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Measures to ensure the technical compatibility of high-speed trains

Dispositions pour assurer la compatibilité technique des trains à grande vitesse

Bestimmungen zur Sicherung der technischen Verträglichkeit der Hochgeschwindigkeitszüge



UNION INTERNATIONALE DES CHEMINS DE FER
INTERNATIONALER EISENBAHNVERBAND
INTERNATIONAL UNION OF RAILWAYS

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IV - Operating

V - Transport stock

VI - Traction

VII - Way and Works

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Summary

This leaflet lists the rolling stock technical regulations that must be harmonised to ensure compatibility between high-speed trains on European infrastructure.

A high-speed train is understood to be any train suitable for running at speeds of 250 km/h or above.

The provisions of this leaflet apply to new high-speed trains.

1 - General

1.1 - Scope of application

This leaflet lists the rolling stock technical regulations that must be harmonised to ensure compatibility between high-speed trains on European infrastructure.

A high-speed train is understood to be any train suitable for running at speeds of 250 km/h or above.

The provisions of this leaflet apply to new high-speed trains.

1.2 - Terminology

1.2.1 - In this leaflet, the terms "high-speed train" and "high-speed stock" should be taken to cover both:

- an electric multiple unit trainset comprising intermediate vehicles between two end power cars (or one power car and a driving trailer),
- an electric multiple unit trainset with distributed traction power.

1.2.2 - The section set aside for conveying passengers may comprise:

- either individual vehicles each resting on two bogies (or sets of running gear),
- or a fixed-formation articulated set, where two adjacent vehicle body ends are borne by a single bogie (or set of running gear).

As such, in this and all other UIC leaflets concerned by this document, the term "coach" may be taken to refer to either of these two possibilities.

2 - Electrification systems

o 2.1 - Voltages, frequencies

The provisions of *UIC Leaflet 600* should be applied.

2.2 - Geometry of high-speed OHL

Reserved.

2.3 - Pantograph-OHL interaction

Reserved.

o 2.4 - Measures to be taken when passing from one power supply system to another

The provisions of *UIC Leaflet 611, point 4.3* should be applied.

o 2.5 - Emergency devices for raising pantographs

The provisions of *UIC Leaflet 611, point 3.5* should be applied.

o 2.6 - Power factor

The traction diagram should obtain a power factor that is approximately equal to 1 for single-phase alternative current and in any case be greater than 0,8, if the power drawn by the tractive unit at substation level is greater than half the nominal power of the tractive unit.

o 2.7 - Cut-out conditions for rolling stock circuit-breakers in relation to sub-stations

To guarantee proper discrimination between protections, in the event of a fault downline from the power car's circuit breaker, protection must be provided by the on-board circuit breaker rather than the sub-station breaker upline.

The cut-out power of the on-board breaker shall be higher than the maximum short-circuit power at sub-station level.

In a 25 kV system, the current breaking capacity of the on-board breaker shall be 12 kA.

In a 15 kV system, the current breaking capacity of the on-board breaker shall be (*reserved*).

o **2.8 - Conditions governing the use of high-speed trains on conventional or upgraded lines**

2.8.1 - Power limitations

On certain conventional or upgraded lines wired with direct current or even single-phase current, the power intake from the sub-station needs to be limited.

This limitation may be effected either using a manual selector or by an automatic control device.

2.8.2 - Equipotential line

Where high-speed trains are equipped with an equipotential line making it possible to balance voltages under 1,5 kV or 3 kV d.c., the railways shall specify the conditions for opening or closing this line.

3 - Signalling systems - Track to train link

3.1 - Signalling and automatic stopping systems

Reserved.

o 3.2 - On-board signal recorder

High-speed trains shall be fitted with an on-board event recorder to give a record of driving events (speed, signals, status of certain equipment, etc.).

Reserved.

o 3.3 - Automatic vigilance device

The provisions of *UIC Leaflet 641* shall apply, together with those in *UIC Leaflet 651, point 4.3.2.6*.

o 3.4 - Indicator equipment

High-speed trains shall have a central module on the driver's desk giving the speed indication and essential cab signalling information.

In-cab repetition of lineside signals and other features specific to each railway should be incorporated into a side module positioned next to the central module.

The dimensions of the space to be set aside for these modules are set out in *UIC Leaflet 651, point 4.3.1.3*.

o 3.5 - Track-to-train service link

This shall be as specified in *UIC Leaflet 651, point 4.3.1.3*.

R 3.6 - Public telephone

High-speed vehicles may be fitted with a public telephone operating on national GSM networks for those railways which use the GSM standard.

3.7 - Alarm devices (radio alarm, flashing headlights, etc.)

Reserved.

4 - Trainset design

4.1 - General running conditions

4.1.1 - Rolling stock gauge

- 4.1.1.1 - Single-deck high speed trains must comply with the UIC gauge in *UIC Leaflet 505-1*.
- 4.1.1.2 - Tilting high speed trains shall meet the gauge given in *UIC Leaflet 505-1, Appendix F* (Reserved for the calculation of pantograph clearance).
- R 4.1.1.3 - Double-deck high speed trains may comply with the GB gauge of *UIC Leaflet 506*, according to the terms of bi- or multi-lateral agreements.

○ 4.1.2 - Negotiation of curves

4.1.2.1 - Single curves

- For fixed formation trainsets:
 - The provisions of *UIC Leaflet 645, point 1* shall apply.
- For trainsets which do not have a fixed formation:
 - The power cars shall meet the requirements of *UIC Leaflet 645, point 2*.
 - The coaches shall meet the requirements of *UIC Leaflet 567, point 1.2.1*.

4.1.2.2 - S curves

High speed trains shall be able to run in S curves as specified in *UIC Leaflet 527-1*.

4.2 - Indications, markings and technical data on the trainset exterior

4.2.1 - Two cases can be considered:

- Fixed formation trainsets:
It is accepted that the provisions below only apply to end vehicles.
When the provision is obligatory for all the vehicles concerned in the trainset, the text is preceded by a dot •.
- Trainsets which do not have a fixed formation:
 - a. The power cars shall meet the requirements of *UIC Leaflet 640*.
 - b. The provisions below apply to all the other vehicles concerned in the trainset.

4.2.2 - The nature and dimensions of the inscriptions and markings for staff instructions to be applied directly on the vehicle are specified in Appendix **A - page 39**.

Appendix **B - page 40** specifies the location of the external inscriptions.

- 4.2.2.1 - • The inscriptions and markings must always be visible.

- **4.2.2.2** - • It is forbidden to give any different meaning to the inscriptions and markings.
 - **4.2.2.3** - The owning railway is left free to apply additional information.
 - This additional information shall always be placed at a reasonable distance away from the locations provided for the inscriptions and markings specified in point **4.2.3**.
 - **4.2.2.4** - • The inscriptions and markings specified in point **4.2.3** shall appear in the form of pictograms, if need be, with Latin characters and Arabic figures.
- 4.2.3** - The inscriptions and marks below, defined in point **4.2.2**, shall be applied in a very prominent manner on the vehicles:
- **4.2.3.1** - The sign of the railway to which the vehicle (or the trainset) belongs, in letters, with in addition, if appropriate, its emblem or logo.
 - **4.2.3.2** - • The identification marking of the vehicle.
 - R **4.2.3.3** - One of the following STI (Technical Specifications for Interoperability) signs, in accordance with *UIC Leaflet 580, Appendix 16*:
 - The sign 000/STI, in accordance with *UIC Leaflet 580, Appendix 16, Figure 1* to indicate that the coach (or the trainset)
 - a. meets the requirements of the TSI,
 - b. can run at the maximum speed indicated in the box on the left of the STI sign.
 - The sign 000/STI, in accordance with *UIC Leaflet 580, Appendix 16, Figure 2*, to indicate that the coach (or the trainset)
 - a. meets the TSI requirements,
 - b. can run at the maximum speed indicated in the box on the left of the STI sign,
 - c. meets the special TSI requirements of the railways on which the vehicle is authorised to run, and of which the initials (in accordance with the *RIC, Appendix I (see Bibliography - page 48)*) are indicated in the box on the right of the STI sign. A vehicle which on certain lines does not meet the special conditions of a railway required in the TSIs, shall carry in the box of the STI the sign * placed close to the symbol of this railway in accordance with *UIC Leaflet 580, Appendix 16, Figure 2*.

The STI sign can be applied to the coaches (or the trainsets) if they satisfy all the other conditions required for the signs to be applied.

 - **4.2.3.4** - For fixed formation high-speed trainsets, the total tare of the trainset including 100% of the total water supplies carried.

For trainsets which do not have a fixed formation, the tare of each vehicle including 100% of the total water supplies carried and the total mass in tonnes, with:

 - for the coaches, the number of seats, as specified in *UIC Leaflet 580, Appendix 9, Figure 4a or 4b*,

- for the baggage vans, the load limit, as specified in *UIC Leaflet 580, Appendix 9, Figure 4c*
- for coaches with a baggage compartment, the number of seats and the load limit in accordance with *UIC Leaflet 580, Appendix 9, Figure 4d*.

- **4.2.3.5** - For air brakes, the signs and inscriptions of *UIC Leaflet 580, Appendix 10* and *UIC Leaflet 545, Appendices 2, 7 and 8*, as well as the braked weight and the inscriptions specified in *UIC Leaflet 545, Appendix 3*.
- **4.2.3.6** - • For vehicles fitted with disc brakes, the instructions for checking the operation of the brake, as specified in *UIC Leaflet 541-3, point 1*.
- R **4.2.3.7** - The date of the last overhaul and the abbreviation of the workshop which did it using a sign from *UIC Leaflet 580, Appendix 11, Figures 1 or 2*.
- R **4.2.3.8** - For the electrical power supply, the inscriptions of *UIC Leaflet 552, Plates I and V*.
- **4.2.3.9** - On all junction boxes and plug rests of the train line, as well as on vehicles fitted with footsteps or seats with a height of more than 2000 mm above the top of the rails or ladders for which the end exceeds this dimension, close to these items, the warning signs in *UIC Leaflet 580, Appendix 12*.
- **4.2.3.10** - • For marking the filling and discharge devices for water tanks and their pipework, the signs defined in *UIC Leaflet 563, point 2*.
- **4.2.3.11** - • For marking the repeating devices for alarm signals when they are enclosed in external casings, the signs in *UIC Leaflet 545, Appendix 4*.
- R **4.2.3.12** - For pressure tight vehicles, a "(p)", in accordance with the *RIC code, plate 11, Figure 4*.
- **4.2.3.13** - • For coaches with sealed toilets, the sign in *UIC Leaflet 563, Appendix 18* to indicate the discharge nozzles.
- R **4.2.3.14** - For non-pressure tight vehicles which have sealed toilets, a "(wc)", in accordance with the *RIC code, Plate 11, Figure 5*.
- **4.2.3.15** - • The support points for lifting and re-railing are marked by the signs specified in the Figures of *UIC Leaflet 581, Appendix 1*.

4.3 - Masses

○ 4.3.1 - Maximum mass per axle - m(e)

The maximum static mass per axle shall be 17 tonnes.

In the case of powered axles, exceptions can be granted depending on the running speed, up to the following limits:

for $V \geq 260$ km/h, $m(e) \leq 17$ t/axle,

for $220 \leq V < 260$ km/h, $m(e) \leq 18$ t/axle.

○ 4.3.2 - Distribution of masses

Masses must be distributed such that the following conditions are met:

○ 4.3.2.1 - Power cars

1. The average mass of the power cars calculated using a statistically representative sample of the order, increased by the value of the standard deviation, shall remain less than M in the following equation:

$M = n(e) \cdot m(e)$, where

n(e) : number of axles on the power car

m(e) : maximum permissible axle-load

2. The mass of each axle on the power car shall not deviate by more than $\pm 1,5\%$ from the average mass of the axles of that power car. This is strictly applicable to power cars where the mass m is greater than (M - 0,2 tonne).

For power cars in which the mass m is less than (M - 0,2 tonne), it is permissible to deviate by +2% from the average mass of the axles of that power car.

3. No axle on any power car may exceed the upper limit of m(e) by more than 2%.

○ 4.3.2.2 - All vehicles

When empty and in running order, the difference in load between one rail and the other shall not exceed 600 kg on the bogie of the whole trainset where the imbalance is most severe.

4.4 - Emergency assistance for trains

○ 4.4.1 - Objectives

It must be possible for a high speed train to:

- be assisted by and assist a vehicle fitted with conventional buffing and draw gear as defined by the UIC rules,
- be assisted by and assist a vehicle fitted with another type of coupler meeting the provisions of the *standard EN XXXXX (to be drafted)* which defines the geometry and locking characteristics for mechanical coupling between two vehicles not equipped with the UIC coupler.

If any additional devices (emergency coupler) are necessary in order to meet the above provisions, their characteristics and performance must conform to the requirements of *standard EN YYYYYY (to be drafted)*.

NB : In the absence of applicable standards, these provisions shall apply on a provisional basis. They concern the definition of an emergency coupler that is compatible with an assisting vehicle fitted with a UIC coupler.

4.4.2 - General

- 4.4.2.1 - In order for assistance to be provided for high-speed trains, it must be possible to fit them with an emergency coupler enabling the trainset to be coupled to a locomotive fitted with a draw hook.

Two emergency couplers shall be provided on each high-speed train. These couplers shall be placed either in the end vehicles or in the two vehicles adjacent to the end.

- **4.4.2.2** - The space set aside for stowing the emergency coupler shall be designed so that the coupler is readily accessible, even on service tracks.

The emergency coupler shall be accessible from both sides of the trainset, or from one side only but in such a way that the couplers are diagonally opposed at each end of the trainset.

- **4.4.2.3** - It shall be compact and of lightweight design so that two people can carry it and fit it within 10 minutes. The maximum mass of each of its component parts must be less than 50 kg.
- **4.4.2.4** - A simple grip system shall be provided for handling and assembly.

R 4.4.2.5 - It is recommended that handles be fitted to facilitate handling.

- **4.4.3 - Fitting**

4.4.3.1 - It shall be possible to fit the emergency coupler manually onto the UIC hook on the rescue vehicle.

4.4.3.2 - At the moment of engagement, the emergency coupler shall be able to engage mechanically with the service coupler of the high-speed train to be rescued under all load conditions.

4.4.3.3 - The emergency coupler must permit coupling on straight track and on curves with a minimum radius of 150 m.

4.4.3.4 - It must be possible to connect the main brake and air supply pipes of the rescue vehicle and the high-speed train one to the other respectively.

- **4.4.4 - Mechanical stresses**

4.4.4.1 - The maximum engagement speed must be less than or equal to 2 km/h. The emergency coupler shall be able to withstand engagement at this speed at least.

4.4.4.2 - The emergency coupler must be able to accommodate tensile and compressive forces of at least 400 kN. For forces of this size, the yield strength of the materials used shall not be exceeded.

4.4.4.3 - It shall be possible using the emergency coupler to start the train from a halt on the maximum permissible gradient for this type of vehicle, when the high-speed train is being hauled or propelled.

4.4.4.4 - The draw hook on the rescue vehicle is not designed to accommodate propelling forces. The emergency coupler must therefore be designed in such a way that the compressive forces are conducted to a zone of greater resistance (headstock, buffers, etc.) on the rescue vehicle.

- **4.4.5 - Running conditions**

4.4.5.1 - It shall be possible to negotiate curves of 125 m minimum radius.

4.4.5.2 - A minimum speed of 60 km/h should be guaranteed when the high-speed train is being hauled and 30 km/h when it is being propelled.

4.4.5.3 - When the rescue operation involves propelling the high-speed train, an audio link shall be set up between the rescue vehicle and the driving cab of the high-speed train.

4.5 - Strength and safety of vehicle bodies

o 4.5.1 - Static strength of vehicle bodies

High-speed trains must conform to the requirements of draft *standard EN 12663* (see [Bibliography - page 48](#)), category P-I.

However, if it is not possible to split the train consist in normal service, the requirements of category P-II may be adhered to, provided compatibility with the provisions of point [4.5.3 - page 11](#) is guaranteed.

These provisions are subject to possible review following the standardisation work on crashworthiness in TC256/WG2.

The maximum payload shall be equal to one of the two following values:

$m_2 = \text{number of seats (not including folding seats)} \times 2 \times 80 \text{ kg}$

or

$m_2 = \text{number of seats (not including folding seats)} \times 80 \text{ kg} + \text{surface area of the aisle and vestibule areas (m}^2\text{)} \times 4 \times 80 \text{ kg}$

o 4.5.2 - Component parts in coaches

The provisions of *UIC Leaflet 566*, points 2.1.1.2, 4.2.1, 4.2.1.1, 4.2.1.2, 4.2.1.3 and 4.2.1.6 shall apply.

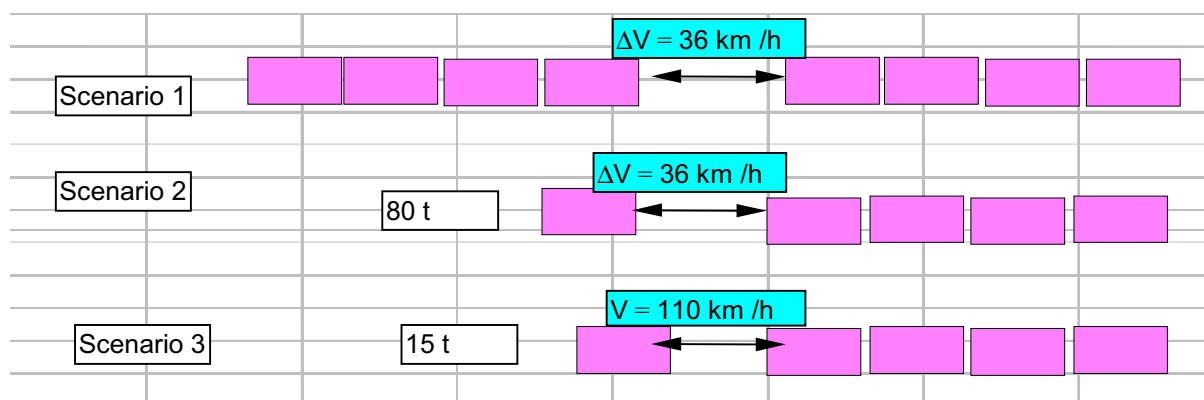
4.5.3 - Crashworthiness of vehicle bodies

4.5.3.1 - Reference accidents

NB : Any request to amend this text should be lodged with the Rolling Stock TSI (Technical Specifications for Interoperability) working group.

Three reference accidents are to be considered:

- Scenario 1
Collision between two identical high-speed trainsets at a relative speed of 36 km/h.
- Scenario 2
Collision between a high-speed trainset and a railway vehicle fitted with side buffers at a relative speed of 36 km/h. The railway vehicle shall be a four-axle freight wagon weighing 80 t, as specified in *UIC Leaflet 571-2*.
- Scenario 3
Collision at a level crossing and a relative speed of 110 km/h with a road vehicle weighing 15 t represented by a rigid mass with a vertical impact surface area equivalent to the front-end surface area of a railway vehicle.



O 4.5.3.2 - Specifications

- Under scenario 1, the driver's cab must not sustain deformation.
- Under scenarios 2 and 3, the driver's cab may sustain deformation. In the rear of the cab a rigid survival space at least 0,75 m long shall be provided for the driver and the access to the technical compartment or passenger area behind the cab left free (*UIC Leaflet 651, point 2.2.4*).
- 6 MJ of energy shall be dissipated, at least 75% of it at the head of the first vehicle in the train, the rest being distributed at each inter-coach zone along the train.
- The strength of the passenger compartments in the leading vehicle and the driver's survival structure shall be enhanced. The sections marking the limits of these areas must be designed to have a static strength at least 1500 kN greater than the average crush force in the crumple zones for each of the three collisions in question.
- The strength of vehicles other than the leading vehicle must be consistent with that of the end vehicles in the train.
- The forces that arise during the crushing of the crumple zones must not lead to average decelerations of more than 5 g in the passenger compartments of the end vehicles or in the driver's survival structure.
- Special fittings must be used on the head of the train and between each pair of vehicles to prevent climbing.

The procedures for validating the technical solutions adopted through testing and simulation are set out in *CEN standard XXXX*.

4.5.4 - Aerodynamic loads on vehicle body structures

The greatest pressure variations to which the body structure is subject occur when trains pass one another in tunnels.

The pressure values encountered depend on a number of factors:

- tunnel cross-section,
- tunnel length,

- vehicle cross-section,
- shape and length of the passing trains,
- speed at which the trains pass.

The body structures must be able to withstand the following aerodynamic loads:

(Reserved).

By way of example, the following criteria are required of DB AG rolling stock:

- Valid for operations involving passing trains, each running at 330 km/h
- Typical tunnel cross-section: 82 m²
- Power car cross-section: 10 m²

Max. speed (km/h)	Max. excess pressure (Pa)	Max. depression (Pa)	Annual frequency	
280 passing 280	3000	-5100		
300 passing 300	3300	-5400		
330	1000 to 1800	-3000 to -4000	112 200	Operations without trains passing
330 passing 330	1950 to 2600 2600 to 3250 3250 to 3900 3900 to 4550 4550 to 5150	-3000 to -4000 -4000 to -5000 -5000 to -6000 -6000 to -7000 -7000 to -8100	5595 8051 16 103 6199 1852	Operations involving trains passing

4.6 - Sealing against pressure waves

o 4.6.1 - Objectives

High-speed trainsets running on railway networks where the lines include tunnels which cause large variations of pressure, must be designed to ensure that the criteria governing comfort from pressure variations are met.

4.6.2 - Conditions for meeting pressure variation comfort criteria

The conditions and method for verifying a train's pressure-tightness described in this section are subject to change in the light of the results obtained from work in ERRI C218 and C223.

o 4.6.2.1 - Conditions to be met when running at the maximum line speed

On the basis of digital pressure measurements every 1/100th second, the following conditions (which are considered as limit values from the point of view of comfort) must be satisfied in the vehicle interior:

- $\Delta P/\Delta T \leq 500 \text{ Pa/s}$

where $\Delta P/\Delta T$ = pressure variation per unit of time

- $\Delta P \leq 800 \text{ Pa}$

where ΔP = maximum variation in pressure over a 3 second period

- $\Delta P \leq 1000 \text{ Pa}$

where ΔP = maximum variation in pressure over a 10 second period

- $\Delta P \leq 2000 \text{ Pa}$

where ΔP = maximum variation in pressure over a period of more than 60 seconds

○ 4.6.2.2 - Static testing on the test bench for resistance to pressure and suction

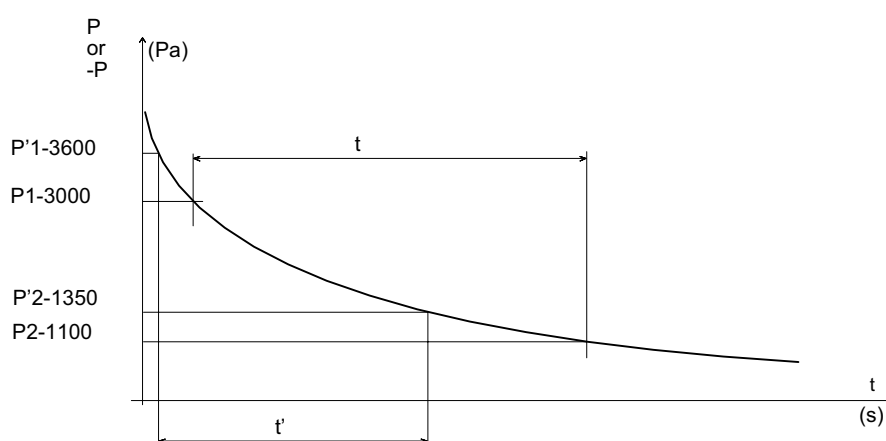
The tests shall be organised as follows:

A single coach, fitted with its inter-coach gangways and sealed at the ends at gangway level, is blown up to an excess pressure P_1 with the air-conditioning on and the pressure-tightness systems active. The incoming air is then cut off and the time t taken for the pressure to fall to the value P_2 is measured.

The values of P_1 and P_2 may be replaced by P'_1 and P'_2 in which case the time t should be replaced by t' .

The same test is carried out under suction.

The two acceptance criteria are as follows:



where $t_i > 18 \text{ s}$.

Design measures shall be taken to ensure that these criteria are met throughout the life cycle of the coach.

○ 4.6.3 - Pressure-tightness of power cars

The provisions of *UIC Leaflet 651, point 2.9.1.3* shall be applied.

R 4.6.4 - Sealing system activation

The sealing system shall be activated automatically:

- either through on-board sensors detecting a variation in pressure,
- or through a positional beacon compatible with the signalling systems.

o 4.7 - Aerodynamic characteristics

The shape and general exterior architecture of high-speed trains shall be chosen in such a way as to reduce to a minimum the pressure waves created when trains pass in tunnels and/or when entering and leaving tunnels, the aerodynamic effects in the outside environment, drag, sensitivity to side-winds, etc.

Criteria that enable these principles to be observed (*Reserved: this text will be filled out in the light of progress made with the work of the Rolling Stock TSI drafting group, ERRI Committees C218 and 223 and TC256/WG6*).

o 4.8 - Train lamps and exterior lighting - Power car and driving trailers

Apply the provisions of *UIC Leaflet 651, point 4.3.2.5*.

5 - Wheel-rail contact

5.1 - Wheel profile - Wear criteria - Bogies and running gear

o 5.1.1 - Wheel profile - Wear criteria - Bogies and running gear - Coaches

The provisions of *UIC Leaflet 510-2, 515-0, 515-1, 515-3, 515-4 and 515-5* shall be applied.

R 5.1.2 - Wheel profile - Wear criteria - Bogies and running gear - Power cars

The provisions of *UIC Leaflet 515-3, 515-5, 615-0, 615-1 and 615-4* shall be applied.

o 5.2 - Testing and approval of railway vehicles from the standpoint of their dynamic behaviour (safety - track fatigue - running quality)

The provisions of *UIC Leaflet 518* shall be applied.

o 5.3 - Detection of bogie instability

To allow power and speed to be reduced in the event of instability, high-speed rolling stock must be fitted with an approved system for detecting bogie instability on a permanent basis. It is acceptable for the system to be activated only when running at speeds in excess of 220 km/h (i.e. for high-speed operations).

o 5.4 - Hot axle-box detection

High-speed trains must have a system for monitoring axle-box temperatures, which may be installed at the trackside or on board the train. The equipment must be able to act without fail on axle-box anomalies within the time it usually takes for the temperature to increase and trigger a reduction in speed or emergency braking through a series of warning messages and then an alarm (in stages if necessary).

6 - Traction and braking

o 6.1 - Performances and starting

The maximum service speed shall be at least 250 km/h on new lines and 220 km/h on existing or upgraded lines. At maximum speed, the residual acceleration of a high-speed train on a flat, straight line shall be 0,05 m/s².

High-speed trains may be operated on the new lines of the railways concerned as well as on their existing or upgraded lines, to provide coverage of a broad geographical area.

To ensure proper compatibility with other types of traffic, the average accelerations taken over the time spent on straight, flat track shall be equal to at least:

- 0,48 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.

o 6.2 - Downgraded conditions

To ensure availability and smooth running of operations, a multiple-unit set carrying its normal load and with one motor bogie out of action shall be able to start on a maximum gradient of 35‰ with a residual acceleration of 0,05 m/s². It shall be possible to retain the starting conditions for 10 minutes and the speed of the train shall be able to reach 60 km/h.

NB : The normal mass of a train comprises the mass of the running train, to which should be added the mass of the passengers (number of seats x 80 kg) and 1000 kg per baggage compartment.

The traction equipment shall be made up of several, fully independent traction modules, the only parts common to more than one module being the pantograph, the circuit-breaker, the transformer and some configuration components.

Should several traction modules fail, the train must be able to continue its journey without damage to the equipment. The maximum number of failed traction modules to take into account should correspond to half the number of modules in a given trainset.

o 6.3 - Adhesion forces

To ensure high traction availability, the adhesion required shall not exceed the maximum values given below:

- when starting and at very low speed: 20%,
- at 100 km/h: 17%,
- at 200 km/h: 13%,
- at 300 km/h: 9%.

The traction equipment must be able to apply these coefficients under poor weather conditions.

The wheel slip prevention system must ensure that the maximum force between wheels and rails is obtained, for the adhesion conditions available.

6.4 - Conditions to guarantee brake safety

Reserved.

6.5 - Performance of the WSP equipment

Reserved.

6.6 - Brakes not based on adhesion

Reserved.

7 - Passenger and staff safety

7.1 - Operation of the doors

7.1.1 - Preliminary remark

Access doors to high-speed trains shall be designed to meet certain characteristics in terms of their working, safety, reliability, maintainability and comfort.

This leaflet contains only the basic principles to be observed when defining access doors, in keeping with the following criteria:

- passenger safety,
- passenger comfort,
- safety of train staff.

This leaflet does not cover the technical solutions that enable the above criteria to be met.

o 7.1.2 - General

With the exception of the paragraphs included in this leaflet, the provisions of *UIC Leaflet 560* are applicable.

7.1.3 - Passenger safety

7.1.3.1 - Terminology

7.1.3.1.1 - Bolted door: a door held closed by a mechanical shutting device in which a bolt slides into engagement.

7.1.3.1.2 - Locked door: a door held closed by its motor.

7.1.3.1.3 - Inoperative door: a door immobilised in the closed position by a mechanical lock that can only be operated using a female key as per the RIC.

o 7.1.3.2 - Locking

7.1.3.2.1 - All access doors shall be closed and locked before the train departs.

This shall be done from a centralised control operated by the train driver and/or train crew member.

7.1.3.2.2 - The door at which the locking control is operated by the crew member can remain open and shall have a system enabling it to be closed before the departure of the train. This system may be the push-button device used by passengers to close the door (see point 7.1.4.2 - page 21).

7.1.3.2.3 - Confirmation that the doors are closed and locked shall be given by a locking command triggered by a speed of around 5 km/h, including the door where the crew member operated the locking control if that door has not yet been closed. A second speed level (15 km/h for example), independent of the first, is necessary to ensure that the doors are safely closed.

7.1.3.2.4 - An indication of any faulty door closure must be given by means of a signal in each driving cab and each passenger vehicle (or at some central point).

○ 7.1.3.3 - Unlocking of access doors

7.1.3.3.1 - The access doors must remain locked as long as the driver has not given the unlocking command and the speed is above 5 km/h.

7.1.3.3.2 - When the train has come to a halt, the access doors shall be unlocked by the driver down one side of the train only.

7.1.3.4 - Emergency opening device

○ 7.1.3.4.1 - A mechanical opening device shall allow the access doors to be unlocked and opened in an emergency, irrespective of the electrical and pneumatic condition of the door.

○ 7.1.3.4.2 - When this device is operated by passengers in an emergency, a seal shall be broken. The train crew must however be able to activate this device at any time using a female key as specified in RIC without damaging the seal.

○ 7.1.3.4.3 - This device cannot function on an inoperative door.

○ 7.1.3.4.4 - It shall be possible to operate this device whatever the speed of the train.

○ 7.1.3.4.5 - A signal shall be given to the driver and train manager when this device is operated.

○ 7.1.3.4.6 - A local signal, acoustic or optical, shall be triggered whenever the device is used.

R 7.1.3.4.7 - This device may be fitted with a time-switch. Where this is the case, the door should return to its initial state at the end of the time-switch period, which shall be long enough to allow for the evacuation of passengers.

○ 7.1.3.5 - Inoperative doors

7.1.3.5.1 - A manual device for the use of the train crew shall be provided to render inoperative an access door that does not open and/or close properly.

7.1.3.5.2 - It must be possible to activate this device from both inside and outside the vehicle.

7.1.3.5.3 - This device isolates the door from any mechanical, electrical or pneumatic action which might be exerted on it to make it open. An inoperative door must maintain the same level of resistance to in-service stresses (without the train having to slow down) as a normally-operative door.

7.1.3.5.4 - When an access door is rendered inoperative, passengers shall be warned of this by an appropriate form of signal.

7.1.3.5.5 - An inoperative door shall be excluded from the indicating system defined in point **7.1.3.2.4** - page 20 of this leaflet.

7.1.3.6 - Obstacle return

○ 7.1.3.6.1 - When a door that is closing automatically encounters an obstacle before being fully closed, a return device shall be provided to bring the door back to its open position.

O 7.1.3.6.2 - This return function shall be linked to a time switch. At the end of the delay period, the automatic closing sequence shall be restarted.

O 7.1.3.6.3 - The obstacle return device shall be deactivated when the distance remaining to closure is less than 10 mm, including any possible crushing of the lining. It shall remain deactivated for as long as the door remains closed.

R 7.1.3.6.4 - If the system has detected an obstacle three times in succession, it is acceptable for the door to remain open and not recommence its closing cycle.

7.1.3.7 - Safety of entrance steps

O 7.1.3.7.1 - Each step, as well as its supporting elements, shall be able to withstand a force of 250 kg distributed across the depth of the step and over a width of 500 mm. This force shall be applied centrally to the step where the access width is less than or equal to 1100 mm.

O 7.1.3.7.2 - A manual device shall be provided to fold away the retractable step.

R 7.1.3.7.3 - A manual device may be provided to fold out the retractable step.

O 7.1.3.7.4 - When the door is closed, there shall be no access steps that can be used from the outside, nor any zone that might allow a person to get a foothold or stand.

O 7.1.3.7.5 - When the door is closed, no exterior fitting (handrail, handle, etc.) shall enable a person to grab hold and hang on to the train.

7.1.4 - Passenger comfort

O 7.1.4.1 - Access space

The access space in a door shall be at least 800 mm wide and at least 1,90 m high at any point on the entrance step.

O 7.1.4.2 - Push-buttons

The door shall be fitted with the following:

- on the inside, a push-button to open the door and one to close it,
- on the outside a push-button to open the door.

Push-buttons shall be located on the door itself or on the coach body at the following heights:

- on the inside, between 1200 and 1400 mm above floor level,
- on the outside, between 1520 and 1790 mm above rail level.

O 7.1.4.3 - Pressure-tight seal

The doors, locks and their mechanisms, as well as the joints in the access doors, shall be designed and built to ensure a pressure-tight fit between the door and the frame during movements caused by pressure waves.

○ **7.1.4.4 - Weather-tight seal**

Access door joints shall be sealed against penetration by air, water and snow. They shall be designed to ensure that the door will function properly under all weather conditions.

○ **7.1.4.5 - Thermal insulation**

The door leaf and its seals shall provide thermal insulation of 3 W/m² for 1°C of difference.

○ **7.1.4.6 - Sound-proofing**

The door leaf and its seals shall provide average sound attenuation of at least 17 dB(A). The emission spectrum is of the white or pink noise type.

○ **7.1.4.7 - Signs**

The access door control devices (including those for the emergency door control) shall be indicated using appropriate signs, luminous or otherwise. An acoustic device installed in each vestibule area shall operate from the moment the locking procedure is activated until the last door on the vestibule is closed.

7.1.4.8 - Entrance steps: general characteristics

○ **7.1.4.8.1 -** The provisions of *UIC Leaflet 560* shall apply, with the following exceptions:

- *point 4.1.4* is replaced by point 7.1.4.8.2 below,
- *point 4.2.4.1* is replaced by point 7.1.4.8.3 below,
- *point 4.2.5* is replaced by point 7.1.4.8.4 below.

○ **7.1.4.8.2 - Compatibility between entrance steps and platforms of different heights** - The entrance steps of all high-speed trains must be adjusted to the platform heights of 550 mm and 760 mm above rail level, as defined in Appendix C - page 42.

R **7.1.4.8.3 - Compatibility between entrance steps and platforms of different heights** - For all trains that are to operate through the Channel Tunnel, it is recommended that the entrance steps be adjusted to the emergency platform height of 525 mm as defined in Appendix C.

○ **7.1.4.8.4 -** The unmasked depth of each step shall be at least 190 mm.

○ **7.1.4.8.5 -** The distance from one step to the next (step height) shall be between 190 and 220 mm.

○ **7.1.4.8.6 -** In entrances with 2 steps, (i.e. 3 levels), the nosing of each level shall be inclined to the horizontal by no more than 45° ± 2°.

○ **7.2 - Fire protection**

7.2.1 - Fire protection - Coaches

Pending publication of the future *European standard EN 45545* (see *Bibliography - page 48*), bi- or multilateral agreements may be concluded based on compliance with a national standard and with *UIC Leaflet 564-2*.

7.2.2 - Fire protection - Power cars

The provisions of *UIC Leaflet 642* shall be applied.

7.3 - Alarm signal

Reserved.

o 7.4 - Materials and products prohibited in rolling stock design

High-speed trains are subject to the same hygiene and safety regulations as conventional stock. They shall comply with the appropriate provisions of current legislation.

o 7.5 - Emergency exits

7.5.1 - Emergency exits - Coaches

7.5.1.1 - Positioning of emergency exits - Vehicles shall have a minimum number of emergency exits on each side. The following rules apply.

- the distance to be covered between any seat and an emergency exit must be less than 16 m,
- the number of emergency exits per vehicle must be at least 2 for less than 40 passengers and at least 4 for more than 40 passengers,
- the emergency exits must provide an access space of at least 700 x 600 mm,
- the emergency exits must not be located in the deformable crumple zones designed to improve crashworthiness.

7.5.1.2 - Operation of emergency exits - In an emergency, it must be possible to leave the train in one of the following ways:

- through the windows, by pushing out the window or pane or by breaking the glass,
- through the compartment doors, by rapid unmounting of the door or breaking the glass,
- through the access doors, by pushing out the pane or breaking the glass.

7.5.1.3 - Windows fitted as emergency exits must be made of tempered or laminated glass.

Where tempered glass is used, the coaches shall be equipped with hammers to break the glass, as described in *UIC Leaflet 564-1, point 5*.

Where laminated glass is used, evacuation is possible by:

- either pushing out the pane,
- or using special laminated glass that can be broken with a hammer, requiring little time to get through.

7.5.1.4 - Signs - The position of the emergency exits shall be indicated to passengers by means of appropriate signs.

7.5.1.5 - High-speed trains shall be fitted with emergency equipment to enable passengers to be evacuated from the access doors when the train is not in a station (e.g. ladders or step-ladders).

7.5.2 - Emergency exits - Power cars and driving trailers

The provisions of *UIC Leaflet 651, points 2.2.4 and 2.7.2* shall be applied.

7.6 - Safety glass

7.6.1 - Safety glass - Coaches

- **7.6.1.1** - The coaches of high-speed trains shall be fitted with safety glass both inside and out. This includes the glass used for interior fittings, like mirrors.

7.6.1.2 - The term safety glass includes both tempered and laminated glass.

- **7.6.1.3** - Where windows are double-glazed, both panes shall be of safety glass.

- **7.6.2 - Safety glass - Power cars and driving trailers**

The provisions of *UIC Leaflet 651, points 2.7.3 and 2.7.4* shall be applied.

- **7.7 - Minimum functions to be provided in the event of electrical power supply failure**

Specific measures shall be taken to ensure that in the event of a high-voltage power failure a number of functions retain a degree of autonomy.

Reserved.

8 - Driving cab and staff notices

o 8.1 - Cab ergonomics

The provisions of *UIC Leaflet 651* shall be applied.

o 8.2 - Driver's desk - Positioning of controls

The provisions of *UIC Leaflet 651, point 4* shall be applied.

8.3 - Signs and notices for staff

o 8.3.1 - The following staff notices shall be placed inside vehicles.

R 8.3.1.1 - An inventory of accessories

If possible the inventory shall be placed inside the control cubicle of the electrical equipment.

o 8.3.1.2 - When the devices to re-engage the alarm signal are enclosed in a box this shall carry the sign indicated in *UIC Leaflet 545, point 5*.

o 8.3.1.3 - The number of the vehicle on each side of the entry vestibules.

o 8.3.1.4 - The signs indicated in *UIC Leaflet 440, point 5.2*, on the doors of the cubicles where the public address installations are located.

o 8.3.2 - The signs and notices for drivers shall conform to the requirements of *UIC Leaflet 640, point 3, 4 and 5*.

8.4 - Safety against high-voltage contact

o 8.4.1 - Access to high-voltage installations - When running, stationary and in maintenance workshops

Access to high-voltage installations, including the train cable, shall only be permitted once all risk to drivers and staff handling the train cable connectors has been neutralised.

The safety measures provided should not just concern the power supply from the high-voltage network but also other risks resulting from:

- untimely power feed,
- residual voltages,
- induced voltages.

8.4.2 - Safety measures

The provisions of *UIC Leaflet 611* shall be applied.

9 - Environment

o 9.1 - External noise

9.1.1 - When train is running

The maximum values permitted in terms of equivalent noise level emission when a high speed train passes ($L_{Aeq, tp}$) are measured at a distance of 25 m from the centre of the track and 3,5 m above the rail level.

$L_{Aeq, tp} \text{ max} = 91 \text{ dB(A) at } 300 \text{ km/h}$

- The track shall be in good condition, a good state of maintenance and, if possible, optimum condition as far as the roughness is concerned.
If the value found exceeds the above limit on a track in a good maintenance condition, the test shall be repeated on track that has been subject to grinding.
This track shall be formed of concrete sleepers on a ballast bed and UIC 54 or UIC 60 rail (depending on the track available). The sleepers can be monobloc or twin block concrete sleepers.
- The measurements shall be made on a sample of several trainsets representative of the population concerned; each trainset should have run at least 10 000 km.
The value to compare with the limit value $L_{Aeq, tp} \text{ max}$ is the mean of the values $L_{Aeq, tp}$ measured for each trainset.
- The other test arrangements are as described in *CEN standard 165E* (see Bibliography - page 48).

9.1.2 - With train stationary

The weighted equivalent acoustic pressure level $A(L_{Aeq, T})$ on a continuous basis for a duration T of 30 seconds during station stops or time spent in maintenance centres, measured at a distance of 7,5 m from the track centre and at a height of between 1,2 and 3,5 m above rail level, without obstruction, shall be:

$L_{Aeq, T} \leq 65 \text{ dB(A)}$ with all auxiliary equipment operational and on full power along the full length of the train.

The weighted equivalent acoustic pressure level $A(L_{pA \text{ max}})$ on an intermittent basis for a duration T of 30 seconds during station stops or time spent in maintenance centres, measured at a distance of 7,5 m from the track centre and at a height of between 1,2 and 3,5 m above rail level, without obstruction, shall be:

$L_{pA \text{ max}} \leq L_{Aeq, T} + 5 \text{ dB(A)}$.

9.1.3 - On starting up

The weighted equivalent acoustic pressure level $A(L_{pA \max})$ measured at a distance of 7,5 m from the track centre and at a height of between 1,2 and 3,5 m above rail level, without obstruction, shall be:

$L_{pA \max} \leq 80$ dB(A) when passing in front of the measuring microphone, with the end of the train initially at a standstill 20 m from the measuring microphone.

o 9.2 - Electromagnetic compatibility

High speed trains shall be designed and built to be electromagnetically compatible with any equipment, installations and public or private systems with which they are liable to interfere.

9.3 - Ground-borne vibrations

Reserved.

o 9.4 - Environmentally-dangerous materials and products (CFCs, halon, pyralene, etc.)

High speed trains are subject to the same rules as conventional stock where hygiene, passenger safety and environmental protection are concerned. They shall comply with the appropriate current legislation.

10 - Passenger comfort

10.1 - Dynamic comfort

The comfort indices, evaluated using the simplified method set out in *UIC Leaflet 513*, shall be: $N_{MV} < 2$ (in accordance with the scale defined in *UIC Leaflet 513*).

CEN standard ENV 12299 (see [Bibliography - page 48](#)), currently at the enquiry stage, will replace *UIC Leaflet 513* with a new definition of the method to be used for evaluating passenger comfort in railway vehicles.

10.2 - Acoustic comfort

10.2.1 - Noise levels in the areas designed for passenger use shall not exceed the mandatory values indicated below, irrespective of the type of vehicle (i.e. with or without compartments). Measurements should be made on track in good maintenance condition. The doors shall be closed.

10.2.2 - Similarly, it is recommended that the noise levels labelled "target" below should be reached:

Maximum running speed km/h	RUNNING ON OPEN TRACK noise level in dB(A) ^a			RUNNING IN TUNNELS ^b noise level in dB(A) ^a		
	At centre of passenger areas 1st and 2nd class	Vestibule areas	Inter-coach gangway	At centre of passenger areas 1st and 2nd class	Vestibule areas	Inter-coach gangway
300	68 Target 65	80 Target 75	82 Target 80	75 Target 72	85 Target 82	87 Target 85
250	65	75	80	73 Target 70	82 Target 80	85 Target 82
Stationary with air-conditioning and other equipment running	55	60	60	-	-	-

a. Measurements made at a height of 1,60 m above floor level.

b. Refers to tunnels with single track (section 55 m² cross-section) and double-track (90 m² cross-section).

10.2.3 - Noise levels at the ends of passenger areas shall not exceed those obtained at the centre of these areas by more than 2 dB(A).

10.3 - Lighting

The provisions of *UIC Leaflet 555* shall be applied. The provisions of point [9 - page 26](#) of this leaflet are subject to revision in the light of the Passenger Commission's position on point [7.7 - page 24](#).

10.4 - Thermal comfort (air-conditioning)

Air-conditioning is mandatory in high-speed vehicles.

The provisions of *UIC Leaflet 553* shall be applied.

10.5 - Seats

In order to offer a high standard of comfort, it is recommended that the following indications be observed.

R 10.5.1 - Leg room

For definitions and dimensions see Appendix D - page 43.

10.5.1.1 - When the seats are face to face, the leg room provided should meet one of the two following requirements:

- The leg room, calculated as the distance between the seat backs at the base of the seats (dimension "L" as specified in Figure 4 - page 43 of Appendix D), should be greater than:
 - 1450 mm in 1st class,
 - 1300 mm in 2nd class.
- The free space at knee level (dimension "B" as specified in Figure 6 - page 44 of Appendix D) measured at the base of the seats should be greater than:
 - 330 mm in 1st class,
 - 180 mm in 2nd class.

10.5.1.2 - When the seats are arranged in rows, the leg room provided should meet one of the two following requirements:

- The leg room at the base of the seats (dimension "J" as specified in Figure 5 - page 43 of Appendix D) should be greater than:
 - 770 mm in 1st class,
 - 680 mm in 2nd class.
- The free space at knee level (dimension "A" as specified in Figure 6 of Appendix D) measured at the base of the seats should be greater than:
 - 210 mm in 1st class,
 - 120 mm in 2nd class.

R 10.5.2 - Seats dimensions

Definition of measurements see Appendix E - page 45.

10.5.2.1 - Height of the seat - The seat should be between 410 and 450 mm above the floor (dimension "h" as specified in Appendix E).

10.5.2.2 - The distance between arm rests for each seat should be at least:

- 500 mm in 1st class,
- 450 mm in 2nd class.

10.5.2.3 - The depth of the seats (dimension "a" as specified in Appendix E - page 45) at the base of the seat should be more than 430 mm.

R 10.5.3 - Inclination of seats

Definition of the dimensions see Appendix E.

10.5.3.1 - Inclination of the seat back

10.5.3.1.1 - To improve the standard of comfort in both classes, the angle of inclination of the seat back should be adjustable.

In the normal (upright) position, the angle " β " should be between 18° and 25°.

In the reclined position, the angle " β " should be between 28° and 38°.

The angle " β " is defined in Appendix E.

10.5.3.1.2 - The adjustable range of the seat back can be reduced in compartments and when seats are positioned face to face.

10.5.3.2 - Inclination of the seat

10.5.3.2.1 - The angle of inclination of the seat (angle " α " as specified in Appendix E) should be greater than 5° in the normal position.

10.5.3.2.2 - The angle of inclination of the seat should change depending on the inclination of the seat back.

10.5.3.2.3 - The angle of opening of the seats (angle " γ " as specified in Appendix E) should be between 105° and 115° in relation to the normal position.

10.5.4 - Ergonomics

R 10.5.4.1 - To improve their ergonomics, the seats should include a lumbar support.

R 10.5.4.2 - Beside the head rest and the arm rests, the seats should have the following accessories:

- a foot rest,
- a tray table,
- a newspaper rack,
- etc.

O 10.5.4.3 - In smoking areas, passengers must have an ashtray within easy reach.

10.6 - Accessibility for passengers in wheelchairs

O 10.6.1 - High speed trains shall have at least one set of facilities for passengers in wheelchairs, situated in the access area and close to the toilet. The provisions of *UIC Leaflet 565-3* shall apply.

R 10.6.2 - On-board equipment and services should be fully accessible to persons in wheelchairs.

O 10.6.3 - Lifting devices - The lifts required to enable passengers in wheelchairs to board the train from the platform should not be built into the vehicles.

R 10.7 - On-board services

It is recommended that the following facilities be available on board high speed trains:

- a compartment for the senior conductor,
- a "family" compartment / "baby" area (with nappy changing table),
- a "conference" area (equipped for example with telex, connections for fax),
- power points for low-power electrical goods, computers, mobile phones, etc.

O 10.8 - WC

High-speed vehicles shall be fitted with sealed toilets.

The provisions of *UIC Leaflet 563* shall be applied.

10.9 - Interior fittings

O 10.9.1 - Apply the provisions of *UIC Leaflet 567, point 2.9* except:

- *point 2.9.1.1.1* shall be replaced by the following text: "It is not proposed to specify the respective proportions of smoking and non-smoking accommodation. The appropriate legal provisions should be observed".
- *points 2.9.1.2 and 2.9.1.3* shall be replaced by point **10.5 - page 29** above,
- *point 2.9.2.1* shall be replaced by point **10.9.2** below,
- *point 2.9.3.2.7* shall not be replaced.

R 10.9.2 - Lengths of the compartments - The following minimum dimensions are recommended:

- 1st class: 2200 mm,
- 2nd class: 1900 mm.

O 10.10 -Public address system and intercom

High-speed vehicles shall be fitted with a public address system. This equipment may comply with the requirements of *UIC Leaflet 568*.

O 10.11 -Catering

High speed trains shall have catering facilities.

The hygiene rules shall conform to *UIC Leaflet 565-2* and the provisions applicable in the country concerned.

10.12 -Passenger signs

10.12.1 - General

- **10.12.1.1** - Passenger vehicles shall be fitted with signs for the information of passengers. The nature and the position of the standard signs and markings, indications of the itinerary and vehicle number are defined in this paragraph.
- 10.12.1.2** - The signs both on the outside and on the inside of the passenger vehicles intended for passenger information shall be classed in three categories:
 - **10.12.1.2.1** - Information regarding dangerous situations.
 - **10.12.1.2.2** - Information regarding the use of the vehicle and its facilities.
 - 10.12.1.2.3** - Information regarding the services provided in the train as well as the features of the vehicle.
- **10.12.1.3** - The position of a sign either inside or outside the passenger vehicles depends on its priority.
- **10.12.1.4** - Information regarding dangerous situations shall be placed in a very evident position close to the dangerous place or the safety equipment.
- **10.12.1.5** - The configuration and the colour of the information signs in these zones shall be harmonised in such a way as to form a good overall impression.
- R **10.12.1.6** - It is recommended that information should be provided inside the vehicle to indicate to passengers the direction of the various services which are offered to them.
- **10.12.1.7** - Signs regarding equipment available to passengers and, if necessary, their method of use shall be integrated in the overall system.
- **10.12.1.8** - Signs intended for passengers shall differ from instructions intended for the staff both in their appearance and their position.
- **10.12.1.9** - The signs and markings shall be done preferably in the form of UIC pictograms as specified in *UIC Leaflet 413* or in block (sans serif font) letters. The pictograms shall not be accompanied by explanatory texts. Should this be impossible these texts shall be included in the overall system.

The signs shall be written in English, in French and in German, in Latin characters and in Arabic figures. A supplementary language can be added depending on the railways served.

○ **10.12.2 - Internal signs and notices**

The following signs, notices and pictograms shall be applied inside the vehicles:

10.12.2.1 - The indication of the class in the side corridor, on the compartment doors or at the side of them, at eye level, and on each of the entrance vestibules of the vehicles on the wall facing the

gangway connection door. In mixed coaches, the indication of the two classes shall be placed on each of the vestibules.

For coaches with a central corridor, it is necessary to place the indications of the class at the ends of the saloons or even in the area of the seats.

10.12.2.2 - A sign prohibiting the opening of the access doors while the train is in motion according to *UIC Leaflet 560, point 1.1.9* in the form of text or a pictogram in accordance with *UIC Leaflet 413, point B.9.3*.

10.12.2.3 - An indication of the alarm and a warning that improper use will be punished according to *UIC Leaflet 545, point 5*.

10.12.2.4 - On the glass covered box containing a hammer for breaking windows:

"Nothammer

Marteau brise-vitres

Window breaking hammer"

and the marking defined in *UIC Leaflet 564-1, point 5*.

10.12.2.5 - The designation of the smoking and non-smoking compartments by the corresponding pictograms visible from the compartment and the corridor.

The access vestibules and the side corridors shall be signed as no smoking zones.

10.12.2.6 - For coaches with a central corridor, the signs "Smoking" and "Non-smoking" shall be applied at the ends of the saloons or in the zones where there are seats.

10.12.2.7 - The following pictograms in accordance with *UIC Leaflet 413, Appendix B*:

- B.7.1: Toilets (general)
The railways are left free to utilise the general toilet symbol B.7.1 or to apply the two pictograms B.7.2 (toilets for ladies) and B.7.3 (toilets for gentlemen).
- B.11.1: Non-smoking.
- B.10.4: Smoking.
- B.6.7: Temperature control device.
- B.6.5: Ventilation switch.
- B.6.4: Light switch.
- B.6.6: Public address volume control.
- B.7.4: Washrooms.
- B.7.6: Foot pedal for WC.
- B.9.2: Not drinking water.

- B.6.8: Socket for electric razor.
- B.12.1: Wastepaper or rubbish bin.
- B.4.4: Directional arrow (for example for the way to the restaurant car or WC).
- B.3.1: Public telephone.
- B.5.1: Restaurant.
- B.5.2: Bar-buffet, buffet car.
- B.10.5: Seats for the mobility impaired.
- B.10.14: Area for small children (accompanied).

The images proposed in *UIC Leaflet 413* for these pictograms are not obligatory.

10.12.2.8 - The sign for the emergency door release as specified in *UIC Leaflet 560, point 3.3.3*.

10.12.3 - Internal route indicators

O 10.12.3.1 - A route indicator shall be placed in each vestibule close to the access doors.

R 10.12.3.2 - The text and font on internal route indicators shall be the same as those for the external route indicators (see point 10.12.5 - page 34).

O 10.12.4 - Internal coach order number

The vehicle order number shall be displayed in each vestibule adjacent to the route indicator of the vehicle or as part of it.

10.12.5 - External inscriptions for the information of passengers

O 10.12.5.1 - The signs and notices intended for passengers shall be grouped together at window level, near to the access doors. They shall not be masked by the doors.

10.12.5.2 - The representation of the pictograms on the information strip shall conform to the "Rules governing the standard reproduction and use of pictograms" in *UIC Leaflet 413, Appendix A*.

10.12.5.3 - Figure indicating class of accommodation - The height of the space reserved for the figure indicating the class of accommodation, which is shown without contour line, according to its value, in the upper position, position 1, corresponds to two grid units. In the arrangement of the pictogram lines, the figure is left-justified or placed in the centre. Its width depends on the typographical rules for the sans-serif font used and the surface area available on the note board.

10.12.5.4 - Other signs and notices - The other signs and notices are shown below by pictograms (with the exception of additional texts) and placed in positions 2 and 3 in the order of their value.

10.12.5.4.1 - If there is no figure to indicate the class of accommodation, for example in the service coaches, position 1 remains free or can be occupied by the pictogram corresponding to the service offered.

- **10.12.5.4.2** - The colour of the signs and notices will depend on the frame colours and should stand out against the background in a contrasting colour.

10.12.5.4.3 - For the combination of the figures for the class of vehicle and the pictograms on the strip of signs, the order of succession - either side by side in line, or one under the other in column - is fixed as follows:

Position 1: Figure indicating the class of accommodation.

Position 2: Signs and notices (first priority).

1. Pictograms "Smoking / Non-smoking".
2. Type of coach:
 - Compartments/central corridor.
 - Restaurant car, buffet car, bar car.

Position 3: Signs and notices (second priority):

1. Installations to serve customers:
 - Passenger secretariat.
 - Public telephone.
 - Compartment for conferences.
 - Compartment for "mother and child".
 - Compartment for disabled people, etc.
2. Details of the coach:
 - (air conditioned coach, etc.).

- **10.12.6 - External route indicator**

10.12.6.1 - At least one route indicator sign shall be situated close to the access doors, on each side of the coach (except for dining cars, bar-buffet cars, etc.). It must not be concealed when the doors open. It shall be flush with the outer surface of the vehicle and must be legible from the platforms whatever the lighting conditions.

10.12.6.2 - The departure station, destination station and main intermediate stations shall be shown in a way that makes them stand out.

10.12.6.3 - In cases where the number and/or the name of the train is to be shown in addition, these indications shall be optically separated from those of the route.

- **10.12.7 - Coach order number**

Except for dining cars, the coach order number shall be shown close to all the doors on the outside surface of the coach.

It shall be visible also when the doors are open.

o **10.12.8 - Marking of seat numbers**

Each seat shall be clearly identified by a seat number.

The provisions of *UIC Leaflet 580* shall be observed for the marking of seats with seat numbers and the fitting of seat reservation frames. Special agreements should be made for electronic reservation.

11 - Stabling, preparation and maintenance of high speed trains before putting them back into service

R 11.1 - Stabling

11.1.1 - Trains may be fitted with systems that give automatic status notification when they are no longer serviceable.

11.1.2 - In order to save energy, it shall be possible to reduce the air conditioning power when the trainset is stationary.

O 11.2 - Preparation

11.2.1 - Cleaning

11.2.1.1 - The staff allocated to internal cleaning shall be able to board the train with the cleaning equipment provided from platforms situated from 550 to 760 mm above rail level.

11.2.1.2 - Sockets complying with *standards EN 60309-1* and *EN 60309-2* (see Bibliography - page 48) shall be provided in the vehicles (rated at 1500 W for 230 V a.c., 50 or 16 2/3 Hz and earthed) to power industrial cleaning equipment. To make it easier to plug in these devices, trains and buildings should ideally be fitted with standard sockets.

11.2.1.3 - It must be possible to clean the trains with a washing machine at a height of:

- approx. 1000 to 3500 mm for single-decker vehicles,
- approx. 500 to 4300 mm for double-decker vehicles.

11.2.1.4 - The speed at which the train passes through the washing machine depends on its design. It shall be adjustable between 4 and 6 km/h.

11.2.1.5 - The trainsets to be cleaned shall be resistant to the action of the maintenance products and to the concentrations of the solutions used. The vehicles shall be designed in such a way as to prevent the maintenance products being sprayed from getting into the vehicle when the doors are closed.

11.2.1.6 - It shall be possible to clean the windscreens from the working platforms indicated in Appendix F - page 47, from platforms situated at a height of 550 and 760 mm above the rail level or from the ground.

11.2.2 - Filling and emptying of toilet installations

It must be possible to replenish the water supply for these installations. If the refilling with water is done in a building, it is important to ensure that the water will not run off into this building.

11.2.3 - Maintenance work

It shall be possible to examine the running gear and the pantographs from inspection pits and working platforms as shown in Appendix F.

o **11.3 - Other installations and equipment provided**

High speed trains must not require major installations for routine maintenance away from their home base.

Appendix A - External indications, technical marks and signs on trainsets

			Applications: * Obligatory -* Obligatory if the equipment exists () Not obligatory			
Order No.	Designation of the signs and notices	Size of characters (mm)	Fixed formation trainset		Non-fixed formation trainset	
			Power car ^a	Coach	Power car	Coach
1	Acronym or logo of the owning railway	Not specified	*	()	*	*
2	Number of the vehicle	Min. 80	*	*	*	*
3	Maximum speed - STI sign	Min. 80	()	()	()	()
4	Tare	Min. 35	*	/	*	*
5	Inscriptions and signs for the brake	Min. 35	()	()	*	*
6	Last repair	Min. 35	()	()	()	()
7	Characteristics of the energy supply	Min. 8	()	()	()	()
8	Danger electricity	As specified in <i>UIC Leaflet 580</i>	*	*	*	*
9	Filling and draining of the water reservoirs (next to the filling connectors)	As specified in <i>UIC Leaflet 563</i>	-*	*	-*	*
10	Cancelling of the alarm signal	As specified in <i>UIC Leaflet 545</i>	-*	-*	-*	-*
11	Sign for pressure-sealed vehicles	Min. 50	()	()	()	()
12	Sign for sealed toilet equipment (next to the filling connectors)	As specified in <i>UIC Leaflet 563</i>	-*	*	-*	*
13	Marking of the support points for lifting and rerailing	As specified in <i>UIC Leaflet 581</i>	*	*	*	*
14	Refilling of sanding gear	As specified in <i>UIC Leaflet 640</i>	*	-*	*	()
15	Battery	As specified in <i>UIC Leaflet 640</i>	*	-*	*	*

a. or end vehicle with driver's cab.

Appendix B - Location of external inscriptions

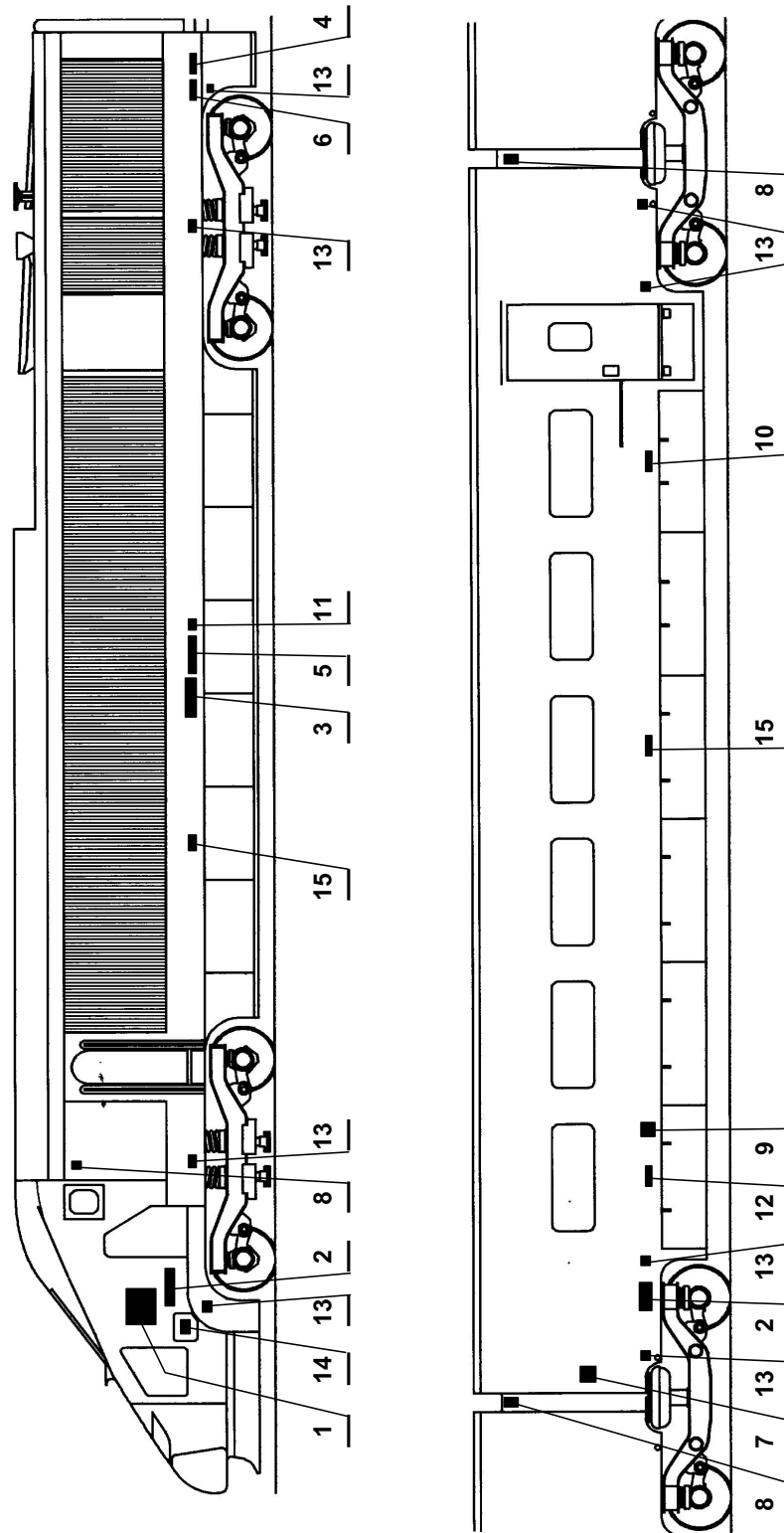


Fig. 1 - Examples for fixed formation trainsets

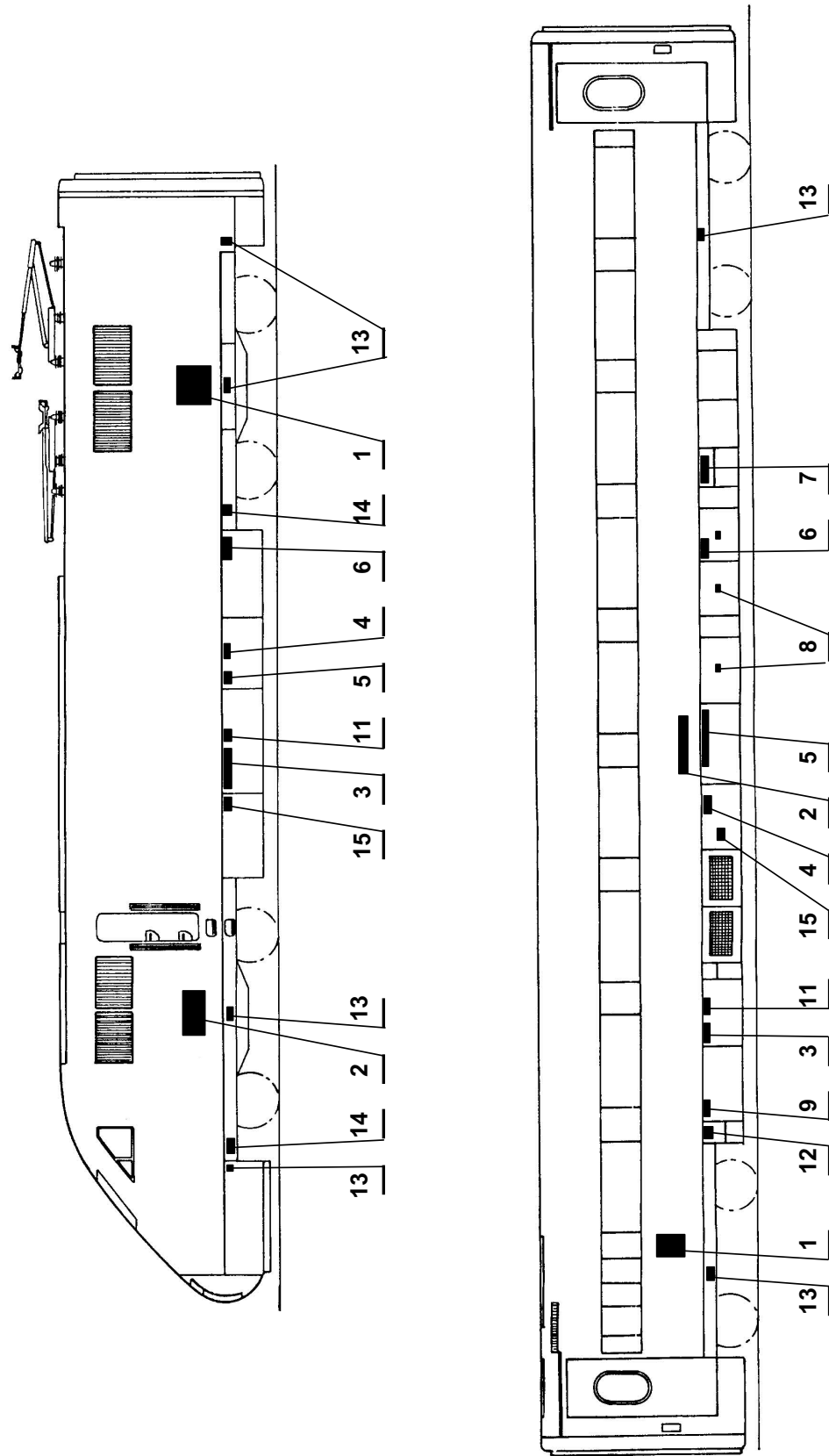


Fig. 2 - Examples for non-fixed formation trainsets

Appendix C - Compatibility of entrance steps with different platform heights

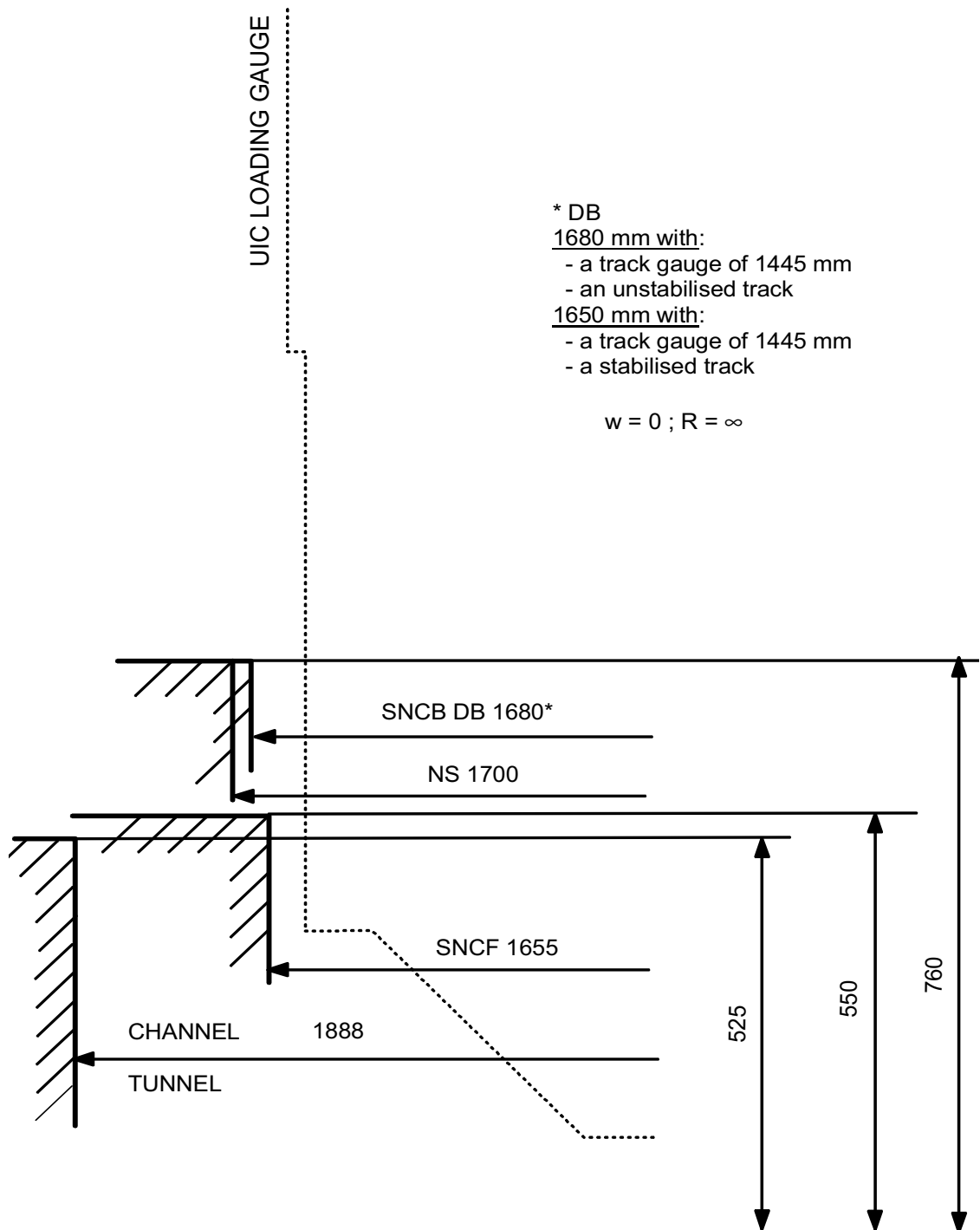


Fig. 3 - Compatibility of entrance steps with different platform heights

Appendix D - Positioning of seats

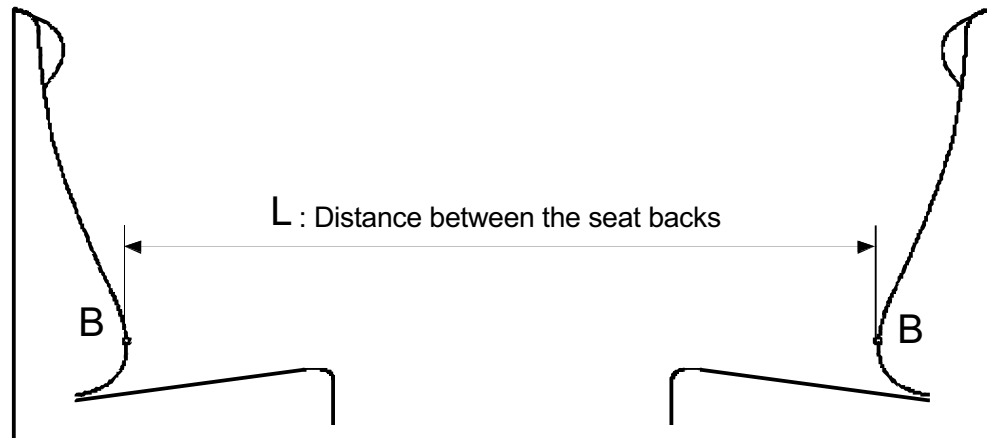


Fig. 4 - Seats arranged face to face

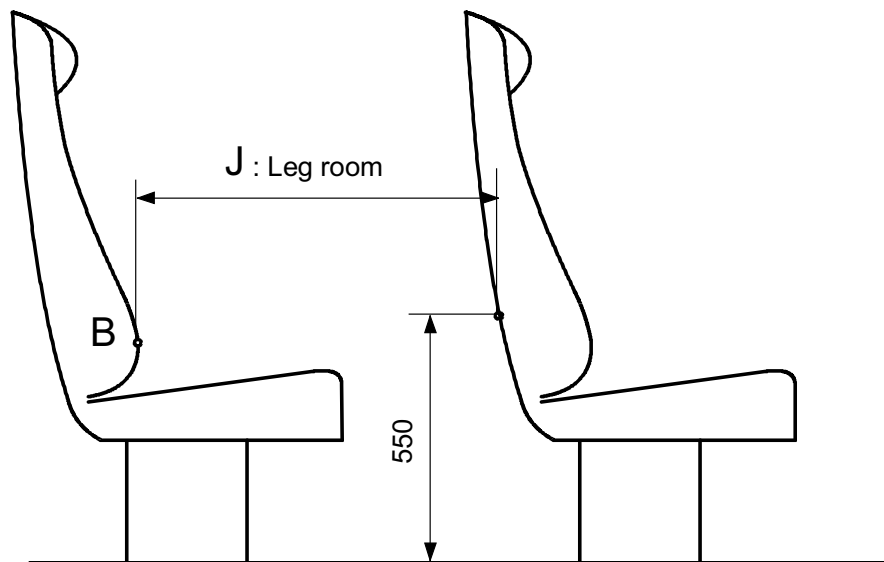


Fig. 5 - Seats arranged in rows

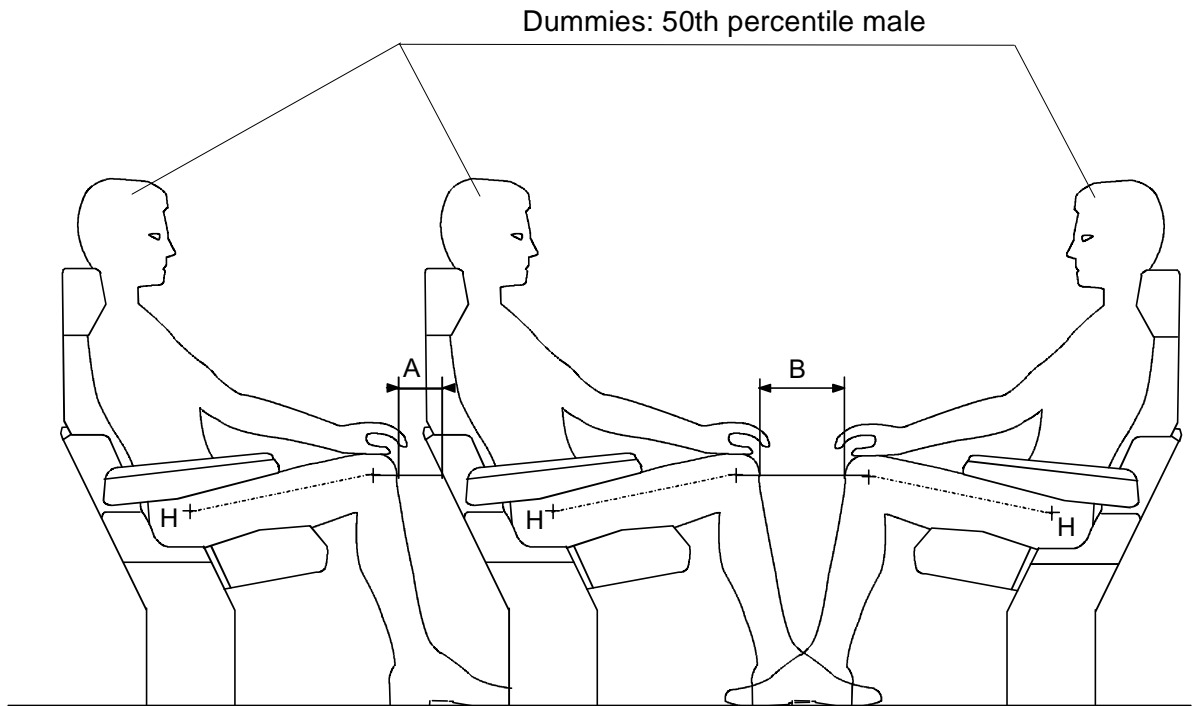
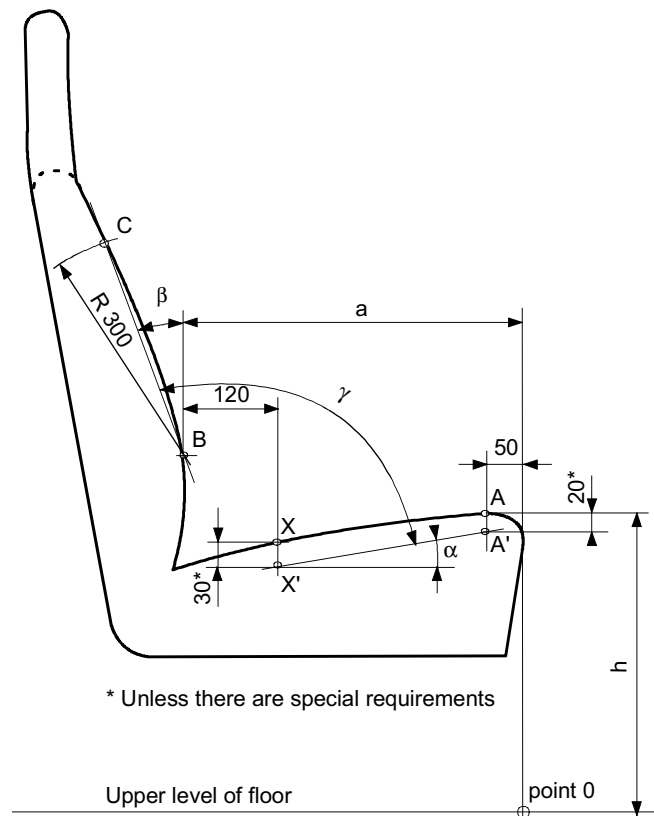


Fig. 6 - Dummies: 50th percentile male

Appendix E - Angles and measurements of seats



Designation of the angles and dimensions

- α = angle of inclination of the seat base (pushed in)
- β = angle of inclination of the seat back
- γ = angle of opening of the seat
- a = depth of the seat
- h = height of the seat (pushed in)

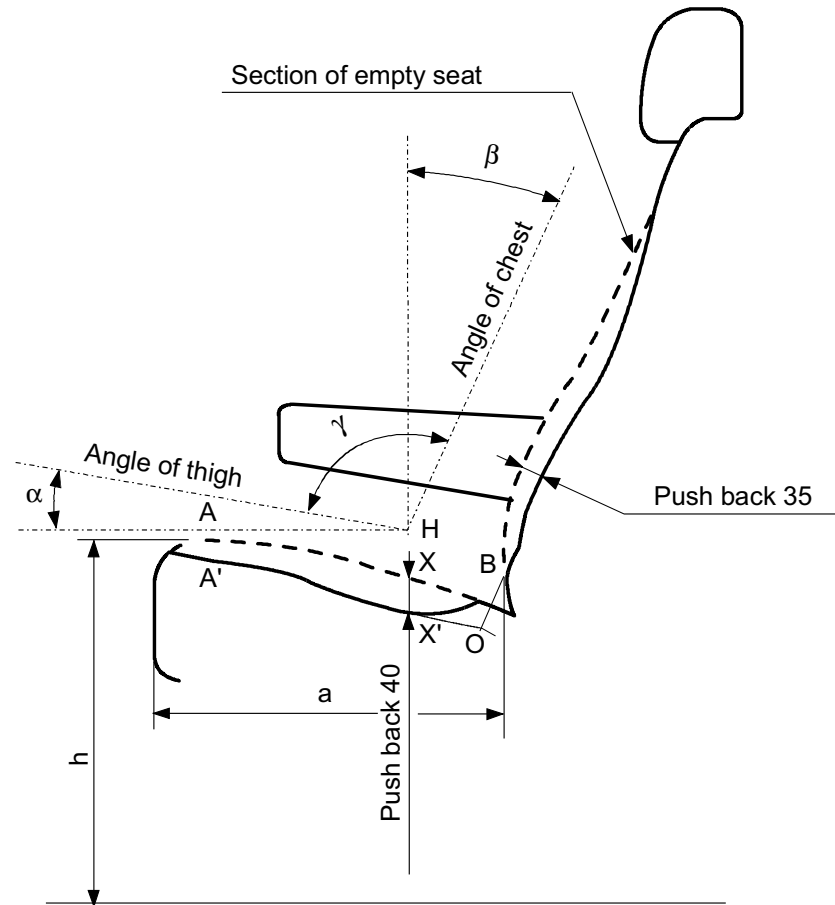
Points on the central section of the seat

- A = 50 mm behind the front edge of the seat on the contour of the upholstery (not pushed back)
- A' = Point A pushed back
- B = Extreme front point of the seat and centre of the lumbar support
- C = Point of intersection of a radius of 300 mm from centre B with the shape of the back
- X = Point of intersection of a vertical with the contour of the upholstery = point X 120 mm in front of the most forward point of the back (point B)
- X' = Point X pushed in

Fig. 7 - Angles and measurements

Point H - Determination of the dimension of the seats

Measurement of the point H as specified in *Standard NF F 31-116* (see Bibliography - page 48).



Points of the central profile of the seat

- A = the highest point of the seat
- B = the most forward point of the seat
- O = the intersection of the tangent to the thigh section and the tangent to the back section
- H = joint of the thigh part and the back part of the dummy
- X = point of the seat section situated on the vertical at point H
- A', X' = points of the section of the occupied seat situated on the vertical of the points A and X.

Angles and measurements

- α = angle of the thigh with respect to the horizontal
- β = angle of the chest with regard to the vertical
- γ = angle of opening of the body: $\gamma = 90^\circ + \beta - \alpha$
- a = depth of the seat
- h = height of the seat

Fig. 8 - Angles and measurements. Point H

Appendix F - Maintenance installations

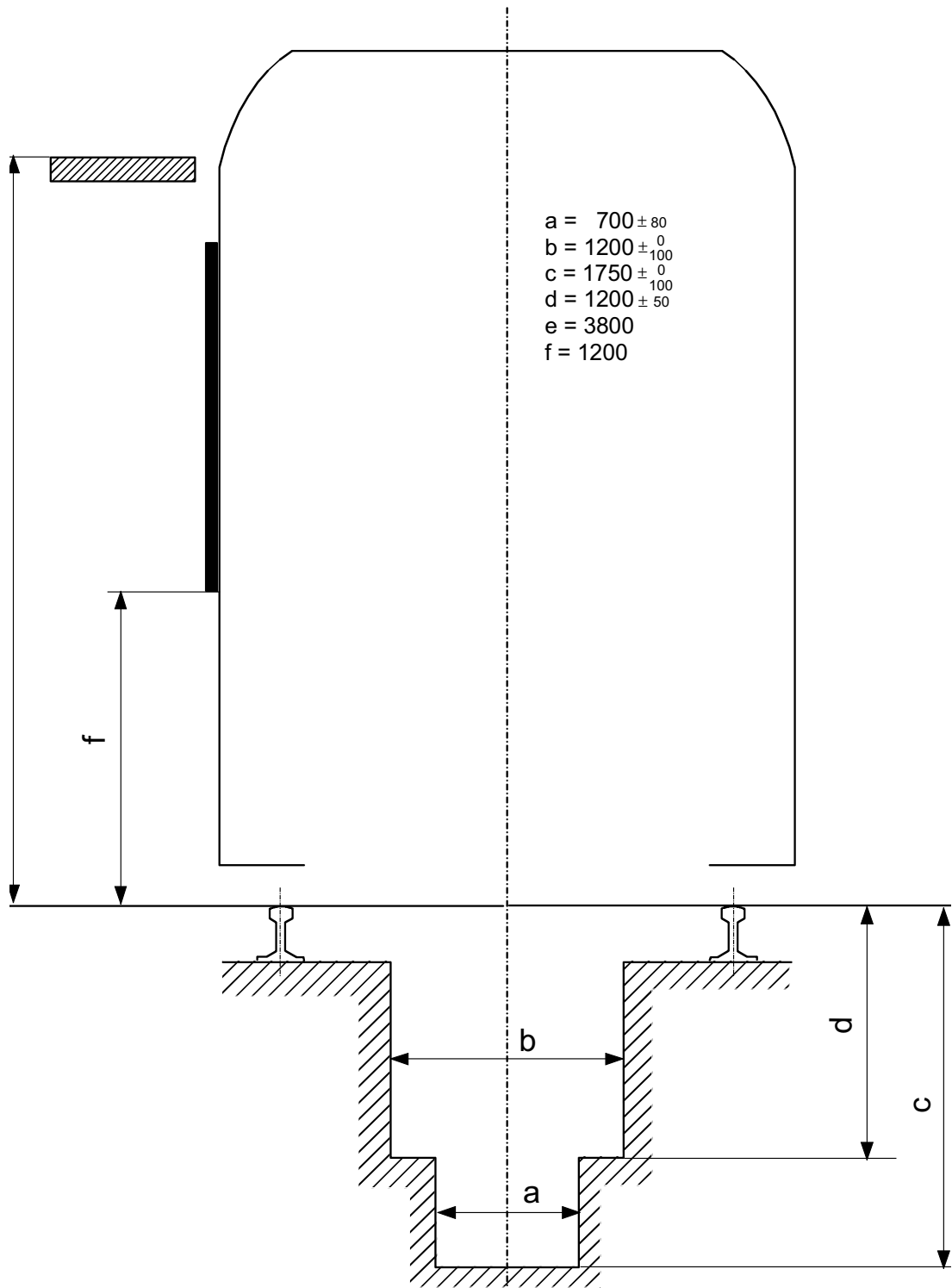


Fig. 9 - Maintenance installations

Bibliography

1. UIC leaflets

International Union of Railways

RIC - Amendment no. 1 - Regulations governing the reciprocal use of coaches and vans in international traffic, 1.1.1993

Leaflet 413: Measures to facilitate travel by rail, 9th edition, December 2000

Leaflet 505-1: Railway transport stock - Rolling stock construction gauge, January 1997 (9th edition under preparation)

Leaflet 506: Rules governing application of the enlarged GA, GB and GC gauges, 1st edition of 1.1.87 and 4 amendments

Leaflet 508-1: Interaction between passenger rolling stock and fixed installations, 1st edition of 1.1.94

Leaflet 508-2: Installations for servicing and stabling passenger rolling stock ready for operation, 1st edition of 1.1.94

Leaflet 510-2: Trailing stock - Wheels and wheelsets - Conditions concerning the use of wheels of various diameters with running gear of different types, (4th edition under preparation)

Leaflet 513: Guidelines for evaluating passenger comfort in relation to vibrations in railway vehicles, 1st edition of 1.7.94

Leaflet 515-0: Passenger rolling stock - Trailer bogies - Running gear, 2nd edition, April 2001

Leaflet 515-1: Passenger rolling stock - Trailer bogies - Running gear - General provisions applicable to the components of trailer bogies, 1st edition of 1.1.94

Leaflet 515-3: Rolling stock - Bogies - Running gear - Axle design calculation method, 1st edition of 1.1.94

Leaflet 515-4: Passenger rolling stock - Trailer bogies - Running gear - Bogie frame structure strength tests, 1st edition of 1.1.93

Leaflet 515-5: Powered and trailer stock - Bogies - Running gear - Tests for axleboxes, 1st edition of 1.7.94

Leaflet 518: Testing and approval of railway vehicles from the point of view of their dynamic behaviour - Safety - Track fatigue - Running quality, 2nd edition, August 2002

Leaflet 527-1: Coaches, vans and wagons - Dimension of buffer heads - Track layout on S-curves, 2nd edition of 1.1.81 and 4 amendments

Leaflet 534: Signal lamps and signal lamp brackets for locomotives, railcars and all tractive and self propelled stock, 3rd edition of 1.7.80

Leaflet 541-3: Brakes - Disc brakes and disc brake parts - General conditions governing bench tests, 4th edition of 1.7.93 and 5 amendments

Leaflet 545: Brakes - Inscriptions - Marks and signs, 7th edition, April 2002

Leaflet 550: Power supply installations for passenger stock, 10th edition of 1.1.97

Leaflet 552: Electric power supply for trains - Standard technical characteristics of the train bus, 9th edition of 1.1.97

Leaflet 553: Heating, ventilation and air-conditioning in coaches, 5th edition of 1.1.90 and 3 amendments

Leaflet 555: Electric lighting in passenger rolling stock, 1st edition of 1.1.78 and 7 amendments

Leaflet 560: Doors, entrance platforms, windows, steps, handles and handrails of coaches and luggage vans, 12th edition, March 2002

Leaflet 563: Fittings provided in coaches in the interests of hygiene and cleanliness, 8th edition of 1.1.90 and 4 amendments

Leaflet 564-1: Coaches - Windows made from safety glass, 6th edition of 1.1.79 - Reprint dated 1.1.90

Leaflet 564-2: Regulations relating to fire protection and fire-fighting measures in passenger carrying railway vehicles or assimilated vehicles used on international services, 3rd edition of 1.1.91 and 2 amendments

Leaflet 565-2: Special comfort and constructional characteristics and rules of hygiene for restaurant cars accepted in international traffic, 1st edition of 1.1.79 and 3 amendments

Leaflet 565-3: Indications for the layout of coaches suitable for conveying disabled passengers in their wheelchairs, 1st edition of 1.1.87 - Reprint dated 1.7.97 and 1 amendment

Leaflet 566: Loadings of coach bodies and their components, 3rd edition of 1.1.90 and addenda and 1 amendment

Leaflet 567: General conditions for coaches, 1st edition of 1.1.91 and 5 amendments

Leaflet 568: Loudspeaker and telephone systems in RIC coaches. Standard technical characteristics, 3rd edition of 1.1.96

Leaflet 580: Inscriptions and markings, route indicators and number plates to be affixed to coaching stock used in international traffic, 6th edition of 1.1.90 and 3 amendments

Leaflet 581: Wagons - Lifting - Rerailing, 1st edition of 1.1.83 and 1 amendment

Leaflet 600: Electric traction with aerial contact line, 3rd edition of 1.1.81 and 1 amendment

Leaflet 611: Regulations to be observed for the acceptance of electric locomotives, rail motor vehicles and multiple unit sets for running on international services, 6th edition, February 2001

Leaflet 615-0: Tractive units - Bogies and running gear - General provisions, 1st edition of 1.1.94

Leaflet 615-1: Tractive units - Bogies and running gear - General conditions applicable to component parts, 1st edition of 1.1.94

Leaflet 615-4: Tractive units - Bogies and running gear - Bogie frame structure strength tests, 1st edition of 1.1.94

Leaflet 640: Motive power units - Inscriptions, marks and signs, 2nd edition of 1.1.97

Leaflet 641: Conditions to be fulfilled by automatic vigilance devices used in international traffic, 4th edition, February 2001

Leaflet 642: Special provisions concerning fire precautions and fire-fighting measures on motive power units and driving trailers in international traffic, 2nd edition, September 2001

Leaflet 645: Regulations applicable to powered units used on international services when running over curves, 2nd edition of 1.7.80

Leaflet 651: Layout of drivers' cabs in locomotives, railcars, multiple unit trains and driving trailers, 4th edition, July 2002

2. European standards

European Committee for Standardization (CEN)

EN 12663: Railway applications. Structural requirements of railway vehicle bodies, 2000

pr-EN 45545-1: Fire protection for railway vehicles - Part 1: General, Draft

EN 12299: Railway applications - Ride comfort for passengers - Measurement and evaluation, 1999

EN 60309-1: Plugs, socket-outlets and couplers for industrial purposes - Part 1: General requirements, 1999

EN 60309-2: Plugs, socket-outlets and couplers for industrial purposes - Part 2: Dimensional interchangeability requirements for pin and contact-tube accessories, 1999

AFNOR

NF F 31-116: Matériel roulant ferroviaire - Détermination du point H d'un siège (Railway rolling stock - Determining the H point of a seat), April 1990

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