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Working Party on the Transport of Dangerous Goods

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**Proposals for amendments to annexes A and B of ADR:
construction and approval of vehicles**

Comments on document 2021/7 - Section 9.7.6 – Rear protection of vehicles

Transmitted by the Government of the Netherlands

Introduction

1. The Netherlands agrees that the wording of 9.7.6 could benefit from clarification. However, it is of the opinion that the interpretations and amendments proposed in document 2021/7 lead to an inconsistent level of protection of the shell and result in more stringent measures than currently applied in several contracting parties to ADR without proper justification. More stringent requirements will lead to reduction of load capacity and payload and result in more transport operations in relation to strict vehicle dimensions limitations in the EU. Moreover, new active driver assistance system, such as Advanced Emergency Braking System, may not justify more stringent requirements.

Background

2. Below the wording of 9.7.6 in ADR 2021 is given (some specific words underlined):

“9.7.6 Rear protection of vehicles

A bumper sufficiently resistant to rear impact shall be fitted over the full width of the tank at the rear of the vehicle. There shall be a clearance of at least 100 mm between the rear wall of the tank and the rear of the bumper (this clearance being measured from the rearmost point of the tank wall or from projecting fittings or accessories in contact with the substance being carried). Vehicles with a tilting shell for the carriage of powdery or granular substances and a vacuum-operated waste tank with a tilting shell with rear discharge do not require a bumper if the rear fittings of the shell are provided with a means of protection which protects the shell in the same way as a bumper.”

3. The origin of 9.7.6 dates to the very beginning of the ADR. At that time terms like “Shell” and “Tank” were used but not so well defined as today. It may be expected that the third sentence of 9.7.6 is added at a later stage when the problems with bumpers on tilting shells was recognized. As can be seen above the terms are not consistently used, where in the first two sentences of 9.7.6 the term “Tank” is used and for the same purpose in the third sentence of 9.7.6 the term “Shell” is used. It is likely that the development of the understanding of the terms “Shell” and “Tank” would result in the more correct application in the third sentence of 9.7.6 rather than the other way round.

Where to measure?

4. In document 2021/7 a new explanation is given to the meaning of the “rear of the bumper”. In normal interpretation of the front and the rear of a vehicle is that rear of the bumper is the face of the bumper that is seen when standing at the back of the vehicle. The

interpretation that the rear of the bumper while standing behind the vehicle is creative but is not likely to be the intention of the original provision.

5. Measuring from the rear side of the bumper while standing at the rear of the vehicle, as proposed in document 2021/7 will lead to inconsistent distance to the end of the shell (or tank) depending on the thickness of the bumper profile and may lead to discussions when corrugated bumpers or additional sections for fitting lights are fitted.

Tank or shell?

6. The main purpose of the requirements of the ADR is to keep the dangerous good contained, inside the shell. The shell shall be protected against damage by distance or other protective measures. Besides distance an additional layer of insulation and a protective weather cover over the insulation is regarded as a protective measure. Other protective measures such as a double tank end construction also give protection to the inner shell as do "non reduced" thickness ends (see EN 13094). This may lead to inconsistent protection of the shell when the distance from the rear of the bumper to the end of the tank (including protective insulation etc.) is considered.

Interpretation in the Netherlands

7. The interpretation based on the wording of 9.7.6 in the Netherlands is (from 1968 on) that the shell is the part that needs protection, and that protection may come from distance and other measures such as insulation, double end constructions, etc. In addition to this, the distance of 100 mm is determined from the face of the bumper that is to the rear of the vehicle is used.

8. As the shell needs the protection, which is given additionally by the insulation the distance to the weather cover of the insulation from the rear of the bumper may be reduced to 50 mm, in that case the distance to the shell itself would be at least 100 mm or more.

9. In addition, it should be reminded that insulated tanks are in most cases tanks with a calculation pressure of 4 bar that have a deep contoured end in very pliable austenitic stainless steel that allows for a high degree of energy absorption in accidents without rupture.

Protection of tilting shells and extruding parts of service equipment at the rear of the vehicle

10. Addition of a section modulus could be a worthwhile addition. However, this is dependent on the material used, the strength in aluminium is different from steel. As the current wording does not give problems of interpretation only adding this section modulus seems to be sufficient. By including a new paragraph for braces, it becomes non design restrictive.

11. In practice these braces are attached to the end of the shell. However, considering the lower risks of granular or powdery substances in aluminium alloy tanks and the heavy construction of vacuum operated waste steel tanks the current text of 9.7.6 in ADR 2021 proves to be sufficient.

Tank design

12. Shapes of shells and material used, have a significant effect on the behaviour in accidents.

For the average diameter tank of approximately 2.5 meter, below a test pressure of approximately 6 bar the minimum wall thickness is based on 6 mm in mild steel without protection and 4 mm in mild steel with protection. However, it is described as lateral protection also the ends as part of the shell may be reduced.

13. Besides the thickness, the contour or shape of the end and the material used has a significant influence in absorbing energy by impact and preventing puncture. On pressure tanks a higher thickness than reduced of the end is required to withstand the pressure, to limit the thickness and the weight a deeper contoured end is used. On gravity discharge shells the contour is very shallow to allow for a greater capacity of the shell.

14. When considering tank types, such as liquid fuel tankers, chemical tankers, Silo tankers for granular substances, and vacuum operated waste tankers, the aluminium alloy liquid fuel tankers are the most vulnerable due to applied material and shape.

15. However, it should be reminded that in EN 13094, in the latest version, non-circular/elliptical gravity discharge tanks shall have “full thickness” ends, or a double end construction to offer additional protection.

16. Silo tankers, mostly aluminium alloy, are in general pressure discharged and have strongly contoured ends that absorb energy in deformation, besides this there is the lower risk of granular substances. Gas tankers and vacuum operated waste tankers have ends that are at or above the minimum prescribe full thickness that deformation is very rare.

Vehicle design

17. At this moment new heavy-duty vehicles (in the EU - July 2014) will be provided with Advance Emergency Braking System (UN Regulation No. 131) that helps preventing collisions or limiting the effects of collisions. More systems that apply to heavy duty vehicles may be expected soon.

18. Bumpers should be properly fitted to the tank vehicle. In the view of the Netherlands this should in principle to the vehicle chassis, or subframe to which the axles are mounted on trailers, to spread the impact energy over a large area of the shell.

19. Light weight “space frame” extensions from the chassis to the mounting of the bumper should not be used. A hint of allowing a lightweight construction is also given in the picture of 2021/7 that should not be promoted. In addition to this, bumper should not be attached to the shell of the tank only giving cause to a rotational force that will cause deformation and possible tearing of the shell.

20. It should also be noted that the UN Regulation No. 58 in Revision 3 has been updated in requirements for bumpers (under run protections).

Proposals

21. Amend 9.7.6 to read (new wording underlined and deleted wording stricken through):

“9.7.6 Rear protection of vehicles

A bumper sufficiently resistant to rear impact shall be fitted at least over the full width of the tank at the rear of the vehicle. There shall be a clearance of at least 100 mm between the rear wall of the ~~shell tank~~ and the rear of the bumper (this clearance being measured from the rearmost point of the surface of the bumper facing the rear of the vehicle and the shell tank wall or from projecting fittings or accessories in contact with the substance being carried). Vehicles with a tilting shell for the carriage of powdery or granular substances and a vacuum-operated waste tank with a tilting shell with rear discharge do not require a bumper if the rear fittings of the shell are provided with a means of protection which protects the shell in the same way as a bumper. Where protection is provided by a brace, the profile shall have a section modulus of 20 cm³ in reference steel or equivalent in another material, and the distance between the rear part of the brace to the rearmost part of the fittings of the shell that need protection shall be at least 100 mm. [The brace shall be placed not more than 100 mm above the fittings].”