

Marek Pawlik PhD

Railway Scientific and Technical Center
Deputy Director for Railway
Interoperability

European Railway Interoperability (Part II): Present and Future Common European Rolling Stock Requirements and Related Cross-acceptance Challenges

This is the second article in a set started by an overview of “creation of a seamless interoperable and safe trans-European railway system based on European common market-related principles”, published in RAILWAY MARKET 1-2007. It deals with rolling stock matters, showing the interoperability dimension and common market dimension of setting common European rolling stock requirements as a basis of the European-wide rolling stock cross-acceptance.

1. Introduction

The way to a single European transport system, in which many Railway Undertakings compete offering services utilizing interoperable rolling stock operated on the trans-European railway network, requires multinational clear and non-discriminatory rolling stock acceptance criteria. One can say that such criteria were already defined by RIV and RIC agreements, respectively for freight wagons and passenger carriages. They were, however, considered not only too general, but also discriminatory to new, usually small railway undertakings. This is because, e.g., under the RIV agreement, new small freight railway undertakings would not practically be able to claim their freight wagons' compliance with the RIV agreement without involving one of the big freight railway operators that would at least take over the responsibility for proper maintenance of those wagons. As a result, European works on common rolling stock requirements started back in 2001 for freight wagons and in 2005 for passenger carriages and traction vehicles.

2. The present common European requirements for freight wagons

Common European requirements are already available for freight wagons. They have been issued as the “Technical Specification for Interoperability, Subsystem: Rolling Stock, Scope: Freight Wagons” (TSI WAG)”, adopted by the European Commission Decision 2006/861/EC dated 28 July, 2006. This decision and the TSI WAG itself were published in the Official Journal of the European Communities L344 dated 8 December, 2006, and are already in force.

TSI WAG is applicable to new as well as to upgraded or renewed freight wagons that have been put into service after 28 January 2007 (six months after notification of the 2006/861/EC decision to the Member States by the European Commission). However it is not applicable to wagons being subject to contracts signed before 28 January, 2007.

TSI WAG covers a wide range of requirements which are requisite not only for technical interoperability but also for meeting the essential requirements established by the respective directive of the European Parliament and Council (2001/16/EC, modified by 2004/50/EC). In particular, TSI WAG defines the requirements regarding:

- coupling of vehicles and sets of vehicles, including characteristics of buffers and draw gear as well as the interaction between those two;
- safe access to freight wagons, including space clearance for loading, as well as requirements related to steps and handrails for shunting personnel safety;
- main vehicle structure strength taking into account exceptional loads as well as fatigue loads and their influence on the vehicle structure stiffness;
- closing and locking of doors and hatches;
- appropriate marking of freight wagons;
- vehicle-track interaction, including kinematic gauge, linear load limits, static axle load limits for different categories of lines up to 22.5t per axle (for higher axle loads the existing national rules continue to apply);
- dynamic wagon behaviour regarding safety against derailment, including running on twisted tracks and maximum longitudinal forces during braking;
- braking performance;

- environmental conditions, including temperatures (subdivided into north and south class, respectively -40 ÷ +35 and -25 ÷ +45), humidity, wind, rain, snow, ice, hail, solar radiation and pollution;
- fire safety, including material requirements and fire tests, electrical protection, including wagon bonding and equipment bonding parameters;
- tail lamps positions and mounting;
- hydraulic and pneumatic freight wagons equipment; as well as maintenance procedures.

In addition to many requirements stated directly, TSI WAG refers also to European Council Directives 96/49/EC and 99/36/EC to pinpoint the detailed requirements applicable to transport of dangerous goods.

Many detailed requirements are based on UIC leaflets and European standards. Those two however are treated differently. The European standards (ENs) are treated as European commonly agreed requirements and therefore TSI WAG refers to them by EN numbers. In view of the respective directive for interoperability (2001/16/EC, modified by 2004/50/EC) such European standards or their respective chapters referred to in TSI, have to be treated as obligatory annexes to such TSI. European standards are by law optional, and therefore we say that referred ENs have two cover pages—one as optional ENs, and the other one as mandatory annexes to TSI (which makes them mandatory only when TSI itself is mandatory—according to TSI applicability, which is precisely defined in chapter one of TSI).

The UIC leaflets are not European documents. They are best practice descriptions agreed by UIC members not only from the EU, but from many countries world wide. As a result, UIC leaflets are not referred to in TSI but quoted there. The respective text taken from a leaflet is usually repeated in TSI or one of its annexes unchanged. There are, however,

some exceptions. Some changes in the requirements taken from UIC leaflets have been made to reflect the state of the art (when the leaflet is already outdated), to set aside non-European practice (omitting statements that are not applicable in Europe) and to ensure full understanding.

In both cases (ENs and UIC leaflets), issuing new documents does not change the applicable requirements. This is obvious in case of UIC leaflets as their numbers are not even given in the TSI. The embedded text, disregarding changes in the original document, stays as it is. Issuing new standards also does not change the applicable requirements. This is because European rules prejudice that even when EN is referred to in a legal document without indicating its version, the applicable standard is the one which was applicable at the time when the respective EC decision was adopted.

3. Cross-acceptance of freight wagons

TSI WAG changes significantly the cross-acceptance of freight wagons. Up to now the big freight railway companies (being UIC members) had the power to declare compliance of freight wagons with RIV requirements as an add-on to national certification. Now new wagons have to be treated as structural subsystems of the trans-European railway system, which means, on the one hand, subdivision of certification into: constituents conformity proving, and subsystem putting into service, and, on the other hand, involvement of so-called notified bodies.

3.1. Interoperability constituents conformity proving

According to TSI WAG (in force in the EU since 28 January 2007), the following wagon parts have the status of interoperability constituents: buffers, draw gear, decals for markings, bogie and running gear, wheelsets, wheels, axles, roller bearings, distributor valve, rely valve automatic empty-load over brake, wheel slide protection device, slack adjuster, brake

Table 1. Conformity modules for conformity proving for TSI WAG interoperability constituents

Interoperability constituents	possible assessment modules	
	for conventional design	for new design
Buffers	A or H1	B+F or B+D or H1
Draw gear (screw coupler)	A or H1	not defined
Decals for markings	A or B+C or H1	
Bogie and running gear	A or H1	B+F or B+D or H2 or V
Wheelsets	A or H1	B+F or B+D or H2 or V
Wheels	A or H1	B+F or B+D or H2 or V
Axles	A or H1	B+F or B+D or H2 or V
Roller bearings	A or H1	B+F or B+D or H2
Distributor valve	B+F or B+D or H2 or V	
Rely valve automatic empty-load over brake	B+F or B+D or H2 or V	
Wheel slide protection device	B+F or B+D or H2 or V	
Slack adjuster	B+F or B+D or H2 or V	
Brake cylinder	B+F or B+D or H2 or V	
Pneumatic half coupling	B+F or B+D or H2 or V	
End cock	B+F or B+D or H2 or V	
Isolating device for distributor	B+F or B+D or H2 or V	
Brake pad	B+F or B+D or H2 or V	
Brake blocks	B+F or B+D or H2 or V	
Brake pipe emptying accelerator valve	B+F or B+D or H2 or V	
Empty/load changeover device	B+F or B+D or H2 or V	

cylinder, pneumatic half coupling, end cock, isolating devices for distributor, brake pad, brake blocks, brake pipe emptying accelerator valve, empty/load changeover device.

For each interoperability constituent, TSI WAG defines all requirements, including those applicable to all interfaces, as well as the way to check whether those requirements are met. This allows producers to reduce significantly the number of certification processes necessary for specific constituents to be accepted in many countries. As an example we can say that wheel producer have to choose one notified body for assessment of a new wheel design. The new wheel is then being assessed according to the common requirements and after positive results, the notified body issues a “certificate of conformity”. Based on such a certificate, the producer of new wheels of this type issues a “EC declaration of conformity” which proves that the supplied constituent is equal to the certified one. Based on such a document, the new wheel is put on the market without any additional certification in all Member States of the EU.

The notified body, depending on the interoperability constituent and the producer’s wish, can use any of the following assessment modules:

- Module A: Internal production control
- Module A1: Internal design control with product verification
- Module B: Type examination
- Module C: Conformity to type
- Module D: Production quality management system
- Module F: Product verification
- Module H1: Full quality management system
- Module H2: Full quality management system with design examination
- Module V: Type validation by in-service experience (suitability for use)

The use of those modules is precisely described in TSI WAG Annex Q, which also defines which modules can be used for which constituent. The possible uses of modules are summarised in Table 1.

3.2. Putting wagons into service

Putting into service involves the contracting entity, the notified body and the national safety authority. The contracting entity (producer) chooses a notified body which is responsible for assessing the wagon as a structural subsystem, using modules SB+SD or SB+SF, or using module SH2.

The use of modules:

- Module SB: Type examination
- Module SD: Product quality management system
- Module SF: Product verification
- Module SH2: Full quality management system with design examination for the EC verification of wagons as structural subsystems is precisely described in TSI WAG Annex AA.

Wagons are not composed only of interoperability constituents, and therefore it is not enough to have a set of “EC declarations of conformity” for wagon constituents. The notified body is therefore responsible not only for the preparation of the set of documents and for checking their completeness, but also for performing the tests required by TSI. After positive results of all the requisite tests, the notified body issues the “certificate of EC verification”.

Figure 1. Overview on conformity assessment modules for interoperability constituents

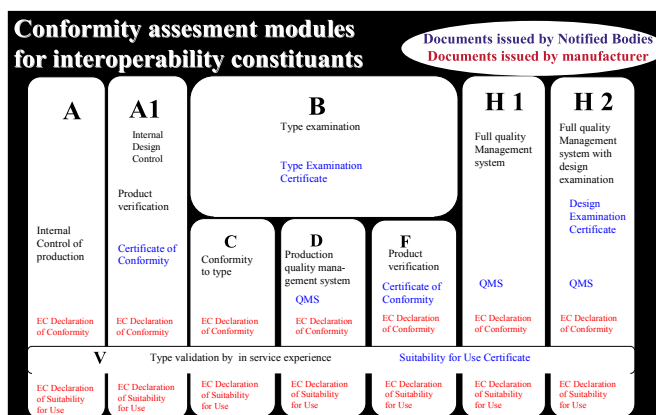
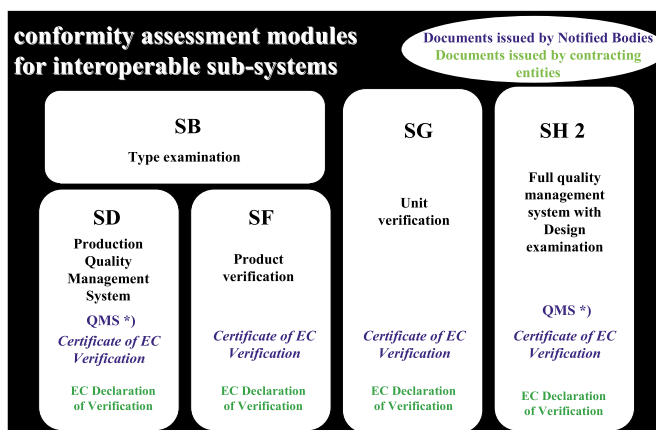


Figure 2. Overview on conformity assessment modules for interoperable sub-systems



Based on such a certificate, the contracting entity issues the “EC declaration of verification” which proves that the supplied wagon is equal to the certified one.

This is still not enough as wagons run on infrastructure that is frequently not interoperable or not fully interoperable. Therefore, compatibility with infrastructure must be checked before putting a wagon into service. That is why wagons require final putting-into-service decisions from the national safety authorities. Such decisions are based on “certificates of EC verification”, on collected and verified supplementary documents, and if necessary, on additional tests usually performed by notified bodies under national regulations in direct cooperation with the national safety authority. Additional tests are usually known in advance thanks to specific cases prescribed in chapter 7 of the TSI WAG for defined Member States.

4. Future common European requirements for passenger carriages and traction vehicles

The full liberalisation in freight railway transport in the European Union started on the 1 January, 2007, is supported by TSI WAG. For passenger railway transport in the European Union, full liberalisation is to start on 1 January, 2010. A “Technical Specification for Interoperability, Sub-system: Rolling Stock, Scope: Passenger Carriages and mul-

tiple units" is under preparation by the European Railway Agency. The respective TSI will be ready at the beginning of 2009. Its official publication as a European Commission decision will probably take about one year, so the situation will be somewhat similar.

The agency is also working on the common requirements for locomotives, needed both for passenger and freight trains. Such requirements will be ready at the beginning of 2009, although cross-acceptance of locomotives for freight trains is already now the most significant barrier for freight railway transport liberalisation.

Unfortunately, even in 2010 or 2011, when all rolling stock Technical Specifications for Interoperability are defined, we will not have sufficiently facilitated rolling stock cross-acceptance as the TSIs apply only to new, upgraded and renewed rolling stock, while railway vehicles have a long life time of about 40 years. This is where we start a new difficult discussion on mutual recognition, which is a key question mainly, but not only, for traction vehicles cross-acceptance.

5. Mutual recognition of existing rolling stock

Mutual recognition is based on EC Treaty Articles 28 and 30 which state that "Member States of destination cannot forbid the marketing or placing in service on their territories of products that are lawfully marketed or placed in service in another Member State and which are not subject to Community harmonisation, even if the products in question were manufactured according to different technical and quality rules than those that must be met for their own products". This is extremely important for the free movement of goods, which is one of the basic freedoms ensured by the European Community.

However, if a locomotive is manufactured only for 25 kV AC it will not run under 3kV DC. Due to the enormous number of such big and small technical differences between railways across the Member States, the mutual recognition principle is not easy to apply. On the other side, we cannot wait, e.g., twenty years or even longer to have mostly interoperable rolling stock all over the European Union.

As a result, the European Commission has proposed changes in EU legislation to facilitate cross-acceptance of rolling stock based on the mutual recognition principle. Known as Railway Package 3b, the proposal modifies the Safety Directive (2004/49/EC), changes the Regulation establishing the European Railway Agency (881/2004), and merges the existing Interoperability Directives (96/48/EC and 2001/16/EC, both amended by 2004/50/EC). Additionally, the European Commission has issued recommendations on rolling stock cross-acceptance, which, though legally not binding, present the Commission's intentions in a single document.

Those intentions can be summarised in the following three points.

I. Notification of national rules

Under the interoperability directives all Member States were requested to notify all their rules to the European Commission and other Member States as regards the essential requirements defined in the directives. As the respective time passed and most Member States notified their rules, the complete set of requirements applicable in different Member States is assumed to be known.

Task Force cross-acceptance check list proposal

Rolling stock characteristics according to Task Force proposal is subdivided into:

- Vehicle dynamics
- Vehicle superstructure
- Draw and buffer gear
- Bogie and running gear
- Wheel set / wheel set bearing
- Brake equipment
- Technical systems requiring monitoring; e.g. Compressed air system
- Front / side windows
- Doors
- Devices for passing
- Control systems (software)
- Drinking water and wastewater systems
- Environmental protection
- Fire protection
- Health and safety in the workplace
- Tank and tank wagons
- Pressure discharge containers
- Load securing
- Marking
- Welding techniques

Polish cross-acceptance check list proposal

Rolling stock characteristics according to Polish proposal is subdivided into:

- General requirements,
- Drawing and buffing gear,
- Strength of vehicle structure,
- Access,
- Toilets,
- Driver's cab,
- Windscreen and front of the train,
- Kinematic gauge,
- Static axle load,
- Rolling stock parameters which influence ground based train monitoring systems,
- Rolling stock dynamic behaviour and wheel profiles,
- Wheelsets,
- Maximum train length,
- Maximum gradients and minimum curve radius,
- Flange lubrication and sanding,
- Braking,
- Passenger information and communication,
- Environmental conditions,
- System protection,
- Traction and electrical equipment,
- Servicing,
- Maintenance,
- Aerodynamic effects on ballast.

This check list is supplemented for common precise understanding of its items by references. Examples can be seen in Table 2.

II. Classification of national rules

Under the changes proposed in Railway Package 3b, the European Railway Agency is responsible for analysing the notified requirements and subdividing them into three categories:

- category A: internationally accepted standards that, once checked by any member state, do not need further checking for cross-acceptance;
- category B: contains requirements that are currently used in specific countries and which:
 - might be fit for cross-acceptance,

Table 2.
Polish check-list proposal

Rolling Stock characteristic items	TSIs clauses referenced only to ensure common understanding of the rolling stock characteristic items
General requirements	HS RST TSI: – General (clause: 4.1 and 4.2.1.1); – Design of trains (clause: 4.2.1.2; 4.3.5.1 - interface to HS OPE TSI 2006). TSI WAG: – General (clauses: 4.1 and 4.2.1).
Drawing and buffing gear	HS RST TSI: – End couplers and coupling arrangements to rescue trains (clause: 4.2.2.2; 4.3.5.2 - interface to HS OPE TSI 2006). TSI WAG: – Interface (e.g. coupling) between vehicles, between set of vehicles and between trains (clause: 4.2.2.1; 4.3.3.1 - interface to CR OPE TSI – open point; 4.3.5.1 – interface to infrastructure subsystem – to be specified at a later stage).
Strength of vehicle structure	HS RST TSI: – Strength of vehicle structure - General description (clause 4.2.2.3.1); – Principles (functional requirements) – (clause 4.2.2.3.2); – Specifications (simple load cases and design collision scenarios) – (clause 4.2.2.3.3). TSI WAG: – Strength of main vehicle structure and securing of freight – General (clauses: 4.2.2.3.1; 4.3.5.2 – interface to infrastructure subsystem – to be specified at a later stage); – Exceptional loads (clause 4.2.2.3.2); – Service (fatigue) loads (clause 4.2.2.3.3); – Stiffness of the main vehicle structure (clause 4.2.2.3.4); – Securing of freight (clauses: 4.2.2.3.5; 4.3.3.3 - interface to CR OPE TSI).

- might need further detailed discussion to move parts to A or C, now or later, in general or for a specific country,
- are not indisputable and undeniably essential and necessary standards and requirements linked to the technical characteristics of the infrastructure for safe and interoperable operation in that country;
- category C: contains indisputable and undeniably essential and necessary standards and requirements linked to the technical characteristics of the infrastructure of a specific country or network, which always need checking, e.g., loading gauge;

in relation to a common check-list proposed to be set up by the amended Safety Directive.

III. Putting into service under mutual recognition principle

The European Commission proposal assumes a common putting into service involving the national railway safety authorities of all Member States on whose territories the rolling stock is foreseen to run. Such a common process will involve single checking of class A requirements, mutual recognition of class B equivalent requirements and class C requirements checking in relation to national or network specific characteristics.

It would be ideal to assign promptly the European requirements to group A, the purely national ones to group C, and to use group B temporarily to hold the few requirements that are not yet classified. However, all three groups can be expected to be improved step by step over the next few years. To name just one reason for that expectation, we can point out that in some Member States the requirements applicable to traction vehicles are not prejudged by law as they were each time defined only in the respective tender documents. This however does not mean that there are no specific requirements imposed by the characteristics of the infrastructure. Another reason is that comparing the requirements defined in different languages and embedded in different legal frameworks—especially if some Member States want to protect their internal railway market by specific requirements—will be time consuming, to say the least. Additionally, what is considered to be a European requirement in one Member State is not necessarily seen as such in another.

As all the requirements are to be classified with reference to a check-list, it is crucial to establish an exhaustive and precise common check-list which will be understood by all railway experts in the same way. At this very moment we have two check-list proposals: one prepared by a Task Force established by the European Commission, which is simply a list of items, and another prepared and offered by Poland which is a list of items and a list of references to already issued Technical Specifications for Interoperability, with a view to ensuring a precise understanding of those items. The decision which one is to be chosen rests with the European Parliament.

6. Closing remarks

Existing RIV wagons are authorised to run in different Member States, but as of 2007, new freight wagons put into service have to comply with the 'TSI for freight wagons' sub-system conformity verification procedures.

Existing RIC carriages as well as passenger carriages to be declared RIC-compliant will be authorised to run in different Member States also after the 'TSI for passenger carriages' is issued, which is expected to take place in 2010 or 2011. However, later on new passenger carriages will have to be put into service according to the sub-system conformity verification procedures defined in TSI.

For electrical and diesel multiple units and locomotives to be authorized to run in different Member States it is necessary to pass the full national certification procedures in all Member States on whose territories such rolling stock is foreseen to run. Once the legal framework changes proposed by the European Commission to the European Parliament are implemented and the classification of national requirements into A, B and C categories in reference to a common check-list is accomplished, the certification procedures will be reduced to a close co-operation of the national railway safety authorities and the notified bodies.

The elaboration of new procedures for putting railway equipment into service (especially as far as locomotives are concerned) presupposes mutual understanding and close international co-operation, and as such is a challenging task. It is, however, indispensable if real competition between the railways and road transport systems is to be ensured.