

Economic Commission for Europe

Inland Transport Committee

Working Party on the Transport of Dangerous Goods

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Item 5 (a) of the provisional agenda

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

Report of the Informal Working Group on section 9.7.5 of ADR

Transmitted by the chair of the Informal Working Group

Summary

Executive summary:	Final report of the working group convened to discuss possible amendments to 9.7.5.1 and 9.7.5.2 of ADR.
Related documents:	ECE-TRANS-WP15-108-GE-INF.5 ECE-TRANS-WP15-108-GE-INF.25 ECE-TRANS-WP15-109-GE-INF.12 ECE-TRANS-WP.15-2021-10 TRANS/WP.15/153 E/ECE/TRANS/503 [ADR 1978]
Action to be taken:	None.

Introduction

Concerns from the industry on how ADR defines the requirements for the stability of tank-vehicles carrying liquids have been reported during the 108th session of the Working Party on the Transport of Dangerous Goods (WP.15), through INF.5 submitted by CEFIC.

An informal working group has been convened with the following mandate (see ECE-TRANS-WP.15-108-GE-INF.25):

1. Analyze the correctness of the calculation of the maximum height of the center of gravity of tanks, as stated in 9.7.5.1.
2. Verify if the reference to UN Regulation No. 111 contained in 9.7.5.2 is sufficient to set the minimum requirements for the stability of road tanks.
3. Analyze if the application of UN Regulation No. 111 only to tank-vehicles with fixed tanks with a capacity of more than 3 m³ intended for the carriage of dangerous goods in the liquid or molten state tested with a pressure of less than 4 bar, is appropriate.
4. Verify the impact the possible amendment of ADR 9.7.5 deriving from points 1, 2 and 3 above would have.

The working group, which comprised members of industry, vehicle, and tank builder associations, as well as country delegates, met virtually five times in 2021. An overview of the discussions and conclusions of the group is below.

Summary of discussion

1. For the discussion during the first and the second meeting, please refer to ECE-TRANS-WP.15-109-GE-INF.12.

2. Discussions during the last three meetings related primarily to the interpretation of data that was generated by an extensive survey conducted by tank builders. This was in relation to the mandate of the working group and the interpretation of the requirements set in 9.7.5.1 and 9.7.5.2

3. Mandate 2 and 3

Verify if the reference to UN Regulation No. 111 contained in 9.7.5.2 is sufficient to set the minimum requirements for the stability of road tanks.

Analyze if the application of UN Regulation No. 111 only to tank-vehicles with fixed tanks with a capacity of more than 3 m³ intended for the carriage of dangerous goods in the liquid or molten state tested with a pressure of less than 4 bar, is appropriate.

4. As a follow up from previous meetings (see [ECE-TRANS-WP15-109-GE-INF 12](#), point 5) the data from the survey has been analyzed and it has been confirmed that R111¹ is applied only to low pressure tanks and not high pressure tanks. Discussions with body builders has also confirmed that its extension to all tanks (i.e. not only low pressure but also all high pressure) would not be feasible.

5. Mandate 1

Analyze the correctness of the calculation of the maximum height of the center of gravity of tanks, as stated in 9.7.5.1.

6. The formula in ADR 9.7.5.1 was introduced in 1978 in its current form (i.e. it has not been amended since then) see E/ECE/TRANS/503. The survey showed the highest permitted center of gravity of 9.7.5.1 is not an issue for low pressure tanks, given that R111 is also applied to these tanks and is more stringent. However, the survey also showed that some high pressure tanks (typically liquefied gases) have a relatively high centre of gravity which in some cases can reach the limit set by 9.7.5.1 (~ 2.8 m).

The possibility of splitting the requirement of 9.7.5.1 for high pressure tanks and 9.7.5.2 for low pressure tanks was discussed. However, conceptually this was not considered appropriate: although 9.7.5.2 is more stringent, 9.7.5.1 must be applicable to all tanks.

Specifying a lower centre of gravity in 9.7.5.1 might in principle be possible and could be seen to proactively improve tank-vehicle safety, but no justification for such a change could be identified in ADR countries.

The possibility that regulations of some non-ADR countries refer to 9.7.5.1 for all types of vehicles, omitting the reference to 9.7.5.2 for low pressure tanks, cannot be overruled. However, it is believed that preventing this from happening is not within the scope of this working group.

7. The working group noted however that clarification of the meaning of “The overall width of the ground-level bearing surface (distance between the outer points of contact with the ground of the right-hand tyre and the left-hand tyre of the same axle)” is needed. This is used in the calculation of 9.7.5.1, and it is not clear which axle should be used for the calculation.

Data from vehicle manufacturers collected and discussed showed that the difference in the axle widths for rigid trucks can lead to significant differences (up to ~ 100 mm) in the value used when calculating the maximum permitted centre of gravity.

¹ Uniform provisions concerning the approval of tank vehicles of categories N and O with regard to rollover stability

In the opinion of the vehicle manufacturers, “width” should be interpreted as meaning the widest value of the axle/tyre. This is because it is the widest axle that will determine stability to the vehicle.

Also, their view on an amendment to 9.7.5.1 is that – although there might be some margin for reducing the centre of gravity height for high pressure tanks to a ratio width/centre of gravity higher than 0.9, this would not be advisable. This is because this might have an adverse effect on existing designs and possibly limit the development of vehicles for the carriage of liquid gases (for example liquid H₂).

8. If a lower centre of gravity is to be required in 9.7.5.1 work must be done to identify a higher value of the ratio width/CoG, which would be feasible. At present the working group doesn't see a reason to do so (see also point 6), but notes that this work could be done in the future.

9. Mandate 4

Verify the impact the possible amendment of ADR 9.7.5 deriving from points 1, 2 and 3 above would have.

10. In practice the correctness of section 9.7.5 is thought to be confirmed simply by the fact that throughout Europe high pressure tanks are operating with a centre of gravity at or close to the limit specified in 9.5.7.1 and there is no evidence that a higher number of rollover incidents are occurring with these vehicles.

11. As a spin off from discussions, it has been recognized that paragraph 9.7.5.1 also sets a requirement for the load distribution between the tractive unit and semi-trailer of articulated vehicles. Although not in the scope of this working group, it is suggested that future work could look to re-evaluate the structure of 9.7.5 in order to make this paragraph clearer.

Conclusions

- The calculation for maximum permitted center of gravity height set out in ADR 9.7.5.1 was inserted in 1978 and there is no evidence that it is incorrect.
- The definition of the overall width of the ground-level bearing surface in 9.7.5.1 should be clarified in a way that makes it clear which axle is to be used in the calculation (see [ECE/TRANS/WP.15/2021/10](#)).
- No changes to the application of R111 are proposed. It is not considered feasible to extend the application of R111 to all vehicles with high pressure tanks.

The mandate of the working group is therefore considered fulfilled.
