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Inland Transport Committee

Working Party on the Transport of Dangerous Goods

Joint Meeting of the RID Committee of Experts and the Working Party on the Transport of Dangerous Goods

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Agenda item 5 (b) of the provisional agenda

Proposals for amendments to RID/ADR/ADN

New proposals

Chapters 3.2 and 3.4

Introduction of a new special provision for the carriage of gas tanks removed from motor vehicles

Proposal transmitted by Germany^{1, 2}

Summary

Explanatory summary:	In connection with the development and commercial launch of alternative vehicle propulsion systems, there is an increasing use of vehicles powered by flammable gases. In the context of maintenance and repair work, quality assurance activities for vehicles and their components and environmentally friendly disposal, used gas tanks or gas storage systems with different degrees of filling have to be carried. The existing provisions do not offer the possibility of carrying such gas tanks properly and in accordance with the law.
Action to be taken:	Introduce a new special provision for the carriage of used gas tanks.
Related documents:	None.

¹ In accordance with the programme of work of the Inland Transport Committee for 2006-2010 (ECE/TRANS/166/Add.1, programme activity 02.7 (c)).

² Circulated by the Intergovernmental Organisation for International Carriage by Rail (OTIF) under the symbol OTIF/RID/RC/2010/19.

Introduction

1. In connection with the development and commercial launch of alternative vehicle propulsion systems, gas powered vehicles are becoming more important. The main technologies used are:

- Vehicles powered by compressed natural gas (CNG vehicles),
- Vehicles powered by liquefied petroleum gas (LPG vehicles),
- Vehicles powered by hydrogen, with both compressed and refrigerated liquefied gas (H₂ vehicles: ICE or F-Cell).

2. The gas fuel tanks being developed by the vehicle industry and different partners, and which are being supplied by various manufacturers, are mounted both as single vehicle tanks and as vehicle tank systems comprising bundles of cylinders or several gas containers.

3. As gas fuel tanks are not intended to be used for the carriage of gas in accordance with the regulations, they are not considered to be pressure receptacles within the meaning of Chapter 6.2 of RID/ADR/ADN, the IMDG Code and the ICAO Technical Instructions, and are not therefore approved as such.

4. To be used in motor vehicles, the gas tanks are approved by a Member State's competent authority in the context of the European vehicle approval. The approvals are valid in all Member States. The following ECE regulations in particular form the basis for the approvals of both passenger and commercial vehicles:

- ECE Regulation No. 67 on the approval of specific equipment of motor vehicles using liquefied petroleum gases in their propulsion system and the approval of a vehicle fitted with specific equipment for the use of liquefied petroleum gases in its propulsion system.
- ECE Regulation No. 110 on the installation of specific components in motor vehicles using compressed natural gas (CNG) in their propulsion system.
- ECE Regulation No. 115 on the installation in motor vehicles of liquefied petroleum gas (LPG) and compressed natural gas (CNG) retrofit systems, which makes reference to the above-mentioned ECE Regulations.
- The following draft ECE Regulations are relevant to hydrogen vehicles in the context of exceptional approvals:
TRANS/WP.29/GRPE/2003/14,
TRANS/WP.29/GRPE/2003/14/Add.1,
TRANS/WP.29/GRPE/2004/3,
TRANS/WP.29/GRPE/2004/3/Add.1.
- In future, the basis for approvals for hydrogen vehicles in Europe will be Regulation 79/2009/EC.

Gas tanks that meet the requirements of the Directives/Regulations listed are marked with an identification plate which has to show the regulations it complies with.

5. The basic technical parameters of gas fuel tanks are:

<i>Gas</i>	<i>LPG</i>	<i>CNG</i>	<i>H₂</i>
Relevant UN Nos.	UN 1011 UN 1075 UN 1965 UN 1969 UN 1978	UN 1971 UN 1954	UN 1049 UN 1966
Geometric volume of individual receptacles in [litres]	50	10 to 120; buses up to 600	220
Nominal working pressure in [bar]	12 (30)	200	350 ... 700
Net (empty) weight in [kg]	10 ... 50	4.5 ... 110	20 ... 110
Material	Mainly steel, where appropriate composite with various liners	Composite with various liners, sometimes steel	Composite with various liners

6. In principle, gas tanks carried in the context of supplying the vehicle industry or vehicle workshops from production plants are carried unpressurised. They are only filled once they have been fitted to the vehicle.

7. In connection with the maintenance and repair of gas powered vehicles, the need regularly arises to carry used gas tanks filled to varying degrees, from empty, uncleaned to the nominal working pressure.

8. It is often not possible to determine the actual degree of filling, especially if there is a fault with the electrically opening valves, because the vehicle workshops do not have the equipment necessary to do this and the gas contained cannot be released for reasons of safety or environmental protection, or can only be released with a disproportionate amount of effort.

9. The carriage of gas tanks in a condition which is non-critical with regard to pressure resistance, but which leads to complaint, is unavoidable in the context of quality assurance programmes, as it is only thus that conclusions can be drawn concerning possible causes of faults and measures necessary to correct faults and hence improve the safety of the containers can be developed.

10. Partially filled or empty, uncleaned gas tanks have to be carried for the purposes of reprocessing or disposal in an environmentally friendly manner.

11. As the receptacles do not have approval as pressure receptacles in the sense of the dangerous goods provisions, it is not possible at present to carry them in accordance with the law either in international road transport or by other modes of transport.

Proposals

12. Chapter 3.2 Table A

For UN Nos. 1011, 1049, 1075, 1954, 1965, 1966, 1969, 1971 and 1978, add special provision xxx in column (6).

13. Chapter 3.3

Add the following new special provision xxx:

"xxx Gas tanks or gas storage systems from motor vehicles powered by gases of UN Nos. 1011, 1049, 1075, 1954, 1965, 1966, 1969, 1971 or 1978 may be carried by derogation from each of the packing instructions and from the provisions of Chapter 6.2 provided the following conditions are met:

(a) The gas tanks or gas storage systems shall be approved for operation in motor vehicles in accordance with the applicable provisions and meet the requirements of the relevant ECE Regulation No. R 67, R 110 or R 115 or the Regulations of the European Union concerning hydrogen vehicles.

(b) The gas tanks or gas storage systems, and any fittings, shall be leakproof and shall not exhibit any signs of external damage.

(c) If the receptacles are not leakproof or if they exhibit damage that could affect their safety, they shall only be carried in pressure-resistant containments designed for at least the maximum allowable working pressure of the gas tanks or gas storage systems.

(d) Any external attachments, e.g. pipework (propellant gas pipes), shall be cleaned before being handed over for carriage and all openings, with the exception of pressure relief devices, shall be so closed as to be gas-tight.

(e) During carriage, the filling quantity in the gas tank shall not exceed the maximum allowable working pressure at 15°C.

(f) Gas tanks with or without other pressurised external attachments shall be packed individually or together in such a way as to prevent damage to the valve and unintentional release of the gas under normal conditions of carriage.

(g) Gas tanks with an internal valve and without other pressurised external attachments may also be carried unpackaged in pallet boxes, on load carriers or on pallets. If transport pallets are used, it shall be ensured that the dimensions of the pallet exceed those of the gas tanks at each point by at least 5 cm and that there is no mechanical damage to the surface of the container. The gas tanks shall be secured in the pallet box, on the load carrier or on the transport pallet so as to prevent slipping, rolling or vertical movement.

(h) Gas tanks with external valves or with pressurised external attachments shall be packed in pallet boxes, on load carriers or in protective frames so as to meet the provisions of 4.1.6.8 (b), (c) or (d).

Where the gas tanks are packed in protective boxes according to 4.1.6.8 (e), the packing unit as presented for carriage shall be capable of withstanding a drop test from 1.8 m without breaking off the valve or pressurised external attachments and without release of the contents of the gas tank.

The drop test shall be performed in accordance with ISO standard 11117:1998 or EN 962:1996 + A2:2000.

The first user shall document the performance of the drop test and the results.

The competent authority of the country in which a gas tank in an overpack, in the sense of a packing unit as presented for carriage, is to be used for the first time shall be informed of the results of the drop test before the gas tank is carried for the first time. The report on the performance of the test shall be submitted to the authority for this purpose.

(i) If several gas tanks are consigned in a pallet box, on a load carrier, in a protective frame or on a pallet, only the markings and danger labels required in accordance with Chapter 5.2 need to be affixed to the packing unit.

(j) Pallet boxes, load carriers and protective frames shall be secured on the wagon/vehicle or in the container in such a way that they cannot become loose or shift under normal conditions or carriage.

(k) The other provisions of RID/ADR/ADN shall be observed.”

Justification

14. Introducing the new special provision for such gases used as fuel to propel motor vehicles would allow the technically essential carriage of empty, uncleaned gas fuel tanks, or gas tanks filled to the maximum allowable working pressure, from motor vehicles, provided they are not damaged and are gas-tight.

Safety

15. The design type test of the gas tanks described, which are an integral component of motor vehicles, is conditional upon meeting the above-mentioned harmonised construction and approval provisions of road transport law. Among other things, for pressurised gases these require that the tests shown in the following table be satisfied. The table shows that bearing in mind the somewhat different operation compared with the usual dangerous goods pressure receptacles, gas fuel tanks are tested similarly from the point of view of technical safety.

<i>Test</i>	<i>Regulation</i>		<i>Regulation (EC)</i>
	<i>EN 12245:2002</i> <i>dangerous goods</i>	<i>ECE R 110</i> <i>CNG-vehicles</i>	<i>No 79/2009</i> <i>Hydrogen vehicles</i>
Pressure: PW/PH	... 300/450 bar	Currently 200/300 bar	... 700/1050 bar
Common volume	...450 Litres	... 200 Litres	Currently are 50 Litres common
Burst pressure (CFRP)	> 200% PH	> 450 bar and > stress ratios (calculation)	> NWP x burst ratio
Ambient load cycle	500 LC/year at PH	1,000 LC/year at 125% NWP (NWP = PW)	9 x fuelling at 125% NWP (NWP = PW)
Extreme temperature load cycle	5,000 LC at PH; +65°C; 95% rH 5,000 LC At PW;-50°C	500 LC/a at 130% NWP; +65°C; 95% rH 500 LC/year at NWP;-40°C	LW: 1.5 x fuelling at 125% NWP; +85°C, 95% rH LC: 1.5 x fuelling at 150% NWP; - 40°C
Flaw-tolerance	2 notches 1 mm, 50% wall thickness 1 st cylinder: burst test > 4/3 x PH; 2 nd cylinder: 1,000 LC at 2/3 x PH without further leakage 4,000 LC at 2/3 x PH without burst	Notches > as identifiable at visual inspection 3,000 LC at 260 bar no leakage 12,000 LC at 260 bar no burst	2 notches: 25 mm long, 1.25 mm depth; 200 mm long, 0.75 mm depth 0.6 x fuelling at 125% NWP, no leakage; 2.4 x fuelling at 125% NWP, no burst
Permeation	X test gas > X filling 672 h at 2/3 PH X ml/h/l max. X = 0.25 or individ.	CNG / 90% N ₂ - 10% He steady state at NWP 0.25 ml/h/Litres max.	500 h or steady state > 48 h at NWP 6 Nccm/h/Litres max.
Impact (bullet)	No burst after 45°-entry at PW	No burst after 45°-entry at NWP	No burst after 45°-entry at NWP
Bonfire	590°C after 2 min with PRD at 100% PW	590°C after 5 min with PRD at 100% NWP and at 25% NWP	590°C after 5 min with PRD at 100% NWP

16. Only the requirements for safe manual handling are dealt with differently because of the different operation in accordance with the provisions. In order to ensure at least the same level of safety in carriage for this area too, it is proposed to introduce the special provision set out above.

17. This would ensure that the necessary transport of gas fuel tanks already in operation from vehicle workshops to technical centres takes place at the level of safety that is required today.
