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Item 4 (a) of the provisional agenda

Proposals for amendments to annexes A and B of ADR:

Construction and approval of vehicles

Clarification of the requirements in 9.3.4.2 for EX/III vehicles

Transmitted by the Government of Germany*

Summary

- Executive summary:** Clarification of the requirements in 9.3.4.2 of ADR for EX/III vehicles. Sub-section 9.3.4.2 describes the protective target of preventing heat input in the body of the vehicles by using heat and flame resistant materials.
- Actions to be taken:** Amend the provisions of 9.3.4.2 on the requirements for EX/III vehicles.
- Reference documents:** Informal document INF.4 and report of the 104th session of the Working Party (ECE/TRANS/WP.15/242; paragraphs 21-25); ECE/TRANS/WP.15/2017/20 (Germany) and informal documents INF.5 (Germany), INF.21 (Finland), INF.26 (CLCCR), INF.27 (Germany) and report of the 103rd session of the Working Party (ECE/TRANS/WP.15/239; paragraphs 42-25); informal document INF.6 from the May 2017 meeting (Germany) and report of the 102nd session of the Working Party (ECE/TRANS/WP.15/237; paragraphs 20-23); informal document INF.5 from the November 2015 meeting (Netherlands) and report of the ninety-ninth session of the Working Party (ECE/TRANS/WP.15/230; paragraphs 12-15); ECE/TRANS/WP.15/2011/14 (France) and report of the ninety-first session of the Working Party (ECE/TRANS/WP.15/212; paragraph 9); Report of the seventy-fourth session of the Working Party (ECE/TRANS/WP.15/174; paragraphs 52-54).

* A/78/6 (Sect. 20), table 20.5.

I. Introduction

1. The provisions on requirements for bodies of EX/III vehicles are based on an outdated state-of-the-art and old materials technology. Moreover, the wording in the corresponding 9.3.4.2 is not clear and leads to uncertainties for the body manufacturers. Here, among others, the question arises of whether the floor panel also forms part of the body in accordance with 9.3.4.2. With regard to the fire behaviour of the body, 9.3.4.2 makes reference to fire classification B-s3-d2 (in accordance with EN 13501-1:2007 + A1:2009), meaning that during classification it is mainly examined whether, when exposed to fire, the material contributes to the fire to a limited extent. This means that no statements regarding the insulation effect or the heat input into the body of EX/III vehicles can be derived from this required fire classification. Possible dangers from an accident fire are therefore not taken into account in the existing requirements to be met by the bodies.

2. The issue has already been discussed at previous meetings of WP.15. Germany had presented informal document INF.6 at the 102nd session of the Working Party (Geneva, 8 to 11 May 2017), which addresses the interpretation of the requirements in 9.3.4.2 of ADR for EX/II and EX/III vehicles.

3. During the 103rd session (Geneva, 6 to 10 November 2017) the Working Party finally decided to set up an informal working group, to be headed by Germany, whose mandate would be to:

Investigate the hazards to which explosive substances and articles were exposed during carriage, determine appropriate measures to mitigate such hazards and clarify the questions raised during the 103rd session of the Working Party, in particular:

- Minimum thickness of materials, if required;
- Which materials met the requirements of standard EN 13501;
- Safety requirements regarding heat sources from outside the vehicle;
- Which materials were allowed inside the load compartment;
- Develop or amend the wording of instructions in the form of performance requirements, so as to clarify subsection 9.3.4.2.

4. The informal working group on clarification of 9.3.4.2 met on 10 and 11 January 2018 and also 1 and 2 October 2018 in Bonn.

5. The described ambiguities and the question of whether the existing provisions are appropriate were to be clarified within the scope of a research project of the German Federal Ministry for Digital and Transport (BMDV) by means of new studies. To this end, existing design solutions based on the current provisions were examined, and their effectiveness when exposed to a typical external heat load in a possible accident fire was determined. This first required the characterization of the heat input by means of tests with typical accident loads (e.g. tyre fire, driver's cab fire, pool fire, fuel tank fire and fire of the entire vehicle). From this, idealized load scenarios were then derived, which can serve as a basis for corresponding calculation models for thermal dimensioning and/or resistance of wall structures. In future, this could be used to limit the heat input into the interior of load compartments in a defined manner.

6. The wording in ADR allows for the approval of EX/III vehicles lined on the inside with phenolic plywood and covered with sheet metal on the outside, with the floor panel consisting of phenolic plywood without an additional sheet metal covering. Such inexpensive and simple load compartments of EX/III vehicles are sometimes actually used for carrying explosives.

7. The studies conducted have shown that the insulating effect and resistance of the tested wall structures are insufficient when exposed to direct fire. The temperature threshold of 80 °C on the inner surface of the load compartment mentioned in 9.3.5 is quickly exceeded in the event of an accident fire. In the fire of the entire vehicle conducted within the scope of the project, the fire reached the interior of the cargo compartment after only approximately 20 minutes. The phenolic plywood floor panel (22 mm wall thickness) without sheet metal

covering turned out to be a weak spot. It burned completely, and only the steel components of the substructure remained. The flames reached the upper edge of the load compartment after approximately 23 minutes. This means that the explosives being carried are not protected from fire in the event of an accident fire and are liable to ignite so that a mass explosion cannot be ruled out. This test clearly showed that the cardboard or wood transport packaging for explosive substances is not thermally resistant for long and that the explosive substance could heat up to 100 °C after just 20 minutes. The side walls of the load compartment also reached temperatures of approximately 200 °C after just 20 minutes, despite the outer sheet steel covering.

8. Based on the test results, it should be clearly regulated in ADR that the floor panel, which must be regarded as critical in an accident fire, is to be included in the fire protection concept of EX/III vehicles. Moreover, covering the floor panel with sheet steel would prevent flames from directly reaching the interior of the body in a short time but not an unacceptable increase in temperature on the inner surface of the cargo compartment.

II. Proposal

9. Amend 9.3.4.2 as follows (amendments in bold):

“The body, **including the floor panel**, shall be made from heat and flame resistant materials with a minimum thickness of 10 mm. Materials classified as Class B-s3-d2 according to standard EN 13501-1:2007 + A1:2009 are deemed to fulfil this requirement.

The floor panel shall be made of steel and its inner surface shall be covered with materials fulfilling the same requirement. If the material used for **the other parts** of the body is metal, the complete inside of the body shall be covered with materials fulfilling the same requirement.”

Insert the following transitional provision:

“1.6.5.26 EX/III vehicles first registered or entering into service before 1 January 2029, which do not conform to the requirements of 9.3.4.2 applicable as from 1 January 2027, may continue to be used.”

III. Justification

10. These amendments clarify that the floor panel, which must be regarded as critical in the event of an accident fire, must be taken into account in the fire protection concept for EX/III vehicles. By covering the floor panel with sheet steel, the potential passage of flames, which occurred after only a short time in the accident fire, is prevented. In this way, a potential spreading of the fire or a potential explosion of the explosive substances can be delayed.

11. Studies of alternative bodies are still in the early stages and could not be concluded and finally evaluated within the scope of the research project. Generally, materials that are not readily combustible and have low heat transfer properties should be favoured. Moreover, the temperature on the inner surface of the bodies should not rise to more than 80 °C within 30 minutes when exposed to fire in the event of an accident. This would give fire and rescue services enough time to extinguish the fire without the explosive substances igniting. Here, there are possible starting points for further research and testing. Further research should be aimed at extending the fire safety of bodies of EX/III vehicles in 9.3.4.2 in such a way that the materials used also have a defined insulating effect to limit the heat input into the load compartment.

12. This proposal supports Sustainable Development Goal 9, “*Industry, Innovation and Infrastructure.*”