



INF. 1

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RID: 17th session of the RID Committee of Experts' working group on tank and vehicle technology

(Ludwigshafen, 14 to 16 October 2019)

Subject: Stress resistance of tank-wagons in accordance with RID 6.8.2.1.2

Proposal transmitted by Germany

SUMMARY

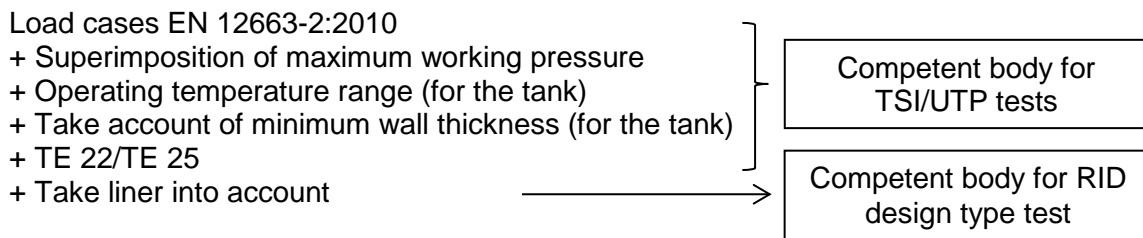
<i>Explanatory summary:</i>	Based on an analysis of the problem carried out in Germany, it is proposed that footnote 1 to RID 6.8.2.1.2 be made more specific in order to ensure additional security of action when designing, testing and approving tank-wagons.
<i>Decision to be taken:</i>	Amend footnote 1 to RID 6.8.2.1.2 in accordance with this proposal.
<i>Related documents:</i>	Final report of the 16 th session of the RID Committee of Experts' working group on tank and vehicle technology; Final report of the 10 th session of the RID Committee of Experts' standing working group.

Introduction

1. At the 16th session of the RID Committee of Experts' working group on tank and vehicle technology and the 10th session of the RID Committee of Experts' standing working group, it was decided to subject the requirements concerning the ability of tank-wagons to withstand the stresses which occur during carriage by rail in accordance with RID 6.8.2.1.2 to a fundamental analysis of the problem and to develop specific proposals for solutions as to how these requirements should be dealt with in future in the interaction between the competent authorities according to RID and the inspection bodies for TSIs or UTPs (see also paragraphs 31 to 37 of the final report of the 16th session of the RID Committee of Experts' working group on tank and vehicle technology and paragraphs 31 to 35 of the final report of the 10th session of the RID Committee of Experts' standing working group). It was agreed that Germany would carry out this analysis and submit it to the working group on tank and vehicle technology for further discussion.
2. An ad hoc working group was accordingly set up at national level in Germany and was attended by tank technology and vehicle technology experts. The results of their work are presented in this document. The results also include a specific text proposal to amend footnote 1 to RID 6.8.2.1.2, as proposed in this document.
3. According to RID 6.8.2.1.2, tank-wagons must be constructed so as "to be capable of withstanding, under the maximum permissible load, the stresses which occur during carriage by rail". According to footnote 1 to RID 6.8.2.1.2, this requirement is deemed to be met if the notified body according to TSI WAG or the assessing entity according to UTP WAG "has successfully evaluated compliance with the provisions of RID, in addition to the requirements of the TSI or UTP mentioned above, and has confirmed this compliance by a relevant certificate". In the past, there was some ambiguity as to which provisions of RID were meant in this context. The ad hoc working group therefore considers it useful to make this provision more specific so that all those involved can proceed with increased certainty.
4. With regard to assessing the strength of vehicles under the influence of stresses that occur during carriage by rail, TSI WAG and UTP WAG refer to standard EN 12663-2:2010 and the load conditions stipulated in Chapter 5. In addition, as an optional additional condition for hump shunting, Appendix C in each case refers to the collision impact test described in Chapter 8 of EN 12663-2:2010. In this context, the tank of a tank-wagon is also to be assessed as a component of the vehicle.
On the other hand, the assessment of the strength of tanks for tank-wagons under the influence of the stresses resulting from the load condition is only subject to the provisions of RID Chapter 6.8, particularly the specifications of standard EN 14025.
5. According to EN 12663-2:2010, calculation-based evidence with the aid of FEM calculations or a reduced testing programme compared to the usual load spectrum can in principle be used to provide verification for the assessment of the strength of vehicles, provided a suitable representative reference vehicle is subjected to the tests specified in EN 12663-2:2010. According to Chapter 9.3 of this standard, similar operating conditions, among other things, must apply to reference vehicles, the overall load path must remain the same and the strength must be demonstrated. However, further specification of criteria for selecting suitable reference vehicles and the scope of reduced test programmes cannot, in the view of the ad hoc working group, be done, as this always depends on each individual case. In the framework of the assessment according to EN 12663-2:2010, the appropriate selection of the reference vehicle must be comprehensively justified in each case.

6. The ad hoc working group established that the calculation provisions and the load cases to be considered in each case in standards EN 12663-2:2010 and EN 14025 are based on very different design concepts, in which, on the basis of values obtained from experience, certain simplifications are combined with threshold values adapted to them. Experts on the ability of vehicles to withstand stresses consider that both concepts, with the effects to be considered in each case, achieve a comparable level of safety. For this reason, it is not considered appropriate to mix the specifications of the calculation provisions of standards EN 12663-2:2010 and EN 14025. The respective calculations should therefore be carried out separately from each other, using the threshold values assigned in each case. This also applies to various safety factors in welded areas, the assessment of which must be clearly documented. The decision taken at the 10th session of the RID Committee of Experts' standing working group no longer to take account of the decision of the 2nd session of the RID Committee of Experts' standing working group with regard to using the permissible stresses according to RID Chapter 6.8 or EN 14025 when assessing the ability to withstand the stresses according to EN 12662-2:2010 is therefore confirmed (cf. paragraphs 32 and 33 of the final report of the 10th session of the RID Committee of Experts' standing working group).
7. In general, according to the ad hoc working group's findings, the operating conditions and operating loads of the respective vehicle have to be taken into account when carrying out assessments in accordance with EN 12663-2:2010. This also applies to the maximum internal pressure of the tank (maximum working pressure) that occurs during its operation. Significant working pressures only occur in tanks that do not have a ventilation device. For these tanks, the load cases according to EN 12663-2:2010, with the superimposition of the maximum working pressure on the respective loads, must be demonstrated.
In contrast, the ad hoc working group did not class the negative internal pressures defined in RID 6.8.2.1.7 as part of the operating conditions, so it is not necessary to demonstrate the superimposition on the respective loads of the maximum internal negative pressure.
If significant working pressures only occur during loading and unloading, this only applies to the relevant load cases for this operating condition (in this case, for example, the hoisting and fatigue load cases would not be superimposed). In the context of the assessment according to EN 12663-2:2010, the choice of load cases with the superimposition of the working pressure must be justified.
8. The ad hoc working group was of the view that taking account of the operating conditions of the vehicle when assessing its structural strength according to EN 12663-2:2010 also concerns the anticipated operating temperatures of tanks, so here, the corresponding material values must be taken into account in the assessment.
9. In the ad hoc working group's view, in the verification according to EN 12663-2:2010 for the tank, the minimum wall thickness according to RID Chapter 6.8 should always be used, rather than the nominal wall thickness, as this defines the most unfavourable borderline case in normal operating conditions. Nominal wall thicknesses include an allowance for corrosion, which, in normal operating conditions, can be thinned down to the requisite minimum wall thickness.
10. The substance-specific special provisions TE 22 (crash buffers) and TE 25 (measures to avoid overriding or limit the damage in the event of overriding) contain technical vehicle specifications and, among other things, have an effect of the strength of the vehicle and the tests or calculations that have to be carried out. The ad hoc working group was therefore in favour of the relevant competent authority's checking that the provisions contained in special provisions TE 22 and TE 25 are appropriately complied with in the framework of the assessment of the ability to withstand stresses which occur during carriage by rail according to RID 6.8.2.1.2. For the design type test of the tank in accordance with RID 6.8.2.3.1, this requires a controlled exchange of the relevant test results between each of the competent inspection bodies.

11. According to information from the ad hoc working group, in the tank design type test, the mechanical suitability of the lining of tanks according to RID 6.8.2.1.24 has previously only been assessed on the basis of values obtained from experience. The ad hoc working group established that the structural strength of liners depends on a number of influencing factors (particularly the manufacturing conditions), but that for each application case, the maximum acceptable elongation of the liner should be defined, which may not be exceeded by any of the elongations determined for all load cases. The ad hoc working group was of the view that this assessment should continue to be made in the framework of the design type test according to RID 6.8.2.3.1, but this requires a controlled exchange of relevant elongation values between each of the competent inspection bodies.
Against this background, the ad hoc working group supported including a note in the relevant standard for the design of tanks (EN 14025) to say that for tanks with a liner, the maximum elongations of tanks that occur under normal conditions of carriage (which derive from the assessments according to EN 12663-2:2010 and EN 14025) must be taken into account. It was also suggested that a procedure for determining the maximum acceptable elongation of the liner should be specified in this standard, with the involvement of the manufacturers of liners.
12. In addition to the fatigue load cases defined in EN 12663-2:2010 resulting from alternating stresses in normal railway operations, the tanks of tank-wagons are also exposed to alternating stresses as a result of pressure variations. However, the ad hoc working group did not consider it necessary to take account of fatigue load cases resulting from pressure variations in accordance with EN 13445-3, which is referred to in EN 14025, which arise because of the usual operating mode in this case, provided it is ensured that when the tank is manufactured, the parts that are subject to the highest stresses are designed with as few indents as possible.
13. The ad hoc working group pointed out that as a rule, the competent bodies for the tests according to the TSI or UTP are not accredited to check the provisions of RID. In view of the extended scope of tests proposed here in the context of the tests for RID 6.8.2.1.2, the points not so far contained in EN 12663-2:2010 would have to be added to this standard so that all the tests to be carried out are covered by the relevant bodies' scope of accreditation. As an interim solution, footnote 1 to RID 6.8.2.1.2 should be amended so that the bodies competent for the TSI/UTP tests can cover the extended scope of tests.
14. In summary, it is considered useful to include the following to make RID 6.8.2.1.2 more specific:



The corresponding certificate from the competent body for the TSI test must provide comprehensive evidence of the aspects listed.

In parallel, standard EN 14025 should be supplemented with suitable verification processes for inner coatings (see paragraph 11). In addition, the other additional test points for tank-wagons should be included in standard EN 12663-2:2010 (see paragraph 13).

Proposal

15. Amend footnote 1 to RID 6.8.2.1.2 to read as follows:

¹ This requirement is deemed to be met if

(a)

- the notified body in charge of verifying compliance with the technical specification for interoperability (TSI) relating to the subsystem "rolling stock – freight wagons" of the rail system in the European Union (Commission Regulation (EU) No 321/2013 of 13 March 2013) or
- the assessing entity in charge of verifying compliance with the uniform technical prescriptions (UTP) applicable to the Rolling Stock subsystem: FREIGHT WAGONS – (Ref. A 94-02/2.2012 of 1 January 2014)

has successfully evaluated ~~compliance with the provisions of RID~~ the requirements listed below, in addition to the requirements of the TSI or UTP mentioned above, and has confirmed this compliance by a relevant certificate:

(1) That the maximum working pressure of the tank has been superimposed on the load cases applicable to the assessment of the ability to withstand stresses

(2) That the operating temperature range of the tank has been taken into account in the load cases applicable to the assessment of the ability to withstand stresses

(3) That the minimum wall thickness of the tank in accordance with RID 6.8.2.1 and 6.8.2.6 has been taken into account in the load cases applicable to the assessment of the ability to withstand stresses

(4) Special provisions TE 22 and TE 25 in accordance with RID 6.8.4

and for tanks with a liner

(b)

the competent authority for the design type test in accordance with RID 6.8.2.3.1 or a body designated by that authority has tested and certified the ability of the liner to withstand the stresses in the load cases applicable to the assessment of the tank's ability to withstand stresses. The necessary data on the assessment of the ability to withstand stresses (particularly the maximum elongations in the tank walls for all relevant load cases and, if necessary, their combinations) shall be made available to the competent authority.

Justification

16. The proposed amendment to footnote 1 to RID 6.8.2.1.2 would ensure additional security of action for tank-wagon manufacturers and operators and for the inspection bodies and approval authorities involved, by making the requirements more specific.