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Item 2 of the provisional agenda

Tanks

Report of the working group on tanks with a protective lining or coating

Transmitted by the Government of the Netherlands^{1, 2}

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Summary

- Executive summary:** Tanks with a protective lining and with shells made of materials that react fiercely with the contents if a defect in the lining occurs should not be used. The report reflects the discussion of the informal working group that met on 20 and 21 April 2016 in the Hague and proposals for amendments.
- Action to be taken:** Amend sections 1.2.1, 1.6.3/1.6.4, chapters 4.3 and 6.8.
- Related documents:** ECE/TRANS/WP.15/AC.1/2015/10, informal document INF.50 of the March 2015 session, paragraphs 12-14, ECE/TRANS/WP.15/AC.1/138, paragraph 9, ECE/TRANS/WP.15/AC.1/2015/51, informal documents INF.28 and INF.50, (paragraph 23 to 26) of the September 2015 session, ECE/TRANS/WP.15/AC.1/140 paragraph 83.

Introduction

1. In paragraph 83 of the report of the Joint Meeting RID/ADR/ADN of its September 2015 session (ECE/TRANS/WP.15/AC.1/140) it is stated that Belgium and the Netherlands would work together with other interested parties on the subject. After initial considerations between the experts of Belgium and the Netherlands it was decided that an informal working group would be the best way forward to work on this topic.
2. The informal working group met on 20 and 21 April 2016 in the Hague, the Netherlands. Sixteen experts attended the meeting representing delegations of Belgium, France, Germany, the Netherlands and Poland, and the following non-governmental organizations: European Chemical Transport Association (ECTA), European Chemical Industry Council (CEFIC) and International Association of the Body and Trailer Building Industry (CLCCR). The meeting was chaired by the Netherlands.

General

3. It was expressed by several participants to limit discussion and amendments to solve the actual problem of tanks with shells that would react fiercely with the substance carried if a defect in the lining or coating occurred. It was noticed that tanks with a protective lining with shells of carbon steel or stainless steel perform satisfactory and that their use should not be restricted. Two differences between tanks of chapter 6.7 and 6.8 emerged during the discussion. One difference is the moment of application of the lining. This is common for road tank vehicles when they are manufactured, the design is often optimized for this application, but are applied anytime in use for portable tanks, being manufactured in large series and coating applied when needed. Another difference is the listing of substances allowed to be carried in combination with a substance with a (+) after the tank code for tank-containers, tanks on wagons and vehicles, which do not exist for portable tanks.

Dangerous reaction

4. In relation to document ECE/TRANS/WP.15/AC.1/2015/51 (Joint Meeting September 2015) of the Netherlands it was discussed that the reaction between hydrochloric acid and aluminum alloy should not be seen as a “dangerous reaction”. It was expressed especially by the expert of Germany (Federal Institute for Materials Research and Testing BAM) that this should be seen as a normal electro chemical reaction and not a “dangerous reaction” despite the development of heat. By this interpretation the wording of 4.3.2.1.5 and 4.2.2.7.1 (portable tanks), where as well the shell material as the lining material shall not react dangerously with the substance carried, is correct. This principle was accepted by the informal working group. Further inconsistencies were discussed between 4.3.2.1.5 and the first paragraph 6.8.2.1.9 (see annex).

Tanks with a protective lining or coating and shells made of aluminum alloy

5. It was said that tanks with a protective lining and shells made of aluminum alloy should not be used for substances which in case of a defect in the lining would react fiercely, like hydrochloric acid. A prohibition of tanks with linings and shells of aluminum alloy was felt to be too rigorous, because some substances which are normally carried in these tanks do not react in this way. Because this can also be mixtures of substances, solutions or substances with impurities it can be difficult to pin point all related UN numbers. After discussion it was agreed not to regulate construction and approval of tanks but the use of tanks. This would be limited to substances that may react fiercely with aluminum alloy. The list of substances normally used in tanks with a protective lining would be the starting point to which a new special provision TUyy would be introduced in column 13 of the table of chapter 3.2. A pH value between 5 and 8 was decided to be the limiting factor if the substance allocated to this UN number could be carried or not.

Failure mechanisms of protective lining

6. It was expressed that on average protective linings (ebonite) would give good performance for 15 years, and that after 15 years repairs will be more frequent.

7. Others countered that it also depended on the use of the tank and the quality of the lining or coating. Important factors in this issue are dedicated use for one product or regular change of substance and the accompanying cleaning to be done.

8. The cleaning is a risk for damage to the lining, although special procedures for cleaning are agreed between carriers and tank cleaners. Traces of substance which are remaining on the lining after cleaning the tank can react with the new load resulting in deterioration. Also heat input by the sun, resulting in an increased of temperature of the substance and reactivity can have a negative effect on the lining or coating. External mechanical damages can also cause defects. Even removing and refitting service equipment or entering of the tank by a person can initiate a defect in the near future.

9. The more these tanks are interfered with the higher the risk for failure. For this reason a more frequent internal visitation is not supported. To prevent solar radiation and defects by mechanical impact an external cladding was seen as an advantage. It was in particular addressed that spark testing of the lining can cause defects in particular if a too high voltage is used. It was also stated that a safe voltage for a lining in use was lower than that for a new lining. It was expressed that a safe voltage for the various ages of the lining should be given by the manufacturer, supplier or applicant of the lining.

10. During the meeting a presentation was given by a representative of Simona AG concerning the properties and application of thermoplastic linings. The advantages such as very good resistance to particular substances and long service life were expressed but also the differences in price between the simple PVC materials and the more exotic, the preforming needed of the stiffer sheet materials, the welding of the sections and bonding to the shell were addressed. The informal working group thanked the representative of Simona AG for the very informative presentation and the answering of all the questions.

Amendments to the regulation

11. Amendments were discussed based on a document supplied to the participants before the meeting by the expert of the Netherlands. The final outcome is represented in the annex to this report.

12. It should be noted that there was no consensus on amending the construction requirements in 6.8.2.1.24 in the line of those in chapter 6.7. In particular the second and last sentence of 6.7.2.2.4 concerning the application of lining material on the face of flanges was felt to be no longer in line with the current state of technology which may also have impact on portable tanks.

Annex

Item	Proposal	Justification
1	<p>Introduce a new definition in 1.2.1 to read:</p> <p><i>“Protective lining” means: (for tanks) a lining or coating protecting the metallic tank material against the substances to be carried.</i></p> <p><i>Note: This does not apply to lining or coating used only to protect the substance to be carried.”</i></p>	<p>Basically, tanks are provided with a lining either for the protection of the tank material against the substance carried or to protect the quality of the substance carried. The wording “protective lining” appears several times in the regulations but to which purpose is not explained. This justifies the adoption of a definition.</p> <p>As there is no similar definition in 6.7 it is checked for compliance with this chapter. In chapter 6.9 the wording protective lining is not used and there is no conflict.</p> <p>A protective layer can be applied by bonding in prefabricated layer(s) of protective material (lining) or it can be sprayed on (coating), it was felt that both systems should be mentioned. However to keep modification of the regulation limited it was decided to name “coating” only in the explanatory wording of the definition itself.</p> <p>The suggestion to introduce both functions of lining into the regulation and have different regimes of approval and control was not accepted. It was decided to follow the wording used in EN 12972:2015 (paragraph 3.4) as far as possible.</p>
2	<p>Introduce a new transitional measure 1.6.3.xx and 1.6.4.xx to read:</p> <p><i>“Fixed tanks and demountable tanks/Tank wagons/Tank-containers constructed before 1 July 2019 in accordance with the requirements in force up to 31 December 2018 but which do not conform to TUyy may continue to be used for the carriage of these substances until 1 January 2023.”.</i></p>	<p>Tanks with a protective lining are used for a specific array of corrosive substances and it needs time to replace existing tanks with an aluminum alloy shell which called for a transitional period after the amendment of the regulation. Also some period was felt to be needed to write of investments in existing tanks.</p> <p>It was said that the latest tank with an aluminum alloy shell was produced 8 years ago. Considering a safe time of use of 15 years, and 3 years to go between 2016 and 2019 would then justify a transitional period of 4 years until 1 January 2023.</p> <p>After the meeting it was remarked that the transitional period may be too short because up till 1-7-2019 tanks with an aluminum alloy shell with a lining may still be manufactured.</p> <p>It may be decided that a transitional measure is not needed for tank wagons because of their particular choice of shell materials.</p> <p>After the meeting it was remarked that a longer transitional measure may be needed as tanks may be manufactured up to 1 July 2019.</p>
3	<p>Introduce a special provision TUyy in column 13 of Table A of 3.2.1 of RID/ADR for:</p>	<p>For considerations see report.</p>

	UN1755 PG II and PG III, UN1778 PG II, UN1779 PG II, UN 1788 PG II and PG III, UN1789 PG II and PG III, UN 1791 PGII and PG III, UN 1803PG II, UN 1805 PG III, UN 1814PG II and PG III, UN 1819 PG II and PG III, UN1814 PG II and PG III, UN 1819 PG II and PG III, UN1824 PG II and PG III, UN 1830 PG II, UN 1832 PG II, UN 1840 PG II, UN 1906 PG II, UN 2031 PG II, UN 2581 PG III, UN 2582 PG III, UN2586 PG III, UN2693 PG III, UN2796 PG II, UN3264 PG II and PG III	<p>The stated entries were checked for compatibility with aluminum alloy against (an older) version of the “BAM list”.</p> <p>During the meeting the list with substances was not available. The representative of CEFIC remarked after the meeting that the list needed further consideration by their members.</p>
4	<p>Introduce a new special provision in 4.3.5 of RID/ADR to read:</p> <p>“TUyy Tanks with a shell constructed of aluminum alloy, including those with a protective lining, shall only be used for this substance if the pH value is between 5 and 8.”</p>	<p>Although pH value is not the only argument it was agreed that the combination of a new Special Provision TU for substances normally carried in tanks with a protective lining and this limitation would be the most efficient way to stop unwanted use.</p>
5	<p>Amend the first paragraph of 6.8.2.1.9 to read (deleted wording stricken through, new wording in italic script):</p> <p>“The materials of shells or <i>and the materials</i> of their protective linings which are <i>directly</i> in contact with the contents shall not contain substances liable to react dangerously (see "Dangerous reaction" in 1.2.1) with the contents, to form dangerous compounds, or substantially <i>appreciably</i> to weaken the material.”</p>	<p>Amendments to make 6.8.2.1.9 consistent with 4.3.2.1.5 where as well the shell material and lining material should not react dangerously with each other and, Replace the word “substantially” with “appreciably” which is used in 4.3 and 4.2.</p>
6	<p>Replace the existing wording of 6.8.2.1.24 by “The protective linings shall be compatible with the material of the shell for bonding and be sufficiently elastic to cope with the expansion characteristics of the shell due to thermal and pressure changes.”</p>	<p>Experts were of the opinion that an amendment of the existing wording of 6.8.2.1.24 was not necessary. However if it was wished by the Joint Meeting that 6.8.2.1.24 was modified, the proposed wording in square brackets would be acceptable.</p> <p>It was felt that additional wording, copying the second and third sentence, of 6.7.2.2.4 was not acceptable as applying lining or coating around the corner around the face of the flange no longer represented the state-of-art.</p>
7	<p>Amend the paragraph after the second set of indents of 6.8.2.2.2 to read (deleted wording stricken through, new wording in italic script):</p> <p>“However, in the case of tanks intended for the carriage of certain crystallizable or highly viscous substances and shells fitted with an ebomite or thermoplastic coating <i>a protective lining</i>, the internal stop-valve may be replaced by an external stop-valve provided with additional protection.”</p>	<p>This is a consequential amendment following the introduction of the definition of “protective lining”.</p>

8	<p>Introduce a new paragraph at the end of 6.8.2.4.1 to read:</p> <p><i>“The protective linings of the shell and its equipment shall be certified by the manufacturer(s), supplier(s) or applicant(s) of the lining material. The certificate shall state the brand and type of lining material and the particulars of the lining such as thickness and number of layers, type of test(s) performed on the lining and results of these test. If applicable the parameters for performing future tests, such as a maximum voltage for the spark test. A copy of this certificate shall be attached to the tank record of the tank.”</i></p>	<p>It was discussed that it was not possible to address one correct party to issue a certificate for the protective lining or coating. When a tank is new it can be the tank manufacturer but it can also happen that the owner will have a lining or coating applied by another party, modifying the (type) approval. The liable party maybe the tank manufacturer or the owner. Sometimes the manufacturer of the lining has no additional knowledge of the particular application but the supplier or applicant has the knowledge.</p> <p>For this reason the three appropriate parties, manufacturer, supplier and applicant, are stated.</p> <p>The paragraph also requires more detailed information to be given for the applied lining or coating.</p> <p>It was suggested to introduce this wording to 6.8.3 but as this section refers to (type approval) certificates issue by competent authorities and that, the contents more directed to an individual tank it was decided to keep it in 6.8.2.4 for testing of tanks.</p>
9	<p>Introduce a new paragraph at the end of 6.8.2.4.2 to read:</p> <p><i>“Protective linings shall be visually examined for defects. In case deviations appear the condition of the lining shall be evaluated by appropriate test(s).”</i></p>	<p>It was agreed to introduce additional wording for tanks with a protective lining or coating in 6.8.2.4.2 (periodic inspection).</p> <p>In particular it was stressed that as a spark test may damage the protective liner it should only be used when there was suspicion of a defect. For this, it is expressed that the basic inspection is a visible one.</p>
10	<p>Introduce a new paragraph at the end of 6.8.2.4.3 to read:</p> <p><i>“Protective linings shall be visually examined for defects. In case deviations appear, the condition of the lining shall be evaluated by appropriate test(s).”</i></p>	<p>Although each intervention in the tank may be a risk to the protective lining or coating, it was agreed that an internal inspection should be part of the intermediate inspection. For this identical wording to 6.8.2.4.2 may be introduced in 6.8.2.4.3.</p>