Organisation intergouvernementale pour les transports internationaux ferroviaires
Zwischenstaatliche Organisation für den internationalen Eisenbahnverkehr
Intergovernmental Organisation for International Carriage by Rail

**INF. 8**

21 November 2019

Original: German

**RID:** **11th Session of the RID Committee of Experts' standing working group**
(Vienna, 25 to 29 November 2019)

**Subject:** **Extra-large tank-containers – questions relating to safety**

**Submitted by Germany**

## Introduction

1. Since the end of 2017, there have been discussions in various international (and national) bodies on questions in connection with the carriage of dangerous goods in extra-large tank-containers. These extra-large tank-containers were developed by BASF in cooperation with the Belgian and French tank-container manufacturers van Hool and Magyar. With a maximum volume of 73,500 litres and a payload of 66 tons, these new 45- and 52-foot tank-containers have twice the load capacity of a current tank-container and a load capacity comparable to that of a chemical tank-wagon. They are made of stainless steel, equipped with reinforcement rings and have a reinforced frame that allows for stacking up to 6 extra-large tank-containers.

2. Together with newly developed container carrying wagons and automated guided vehicles (AGV), on which these extra-large tank-containers are currently carried on the company premises, they make up a completely new freight transport system for rail freight transport.

3. This new development has been noted with great interest by the stakeholders. However, these extra-large tank-containers also raise several safety issues. The starting point of these discussions was informal document INF.18 submitted by Switzerland for the 8th session of the RID Committee of Experts' standing working group (Utrecht, 20 - 24 November 2017).

4. According to the information available, the extra-large tank-containers have been constructed in accordance with the requirements for current tank-containers under Chapter 6.8 of RID and approved by Bureau Veritas Belgium. They are, however, more than twice the size of conventional tank-containers, and the question arises, in particular, whether these tank-containers, whose volume is equivalent to that of a tank-wagon, should also be subject to the partly more stringent provisions for tank-wagons.

5. A comparative table of the provisions applicable to tank-wagons and tank-containers (cf. documents OTIF/RID/CE/GTP/2018/1 (Germany) and -2018/2 (United Kingdom)) served as a basis for discussion at the 15th session of the working group on tank and vehicle technology (Hamburg, 30 – 31 January 2018).

6. The partly differing provisions with regard to the tank and the requirements to be met by vehicles were discussed, e.g.:

   – Stresses in rail transport (proof of load cases in accordance with 6.8.2.1.2 of RID)

     While for tank-wagons and carrying wagons acceleration values of 5g in the direction of travel are prescribed in EN 12663-22010, 2g are prescribed in UIC leaflet 592 for the fastenings of tank-containers and the tank-containers themselves, even with a maximum authorized mass of 36 tonnes.

     The carrying wagons used for extra-large tank-containers are fitted with long-stroke buffers and fixing pins made of high-strength materials that achieve a maximum acceleration value of 2.7g.

   – Reduction of the wall thickness of the tanks:

     For tank-containers: at least 6 mm for mild steel; when using another metal with better properties, wall thickness may, however, be reduced to 3 mm;

     for tank-wagons: at least 6 mm for mild steel; when using another metal, under no circumstances less than 4.5 mm.

   – Energy absorption elements (crash buffers) and protection against overriding

     For tank-wagons: for the carriage of certain dangerous liquids and gases [6.8.4 (b) of RID, TE 22 and TE 25].

     So far, there is no such provision for carrying wagons of tank-containers (depending on the equipment, this would result in the carrying wagons no longer being able to be deployed flexibly for all transport operations in container transport).

7. Individual questions relating to tanks were forwarded to the working group on tanks (minimum wall thickness, pressure resistance of closures, inscription of the date of the next inspection on the tank and general requirements), cf. document ECE/TRANS/WP.15/ AC.1/150/Add.1, paragraphs 27-35.

8. However, the various bodies were unable to clearly assess the majority of the individual questions, as there is no experience yet as regards tank-containers of such large size.

9. The discussion on the question of the minimum wall thickness revealed, for instance, that the freight transport system developed in the 1970s was probably designed around a tank-container with a maximum capacity of approx. 36,000 litres. Originally, the tanks of these tank-containers were protected by full frames. It was assumed that this was one of the reasons why the wall thickness of 6 mm for mild steel was allowed to be reduced to 3 mm for other metals. Therefore, the question arises whether the reduction to 3 mm is justified in the case of an increase in capacity to 73,500 litres, which is equivalent to the capacity of a bogie tank-wagon, cf. document ECE/TRANS/WP.15/AC.1/150/Add.1 paragraph 30, or whether the same minimum wall thickness as for tank-wagons (4.5 mm) should be prescribed for these extra-large tank-containers.

10. This and some other questions (fixings for welded elements, pressure resistance of closures on the shell, minimum distance between the headstock plane and the shell) could not be answered at that time in the various working groups; thus it was agreed to first wait for the results of a risk assessment and the tests to be carried out within this framework.

11. Within the framework of these discussions, BASF had offered to carry out a risk assessment of extra-large tank-containers in comparison with conventional tank-wagons and with conventional tank-containers carried on conventional carrying wagons. This risk assessment was also to be used to examine whether this new freight transport system, which also imposes particular requirements to be met by carrying wagons, constitutes a significant change within the meaning of the "common safety method for risk evaluation and assessment" (CSM Regulation (EU) No 402/2013).

12. The result of the risk assessment was presented at the 17th session of the RID Committee of Experts' working group on tank and vehicle technology (Ludwigshafen, 14/15 October 2019), cf. informal document INF.4 (BASF) as well as the presentation of the Technische Universität Berlin.

**Conclusions from the discussions at the 17th session of the working group on tank and vehicle technology (Ludwigshafen, 14 - 15 October 2019)**

13. Germany supports the statement in paragraph 7 of the final report that the discussions that took place at this session can only be considered as provisional. As the relevant documents had only been made available one week before the session, it was not possible to examine this complex issue in depth. Moreover, informal document INF.4 only contains conclusions, without providing proof of how these results were obtained. A meaningful examination requires the possibility of examining the test results in detail.

14. The detailed risk assessment is contained in a comprehensive research report of the Technische Universität Berlin. This document was first made available at the end of October 2019, so there was not sufficient time to examine the document in detail to enable answers to be found to the various questions before the 11th session of the RID Committee of Experts' standing working group.

15. Besides this risk assessment commissioned by BASF, the verification of this assessment by an independent body as provided for in the CSM Regulation (EU) No. 402/2013 is, of course, also of importance. This verification by an independent body is, however, not yet available.

16. Germany therefore considers it necessary to continue the discussion beyond the current session of the RID Committee of Experts' standing working group.

17. Furthermore, it should be discussed which aspects are also relevant for the Joint Meeting and should also be considered by the Joint Meeting's working group on tanks.

    The extra-large tank-containers have so far only been carried by rail, but it has been announced on various occasions that in the future, dangerous goods transport operations are to be carried out with extra-large tank-containers on automated guided vehicles also outside the company premises on public roads (initially on test tracks). So far, there are no dangerous goods provisions for this, and the risk assessment carried out only refers to the systems that operate by rail. Such considerations should be included in the discussions, as they would be incompatible with the proposal to abolish the degree of filling, for instance.

    So far, the Joint Meeting's working group on tanks has addressed various questions related to the extra-large tank-containers only once, in March 2018. At that time, it was still assumed that the issues were railway-specific. As mentioned above, this has changed in the meantime, but irrespective of that, it was also assumed at that time that in the further course of dealing with

tank questions in the working group on tank and vehicle technology, tank experts would be involved. However, this was not the case, or only to a very limited extent, at the 17th session of the working group on tank and vehicle technology.

**Germany's preliminary assessment regarding the individual questions:**

18. Degree of filling in accordance with 4.3.2.2.4 of RID

In order to prevent dangerous surge movements, shells for the carriage of substances in the liquid state or liquefied gases or refrigerated liquefied gases (without partitions or surge plates) have to be filled to not less than 80% or not more than 20% of their capacity.

During the tests carried out within the framework of the risk assessment, according to BASF, apparently no dangerous surge movements were noted. In the opinion of Germany, this conclusion should be verified by tank experts, if appropriate. Questions can already be raised as to the extent to which the findings can be applied to other tank/vehicle combinations, differing tank volumes, different densities of cargoes and other degrees of filling than the tested 50%.

Moreover, Germany believes that it does not make sense for an intermodal means of transport to dispense with the provisions of 4.3.2.2.4 only for the rail mode. This is also true for extra-large tank-containers.

19. Reduction of the shell thickness

6.8.2.1.18 of RID provides for a minimum shell thickness of 4.5 mm for tank-wagons and 3 mm for tank-containers. The German representative had already explained at the 17th session of the working group on tank and vehicle technology that the provisions for the construction of tanks for tank-containers were developed in the 1970s on the basis of the tank-containers that existed at that time. For extra-large tank-containers with 2.5 times the capacity, these questions would have to be reassessed; see also paragraph 19 of the final report.

In paragraph 6 of the final report of the 17th session, it is stated that in frontal collisions the minimum wall thicknesses examined had no effect on safety and that it was not therefore necessary to amend the provisions on the minimum wall thicknesses. Germany does not share this conclusion from the risk assessment based on the results presented. Serious accidents with rail tank-wagons sometimes result in the tanks-wagons overturning on one side. This means that the possible penetration behaviour of the shells (comparison of lateral position with 3.0 mm and 4.5 mm wall thickness) would also have to be considered, taking into account the possible loss of product (risk = likelihood x consequence).

As a matter of fact, this is also true for side-on collisions where a tank-wagon is impacted laterally by a carrying wagon with extra-large tank-containers, and initial contact occurs between the tanks. This scenario was not examined in the tests conducted by BASF and TU Berlin. What is more, the effects of an impact between of wagon bodies of more aggressive shapes (e.g. box containers) and extra-large tank-containers or tank-wagons in both side-on and frontal collisions have not been considered.

The different volumes should also be taken into account in a risk assessment. Additionally, the safety level should be discussed again if these large tank-containers are to be deployed on the roads and, as a result, the safety gain provided by the special carrying wagons is lost (e.g. in frontal collisions).

The minimum wall thickness also has a major impact on the stability of long, unsupported tanks.

In addition, at least in ADR there is the principle that special tanks with smaller volumes may also have a lower minimum wall thickness (see 6.8.2.1.21 of ADR) in comparison with tanks of greater volumes.

Moreover, it should be noted that in the final report of the 15th session of the RID Committee of Experts' working group on tank and vehicle technology (Hamburg, 30/31 January 2018) it was stated in connection with the question of "reducing the wall thickness" in paragraph 18 that the "representative of van Hool was asked to submit approval documentation with regard to the calculation of the wall thickness and the material used". These calculations and the material certificates have not yet been submitted. Therefore, the statements regarding wall thickness are not verifiable.

20. Fixing of welded elements

Germany supports the recommendation of the working group on tank and vehicle technology (para. 24 of the final report of the 17th session) that the requirements in 6.8.2.2.1 of RID that currently only apply to tank-wagons also be included for tank-containers (welded elements have to be fixed to the tank in such a way that tearing of the shell due to accidental stresses is prevented).

21. Pressure resistance of closures on the shell

Germany also supports the recommendation of the working group on tank and vehicle technology (para. 26 of the final report of the 17th session) that the requirements in 6.8.2.2.4 of RID that currently only apply to tank-wagons also be included for tank-containers (specified pressure resistance of the closures of openings).

22. Vehicle technology issues: design of spigots and marking of carrying wagons fitted with reinforced spigots

The issue of marking carrying wagons fitted with reinforced spigots and of carrying wagons with two external solebars is currently still being discussed within UIC; see also paragraphs 27, 28 and 45 of the final report of the 17th session. The use of suitable carrying wagons is an indispensable prerequisite for the "B-TC on special carrying wagons" system examined within the framework of the risk assessment.

However, as long as there is no clear marking, there is the risk that extra-large tank-containers are loaded onto carrying wagons that are not equipped for the carriage of extra-large tank-containers. Therefore, the question arises of which measures or requirements can be implemented to ensure that the carrying wagons are used correctly until they are marked. From a regulatory perspective, this question has to be considered in an abstract way in relation to a general solution, even if it is concluded that in the specific case of the deployment by BASF, suitable internal workflows have been implemented.

In addition, the further proposal only to approve tank-containers with a minimum wall thickness of 4.5 mm in the case of carrying wagons with only one central solebar makes the practical work of combining different types of tank-containers with different types of carrying wagons difficult. It would be difficult enough to ensure that extra-large tank-containers are only carried on the carrying wagons intended for them. This might be arranged by means of a corresponding marking of the carrying wagons (see also para. 22 on marking) and by introducing new vehicle features (e.g. reinforced spigots). A further differentiation by the wall thickness of the tank-containers (at least 3 or 4.5 mm) and the corresponding carrying wagon (2 external solebars or 1 central solebar) is probably difficult to implement.

Paragraph 22 of the final report of the 17th session of the working group on tank and vehicle technology contains the statement that no provisions concerning the use of carrying wagons can be included in RID. However, Germany would like to note that there already are provisions on the loading of tank-containers (e.g. in 7.5.7.4) that could be amended, if necessary. The introduction of a definition of extra-large tank-containers would be helpful for this. Germany believes that the development of a safety target proposal and addressing this proposal in the

Joint Coordinating Group of Experts (JCGE) alone is not sufficient.

23. Vehicle technology issues: minimum distance between the headstock plane and the shell

6.8.2.1.29 of RID specifies that the minimum distance between the headstock plane and the most protruding point at the shell extremity on tank-wagons has to be 300 mm (alternative: override protection). There is no equivalent provision for carrying wagons of tank-containers. However, the provisions in 4.3.2.3.2 apply, according to which, during carriage, tank-containers have to be loaded on the carrying wagon in such a way as to be adequately protected by the fittings of the carrying wagon or of the tank-container itself against lateral and longitudinal impact and against overturning. In this context, it had already been noted in the past that the discharge devices of the extra-large tank-containers are fitted to the ends, and that, in the event of the buffers overriding, they are therefore in the immediate danger area; see also paragraphs 20 and 21 of the final report of the 15th session of the working group on tank and vehicle technology.

None of the delegations expressed an opinion on this point at the last session of the working group on tank and vehicle technology; see also paragraphs 29 and 30 of the final report of the 17th session. However, Germany assumes that this provision continues to be justified for tank-wagons and that, given the volume, it should also apply to extra-large tank-containers.

24. Vehicle technology issues: energy absorption elements and protection against overriding

Special provisions TE 22 and TE 25 specify that, for tank-wagons for the carriage of certain dangerous liquids and gases, energy absorption elements and means of protection against the overriding of buffers and/or for the limitation of damage caused by overriding buffers are to be used. Germany believes that in principle, it is possible to apply these provisions to carrying wagons for extra-large tank-containers, as the carrying wagons are new constructions anyway.

Should technical issues arise with crash buffers due to the fact that the trigger level of these buffers is more or less equivalent to an impact test with an acceleration of 6g and, given such an acceleration, it cannot be ensured that the extra-large tank-containers remain on the carrying wagons, as the reinforced spigots are only designed to withstand 3g, this would, in the opinion of Germany, not result in the measure's being dispensable, but instead in the possible approval of alternative measures.

With regard to special provision TE 25 (override protection) and its applicability to (extra-large) tank-containers, reference is made to the comments by Belgium and UIP at the last session of the working group on tank and vehicle technology, see also paragraphs 33 and 44 of the final report of the 17th session.

Germany requests that the discussion in the RID Committee of Experts' working group on tank and vehicle technology be continued and that the Joint Meeting's working group on tanks again be involved.