Economic Commission for Europe

Inland Transport Committee

Working Party on the Transport of Dangerous Goods

Joint Meeting of the RID Committee of Experts and the Working Party on the Transport of Dangerous Goods **25 March 2015**

Report of the Working Group on Tanks

1. The Working Group on Tanks met from 23 to 25 March 2015 in Bern on the basis of an appropriate mandate from the RID/ADR/ADN Joint Meeting, under the chairmanship of Mr. Arne Bale (United Kingdom) and with Mr. Michaël Bogaert (Belgium) as secretary. The relevant documents were submitted to the plenary session and transferred to the Working Group for consideration.

2. The Working Group on Tanks, consisting of 25 experts from 13 countries and 5 non-governmental organizations, dealt with the following official and informal documents :

Documents: ECE/TRANS/WP.15/AC.1/2014/13 (Ukraine)
ECE/TRANS/WP.15/AC.1/2015/3 (OTIF)
ECE/TRANS/WP.15/AC.1/2015/8 (France)
ECE/TRANS/WP.15/AC.1/2015/10 (Netherlands)
ECE/TRANS/WP.15/AC.1/2015/16 (France)
ECE/TRANS/WP.15/AC.1/2015/19 (UIC)
ECE/TRANS/WP.15/AC.1/2015/20 (UIC)
ECE/TRANS/WP.15/AC.1/2015/22 (United Kingdom)

Informal documents:INF.48 (March 2014 session) (Russian Federation)
INF.10 (Germany)
INF.12/rev.1 (Poland)
INF.15 (Germany)
INF.17 (UIC)
INF.18 (United Kingdom)
INF.22 (Russian Federation)
INF.41 (AEGPL)
INF.42 (Belgium)

Item 1: ECE/TRANS/WP.15/AC.1/2014/13 (Ukraine) – Proposals of amendments to special provisions TU21 and TU16 to align with the requirements of SMGS, Appendix 2 + INF.48 (Russian Federation)

3. The Working Group recalled its discussions on this topic during the spring and autumn sessions of 2014. reflected in the Working Group on Tanks reports ECE/TRANS/WP.15/AC.1/134/Add.1 and ECE/TRANS/WP.15/AC.1.136/Add.1.

4. The conclusions from the autumn session of 2014 are reproduced below:

After discussion and an explanation of the current practice in transport between Ukraine and Germany, the Group did not come to a consensus if the current provisions under TU21 allow the use of water without additional nitrogen for the stable transport of phosphorus (UN 2447 and UN 1381). While SMGS Appendix 2 allows water on its own to be used, it was noted that the water height in this system is 30-60 cm, whereas ADR/RID only require a minimum of 12 cm. It is unclear however if the overall system in SMGS is identical to the ADR/RID system (e.g. are the tanks hermetically sealed,…). Some experts felt that using only 12 cm of water, without additional nitrogen, could not guarantee that the solid phosphorus would be entirely covered during transport and little information was found on the origin of these technical provisions in the regulations.

Ultimately, the Group agreed that the current text leads to problems of interpretation and should be amended. In order to do this, the Group felt that it requires more information on:

- *current practices in countries (through feedback from the concerned industry)*
- *the substance behaviour in the tank when only 12 cm of water is present*
- *the substance behaviour at different degrees of filling*
- *the physical state of the phosphorus during carriage*

The Group agreed to invite the concerned industry to participate at a future session of the Working Group to help clarify the issue.

The Group also considered in detail the question set out in INF.48, if filling to 96% or 98% was necessary for empty, uncleaned tanks when the majority of the residue is at the bottom of the tank. The Group felt that this question was linked to the first one since it is necessary to understand fully the substance behaviour in the tank (e.g. do residues adhere to the sides of the shell, does caking occur,…) to evaluate this provision.

5. Following the request from the Working Group, a detailed presentation on the current practice of transport of yellow phosphorus was given by Dr. Heiko Mammen from ICL. The presentation showed that today mainly UN 1381 is used in practice for the tank transport of yellow phosphorus. Different practices are used for rail tank-wagons and tank-containers. For tank-wagons a water layer of 30 cm is typically used, as prescribed in SMGS, since there are some doubts if the used tank-wagons are hermetically sealed. For tank-containers a water layer of 12 cm is used, with additional nitrogen blanket. The tanks involved are typically dedicated tanks, due to the high density of the product and current trends show an increase in the use of tank-containers and decreasing use of tank-wagons. It was mentioned that in North America this substance is carried with water layers below 12 cm and additional nitrogen blanket. In the past at least 1 supplier used only a nitrogen blanket, with highly optimized equipment. Applying only a water layer of 12 cm without additional nitrogen in an RID tank-wagon was presented as safe, since the main condition for safety was that the phosphorus stayed wet and the tank was hermetically sealed.

6. After this presentation, a discussion in detail took place and it was concluded that three options offered a satisfactory level of safety: a) using a minimum water layer of 12 cm, b) using only a nitrogen blanket, c) using a combination of water and a nitrogen blanket. The current wording of TU21 seemed to allow these three options, but it was felt that the text could be made clearer.

There were also indications that in future SMGS might see amendments to include the use of 12 cm of water and a nitrogen blanket for tank-containers, in line with RID.

7. The proposal in 2014/13 to amend the transport document was considered an issue for the RID Standing Working Group.

8. The problem described in INF.48 regarding TU16 and needing to fill empty-uncleaned tanks to 96% water capacity was considered in further detail. In practice suppliers are unable to handle the large amounts of toxic waste water this practice would generate, leading to the current use of only 25-30 cm of water with an additional nitrogen blanket. No residues seem to adhere to the tank surface but a slurry is formed at the tank bottom. To reflect this practice, the Group proposes to modify TU16 as follows:

Proposal

Modify TU16 as follows (modifications underlined):

TU16 Uncleaned empty tanks, shall, when handed over for carriage, either:

- be filled with nitrogen *(with or without water)*; or

- be filled with water to not less than 96% and not more than 98% of their capacity; between 1 October and 31 March, this water shall contain sufficient anti-freeze agent to make it impossible for the water to freeze during carriage; the anti-freeze agent shall be free from corrosive action and not liable to react with phosphorus.

9. Finally, The Working Group noted that for UN portable tanks, there is no special tank provision for UN 1381 for the elimination of air above the phosphorus. This matter should be brought to the attention of the UN Sub-committee of Experts where a similar provision to TP7, assigned to UN 2447, should be considered for UN 1381.

Item 2: ECE/TRANS/WP.15/AC.1/2015/8 (France) – Wall thickness of tanks with a capacity less than 5000 liters made of austenitic-ferritic stainless steel

10. The Working Group endorsed the proposal made by France to amend the table in 6.8.2.1.21 (ADR only) to include austenitic-ferritic stainless steel. Additionally, it was mentioned that the English text in 6.12.3.1.3 and 6.12.3.2.3 which mentions “stainless austenitic steels” should be corrected to read “austenitic stainless steels”.

Proposal

11. Amend the second table of 6.8.2.1.21 of ADR as follows:

	Maximum radius of curvature of shell (m)	*≤ 2*	*2–3*	*2–3*
	Capacity of shell or shell compartment (m^3)	5.0	≤ 3.5	> 3.5 but ≤ 5.0
Minimum thickness of shells	Austenitic stainless steels	2.5 mm	2.5 mm	3 mm
	Austenitic-ferritic stainless steels	***3 mm***	***3 mm***	***3.5 mm***
	Other steels	3 mm	3 mm	4 mm
	Aluminium alloys	4 mm	4 mm	5 mm

Maximum radius of curvature of shell (m)	*≤ 2*	*2–3*	*2–3*
Capacity of shell or shell compartment (m^3)	5.0	≤ 3.5	> 3.5 but ≤ 5.0
Pure aluminium at 99.80%	6 mm	6 mm	8 mm

Proposal

Replace the English text in 6.12.3.1.3 and 6.12.3.2.3 which mentions “stainless austenitic steels” to read “austenitic stainless steels”.

Item 3: ECE/TRANS/WP.15/AC.1/2015/10 (Netherlands) – Shells made of aluminium alloy with protective lining

12. The Working Group considered document 10 in detail. The substance involved in the accident described in the document was hydrochloric acid instead of hydrofluoric acid. During the discussion, although the principal of the proposal was supported by the Group, some experts felt that using pH alone as a criterion to prohibit the use of aluminium as shell material for lined tanks was not adequate as some substances which are corrosive to metals don’t have extreme pH values (e.g. hypochlorite solutions) and also other factors such as impurities and temperature play a role in corrosion. Additionally, some linings don’t serve to protect the tank from the substance, but to ensure the purity of the substance.

13. Some experts explained that they, through regulation or in practice, did not accept aluminium at all as construction material for lined tanks and had prohibited for new construction of these tanks from a certain date. An additional reason for this is the operational difficulty posed by the different thermal expansion between aluminium and lining materials.
Other experts believed that an alternative approach might be to work with special tank provisions, prohibiting certain construction materials, assigned to specific substances. When the lining fails, the substance will inevitably weaken the construction material. In such a case, the idea is to use the construction material which will not lead to “catastrophic failure”. Industry compatibility lists for materials and substances exist, but it is not clear what the workload would be of such a substance by substance review.

14. Ultimately, the Group remained with a set of questions and alternatives where further consideration is needed:

- How many tanks are involved?
- What would be the impact and timeframe needed to phase out these tanks?
- Is the prohibition warranted if the lining is there only to safeguard the purity of the substance?
- Is there a need for additional inspection on linings of existing tanks?
- Should it be a general approach or specific for certain substances?

The Working Group decided to invite the Netherlands to come back at the next session, taking the discussion into account.
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Item 4: ECE/TRANS/WP.15/AC.1/2015/16 (France) – Periodic inspection of tanks with internal lining

15. The Working Group analysed the request from France for an exchange of experience on the question if pressure tests during periodic inspections might cause defects in the internal thermosetting lining of tanks. The tanks in question have a calculation pressure of 4 bar.

16. It was mentioned that thermosetting linings might contain air bubbles from solvent evaporation that might induce cracks. Possible remedies for this are curing at higher temperature and ensuring sufficient elasticity. The polymers in question seemed to involve a low temperature application of the lining. The question was raised if these polymers might be more brittle than other materials typically used for linings (e.g. epoxy thermosetting polymers). It was also recalled by the Group that EN 12972 requires that the lining is able to resist pressure testing. Finally, the Group also discussed some of the difficulties in assessing the quality of the linings during periodic inspection, since spark testing can be slightly destructive for the lining. France asked if other countries could share information if the concerned lining is also applied elsewhere.

Item 5: ECE/TRANS/WP.15/AC.1/2015/3 (OTIF) – 4.3.2.2 Degree of filling + INF.22 (Russian Federation)

17. The Working Group carefully considered the proposal from OTIF and the supporting information in INF.22. However, the Group did not support the proposed amendments for the following reasons:

- The main difference between chapters 4.2 and 4.3 for the use of extreme temperature variations in the calculation of the thermal expansion coefficient is that different maximum filling ratios are allowed between both systems. Where UN portable tanks have a maximum degree of filling of 95% or 97% (compensated for the thermal expansion), RID/ADR tanks can be filled up to 98% or even 100% (compensated for the thermal expansion) depending on the substance involved.
- It was recalled that currently there are some concerns with overfilling of tanks and it was felt that allowing lower reference temperatures for determining the maximum degree of filling than the currently used 50°C would not help these concerns.
- There is no real interoperability issue between SMGS annex II and RID in this matter, as long as the most stringent of both filling ratios is applied.

Item 6: ECE/TRANS/WP.15/AC.1/2015/19 (UIC) – Carriage of tanks, battery-vehicles/battery-wagons, and MEGCs following expiry of deadlines for periodic and intermediate inspections

18. The Working Group analysed the UIC proposal, taking over principles currently applied for UN portable tanks, to allow for some flexibility for the deadline of the intermediate and periodic inspection. However, most experts in the Group did not support the UIC proposal. It was felt that RID/ADR journeys are typically shorter than maritime journeys for UN portable tanks, which was the reason to allow flexibility for UN portable tanks, and extending the period between inspections would only move the problem a bit further in time. The necessity of the proposal in practice was questioned. Some experts

however were favourable to the proposal, especially for disposal or recycling of product, but with a shorter period of flexibility. For empty, uncleaned tanks, 4.3.2.4.4 already allows carriage after the expiry date for undergoing the inspection.

19. The Working Group invites UIC to take account of the discussion and to consider revisiting the issue with further justification and possible information on how this is handled in other parts of the world (e.g. in SMGS or in North American rail regulations).

Item 7: ECE/TRANS/WP.15/AC.1/2015/20 (UIC) – Indication of date of next inspection on both sides of tank containers, portable tanks and MEGC

20. Some experts recognised, as discussed previously in the Working Group, the need expressed by UIC, but repeated that the UN Subcommittee of Experts should be consulted first. For maritime journeys, some experts did not identify the need for this change since a certificate with the test date is generally asked for before loading. For rail transport, it was recognised that inspection and enforceability might benefit from this additional information. A recent agreed modification to RID, where the carrier can rely on information supplied by the filler, might alleviate this concern to some extent. There was sympathy for the issue in relation to refrigerated liquefied gases where there was a suggestion of consideration of alignment with the periodicity given in chapter 6.7.

21. The Working Group did not reach a consensus but concluded that it might be premature to propose these changes for tank-containers before a renewed discussion at the UN Subcommittee of Experts

Item 8: INF.10 (Germany) – Requirements to be met by fixed special receptacles and special containers for the carriage of heat energy without loading and unloading the heat storage medium

22. There was general support from the Working Group for the proposal, however several comments and questions were raised for further consideration. Germany is invited to come back with a formal paper for the next session, taking the following comments into account:

- Other substances (such as calcium nitrate and sodium nitrate) might be included
- Does the reference to chapter 5.3 mean placarding and marking as for tanks ?
- 6.8.2.1.28 in the construction requirements is ADR only and 6.8.2.1.26 is only for substances with flashpoint below 60°C, which are not targeted in the proposal
- Is there only permission needed from the country of manufacture or every country concerned in the transport operation?
- Why is 6.8.2.1.1, which contains general requirements for resisting stresses, not mentioned? Is the general reference to 6.8.2.1.23 appropriate as it stands, since inspection will depend on the type of containment?

- The first paragraph of the proposed SP XYZ should be clarified that also approvals given by ADR/RID contracting parties should meet the minimum requirements listed further in the special provision
- Some experts felt that perhaps a more general approach could be taken (e.g. as done for elevated temperature substances in VC3) given the very different configurations possible for these types of containment
- Is a parallel discussion at the UNSCETDG- level warranted?

The plenary is invited to give further direction to Germany as to what level of detail is desirable, given the variety of possible systems and configurations.

Item 9: INF.12/rev.1 (Poland) + INF.41 (AEGPL) – Application of standards for LPG tanks

23. A extensive debate on the presented calculations took place in the Working Group. Additional input was received via teleconference with an expert within CEN TC 286. The Group ultimately came to the following conclusions:

1. Both standards EN 14025 and EN 12493 may be used for the design and construction of LPG tanks. EN 12493:2008 was limited in ADR 2013 until 31/12/2013 for new type approvals, meaning that either the standard EN 14025 could be applied between 1/1/2014 and 1/1/2015 or the 2013 version of EN 12493 based on a national recognition under 6.8.2.7. The choice of the design standard does not need consent of the competent authority.
2. The table in 6.8.2.6.1 contains provisions and deadlines for type approvals, so it is allowed to continue the design, manufacture and approval for LPG tanks based on EN 14025:2008 until 31/12/2016.
3. There is a problem in the application of these standards linked to differing interpretations regarding the application of the maximum working pressure and how it is defined in 1.2.1. This has led to different results in both presented calculations. The maximum working pressure for LPG is not clearly defined, leading to different interpretations on the value to be used when calculating according to the operation conditions instead of according to the test conditions.
4. Irrespective of the differing interpretations, both standards will yield a minimum wall thickness greater than the minimum wall thickness required by RID/ADR.
5. The 2013 version of EN 12493 seems to contain an error within section D.2 with regard to the “multiplying factor” used between semi-trailers and tankers used to pull tank trailers, which should be corrected by CEN TC 286. According to the expert from CEN TC 286, the original wording from EN 12493:2008 D.2.2 and D.2.3 should continue to be used in the meantime. This was in particular surprising to the Group, as EN 12493 was recently revised without additional comments on this section.
6. Additional work, in particular a general review of the definition of maximum working pressure in 1.2.1, is needed to help clarify the situation for all types of tanks.

Item 10: INF.15 (Germany) – Interpretation of the term cross-section in paragraph 6.8.2.1.20 of ADR and in section 6 of standard EN 13094:2008

23. A presentation of the UNITAS 2000 tank-semitrailer was given by Mr. Lutz Gösslinghoff, who explained that it was considered that the tank described in figure 1 of INF.15 has a circular cross section, but with a cut-out replaced by a concave plate. Under EN 13094 § 6.1 a) reference is made to EN 14025 for circular shells. This standard in turn refers to the possibility to do calculations (in accordance with EN 13445-3) or evaluation via finite element methods for circular cross-sections with cut-outs. Results from these calculations were presented and the tank has received a type approval in a significant number of countries. The tank type was also evaluated in the THESEUS research program in 1994 and currently more than 1500 tank-vehicles of this design type were manufactured without any problems.

24. Other experts referred to footnote 2 under 6.8.2.1.28 where a circular cross-section with cut-out is not specifically mentioned. If the tank is considered to have a non-circular cross-section, the words “radius of convexity” seem to preclude “concavity” in the tank design. This is currently referred to CEN TC 296 WG 2 for discussion.

25. The Working Group agreed that further discussion on possible clarification should await the outcome of the discussion in CEN TC 296.

Item 11: INF.17 (UIC) – Ascertainment of information on the expiry of holding times in the transport document when carrying refrigerated liquefied gases

26. The Working Group endorsed the proposal made by UIC. For empty, uncleaned tanks further work is needed to link the normal calculations to the prediction of the holding time due to the small amount of cryogenic liquid present in the tank. EIGA proposed to undertake this work for the RID/ADR 2017 editions, when the adopted text for cryogenic holding times will come into effect. Initial guidance for the operators is already provided for in EIGA Guidance documentation.

Proposal

Adopt the proposal made by UIC in INF.17.

Item 12: INF.42 (Belgium) – ADR 2015 – Application of special provision 664: Interpretation/specification with regard to ADR 6.8.2.1.23.

27. The Working Group endorsed the proposal made by Belgium to allow for alternative testing methods instead of the NDT methods in 6.8.2.1.23 (ultrasound and radiography). The large variety in design of additive devices renders some NDT methods inappropriate for the evaluation of the quality of the welds and in many instances a visual examination (in line with the testing requirements under SP 664 d)) is performed. Additionally, it is only the first paragraph of 6.8.2.1.23 (qualification of welders and evaluation of the welding quality) that was envisaged in the reference to 6.8.2.1.23.

28. The Group agreed on a modified text to clarify this issue, which should be brought to the attention of the next WP.15 meeting. It should be evaluated if this clarification can be seen as an interpretation in the interim period until ADR 2017 or if a multilateral agreement is needed.

Proposal for WP.15

Modify the last sentence of SP 664 a) ii) as follows:

"Welding shall be carried out in accordance with ***the first paragraph of*** *6.8.2.1.23,* ***except that other suitable methods may be applied to confirm the quality of the welding***

Item 13: ECE/TRANS/WP.15/AC.1/2015/22 (United Kingdom) – United Kingdom experience with improperly manufactured and wrongly certificated road tank vehicles + INF.18 (United Kingdom).

29. The UK gave an extensive technical presentation on the identified issues with improperly manufactured and incorrectly certificated road tank vehicles which were used for petrol distribution. This led to an extensive research programme involving highly specialised technical institutes with a cost of around 1.5 million pounds. In this respect, particular issues regarding the appointment of inspection bodies, their extra-territorial activities, monitoring and inspection procedures arose. Nationally, additional VCA procedures were issued as a consequence.

30. The Working Group supported the initiative from the UK to create an informal working group to further look into the matter. General comments and points of attention as input for the UK were:

- There are specific issues with accreditation to be taken into account and different countries have different practices in place
- Harmonisation of inspection procedures has become difficult and a renewed interest by a central organisation of inspection bodies is desirable
- Many inspection bodies have international activities and offices in multiple countries, providing challenges to monitoring of their activities
- Harmonising the format for certificates would be welcomed by the industry and facilitate enforcement
- ECE/TRANS/WP.15/AC.1/2015/13 discusses many of the same or closely related topics and both workflows need to be combined

31. Ultimately, the Working Group agreed on the following items for a mandate for the informal working group, which would need to be combined with the work mentioned in the first series of action points identified in the Würzburg Working Group (see document 2015/13 (Germany):

- Evaluate the arrangements for appointment of inspection bodies

- Evaluate monitoring mechanisms (e.g. through a centralised database) for inspection bodies and supervision of extra-territorial activities, as well as follow-up of the activities carried out in name of the competent authority

- Review of inspection procedures

- Review of the relevant provisions in chapter 6.8 and referenced standards, in particular provisions concerning internal and exceptional inspections

- Evaluate possible improvements for maintaining the tank records

- Establish a list of RID/ADR inspection bodies

32. The presentation on the outcome of the research programme and the executive summary of the published report referred to in ECE/TRANS/WP.15/AC.1/2015/22 will be appended to the report of the Working Group on Tanks, annexed to the report of the Joint Meeting.

Item 14: Tribute to Mr. Michaël Bogaert

33. As he would soon be leaving his post within the Belgian Federal Public Service, the chairman warmly thanked Michaël Bogaert for all his valuable contributions to the discussions in the Working Group over the years, particularly in his capacity as secretary. The Working Group wished him well in his future career.