

Economic Commission for Europe

Inland Transport Committee

Working Party on the Transport of Dangerous Goods

109th session

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Geneva, 3-7 May 2021

Item 5 (a) of the provisional agenda:

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

Engine fire suppression systems and tyre fire protection systems to reduce the likelihood of a BLEVE

**Transmitted by the Government of Spain on behalf of the BLEVE
Working Group**

Introduction

1. The BLEVE Working Group, working according to terms of reference from the Joint Meeting, has been looking at measures that will prevent a BLEVE occurring in the event of a fire when flammable liquids and flammable gases are transported.
2. At the Joint Meeting last September, documents ECE/TRANS/WP.15/AC.1/2020/42, INF.7, INF.7/Add.1 to Add.7 and INF.20 were presented, and after its discussion, the following decisions were taken (see report in ECE/TRANS/WP.15/AC.1/158):

Report of BLEVE Working Group meeting held on 22-24 October 2019 in Madrid

Document: ECE/TRANS/WP.15/AC.1/2020/42 (Spain)

Informal documents: INF.7, INF.7/Add.1 to Add.7 (Spain)
INF.20 (United Kingdom)

34. The Joint Meeting welcomed the report on the meeting of the BLEVE Working Group held in October 2019 included in document ECE/TRANS/WP.15/AC.1/2020/42 and in informal document INF.7 and its addenda. The representative of Spain sought guidance on the six recommended measures to prevent in future boiling liquid expanding vapor explosions (BLEVE): (a) installation of metallic mudguards), (b) installation of engine fire suppression systems, (c) installation of a safety valve, (d) introduction of technical devices for general traffic safety, (e) heat resistant screen between cabin and tank, and (f) use of expanded aluminium alloys (EAA).
35. The Joint Meeting agreed to prioritize measures (a), (b) and (c) in an individual or combined manner. Considering informal document INF.20 on the mandatory application dates of safety provisions for new goods vehicles, delegates felt that the measures under (d) were already addressed by the World Forum for Harmonization of Vehicle Regulations (WP.29). The Joint Meeting also agreed to further assess measure (e). Some delegates recommended to further investigate on thermal coating in the case new elements appear. Measures under (f) were not considered as relevant due to the uncertainty with respect to the efficiency, the impact on maintenance or inspections and the costs resulting from the use of EEA.
3. Background information about the BLEVE Working Group and the discussions can be found in documents INF.8 and INF.23 from the March 2019 session of the Joint Meeting.

4. The measures related to equipping vehicles with engine fire suppression systems and tyre fire protection only relate to road transport. The BLEVE Working Group therefore submits this document to WP.15 in the first instance to advise them of initial proposals that will form the basis of an official document that will be submitted to the next session to WP.15 in November 2021.

5. Both measures are complementary, and, together with a mandatory requirement for safety valves to be fitted to certain tanks, can be effective in preventing a BLEVE according to the research that has been done by INERIS for the Government of France (see documents mentioned in paragraph 3).

6. As shown below, different alternative proposals are included in this document, both for engine compartment fire suppression systems and for tyre fire protection. WP.15 is kindly asked to give an initial view on these in order to provide an indication to the BLEVE Working Group of the direction in which the proposals should be developed.

7. For both the engine compartment fire suppression systems and tyre fire protection proposals, transitional measures are proposed that would not require such systems to be retrofitted to vehicles that are currently in service.

8. Proposals concerning safety valves will be submitted by the BLEVE Working Group to the Joint Meeting separately, as they may concern different modes.

Proposals

New text is underlined, deleted text ~~stricken through~~.

Proposal 1: Engine Fire suppression systems for FL vehicles

Option A: Basic option, widening the scope of 9.7.9.1 with FL vehicles:

9.7.9 Additional safety requirements concerning EX/III and FL vehicles

9.7.9.1 EX/III and FL vehicles shall be equipped with automatic fire extinguisher systems for the engine compartment.

Option B: Inclusion of a note with reference to applicable standards, and using the terminology fire suppression system, more widely used in literature:

9.7.9 Additional safety requirements concerning EX/III and FL vehicles

9.7.9.1 EX/III and FL vehicles shall be equipped with automatic fire ~~extinguisher~~ suppression systems for the engine compartment.

Note: Requirements regarding design and testing of fire suppression systems can be found in UN Regulation No 107, testing procedures for this regulation can be found in RISE SP Method 4912.

Option C: Modification of 9.7.9, adding more specific requirements, adapting the text found in Regulation 107 Annex 3, and using the terminology fire suppression system, more widely used in literature:

9.7.9 Additional safety requirements concerning EX/III and FL vehicles

9.7.9.1 Automatic fire suppression systems for EX/III and FL vehicles

9.7.9.1.1 Vehicles shall be equipped with a fire detection and suppression system in the engine compartment and each compartment where a combustion heater is located.

9.7.9.1.2 Compartments fitted with an internal combustion engine or a combustion heater shall be equipped with a fire detection system providing the driver with both an acoustic and a visual signal, and activating the hazard warning signal, in the event of excess temperature in the engine compartment and in each compartment where a combustion heater is located.

9.7.9.1.3 The alarm system and the fire suppression system shall be automatically activated through a fire detection system. The detection system shall be designed to detect a temperature in the engine compartment, and in each compartment where a combustion heater is in excess of the temperature occurring during normal operation.

Note: Testing procedures for detection systems can be found in RISE SP Method 5320.

9.7.9.1.4 The alarm system and the fire suppression system shall be operational whenever the engine start device is operated, until such time as the engine stop device is operated. They may remain operational after the ignition is switched off or the vehicle master control switch is deactivated, wherever applicable. The alarm system shall remain operational whenever the combustion heater is in operation.

9.7.9.1.5 The installation of the fire suppression system shall comply with the following requirements:

- The fire suppression system shall be installed according to the system manufacturer's installation manual.
- An analysis shall be conducted prior to the installation in order to determine the location and direction of the suppression agent discharge point(s) (e.g. nozzles, extinguishing agent generators or extinguishing agent discharge tube or other distribution points).
- Potential fire hazards within the engine compartment and each compartment where a combustion heater is located, shall be identified and the discharge point(s) located such that the suppression agent will be distributed to cover the fire hazard when the system activates.
- The spray pattern and direction of discharge points, as well as the discharge distance, shall be ensured to cover identified fire hazards.
- The system shall also be ensured to work properly regardless of the vehicle's attitude.

9.7.9.1.6 The fire hazard analysis indicated in 9.7.9.1.5 shall, as a minimum, take into account the following components:

- (a) Those whose surface may reach temperatures above the auto-ignition temperature for fluids, gases or substances that are present within the compartment;
- (b) Electrical components and cables with a current or voltage high enough for an ignition to occur;
- (c) Hoses and containers with flammable liquid or gas (in particular if those are pressurized).

The analysis shall be fully documented.

1.6.5.xx EX/III vehicles first registered (or which entered into service if registration is not mandatory) before 1 January 2025, in compliance with the requirements of 9.7.9.1 applicable until 31 December 2022, but not in compliance with the requirements of 9.7.9.1 applicable as from 1 January 2023, may continue to be used. *[Necessary for B or C]*

1.6.5.xx FL vehicles first registered (or which entered into service if registration is not mandatory) before 1 January 2025, not in compliance with the requirements of 9.7.9.1 applicable as from 1 January 2023, may continue to be used. *[Necessary for A-B-C]*

Proposal 2: Tyre fire protection for FL vehicles

Option A: Basic option, widening the application of 9.7.9.2 with FL vehicles (Compatible with option A for Fire extinguishing systems):

9.7.9 Additional safety requirements concerning EX/III and FL vehicles

9.7.9.2 Protection of the load by metal thermal shields against tyre fire shall be provided.

Option B: Small additional modifications to the text, making the need for protecting the cabin visible and allowing alternative materials to metal.

9.7.9 Additional safety requirements concerning EX/III and FL vehicles

9.7.9.2 Protection of the load and the cabin by ~~metal~~ non-combustible thermal shields against tyre fire shall be provided.

Option C: Giving specific requirements for the mudguards. It may be studied if this change should also be applied to EXIII vehicles:

9.7.9 Additional safety requirements concerning EX/III and FL vehicles

9.7.9.2 For EX/III vehicles, protection of the load by metal thermal shields against tyre fire shall be provided.

9.7.9.3 For FL vehicles, protection of the load and the cabin by thermal shields against propagation of tyre fire shall be provided. A minimum thickness of [2 mm] of steel, or a justified thickness of other materials providing an equivalent protection, shall be used.

Option D: Inclusion of more specific requirements, like limiting the heat flux or the increase in temperature on one side and the other of the mudguard can be studied.

1.6.5.xx EX/III vehicles first registered (or which entered into service if registration is not mandatory) before 1 January 2025, in compliance with the requirements of 9.7.9.2 applicable until 31 December 2022, but not in compliance with the requirements of 9.7.9.2 applicable as from 1 January 2023, may continue to be used. *[Necessary for B-C-D]*

1.6.5.xx FL vehicles first registered (or which entered into service if registration is not mandatory) before 1 January 2025, not in compliance with the requirements of 9.7.9.2 applicable as from 1 January 2023, may continue to be used. *[Necessary for A-B-C-D]*
