Specific case

Vehicles to be transported by ferry must meet the requirements of the following standards: UIC 569 and UIC 507.

3.2 *Vehicle dynamics*

3.2.1 Running safety and dynamics

The running safety of vehicles must be satisfactory. The vehicle's running characteristics must be tested in order to determine the vehicle's dynamic load (stress) and its interaction with the track.

When calculating and testing the vehicle's anti-derailment safety and running characteristics the methods in EN 14363 or UIC 518 shall be used. Relevant limit values related to track characteristics are specified by the infrastructure manager.

During dynamic testing, the load on the track and on vehicle components that are relevant to safety shall be recorded with regard to overloading, the risk of derailment, structural design and validation of calculations.

Older vehicles that have not been produced in accordance with a recognised safety-controlled process shall carry out a risk assessment in accordance with the common safety method on the basis of experience whereby it is demonstrated that it can operate safely on equally demanding infrastructure. The risk assessment shall identify any limits on the use of the vehicle and measures to reduce the risk to an acceptable level. In the absence of sufficient empirical data and a satisfactory risk assessment, the requirements of the third paragraph of this subsection shall apply correspondingly.

The requirements in TSI LOC & PAS clause 4.2.3.4.2 apply correspondingly.
The requirements in TSI WAG clause 4.2.3.4 apply correspondingly.

The following standards are otherwise accepted: UIC 530-2, UIC 510, UIC 432 and UIC 645.

3.2.2 Equivalent conicity, wheel profile and limit values

The requirements in TSI LOC & PAS clause 4.2.3.4.3 apply correspondingly. The following requirements shall also apply:

The range for the equivalent conicity where the vehicle running dynamic conditions have been assessed and the vehicle found to be stable shall be specified.

The wheel profile shall contribute to stable running. Measurements shall be taken and treated in accordance with the rules in UIC 518 or EN 14363. The wheel profile shall be in accordance with UIC 510-2. A P8 wheel profile is acceptable for general operation. Other wheel profiles may be accepted on the basis of tests and safety assessments. Tables of coordinates and drawings of rail profiles are provided by the infrastructure manager. The hollow-worn wheel must not exceed 2 mm. Wheel surface material defects (flaked-off material) and wheel hammer-blow/wheel flats shall not exceed an area of 60 mm in length for wheels with diameter over or equal to 920mm, and 40 mm for wheels with diameter under 920mm.

The following standards are accepted: EN 15302:2008, EN 13715:2006, EN 13674-1:2003, EN 14363, UIC 518, UIC 519 and UIC 510.

3.2.3 Track loading compatibility parameters

The vehicle must not overload the track in relation to the parameters provided by the infrastructure manager to ensure compatibility between the vehicle and the track. The requirements set out in clause 3.2.1 in this annex shall apply correspondingly to testing of track loading.

The requirements in TSI Loc & PAS clause 4.2.3.4.2.2 apply correspondingly.

The requirements in TSI WAG clause 4.2.3.2 apply correspondingly.

The following standards are accepted: EN 15528, EN 14363, UIC 615, UIC 518, and EN 13749.

3.2.4 Vertical acceleration

Vertical acceleration, own frequency and dynamic loading of bridges must not exceed their load-bearing capacity. Limit values are specified by the infrastructure manager.

In order to ensure safety and running stability, measurements in different operating conditions or comparison studies with a proven design (e. g. simulation/calculation) have to be carried out to assess the dynamic loading taking into consideration, mass and inertia of car body, bogies and wheel sets, suspension characteristic of the vehicle, distribution of the payload.

The requirements in TSI LOC & PAS clause 4.2.3.4.2.2 and TSI WAG clause 4.2.3.2 apply correspondingly.

Additional risk analyse is required for axel loads over 22,5 ton

The provisions in clause 3.2.1 in this annex apply correspondingly.

3.3 Bogies/ running gear

3.3.1 Bogies

Bogies shall be dimensioned in accordance with recognised standards with a safety margin for the bogie frame, attached equipment and bogie to body connections based on provisions as described in clause 3.2.1 in this annex.

The requirements in TSI LOC & PAS clause 4.2.3.5.1 apply correspondingly.

The requirements in TSI WAG clause 4.2.2.3.2.5 apply correspondingly.

The following standards are accepted: UIC 515-4, UIC 615-4, EN13749:2005, EN 15687: 2010 and EN 15827: 2011

3.3.2 Wheel sets (axle + wheels)

Wheel sets shall be dimensioned in accordance with recognised standards with a sufficient safety margin.

The requirements in TSI LOC & PAS clause 4.2.3.5.2 and 4.2.3.5.2.1 apply correspondingly.

The following standards are accepted: EN 13260, EN 13103, EN 13104, EN 13261, EN 13749, UIC 510-3, UIC 515-4 and UIC 615-4.

3.3.3 Wheel

Wheels shall be designed and dimensioned to ensure safe operation on the railway network.

The wheels shall be dimensioned with a sufficient safety margin.

The requirements in TSI LOC & PAS clause 4.2.3.5.2.2 apply correspondingly.

Only monoblock forged and rolled steel wheels are generally accepted. For other types of wheels the requirements linked to thermo mechanical capacity shall be satisfied, see clause 4.5 3 in this annex.

The following standards are accepted: EN 13715, EN 13262, EN 13979-1:2003, UIC 510, UIC 518-2, UIC 519 and UIC 812.

3.3.4 Wheel/rail interface (including lubrication and sanding)

Equipment for lubrication and sanding may be installed according to relevant standards and taking into account the vehicle gauge.

For geometrical characteristics of the wheels the requirements in TSI LOC & PAS clause 4.2.3.5.2.2 apply correspondingly.

The following standards are accepted: EN 12080, EN 12081, EN 12082, EN 50238 and UIC 512.

3.3.5 Wheel set bearings

Wheel set bearings shall be dimensioned for the intended use of the vehicle and taking into consideration load cases consistent with defined load conditions.

The following standards are accepted: EN 12082, EN 12081, EN 12080, EN 15437, UIC 515, UIC 615 and UIC 510.

3.3.6 Minimum curve radius to be negotiated

The requirements in TSI Loc & PAS clause 4.2.3.6 apply correspondingly.

The vehicle shall be dimensioned for minimum curve radius through the diverging track in railway switches at 135 m.

3.3.7 Rail guard

Traction vehicles must be fitted with a rail guard to protect the wheels against foreign objects. The rail guard must be dimensioned to withstand static forces of at least 20 kN in the running direction without being permanently deformed. This can be verified by calculations. The requirements in TSI LOC & PAS clause 4.2.3.7 apply correspondingly.

The maximum height of the check rail over the railway head, including rail wear, is 70 mm. When calculating or adjusting the height of the rail guard, account must be taken of wheel wear and travel of the suspension spring system.

Rail guards may be replaced by a snow plough as described in clause 2.1.1.1 in this annex or an obstacle deflector as described in TSI LOC & PAS clause 4.2.2.5 last paragraph as long as they do not come into conflict with the check rail.

3.4 *Limit of maximum longitudinal positive and negative acceleration*

The requirements in TSI LOC & PAS clause 4.2.4.5.1 last paragraph apply correspondingly.

The UIC 566 and EN 12663 standards are accepted for shunting impact.

4 Braking

The requirements in this chapter apply to all vehicles unless otherwise specified.

4.1 Functional requirements for braking at train level

All vehicles must have brakes. The brakes must be capable of stopping a train within a maximum braking distance defined by the infrastructure manager for each section on which the vehicle is to operate, regardless of the conditions. The brake system must be of the fail-to-safe type. The brake system shall work automatically and continuously, and shall be inexhaustible during normal operation.

Passenger cars, locomotives and train sets shall be equipped with emergency brakes, service brakes and parking brakes.

The requirements in TSI LOC & PAS clause 4.2.4.2.1 apply correspondingly.

The following standards are accepted: The UIC 540-549 series.

4.2 Safety requirements for braking at train level

4.2.1 Traction/braking interlocking and traction inhibition

The requirements in TSI LOC & PAS clause 4.2.4.2.2, clause 4.2.4.4.1 last paragraph and clause 4.2.4.4.2 second paragraph apply correspondingly.

4.3 Brake system, recognised architecture and associated standards

The requirements in TSI LOC & PAS clause 4.2.4.3 first and second paragraph apply correspondingly. When using a brake system other than a UIC-based brake system, separate risk assessments must be carried out in order to determine the suitability and safety of the brake system.

The following standards are accepted: The UIC 540-549 series and EN 50125-1 chapter 4.4.

4.4 Brake command

4.4.1 Emergency braking command

Passenger train vehicles shall have a system that permits the emergency brake to be operated from all vehicles in the train. On recent manufactured vehicles it must be possible for the driver to delay the activation of the emergency brake. Once the vehicle has stopped, definite handling must be taken to disengage the emergency brakes.

The requirements in TSI LOC & PAS clause 4.2.4.4.1 apply correspondingly.

The following standards are accepted: The UIC 540-549 series.

4.4.2 Service braking command

The requirements in TSI LOC & PAS clause 4.2.4.4.2 apply correspondingly.

The following standards are accepted: The UIC 540-549 series.

4.4.3 Direct braking command

The requirements in TSI LOC & PAS clause 4.2.4.4.3 apply correspondingly.

The following standards are accepted: The UIC 540-549 series.

4.4.4 Dynamic braking command

The requirements in TSI LOC & PAS clause 4.2.4.4.4 apply correspondingly.

The following standards are accepted: The UIC 540-549 series.

4.4.5 Parking braking command

The requirements in TSI LOC & PAS clause 4.2.4.4.5 apply correspondingly.

The following standards are accepted: The UIC 540-549 series.

4.5 Brake performance

4.5.1 Emergency braking

The requirements in TSI LOC & PAS clause 4.2.4.5.2 apply correspondingly.

The following standards are accepted: The UIC 540-549 series.

4.5.2 Service braking

The requirements in TSI LOC & PAS clause 4.2.4.5.3 apply correspondingly.

The following standards are accepted: The UIC 540-549 series.

4.5.3 Calculations related to thermal capacity

The principles in TSI LOC & PAS clauses 4.2.4.5.4 and 4.2.3.5.2.2, and TSI WAG clause 4.2.4.1.2.5 apply correspondingly; with the exception from the reference case subject to a speed of 80 km/h to be maintained at a downhill gradient of 2.2% over a distance of 75 km.

The following standards are accepted: The UIC 540-549 series.

4.5.4 Parking brake

All vehicles shall have a parking brake or other equipment for safe parking and storage. The parking brake must be designed to a standard which ensures it will hold the vehicle, with design mass in working order with maximum load, until it is intentionally released. Other appropriate means of securing the vehicle against unintentional movement may also be used.

The requirements in TSI LOC & PAS clause 4.2.4.5.5 apply correspondingly.

The requirements in TSI WAG clause 4.2.4.1.2.8 apply, correspondingly.

The following standards are accepted: The UIC 540-549 series.

4.6 Braking adhesion management

4.6.1 Limit of wheel/rail adhesion profile

The requirements in TSI LOC & PAS clause 4.2.4.6.1 apply correspondingly. When calculating braking action and designing the brake system, account must be taken of low adhesion values as a result of climatic conditions.

The following standards are accepted: UIC 544 and UIC 546.

4.6.2 Wheel slide protection system

The requirements in TSI LOC & PAS clause 4.2.4.6.2 and TSI WAG clause 4.2.4.1.2.6 apply correspondingly. When calculating braking action and designing and adjusting the wheel slide protection system, account must be taken of low adhesion values as a result of climatic conditions.

The following standards are accepted: UIC 541 and EN 15595.

4.7 Braking force production

Vehicles with pneumatic brakes must have systems for producing compressed air that are appropriate to the climatic conditions, particular to harsh winter conditions. The air compression system shall include equipment to ensure the production of dry and clean compressed air. When considering humidity levels, clause 6.1.1.3 in this annex applies correspondingly.

4.7.1 Friction brakes

4.7.1.1 Brake blocks

Composite materials in the brake blocks must work satisfactorily under all foreseeable climatic conditions, particularly under difficult temperature and snow conditions in winter, and must provide sufficient braking capacity. Such materials shall be in accordance with UIC 541-1. For vehicles to be placed in operation without operational restrictions, testing must be carried out to ensure that the requirements are fulfilled in normal service.

4.7.1.2 Brake discs

The material quality of brake discs must be adapted to the corresponding friction material to provide satisfactory braking power under all foreseeable operational conditions, including harsh climatic conditions.

4.7.1.3 Brake pads

Composite material may only be used in brake pads if the test mentioned in clause 4.7.1.1 in this annex shows that they produce sufficient friction under all foreseeable climatic conditions, particularly at low temperatures and under harsh snow and ice conditions.

4.7.2 Dynamic brake linked to traction

The requirements in TSI LOC & PAS clause 4.2.4.7 apply correspondingly.

4.7.3 Magnetic track brake

The requirements in TSI LOC & PAS clause 4.2.4.8.2 apply correspondingly.

4.7.4 Eddy current track brake

Eddy current track brakes can interfere with signalling systems and other electrical systems. It must therefore be considered in this particular case whether or not the use of an eddy current track brake is appropriate and meets the requirements for technical compatibility. A comprehensive safety case and on track test validation is required.

4.7.5 Parking brake

See clause 4.5.4 in this annex. The vehicle shall be kept permanent stationary regardless of any kind of power supply.

4.8 Brake state and fault indication

The requirements in TSI LOC & PAS clause 4.2.4.9 apply correspondingly.

The following standard is accepted: UIC 547. In the case of brake systems not based on UIC norms, an additional assessment is required. In case of brake performance lower than the performance required (degraded mode) on brake systems other than UIC-based the recommendations in TSI LOC & PAS clause 4.2.4.9 apply correspondingly.

4.9 Brake requirements for rescue purposes

The requirements in TSI LOC & PAS clause 4.2.4.10 apply correspondingly. The requirements also apply to vehicles in train configurations weighing less than 200 tonnes.

5 Passenger-related items

The requirements in this chapter apply to all newer passenger train vehicles. In the case of older vehicles, the requirements are applicable insofar as structural factors do not stand in the way of compliance.

5.1 Access

5.1.1 Exterior doors

Exterior doors shall be designed and controlled so as to ensure the safety of passengers and staff. On closing, the doors must be capable of registering whether passengers or staff are being trapped stop automatically, and open for a limited time, according to accepted or recognized door management systems.

The doors and adjacent door equipment shall withstand the forces exerted to them during operation.

The requirements in TSI LOC & PAS clauses 4.2.5.6, 4.2.5.7 and 4.2.5.8 apply correspondingly.

The following standards are accepted: UIC 560, UIC 651, UIC 560, UIC 565 and EN 14752.

5.1.2 Interior doors

Interior doors shall be designed and controlled so as to ensure the safety of passengers and staff. On closing, the doors must be capable of registering whether passengers or staff are being trapped stop automatically and open for a limited time.

The doors and adjacent equipment shall withstand the forces exerted to them during operation

The requirements in TSI LOC & PAS clause 4.2.5.8 and TSI PRM clause 4.2.2.4.3 apply correspondingly

The following standard is accepted: UIC 560.

5.1.3 Clearways

The requirements in TSI PRM clause 4.2.2.7 apply correspondingly.

The following standard is accepted: UIC 560.

5.1.4 Steps and lighting

The requirements in TSI PRM clauses 4.2.2.5, 4.2.2.12.1 and 4.2.2.12.2 apply correspondingly to the extent that this is physically possible without any major structural intervention.

The following standards are accepted: UIC 555, UIC 560 and EN 13272.

5.1.5 Floor height changes

The requirements in TSI LOC & PAS clause 4.2.2.9 apply correspondingly

5.1.6 Handrails

The requirements in TSI PRM & PAS clause 4.2.2.10 apply correspondingly.

The following standards are accepted: UIC 535, UIC 560, UIC 565/3 and EN 14752.

5.1.7 Boarding aids

The use of boarding aids to reduce the gap between the platform and the vehicle shall always be considered. If the gap between the platform and the vehicle exceeds that which follows from TSI PRM clause 4.1.2.18.2, as adapted to the EEA Agreement Chapter XIII no 37m, appropriate boarding aids shall be in place for safe boarding and alighting.

The requirements in TSI PRM clause 4.2.2.12.3 apply correspondingly.

The following standard is accepted: UIC 560.

5.2 Side windows

The design and properties of windows shall ensure the safety of passengers and staff.

The requirements in TSI LOC & PAS clause 4.2.2.9 apply correspondingly.

The following standards are accepted: UIC 560, UIC 564, UIC 651, UIC 617 and UIC 625.

5.3 Toilets

Toilets shall be installed on board passenger vehicles to the extent that this is necessary. The requirements in TSI LOC & PAS clause 4.2.5.1 apply correspondingly. Climatic conditions must be taken into account in the design and operation of toilet systems, so that their functionality is ensured under all foreseeable operating conditions.

If installed toilets are adapted for wheelchair use, the requirements in TSI PRM clause 4.2.2.6 apply correspondingly..

5.4 Passenger information

5.4.1 Public address system

A public address system must be in place on board the vehicle, to ensure that the driver is able to address the passengers. The requirements in TSI HS RST clause 4.2.5.1 and TSI LOC & PAS clause 4.2.5.2 apply correspondingly insofar as they are appropriate to the existing on-board communication system.

The following standard is accepted: UIC 176.

5.4.2 Signs and information

Emergency exits and evacuation routes shall be marked to enable safe evacuation.

The requirements in TSI LOC & PAS clause 4.2.5.4 and TSI PRM clause 4.2.2.8 apply correspondingly to the information and signs for passengers. The information displayed must be in the Norwegian language.

5.5 Seats and specific arrangements for persons with reduced mobility

The requirements in TSI PRM clause 4.2.2.2 apply correspondingly as long as there are no vehicle structural considerations that stand in the way of compliance with those requirements.

The following standards are accepted: UIC 566 and EN 12663.

5.6 Specific passenger-related facilities

5.6.1 Lift systems

When installing lift systems for travellers, the requirements in TSI PRM clause 4.2.2.12 apply correspondingly as long as there are no vehicle structural considerations that stand in the way of compliance with those requirements.

The following standard is accepted: UIC 565/3.

5.6.2 Heating, ventilation and air conditioning systems

The requirements in TSI LOC & PAS clause 4.2.5.9 apply correspondingly. The ventilation system shall be designed and controlled in such a way that it does not contribute to spreading smoke or other toxic gases in the event of fire.

The following standards are accepted: UIC 553, EN 13129 and EN 14813.

5.6.3 Other

Other passenger facilities must be used, mounted, fixed etc. in accordance with the manufacturer's specifications.

6 Environmental conditions and aerodynamic effects

This chapter applies to all vehicles unless otherwise specified.

6.1 Impact of the environment on the vehicle

6.1.1 Environmental conditions impacting the vehicle

6.1.1.1 Altitude

Vehicles must meet the requirements relating to technical functionality at applicable altitudes as described in the EN 50125-1 standard.

6.1.1.2 Temperature

Vehicles must be designed in accordance with class T2 in the EN 50125-1 standard (-40 to +35 °C). In the case of vehicles designed for minimum temperatures higher than -40 °C, operational restrictions must be considered.

6.1.1.3 Humidity

The requirements in TSI LOC & PAS clause 4.2.6.1.3 apply correspondingly, but the maximum temperature variation to be taken into account shall be up to 40 K. It must be possible to drain all safety-critical spaces and openings in which condensation can occur. See also clause 4.7.1 in this annex regarding compressed air systems.

6.1.1.4 Rain

Vehicles must be able to withstand rain volumes as described in section 4.6 of the EN 50125-1 standard section 4.6.

6.1.1.5 Snow, ice and hail

Traction vehicles must be fitted with a snow plough in accordance with clause 2.1.1 in this annex.

The vehicle must be tested under all foreseeable winter conditions in order to ensure normal operation without restrictions.

The requirements in TSI LOC & PAS clause 4.2.6.1.5 linked to severe snow, ice, and hail conditions, apply correspondingly.

6.1.1.6 Solar radiation

Vehicles must be able to withstand solar radiation as described in section 4.9 of the EN 50125-1 standard.

6.1.1.7 Chemical and particulate matter

The requirements in TSI LOC & PAS clause 4.2.6.1.7 apply correspondingly.

6.1.2 Aerodynamic effects on the vehicle

6.1.2.1 Crosswind effects

During vehicle design and construction foreseeable crosswind effects shall be taken into account..

The following standards are accepted: EN 50125 and EN 14067.

6.1.2.2 Maximum pressure variation in tunnels

During vehicle design, construction, operation and modifications, account must be taken of air pressure variations that arise on entering and leaving tunnels, and on passing other vehicles in tunnels.

The following standards are accepted: EN 50125 and EN 14067.

6.2 Impact of the vehicle on the environment

6.2.1 Chemical and particulate emissions

6.2.1.1 Toilet emissions

The use of open toilet systems is not permitted in railway vehicles.

6.2.1.2 Exhaust gas emissions

The requirements in TSI LOC & PAS clause 4.2.8.3 apply correspondingly.
The requirements in Directive 2004/26/EC apply correspondingly.

The following standards are accepted: UIC 623 and 624.

6.2.2 Limits for noise emissions

6.2.2.1 Exterior noise impact

Exterior noise must not exceed permitted levels in accordance with TSI Noise.

The following standard is accepted: UIC 567.

6.2.2.2 Stationary noise impact

Stationary noise must not exceed permitted levels in accordance with TSI Noise.

The following standards are accepted: UIC 553, UIC 567 and UIC 651.

6.2.2.3 Starting noise impact

Starting noise must not exceed permitted levels in accordance with TSI Noise.

6.2.2.4 Pass-by noise impact

Pass-by noise must not exceed permitted levels in accordance with TSI Noise.

6.2.3 Limits for aerodynamic loads impact

6.2.3.1 Head pressure pulses

The requirements in TSI LOC & PAS clause 4.2.6.2.3 apply correspondingly.

6.2.3.2 Aerodynamic impact on passengers/materials on the platform

The requirements in TSI LOC & PAS clause 4.2.6.2.1 apply correspondingly.

The following standard is accepted: UIC 660.

6.2.3.3 Aerodynamic impact on track workers

The requirements in TSI LOC & PAS clause 4.2.6.2.2 apply correspondingly.

6.2.3.4 Ballast pick-up and projection onto neighbouring property

See clause 6.1.1.7. When estimating the impact of the vehicle on the ballast, account must be taken of the fact that, in Norway, the nominal grain size for ballast is 25 to 63 mm.

7 External warning, marking functions and software integrity requirements

The requirements in this chapter apply to all vehicles to be operated as a train or part of a train.

7.1 Integrity of software employed for safety-related functions

Software used for safety-related functions shall be developed in accordance with EN 50128 and EN 50129. A separate evaluation must be carried out for functions designed to ensure compliance with operational requirements that are specifically Norwegian and in the case of more recently produced systems that are not based on recognised standards.

7.2 Visual and audible vehicle identification and warning functions

7.2.1 Vehicle marking

The vehicle shall be marked in accordance with requirements in, or pursuant to the Norwegian Interoperability Regulation. The requirements in TSI WAG clause 4.2.2.5 and Annex B, TSI OPE clause 4.2.2.3 and Annex P and clause 4.2.3.2 and Annex R apply correspondingly.

The following standards are accepted: UIC 640, UIC 580, UIC 581, UIC 438, UIC 545, UIC 552 and UIC 563.

7.2.2 External lights

7.2.2.1 Headlights

The requirements in TSI LOC & PAS clause 4.2.7.1.1 apply correspondingly.

7.2.2.2 Marker lights

The requirements in TSI LOC & PAS clause 4.2.7.1.2 apply correspondingly.

7.2.2.3 Tail lights

The requirements in TSI LOC & PAS clause 4.2.7.1.3 apply correspondingly.

7.2.2.4 Lamp controls

The requirements in TSI LOC & PAS clause 4.2.7.1.4 apply correspondingly to all newer vehicles.

The following standards are accepted: UIC 534 and UIC 532.

7.2.3 Warning horn

7.2.3.1 Warning horn tones

The requirements in TSI LOC & PAS clause 4.2.7.2.1 apply correspondingly.

The following standards are accepted: EN15153-2 and UIC 644.

7.2.3.2 Warning horn sound pressure levels

The requirements in TSI LOC & PAS clause 4.2.7.2.2 apply correspondingly.

The following standard is accepted: EN15153-2.

7.2.3.3 Warning horns, protection

The requirements in TSI LOC & PAS clause 4.2.7.2.3 apply correspondingly.

The following standard is accepted: UIC 644.

7.2.3.4 Warning horns, control

The requirements in TSI LOC & PAS clause 4.2.7.2.4 apply correspondingly.

The following standard is accepted: UIC 644.

7.2.3.5 Warning horns, verification of sound pressure levels

The requirements in TSI LOC & PAS clause 4.2.7.2.2 apply correspondingly.

The following standard is accepted: EN15153-2.

7.2.4 Brackets

See also clause 2.1.5 in this annex regarding the fixing of devices to car body structure.

The following standards are accepted: EN 12663, UIC 532, UIC 566 and UIC 644.

8 Onboard power supply and control systems

This chapter applies to traction vehicles.

8.1 Traction performance requirements

8.1.1 Residual acceleration at max speed

No specific requirements apply.

8.1.2 Residual traction capability in degraded mode

Residual traction capability required in degraded mode shall be sufficient for safe passage through tunnels. Geographical and climatic aspects, like gradient and severe winter conditions, shall be taken into consideration

8.1.3 Traction wheel/rail adhesion requirements

No specific requirements apply. See clause 4.6.1 in this annex.

8.2 Functional and technical specifications related to the interface between the vehicle and the energy subsystem

8.2.1 Functional and technical specifications related to the electric power supply

8.2.1.1 Power supply

The traction vehicle must work satisfactorily together with the power supply for the railway infrastructure and the other traction vehicles on the national railway network, without any adverse impact on other parts of the railway system.

The national railway network has an AC 15 kV 16.7 Hz power supply system in accordance with TSI ENE clause 4.2.3.

8.2.1.2 Impedance between pantograph and wheels

No specific requirements apply.

8.2.1.3 Voltage and frequency of overhead contact line power supply

The requirements in TSI LOC & PAS clause 4.2.8.2.2 apply correspondingly together with the requirements for testing set out in EN50163:2004 section 5. In addition, overhead contact line voltages down to 10,000 V must not trigger off the low voltage protection, cause damages or faults to the traction vehicle.

There are no requirements for the length of the 'unspecified period' described in EN 50163:2004 section 4.1 letter f) if the increase in voltage is caused by energy recuperation. This means that a traction vehicle may generate voltages of up to $U_{\max 2}$ on a continuous basis through recuperation.

The traction vehicle must be operational under expected over-harmonic voltage conditions with related recurring over-voltages on the contact line. The 99.95 percentile for contact line voltages is a total harmonic distribution (THD_u) of 34% with a related peak voltage of 33 kV. The traction vehicle shall be tested under relevant conditions.

A practical short-circuiting test as described in EN 50215:2009 section 9.16.5 shall not be carried out on the line, but as a factory test.

8.2.1.4 Energy recuperation

The requirements in TSI LOC & PAS clause 4.2.8.2.3 apply correspondingly together with the requirements for testing set out in EN 50388:2005 section 13.

The traction vehicle shall not recuperate more energy than the power supply network can withstand. This requirement concerns the total effect/current from all vehicles under the same control, and may be fulfilled by means of manual actions by the driver or by means of a technical solution.

On the basis of the thermal capacity of the contact line and the capacity of the contact line's protection capability to detect short circuits on the same section the traction vehicle is recuperating energy on, the national railway network has been divided into classes of maximum allowed recuperated energy. The classification is included in the infrastructure manager's network statement.

If the traction vehicle automatically stops regenerating energy when a short circuit occurs on the section occupied by the traction vehicle, the capacity of the contact line's protection device to detect concurrent short circuits can be made more lenient. Such a functionality situation shall be documented.

8.2.1.5 Maximum power and maximum current that it is permissible to draw from the overhead contact line

The requirements in TSI LOC & PAS clause 4.2.8.2.4 apply correspondingly. A classification of the national railway network in terms of maximum power and maximum current that it is permissible to draw from the overhead contact line, is included in the infrastructure manager's network statement.

Automatic current limitation at low contact line voltages in accordance with EN 50388:2005 section 7.2 shall also be active during normal operation.

8.2.1.6 Power factor

The requirements of TSI LOC & PAS clause 4.2.8.2.6 apply correspondingly together with EN50388:2005 section 6.

In addition, the following specifically Norwegian conditions apply:

- The capacitive power factor shall not be less than 0.95 at contact line voltages of more than 16.5 kV when the traction vehicle is actively consuming power.
- The capacitive power shall not exceed 60 kVAr when the traction vehicle regenerates power.
- The inductive power factor shall not be less than 0,95 at contact line voltages less than 16.5 kV when the traction vehicle regenerates power.

8.2.1.7 System energy disturbances

8.2.1.7.1 Harmonic characteristics and related over-voltages on the overhead contact line

The requirements in TSI LOC & PAS clause 4.2.8.2.7 apply correspondingly. Additionally, in order to ensure technical compatibility, information shall also be obtained from the infrastructure manager in accordance with EN50388:2005 Annex D insofar as the information in EN50388:2005 Annex D is not sufficient to ensure technical compatibility between the vehicle and the infrastructure on the national railway network. The current supply on the national railway network may deviate significantly in relation to what are deemed to be typical characteristics.

When testing the technical compatibility of the vehicle and the power supply on the national railway network, the following must be taken into consideration:

- A general weak power supply characterised by long feeding distances, single tracks (high impedance on the catenary) and rotating converters as well as static converters from 50 Hz to 16 2/3 Hz with a low level of output
- Low-frequent oscillations at feeding from rotating converters due to electromagnetic resonant frequencies with little alleviation
- A high amount of harmonic (over 30 % THDu) in the catenary voltage, especially 3. and 5. harmonic and repeating high top voltage values (up to 33 kV) due to many existing traction vehicles with half-controlled thyristor gaps,

- The use of automatic limitation of the power/current at low catenary voltages and capacitive compensation for increased transmission capacity at long feeding distances
- The use of automatic limitations of power/current at high catenary voltages and inductive compensation to limit the catenary voltage when recuperating energy
- Low electrical resonance frequencies due to a high amount of cable in the infrastructure and passive filters in existing traction vehicles.

8.2.1.7.2 Effects of DC content in AC supply

Electrical traction vehicles shall work satisfactory when DC content occurs as a result of extensive ice and hoar frost formation on the contact line, whether generated by the traction vehicle itself or another traction vehicle. The requirements in TSI HS RST clause 4.2.8.3.4.2 apply correspondingly.

8.2.1.8 Electrical protection

The requirements in TSI LOC & PAS clause 4.2.8.2.10 apply correspondingly together with the requirements for testing set out in EN 50388:2005 section 13, with the exception of onboard short circuit as described in EN 50388:2005 section 13.

To prevent unnecessary disconnection of the contact line's electrical protection, the maximum value of the start-up current from the transformer or other equipment on board the traction vehicle shall not exceed 2.0 kA (peak value) during the two first periods (120 ms) after coupling or starting up (for example after activation of high-voltage switch) at a consistent voltage of 16,500 V. This also apply when several vehicles are controlled together.

Compliance with this requirements shall be tested by making a minimum of 25 connections to a network with a short circuit capability of at least 20 kA. If coupling or starting up is synchronised with the voltage's ground trough, it is sufficient to make the couplings ten times.

8.2.2 Pantograph functional and design parameters

8.2.2.1 Pantograph overall design

The requirements in HS TSI RST clause 4.2.8.3.7.1 apply correspondingly. In addition, the pantograph must meet requirements set out in EN 50206-1, IEC 494:2002, IEC 1133 and EN 50367:2011.

8.2.2.2 Pantograph head geometry

The requirements in TSI LOC & PAS clause 4.2.8.2.9.2 apply correspondingly. In addition, the geometry of the pantograph must be as described in EN 50367:2011 Figure B.6 (1,800 mm). On sections specified in the infrastructure manager's network statement, it is permitted to employ a pantograph geometry as described in EN 50367:2011 Figure A.8 (1,950 mm) and Figure A.7 (1,600 mm).

8.2.2.3 Pantograph static contact force

During standstills, pantographs shall have a static contact force of 55 N. On sections specified in the infrastructure manager's network statement, the requirements of TSI LOC & PAS clause 4.2.8.2.9.5 apply correspondingly.

8.2.2.4 Pantograph contact force (including dynamic behaviour and aerodynamic effects)

The requirements in TSI LOC & PAS clause 4.2.8.2.9.6 apply correspondingly. In addition, pantographs must meet requirements for compliance with a curve based on the following formula:

$F_m = 0.00097v^2 + 55$, with a tolerance of $\pm 10\%$.

On sections specified in the infrastructure manager's network statement, pantographs must meet requirements for compliance with a curve based on the following formula:

$F_m = 0.00097v^2 + 70$, with a tolerance of $\pm 10\%$.

This requirement must be seen in conjunction with clause 8.2.2.3 in this annex.

8.2.2.5 Working range of pantographs

The requirements in TSI LOC & PAS clause 4.2.8.2.9.1 apply correspondingly. In addition, pantographs shall have a working range as described in EN 50367:2011 Table B.3.

8.2.2.6 Current capacity

The requirements in TSI LOC & PAS clause 4.2.8.2.4 and TSI HS RST clause 4.2.8.3.7.5 apply correspondingly. The following standards are accepted: EN 50388, EN 50206

8.2.2.7 Arrangement of pantographs

The requirements in TSI LOC & PAS clause 4.2.8.2.9.7 apply correspondingly. In addition, pantographs shall be arranged as described in EN 50367:2011.

8.2.2.8 Insulation of pantograph from the vehicle

The requirements in TSI LOC & PAS clause 4.2.8.2.9.9 'insulation of pantograph from vehicle' apply correspondingly.

8.2.2.9 Pantograph lowering

The requirements in TSI LOC & PAS clause 4.2.8.2.10 apply correspondingly. On newer vehicles the pantograph shall be lowered automatically when there are defects in the contact strip, using a so-called automatic drop device (ADD). See clause 8.2.3.4 in this annex.

8.2.2.10 Running through phase separation sections

The requirements in TSI LOC & PAS clause 4.2.8.2.9.8 'Running through phase or system separation sections' apply correspondingly together with the requirements for testing set out in EN 50388:2005 section 13. Regenerated power shall also be reduced to zero when running through phase separation sections. Vehicles must be equipped so that they are able to run through unearthed "dead" sections by lowering the pantograph or shutting out.

8.2.2.11 Running through system separation sections

See clause 8.2.2.10 in this annex

8.2.3 Contact strip functional and design parameters

8.2.3.1 Contact strip geometry

The requirements in TSI LOC & PAS clause 4.2.8.2.9.4.1 apply correspondingly. In addition, the geometry of the contact strip must be in accordance with EN 50206-1 section 4.7.4 and EN 50367:2011 Annex B. In the case of sections specified in the infrastructure manager's network statement, EN 50367:2011 Annex A shall also be complied with. This requirement must be seen in conjunction with clause 8.2.2.2 in this annex.

8.2.3.2 Contact strip material

The requirements in TSI LOC & PAS clause 4.2.8.2.9.4.2 apply correspondingly. Furthermore, non-metallised carbon shall be used for the contact strip. See EN 50206-1, EN 50367:2011 and UIC 608:2003.

8.2.3.3 Contact strip assessment

The requirements in TSI LOC & PAS clause 6.1.2.2.7 apply correspondingly

8.2.3.4 Detection of contact strip breakage

On newer vehicles the pantograph shall be lowered automatically when there are defects in the contact strip, using a so-called automatic drop device (ADD). See clause 8.2.2.9 in this annex.

8.2.3.5 Current capacity

See clause 8.2.2.6 in this annex. The requirements in TSI Loc & PAS clause 4.2.8.2.9.3 apply correspondingly

8.3 *Electrical power supply and traction system*

8.3.1 Energy consumption measurement

If the vehicle has equipment for measuring energy consumption, the requirements in TSI LOC & PAS clause 4.2.8.2.8 apply correspondingly.

8.3.2 Main electrical circuit configuration

No specific requirements apply.

8.3.3 High voltage components

No specific requirements apply.

8.3.4 Earthing

The requirements in TSI LOC & PAS clause 4.2.8.4 apply correspondingly.

Necessary information about disconnection and earthing of the vehicle shall be provided in the form of decals/signs on the vehicle or in easy-to-understand manuals in each individual vehicle so that fault conditions can be dealt with. This requirement does not apply to information of an obvious nature or that must be assumed to be generally known to those who are assigned to carry out specific tasks. Instructions for earthing, equipment for earthing and signs are specified in EN 50153.

8.4 Electromagnetic compatibility

8.4.1 Electromagnetic compatibility within the onboard electrical power supply and control system

Tests of the electromagnetic compatibility within the onboard electrical power supply and control system must be carried out according to EN 50121.

8.4.2 Electromagnetic compatibility with the signalling and telecommunications network

Tests of the electromagnetic compatibility between the vehicle and the signalling and telecommunications network must be carried out according to EN 50121, TS 50238-2 and TS 50238-3. Train detection and axle counters to be considered are listed in the network statement

8.4.3 Electromagnetic compatibility with other vehicles and with the trackside part of the railway system

Vehicles should not have a negative impact on other vehicles and the trackside part of the railway system. A declaration of conformity according to Regulation 22 January 2007 no 89 regarding electromagnetic compatibility (EMC) for electronic communication must be available.

The main switch must be automatically disconnected if the current in all frequency areas with 1 Hz frequency gap in the areas 92 – 98 Hz and 102 – 108 Hz is equal to or greater than 2 Arms in minimum 1,0 s.

The following standard is accepted: EN 50121.

8.4.4 Electromagnetic compatibility with the environment

The vehicle must not have any negative electromagnetic impact on the environment. Tests to show such compatibility should be performed according to EN 50121.

8.5 Protection against electrical hazards

The requirements in TSI LOC & PAS clause 4.2.8.4 and TSI WAG clause 4.2.7.3 apply correspondingly.

8.6 Diesel and other thermal traction system requirements

The requirements in TSI Loc & PAS clause 4.2.8.3 apply correspondingly.

8.7 Systems requiring special monitoring and protection measures

8.7.1 Tanks and pipe systems for flammable liquids

The requirements in RID and TSI LOC & PAS clause 4.2.10.3 apply correspondingly.

8.7.2 Pressure vessel systems/pressure equipment

No specific requirements apply.

8.7.3 Steam boiler installations

No specific requirements apply.

8.7.4 Technical systems in potentially explosive atmospheres

No specific requirements apply.

8.7.5 Ionisation detectors

No specific requirements apply.

8.7.6 Hydraulic/pneumatic supply and control systems

See clause 4.7 and 6.1.3 in this annex.

9 Staff facilities, interfaces and environment

The requirements set out in this chapter apply to traction vehicles with a driver's cab unless otherwise specified under each requirement.

9.1 Driver's cab design

9.1.1 Cab design

9.1.1.1 Interior layout

The requirements in TSI LOC & PAS clause 4.2.9.1.4 apply correspondingly.

The following standards are accepted: UIC 617-4, UIC 617-6 and UIC 651.

9.1.1.2 Desk ergonomics

The requirements in TSI LOC & PAS clause 4.2.9.1.6 apply correspondingly.

The following standard is accepted: UIC 651.

9.1.1.3 Driver's seat

The requirements in TSI LOC & PAS clause 4.2.9.1.5 apply correspondingly.

The following standard is accepted: UIC 651.

9.1.1.4 Means for the driver to exchange documents

No specific requirements apply.

9.1.1.5 Other facilities to control operation of the train

No specific requirements apply.

9.1.2 Access to driver's cab

9.1.2.1 Access, egress and doors

The requirements in TSI LOC & PAS clause 4.2.2.8 and 4.2.9.1.2.1 apply correspondingly to newer vehicles.

The following standards are accepted: EN 14752, UIC 646 and UIC 651.

9.1.2.2 Driver's cab emergency exits

The requirements in TSI LOC & PAS clause 4.2.9.1.2.2 apply correspondingly to newer vehicles.

The following standards are accepted: EN 14752 and UIC 651.

9.1.3 Windscreen in driver's cab

9.1.3.1 Mechanical characteristics

The requirements in TSI LOC & PAS clause 4.2.9.2.1 apply correspondingly to newer vehicles.

The following standards are accepted: UIC 651, UIC 617-4 and EN 15152.

9.1.3.2 Optical characteristics

The requirements in TSI LOC & PAS clause 4.2.9.2.2 apply correspondingly.

The following standards are accepted: UIC 651, UIC 617-7 and EN 15152.

9.1.3.3 Equipment

The requirements in TSI LOC & PAS clause 4.2.9.2.3 apply correspondingly.

9.1.3.4 Front visibility

The requirements in TSI LOC & PAS clause 4.2.9.1.3.1 apply correspondingly.

The following standards are accepted: UIC 525-6 and EN 15152.

9.2 Working conditions

9.2.1 Environmental conditions

9.2.1.1 Heating, ventilation and air conditioning systems in driver's cab

The requirements in TSI LOC & PAS clause 4.2.9.1.7 apply correspondingly.

The following standards are accepted: EN 14813 and EN 13129.

9.2.1.2 Noise in driver's cab

In the case of modifications, the noise level in the driver's cab must not be increased. The requirements in Regulation 26 April 2006 No 456 on noise protection in the workplace applies, though authorisation to place into service in conformity with the present regulation is issued regardless of fulfilment for those requirements. The requirements in TSI Noise clause 4.2.3 apply correspondingly.

9.2.1.3 Lighting in driver's cab

The requirements in TSI LOC & PAS clause 4.2.9.1.8 apply correspondingly.

The following standards are accepted: EN 13272, UIC 651 and UIC 555.

9.2.2 Other

No specific requirements apply.

9.3 *Driver/machine interface*

9.3.1 Driver/machine interface

9.3.1.1 Speed indication

There must be a device in place for displaying the correct speed to the driver. The requirements in TSI LOC & PAS clause 4.2.9.3.2 apply correspondingly.

The following standards are accepted: UIC 617-3 and UIC 612.

9.3.1.2 Driver display unit and screens

The requirements in TSI LOC & PAS clause 4.2.9.3.3 apply correspondingly.

The following standard is accepted: UIC 612.

9.3.1.3 Controls and indicators

The requirements in TSI LOC & PAS clause 4.2.9.3.4 apply correspondingly.

The following standard is accepted: UIC 612.

9.3.2 Driver supervision

The requirements in TSI LOC & PAS clause 4.2.9.3.1 apply correspondingly.

The following standard is accepted: UIC 641.

9.3.3 Rear and side view

The requirements in TSI LOC & PAS clause 4.2.9.1.3.2 apply correspondingly, in addition the driver must be able to have a rear view along the train when the train is running. The equipment must provide rear visibility under all climatic conditions, particularly in case of condensation, frost and ice formation.

9.4 *Marking and labelling in driver's cab*

The requirements in TSI LOC & PAS clause 4.2.9.3.5 apply correspondingly.

The following standard is accepted: UIC 640.

9.5 *Onboard equipment and other facilities for staff*

9.5.1 Onboard facilities for staff

9.5.1.1 Staff access to coupling/uncoupling

The requirements in TSI LOC & PAS clause 4.2.2.2.5 apply correspondingly.

The following standards are accepted: EN 50153, UIC 521, UIC 571 and UIC 536.

9.5.1.2 External steps and handrails for shunting staff

The requirements in TSI WAG clause 4.2.2.2 apply correspondingly to freight cars.

The following standards are accepted: UIC 535, UIC 560 and UIC 646.

9.5.1.3 Storage facilities for use by staff

The requirements in TSI LOC & PAS clause 4.2.9.5 apply correspondingly, however storage facilities for use by staff must be adapted to the need for storing necessary personal equipment according to the climatic conditions.

9.5.1.4 Other facilities

No specific requirements apply.

9.5.2 Staff and freight access doors

Staff and freight doors shall be designed and equipped in such a way to permit operation by authorised staff only.

The requirements in TSI LOC & PAS clause 4.2.2.8 apply correspondingly. See also clause 5.1.1, 5.1.2 and 9.1.2.1 in this annex.

The following standards are accepted: EN 14752 and UIC 560.

9.5.3 Onboard tools and portable equipment

The requirements in TSI LOC & PAS clause 4.2.9.4 apply correspondingly.

9.5.4 Audible communication system

The public address system mentioned in clause 5.4.1 in this annex may also be used for communication between onboard staff or between onboard staff and staff outside the train.

The following standards are accepted: UIC 558, UIC 561, UIC 568 and UIC 751.

9.6 Recording device

All traction vehicles shall be equipped with a technical recording system for registration of speed, as a minimum. All information recorded by the automatic speed control system shall be stored and reliably recovered for use in connection with any investigations of railway accidents, serious railway incidents and railway incidents.

9.8 Remote control function

The requirements in TSI LOC & PAS clause 4.2.9.3.6 apply correspondingly. Remote control systems must meet the requirements for acceptable risk.

10 Fire safety and evacuation

The requirements set out in this chapter apply to all vehicles unless otherwise specified under each requirement.

10.1 Fire safety

10.1.1 Fire protection concept

10.1.1.1 Classification of vehicle/fire categories

The vehicle must not contain highly flammable materials. The materials used shall emit a minimum of smoke and harmful combustion gases in the event of fire.

The requirements in TSI LOC & PAS clause 4.2.10.1 apply correspondingly.

The following standards are accepted: TS 45545, UIC 564 and UIC 642.

10.1.2 Fire protection measures

10.1.2.1 General protection measures for vehicles

The requirements in TSI LOC & PAS clauses 4.2.10.1.1 and 4.2.10.1.3 apply correspondingly.

The following standard is accepted: TS 45545.

10.1.2.2 Fire protection measures for specific types of vehicle

The requirements in TSI LOC & PAS clause 4.2.10.1.2 apply correspondingly.

10.1.2.3 Protection of driver's cab

The driver's cab must be protected in the event of fire. The requirements in TSI LOC & PAS clause 4.2.10.1.3 and TSI SRT clause 4.2.5.3.2 apply correspondingly.

The following standard is accepted: UIC 564.

10.1.2.4 Fire barriers

The requirements in TSI LOC & PAS clause 4.2.10.5 apply correspondingly.

The following standards are accepted: TS 45545, UIC 564 and UIC 642.

10.1.2.5 Material properties

Rolling stock must not contain highly flammable materials. The materials used shall emit a minimum of smoke and harmful combustion gases in the event of fire. The requirements in TSI LOC & PAS clause 4.2.10.2 apply correspondingly.

The following standards are accepted: TS 45545, UIC 564 and UIC 642.

10.1.2.6 Fire detectors

The requirements in TSI SRT clause 4.2.5 apply correspondingly.

Fire detectors must be in place in high-risk areas such as the diesel engine compartment and sleeper coaches. Fire detectors are mandatory in all newer vehicles.

10.1.2.7 Fire extinguishing equipment

The requirements in TSI SRT clause 4.2.5 apply correspondingly.

The following standards are accepted: UIC 564-2, UIC 642, UIC 895 and CEN/TS 45545.

10.2 Emergencies

10.2.1 Passenger emergency exits

The requirements in TSI LOC & PAS clause 4.2.10.4 apply correspondingly. Furthermore, special arrangements must be made for the evacuation of persons with impaired sight/hearing or mobility.

The following standards are accepted: UIC 560, UIC 564-1, UIC 651 and EN 13272.

10.2.2 Rescue services' information, equipment and access

The vehicle shall be designed in order to facilitate efficient rescue operations by rescue personnel.

The vehicle shall have onboard emergency equipment suitable for rescue operations. Emergency equipment and where it is located shall be marked.

10.2.3 Passenger alarm

It must be possible for the passengers to alert the driver of an emergency situation by means of an alarm or emergency stop function. See clause 4.4.1 in this annex for the activation of the emergency brake. The requirements in TSI LOC & PAS clause 4.2.5.3 and TSI SRT clause 4.2.5.8 apply correspondingly.

The following standard is accepted: UIC 541.

10.2.4 Emergency lighting

Vehicles must have emergency lighting. The requirements in TSI SRT clause 4.2.5.9 apply correspondingly.

The following standard is accepted: UIC 555.

10.3 Additional measures

The requirements in TSI SRT clause 4.2.5.5 apply correspondingly.

11 Servicing

11.1 Train cleaning facilities

11.1.1 Train external cleaning facilities

No specific requirements apply.

11.1.2 Train internal cleaning facilities

No specific requirements apply.

11.2 Train refuelling facilities

11.2.1 Waste water disposal system

No specific requirements apply.

11.2.2 Water supply system

No specific requirements apply.

11.2.3 Further supply facilities

On the national railway network, train heating posts are available, with three-phase 400 V 50 Hz, one-phase 1,000 V 16.7 Hz and/or one-phase 1,000 V 50 Hz power supply in selected places. The requirements in TSI LOC & PAS clause 4.2.11.6 apply correspondingly. All requirements apply to the whole combination of vehicles to be connected to the train heating post.

In order to use the three-phase 400 V 50 Hz train heating post (open case in CR LOC & PAS TSI clause 4.2.11.6) the vehicle's train heating plug must be circular 436-6 and have a pilot contact (L1-L2-L3-N-PE-pilot). The connection shall be in accordance with UIC 554-1:1979, plate IV.

In the case of 16.7 Hz systems, the voltage and frequency of the train heating post is expected to vary as stated in 8.2.1.3 adjusted for a transformation ratio of between 15:1 and 16.5:1 as described in EN 50160:2007 for 50 Hz systems.

Vehicles that are connected to a train heating post shall have automatic interlocking to prevent simultaneous connection of voltages from the train heating post, contact line and other sources of power. This requirement shall be verified by means of a technical and functional description. Specified manual operating procedures shall be established and observed where technical interlocking is incomplete or not yet established.

The requirements for over-harmonic and dynamic characteristics correspond to those described for the contact wire in clause 8.2.1.7.1 in this annex.

In order to ensure selectivity, the first peak value of the start-up current on connecting a train to a train heating post must not exceed 2.0 kA at 1,000 V. This shall be verified through making a minimum of 25 connections to a train heating post.

Maximum permitted power consumption from a single train heating post is stated by the infrastructure manager in the network statement.

11.2.4 Interface to refuelling equipment for non-electric rolling stock

No specific requirements apply.

12 Onboard control, command and signalling

12.1 Onboard radio system

Traction vehicles shall be equipped with a GSM-R 8W permanently installed train radio with exterior antennae for use in train operation and for emergency communication, so that the driver and the traffic control centre at all times have a reciprocal possibility of establishing rapid contact. The train radio must meet the requirements of the EIRENE standard.

In addition, a hand-held GSM-R telephone must be available, for use by the driver in situations requiring tasks to be performed outside the driver's cab.

12.1.1 Non-GSM-R radio system

Other radio communication systems may be used in addition to the GSM-R system in connection with shunting.

12.1.2 GSM-R compliant radio system

See clause 12.1 in this annex. No additional requirements apply other than those that follow from the EIRENE standard.

12.1.2.1 Text messages

No additional requirements apply other than those that follow from the EIRENE standard.

12.1.2.2 Call forwarding

No additional requirements apply other than those that follow from the EIRENE standard.

12.1.2.3 Broadcast calls

No additional requirements apply other than those that follow from the EIRENE standard.

12.1.2.4 Cab-radio-related requirements

The operational interface must be in a language that the user understands. No additional requirements apply other than those that follow from the EIRENE standard.

12.1.2.5 Network selection by external trigger

No additional requirements apply other than those that follow from the EIRENE standard.

12.1.2.6 General-purpose radio-related functions

No additional requirements apply other than those that follow from the EIRENE standard.

12.1.2.7 Primary controllers MMI functionality

No additional requirements apply other than those that follow from the EIRENE standard.

12.1.2.8 Use of hand-held units such as the cab's mobile radio

See clause 12.1 second paragraph in this annex. No additional requirements apply other than those that follow from the EIRENE standard.

12.1.2.9 Capacity of on-board GSM-R

No additional requirements apply other than those that follow from the EIRENE standard.

12.1.2.10 GSM-R/ETCS interface

No additional requirements apply other than those that follow from the EIRENE standard.

12.1.2.11 Interconnection and roaming between GSM-R networks

No additional requirements apply other than those that follow from the EIRENE standard.

12.1.2.12 Border crossing

A risk assessment for GSM-R frequency limitation of the bandwidth, installation of filters to limit disturbances and key management must be performed. Only manual procedures for GSM-R roaming are accepted. The EIRENE standard applies correspondingly.

12.1.2.13 GPRS and ASCI

No additional requirements apply other than those that follow from the EIRENE standard.

12.1.2.14 Interface between rolling stock driver's safety device, vigilance device and GSM-R onboard assembly

No additional requirements apply other than those that follow from the EIRENE standard.

12.1.2.15 Test specification for mobile GSM-R equipment

Where it cannot be documented that the GSM-R equipment is fully in compliance with the requirements in this sub-section, equipment must be subjected to a verification process as provided for by the system owner. This requirement only applies for equipment not yet tested and accepted for use.

12.1.2.16 Directed/automatic network selection

No additional requirements apply other than those that follow from the EIRENE standard.

12.1.2.17 Registration and deregistration

No additional requirements apply other than those that follow from the EIRENE standard.

12.1.2.18 GSM-R version management

See clause 12.1.2.15 in this annex.

12.2 Onboard signalling

12.2.1 National onboard signalling systems

Traction vehicles to be used on sections equipped with class-B automatic train control must have equipment that is compatible with the control system. Class B equipment approved for use in Norway is listed in TSI CCS Annex B.

Requirements for the STM module are specified in the Regulation on railway infrastructure § 3-12 and § 3-13.

12.2.2 Compatibility of signalling system with the rest of the train

In order to ensure technical compatibility and safe integration, steering and control equipment (class-B equipment) must be tested on integration of such equipment in the vehicle (integration testing). The infrastructure manager has supplementary rules on integration testing.

12.2.3 Compatibility of rolling stock with track infrastructure

12.2.3.1 Relationship between axle distance and wheel diameter

The requirements in TSI CCS Annex A appendix 1 apply correspondingly.

12.2.3.2 Metal-free space around wheels

The requirements in EN 50238 relating this area are applicable.

12.2.3.3 Metal mass of vehicle

No specific requirements apply.

12.2.4 ETCS cab signalling system

12.2.4.1 Awakening

No specific requirements apply.

12.2.4.2 Train categories

No specific requirements apply.

12.2.4.3 Performance requirements for onboard GSM-R equipment related to quality of service

No specific requirements apply.

12.2.4.4 Use of ETCS modes

No specific requirements apply.

12.2.4.5 ETCS requirements when vehicle is driven from outside cab

A comprehensive safety case is required for use of ETCS in the case the vehicle is remote controlled e.g. shunting.

12.2.4.6 Level crossing functionality

No specific requirements apply.

12.2.4.7 Braking safety margins

No specific requirements apply.

12.2.4.8 Reliability – Availability – Safety requirements

RAMS requirements for ETCS on board solutions are provided by the infrastructure manager.

12.2.4.9 Marker boards

No specific requirements apply.

12.2.4.10 Ergonomic aspects of the DMI

No specific requirements apply.

12.2.4.11 ETCS values of variables controlled outside UNISIG — Manual

No specific requirements apply.

12.2.4.12 KM conformance requirements

Risk assessment for Key Management control (ex. requirements about interfaces to change the crypto keys) is requested.

12.2.4.13 Requirements for pre-fitting ETCS onboard equipment

No specific requirements apply.

12.2.4.14 ETCS version management

No specific requirements apply.

12.2.4.15 Specification of ETCS variables

No specific requirements apply.

12.2.4.16 RBC — RBC interface

No specific requirements apply.

12.2.4.17 Additional requirements on locomotives and multiple units

No specific requirements apply.

12.2.4.18 Functionality and interfaces of staff protection systems to the signalling system

No specific requirements apply.

12.2.4.19 Interface with service brake

Risk assessment for interface between ETCS and train brake system is required

13 Specific operational requirements

13.1 Specific items to place on board

The vehicle shall be equipped with first aid kit for staff and passengers and equipment for short-circuiting track circuits. In order to improve self-rescue capabilities the vehicle shall have stored adequate equipment that facilitates evacuation. The relevant requirements in clause 10 in this annex apply correspondingly.

13.2 Occupational health and safety

No specific requirements apply other than those that follow from clause 9.2 in this annex.

13.3 Lifting diagram and instructions for rescue

The requirements in TSI LOC & PAS clause 4.2.12.5 apply correspondingly.

14 Freight-related items

14.1 Design, operation and maintenance constraints for the transport of dangerous goods

No specific requirements apply other than those that follow from the Regulations relating to overland transport of dangerous goods.

14.2 Specific facilities for the transport of freight

When specific facilities are used for transporting freight, the follow standard applies: UIC 576.

14.3 Doors and loading facilities

See clause 9.5.2 in this annex. The requirements in TSI WAG clause 4.2.2.4 apply correspondingly.

For doors and loading facilities, the following standard is accepted: UIC 576.

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