



CR TSI Locomotives and Passenger RST

Technical requirements



- **Technical requirements: section 4.2 of the CR LOC&PAS TSI**
 - Relationship to EN Standards
 - Detailed requirements
- **Interoperability constituents: section 5 of the CR LOC&PAS TSI**
 - Definition
 - List of IC



Technical requirements – Relationship to EN Standards

- **The TSI specifies mandatory functional requirements.**
- **EN standards** define detailed requirements or technical solutions which give **presumption of conformity** and are used on a voluntary basis; the relevant standards are listed in **the application guide of the TSI.**
- **Consistency between these different documents must be ensured** (even if in any case, the TSI prevails).
- During the drafting process of the TSI:
 - EN standards already published or in final phase of elaboration are considered.
 - In case a TSI requirement discussed in the WPs corresponds to a precise clause of an EN standard, this is identified; the requirement is then expressed in the TSI in full, or by reference to the precise clause of the standard (therefore this clause becomes mandatory).
 - If new standards are needed, mainly for the conformity assessment, a request for standard is addressed to the Standardisation Bodies.



Content clause 4.2 of the CR LOC&PAS TSI

- Structures and mechanical parts
- Track interaction and gauging
- Braking
- Passenger related items
- Environmental conditions & Aerodynamic effects
- External lights & visible and audible warning devices
- Traction and electrical equipment
- Driver's cab and driver-machine interface
- Fire safety and evacuation
- Servicing
- Documentation for operation and maintenance



Structures and mechanical parts (1)

- **Mechanical interfaces:**

The type of end coupler not imposed.

It shall be possible for the RST to be towed by a power unit equipped with a “standard” manual coupling (using if necessary a rescue (adaptor) coupler) .

- **Gangway:**

General requirement; reference to PRM TSI.

- **Strength of vehicle structure:** Requirement to ensure integrity. Standard EN 12663 as technical basis.

- **Passive safety:** required by essential requirement 2.4.1 of Directive.

Enquiry to NSAs made to evaluate state of the art for new RST. Standard EN15227 as technical basis.



Structures and mechanical parts (2)

- **Lifting and jacking:** needed for rescue (useful for maintenance)
Geometry and localisation of lifting points specified.
- **Mechanical characteristics of glass:** to protect passengers from injuries.
Laminated or toughened glass required.
- **Load conditions and weighted mass:**
The load conditions considered in the design of the RST have to be described in an harmonised way.



Track interaction and gauging (1)

- **Gauge:** “Interoperable” gauges GA, GB, GC defined in the INF TSI. Standard prEN 15273-2 referred to for conformity assessment (kinematic method).
- **Axle load:** no value imposed in the LOC&PAS TSI; limits are set up in the CR INF TSI.
- **Compatibility with CCS subsystem (train detection system).**
The CR CCS TSI is under revision; a target system for train detection system will be defined, covering axle counters, track circuits, loops (e.g. level crossings).
For RST: conditions for compatibility with these target systems will be specified.



Track interaction and gauging (2)

- **Axle bearing condition monitoring:** track side or on-board system. For track-side system: conditions for compatibility specified, based on prEN 15437-1.
- **Running dynamic behaviour:** Safety against derailment. Standard EN 14363 (developed from UIC 518) as basis.
- **Running gear:**
 - Bogie frame: structural design.
 - Wheelsets and wheels: mechanical and geometrical characteristics.
- Minimum curve radius.
- Life guards.



- **Functional requirements:** continuous, automatic (safety)
- **Safety requirement:** Safety analysis, including consequence of failures.
- **Type of brake system:** compatible with UIC brake system specified for units assessed to be operated in various train formations.
- **Braking performance:** harmonised method to evaluate the braking performance specified; level of performance not specified.
- **Wheel slide protection:** the TSI defines criteria for which a WSP shall be provided.
- **Magnetic track brake:** the TSI specifies the geometric characteristics of the end elements of the magnets for compatibility with infrastructure.



Passenger related items (1)

- **Sanitary systems**
 - No release of material that may be detrimental to health or environment (quality of rejections, location of release point)
- **Public address**
 - Crew to passengers, crew to ground control, crew to crew communication devices
 - Autonomy
- **Communication devices – call for aid**
 - Location



Passenger related items (2)

- **Passenger Alarm**
 - HS solution: direct application of brake, possibility for the driver to override.
 - Alternative solution (reflecting recent developments on UIC 541-6): information to the driver – application of brake when: train in a station or driver doesn't react within a timeframe.
- **Exterior doors**
 - Information to the crew about the status of doors
 - Locking out of service
 - Door/traction interlock
 - Exterior door construction
- **Inter-unit doors**



Passenger related items (3)

- **Internal air quality**
 - Aimed at securing passenger health by:
 - adequate ventilation (criteria based on CO2 concentration to allow for energy saving solutions)
 - Shutting down ventilation to avoid passenger exposure to fumes.
- **Body side windows**
 - Size of the opening (if any) limited, to avoid ingress of objects from outside.
 - Toughened or laminated glass (see mechanical parts).



Environmental conditions & Aerodynamic effects

- **Environmental conditions:**

The nominal range of environmental parameters is specified; for extreme ranges, design and/or test provisions taken shall be described in the technical documentation.

- **Aerodynamic effects:**

Slipstream effect and pressure head pulse: requirements consistent with the HS RST TSI only for speed higher than 160 km/h.

Maximum pressure variation in tunnels: open point.

Cross wind: open point.



External lights & visible and audible warning devices

Requirements in the TSI aim at an **harmonization** of these functions at EU level, to avoid barrier to interoperability.

There is a positive effect on the market (RST and IC), as a consequence.

- Head lights: 2 luminous intensity levels required.
- Marker lights and tail lights
- Horns: Frequency (2 possibilities) and sound pressure level specified.



Traction and electrical equipment

- Level of **traction performance** not specified:
Depends on the intended service.
- **4 voltage systems** as described in the CR ENE TSI.
- **2 pantograph** heads geometries as specified in the CR ENE TSI.
- **Protection against electrical hazards:** safety
Reference to EN 50153.
- **Thermal traction:** no requirement in addition to those covered by other Directives.



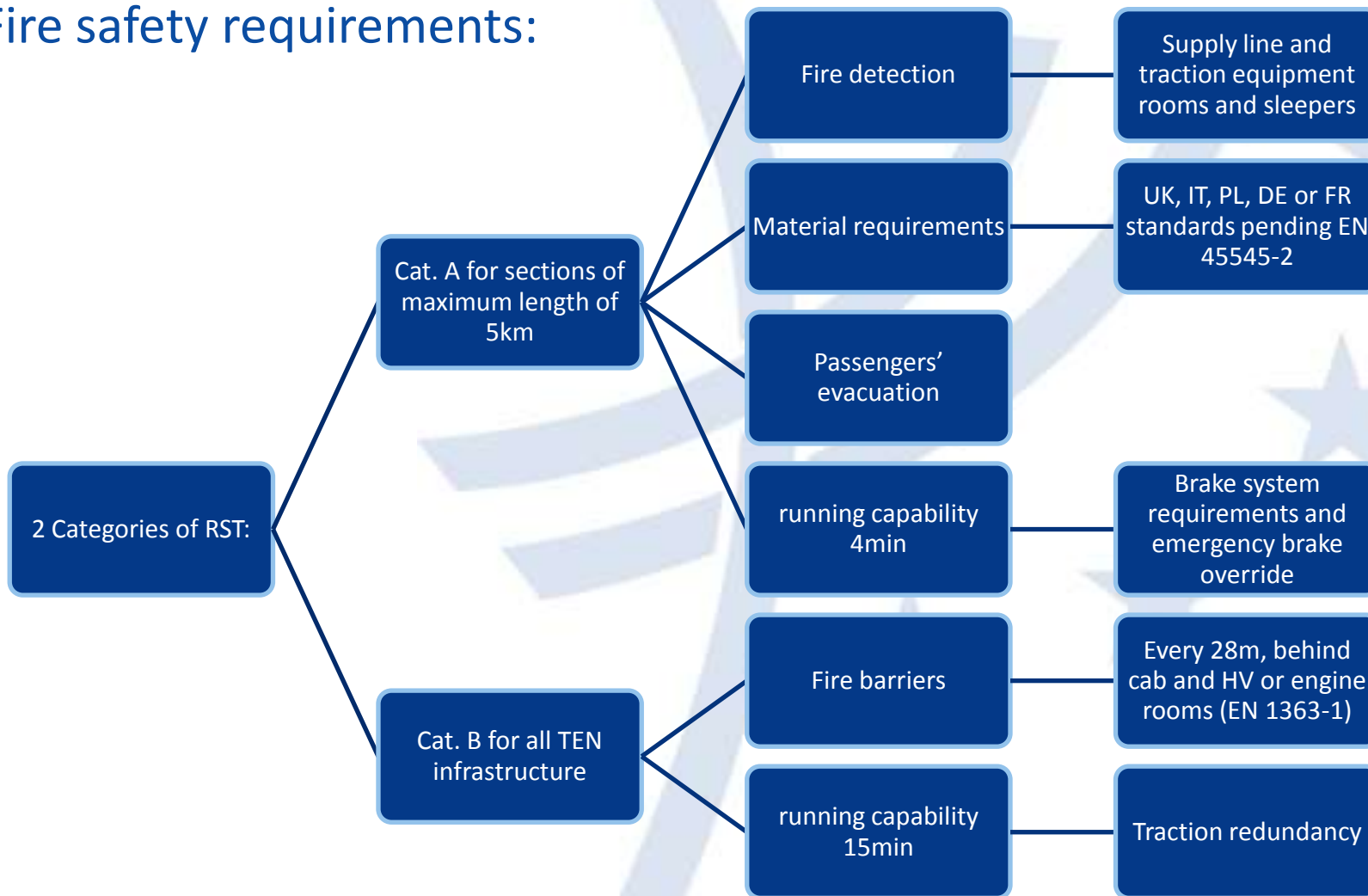
Driver's cab and driver-machine interface

- Driver's cab shall be designed to permit operation by a single driver.
- **Access and egress:** covers normal operating conditions and emergency exits.
- **External visibility:** ensure visibility of signs.
Note: EN standard under development (from UIC 651).
- **Driver's desk / driver's machine interface:** requirements to allow proper use.
“unified driver's desk” not specified (let to the voluntary domain).
- **Driver's activity control:** functional requirement set up to avoid barriers to interoperability.
- **Recording device:** open point.



Fire safety and evacuation (1)

- Fire safety requirements:





Fire safety and evacuation (2)

- **Fire safety requirements** (based on TS(EN)45545)
 - ✓ Categorisation according to SRT TSI
 - ✓ Requirements specified in the SRT TSI
 - ✓ Material properties (behaviour): TS45545-2 also allowed pending EN45545-2 availability (then mandatory)
 - ✓ Fire detection, mitigation, protection of passenger and vehicle: voluntary application of the relevant sections of EN45545
 - ✓ Fire barriers in passenger areas for cat.B fire safety RST: Fire Spreading Prevention Measures requested, equivalent to full cross-section partition as per SRT / HS TSI
 - ✓ Flammable liquids: EN45545-7 voluntary



Fire safety and evacuation (3)

- **Passenger evacuation** (based on TS(EN)45545-4)
 - ✓ Requirements specified in the SRT TSI
 - ✓ Number, size and location of emergency exits are specified;
 - ✓ Emergency opening of external passenger doors
 - ✓ Specific requirements for compartments
 - ✓ Evacuation aid needed if height of the lowest part of the emergency exits is more than 1.8m above top of rail.



Requirements are defined to allow interventions necessary to ensure the continuity of operation on parts of the network distant from the vehicle home base:

- Exterior cleaning: interface to washing plant.
- Toilet discharge: interface to fixed installation.
- Water refilling: water quality, and interface to fixed installation.
- Power supply while stabled: interface to fixed installation.
- Refuelling: interface to fixed installation.



Documentation for operation and maintenance

The documentation required is part of the technical file attached to the EC declaration of verification. It provides technical information related to the RST, to be used as input for:

- The maintenance manuals, including:
 - Justification of maintenance criteria (limit values, periodic checks...)
 - Documentation necessary to undertake maintenance activities.
- The operating manuals, including degraded conditions:
 - Rescue
 - Lifting



Interoperability constituents

- **An IC can be defined when a parameter linked to Interoperability can be assessed at constituent level, independently from the subsystem**
- **If an IC is specified, this specification becomes mandatory for the corresponding component:**
 - It is not allowed to put a non-compliant constituent on the market, for the use as specified in the TSI;
 - Constituents not carrying an EC declaration may only be used on non TSI compliant sub-systems (maintenance or up-grade/renewal purposes).
- **An IC specification does (in general) not describe a complete product:**
 - Requirements on an IC only describe the relations to interoperability (as specified in Section 4 of the TSI); additional requirements may be found in EN standards of voluntary application;
 - An IC does not create per definition interchangeable components.



Interoperability constituents

- Rescue coupler
- Wheels
- Wheel slide protection system
- Head lights
- Marker lights
- Tail lights
- Horns
- Pantograph
 - Contact strips
- Main circuit breaker
- Toilet discharge connection
- Inlet connection for water tanks



Thank you for your attention!

Denis BIASIN / Hubert LAVOGIEZ

European Railway Agency

Firstname.lastname@era.europa.eu

www.era.europa.eu