



**Committee of Experts on the Transport of Dangerous Goods
and on the Globally Harmonized System of Classification
and Labelling of Chemicals****Sub-Committee of Experts on the Transport of Dangerous Goods****Fiftieth session**

Geneva, 28 November – 6 December 2016

Item 2 (e) of the provisional agenda

**Recommendations made by the Sub-Committee on its forty-seventh,
forty-eighth and forty-ninth sessions and pending issues: transport of gases****Transport of gas tanks for motor vehicles****Submitted by the expert from Germany¹****Introduction**

1. At its forty-ninth session, the Sub-Committee considered document ST/SG/AC.10/C.3/2016/8 proposing a special provision on the transport of gas tanks for motor vehicles. The proposal followed up on discussions held the previous year (document ST/SG/AC.10/C.3/2015/5 and informal document INF. 12 of the forty-eighth session). Most delegations were in favour of the proposal. Several comments were provided on the details of the draft text which were considered for the revised proposal.

Background

2. Usually, tanks to be fitted in vehicles are transported either empty or filled with inert gas at low pressure. However, there are some cases in which a transport of filled tanks is necessary, in particular if demounted tanks have to be transported for repair, disposal or recycling or to meet the needs of the production process.
3. When a tank is replaced at a repair shop, this shop usually does not have the equipment needed to empty the tank (completely). The demounted tank then has to be

¹ In accordance with the programme of work of the Sub-Committee for 2015–2016 approved by the Committee at its seventh session (see ST/SG/AC.10/C.3/92, paragraph 95 and ST/SG/AC.10/42, para. 15).

transported in a filled state for disposal or recycling. This may also be the case when a demounted tank is transported to an inspection site, e.g. in the case of a warranty claim.

4. Moreover, for the simplification of the production process, there is also a need to transport new filled hydrogen tanks to the assembly facility. Usually, the tank is tested for leakage by means of an inert gas at the production facility and then transported further at low pressure. At the assembly facility, the tank then has to be flushed with hydrogen several times to ensure that the required mixing ratio in the fuel cell is achieved. The fuel cell is sensitive to contaminations of the fuel gas. If the tank was already tested for leakage with hydrogen or hydrogen mixtures, the effort required for eliminating the inert gas at the assembly facility would be considerably lower.

5. Vehicle tanks have to comply with the relevant standards and regulations for road vehicles. The referenced ECE Regulations and ISO standards for CNG and LPG tanks and the GTR provide a high level of safety (Annex of document ST/SG/AC.10/C.3/2015/5 shows selected test requirements). The tests were developed to demonstrate that the tank is capable of performing critical functions. These comprise functions related to the usage of a vehicle including fuelling/de-fuelling, parking in extreme conditions and performance in a fire. Manufacturers are expected to monitor the reliability, durability and residual strength of representative production units throughout the entire life of a vehicle. In the case of fire the gas will be released through a valve and no explosion will occur.

6. The status of application of the ECE Regulations and the global technical regulations and the possibility of referring to other national standards was discussed during the previous sessions. It became clear that different regulations and standards apply in different parts of the world; also ECE Regulations and GTRs have a limited territorial scope. The function of the references in this context is to describe the gas tanks and to ensure a sufficient level of safety, but a global application of the referenced regulation/standards is not required: E.g. gas tanks are manufactured in country A but will be installed in vehicles used in country B and thus have to comply with the technical standards applicable in country B. Consequentially, further national and European regulations have been incorporated in the proposal.

7. LNG tanks are not covered by the proposal. Requirements for LNG components have been incorporated into ECE R 110. However, the insulation of LNG tanks might not be sufficient to keep the necessary temperature level to prevent a discharge of overpressure through the venting system during longer transport. The minimum design hold time of vehicle LNG tanks is not more than 5 days. With regard to possible longer transport durations, in particular in sea transport, this seems not sufficient to ensure a safe transport in all modes of transport on the basis of the UN Model Regulations. Special transport conditions for LNG tanks might be developed at a later stage, if necessary.

8. In this context also the discussion on dangerous goods in machinery, apparatus or articles, N.O.S should be taken into consideration. Without the insertion of new specialized provisions for gas tanks for vehicles, they might be consigned as dangerous goods in articles in future.

Proposal

9. It is proposed to include a new special provision with the relevant transport requirements for fuel gas containment systems. Editorial improvements based on comments made during the previous session have been incorporated in the revised text. Standard ISO 13985:2006 – Liquid hydrogen has been deleted to be in line with the scope of the proposal. As some of the comments referred to the volume of the standard a second option listing the standards in a table instead of the footnotes has been included. In this context, the question

has arisen how to deal with gas tanks designed and constructed according to previous versions of the referenced standards. The previous versions of the proposal did not contain dates of the standard, but based on the comments received during the forty-eighth session the years had been added. One solution could be to delete the dates again. However, it seems to be appropriate to keep the dates to follow the usual way of referencing standards in the UN Model Regulations but to include text on gas tanks designed and constructed in accordance with previous versions of the standards.

Option 1

10. Amend the Model Regulations as follows:

Chapter 3.2 Dangerous Goods List

For UN No 1011, 1049, 1075, 1954, 1965, 1969, 1971, 1978 add special provision xxx in column 6

Add the following special provision "xxx" to Chapter 3.3:

"xxx For the transport of fuel gas containment systems designed and approved to be fitted in motor vehicles containing this gas the provisions of sub-section 4.1.4.1 and Chapter 6.2 of these Regulations need not be applied when transported for disposal, recycling, repair, inspection, maintenance or from where they are manufactured to a vehicle assembly plant, provided the following conditions are met:

(a) The fuel gas containment systems shall meet the requirements of ECE Regulation No. 67 Revision 2² or ECE Regulation No. 115³, ECE regulation No. 110 Revision 1⁴ or ISO 11439/ISO 15500⁵ or ANSI NGV 2⁶ or CSA B51 Part 2⁷, the

² ECE Regulation No. 67 (Uniform provisions concerning: I. Approval of specific equipment of motor vehicles using liquefied petroleum gases in their propulsion systems; II. Approval of a vehicle fitted with specific equipment for the use of liquefied petroleum gases in its propulsion system with regard to the installation of such equipment)

³ ECE Regulation No. 115 (Uniform provisions concerning the approval of: I. Specific LPG (liquefied petroleum gases) retrofit systems to be installed in motor vehicles for the use of LPG in their propulsion systems; II Specific CNG (compressed natural gas) retrofit systems to be installed in motor vehicles for the use of CNG in their propulsion system)

⁴ ECE Regulation No. 110 (Uniform provisions concerning: I. Specific components of motor vehicles using compressed natural gas (CNG) in their propulsion system; II. Vehicles with regard to the installation of specific components of an approved type for the use of compressed natural gas (CNG) in their propulsion system)

⁵ ISO 11439:2013 Gas cylinders — High pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles and ISO 15500 Road vehicles - Compressed natural gas (CNG) fuel systems

ISO 15500-1:2015 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 1: General requirements and definitions

ISO 15500-2:2012 Road vehicles - Compressed natural gas (CNG) fuel system components -- Part 2: Performance and general test methods

ISO 15500-3:2013 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 3: Check valve

ISO 15500-4:2012 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 4: Manual valve

ISO 15500-5:2012 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 5: Manual cylinder valve

Global Technical Regulation (GTR) No. 13⁸ or ISO/TS 15869⁹ or Regulation (EC) No.79/2009¹⁰ in combination with Regulation (EU) No. 406/2010¹¹ Regulation (EC) No. 134¹², as applicable. Gas tanks designed and constructed in accordance with previous versions of these standards which were applicable at the time of the certification of the vehicles for which the gas tanks were designed and constructed may be continued to be transported.

(b) The fuel gas containment systems shall be leakproof and shall not exhibit any signs of external damage which may affect their safety.

ISO 15500-6:2012 Road vehicles -- Compressed natural gas (CNG) fuel system components --

Part 6: Automatic valve

ISO 15500-7:2015 Road vehicles -- Compressed natural gas (CNG) fuel system components --

Part 7: Gas injector

ISO 15500-8:2015 Road vehicles -- Compressed natural gas (CNG) fuel system components --

Part 8: Pressure indicator

ISO 15500-9:2012 Road vehicles -- Compressed natural gas (CNG) fuel system components --

Part 9: Pressure regulator

ISO 15500-10:2015 Road vehicles -- Compressed natural gas (CNG) fuel system components --

Part 10: Gas-flow adjuster

ISO 15500-11:2015 Road vehicles -- Compressed natural gas (CNG) fuel system components --

Part 11: Gas/air mixer

ISO 15500-12:2015 Road vehicles -- Compressed natural gas (CNG) fuel system components --

Part 12: Pressure relief valve (PRV)

ISO 15500-13:2012 Road vehicles -- Compressed natural gas (CNG) fuel system components --

Part 13: Pressure relief device (PRD)

ISO 15500-14:2012 Road vehicles -- Compressed natural gas (CNG) fuel system components --

Part 14: Excess flow valve

ISO 15500-15:2015 Road vehicles -- Compressed natural gas (CNG) fuel system components --

Part 15: Gas-tight housing and ventilation hose

ISO 15500-16:2012 Road vehicles -- Compressed natural gas (CNG) fuel system components --

Part 16: Rigid fuel line in stainless steel

ISO 15500-17:2012 Road vehicles -- Compressed natural gas (CNG) fuel system components --

Part 17: Flexible fuel line

ISO 15500-18:2012 Road vehicles -- Compressed natural gas (CNG) fuel system components --

Part 18: Filter

ISO 15500-19:2012 Road vehicles -- Compressed natural gas (CNG) fuel system components --

Part 19: Fittings

ISO 15500-20:2015 Road vehicles -- Compressed natural gas (CNG) fuel system components --

Part 20: Rigid fuel line in material other than stainless steel

⁶ ANSI NGV 2-2007 - Compressed natural gas vehicle fuel containers

⁷ CSA B51 Boiler, pressure vessel, and pressure piping code Part 2 Requirements for high-pressure cylinders for on-board storage of fuels for automotive vehicles

⁸ Global technical regulation No. 13: Global technical regulation on hydrogen and fuel cell vehicles (ECE/TRANS/180/Add.13).

⁹ ISO/TS 15869:2009 Gaseous hydrogen and hydrogen blends - Land vehicle fuel tanks

¹⁰ Regulation (EC) No. 79/2009 of the European Parliament and of the Council of 14 January 2009 on type approval of hydrogen-powered motor vehicles, and amending Directive 2007/46/EC

¹¹ Commission Regulation (EU) No 406/2010 of 26 April 2010 implementing Regulation (EC) No 79/2009 of the European Parliament and of the Council on type-approval of hydrogen-powered motor vehicles.

¹² ECE-Regulation No. 134 (Hydrogen and fuel cell vehicles (HFCV))

NOTE 1: Criteria may be found in standard ISO 11623:2015 Transportable gas cylinders – Periodic inspection and testing of composite gas cylinders (or ISO 19078:2013 Gas cylinders – Inspection of the cylinder installation, and requalification of high pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles).

NOTE 2: If the fuel gas containment systems are not leakproof or overfilled or if they exhibit damage that could affect their safety, they shall only be carried in salvage pressure receptacles in conformity with these Regulations.

(c) If a fuel gas containment system is equipped with two valves or more integrated in line, two valves shall be closed as to be gastight under normal conditions of transport. If only one valve exists or only one valve works all openings with the exception of the opening of the pressure relief device shall be closed as to be gastight under normal conditions of transport.

(d) Fuel gas containment systems shall be transported in such a way as to prevent obstruction of the pressure relief device or any damage to the valves and any other pressurised part of the fuel gas containment systems and unintentional release of the gas under normal conditions of transport. The fuel gas containment system shall be secured in order to prevent slipping, rolling or vertical movement.

(e) Valves shall be protected by one of the methods described in 4.1.6.1.8 (a) to (e).

(f) Fuel gas containment systems transported from where they are manufactured to a vehicle assembly plant shall be filled with not more than 20 % of their nominal filling ratio or nominal working pressure, as applicable.

(g) Notwithstanding chapter 5.2, when fuel gas containment systems are consigned in a handling device, markings and labels may be affixed to the handling device.

(h) Notwithstanding 5.4.1.5, the information on the total quantity of dangerous goods may be replaced by the following information:

(i) The number of fuel gas containment systems;

(ii) In the case of liquefied gases the total mass (kg) of gas of each fuel gas containment system and, in the case of compressed gases, the total water capacity (l) of each fuel gas containment system followed by the nominal working pressure.

Examples for information in the transport document:

Example 1: “UN 1971 natural gas, compressed, 2.1, 1 fuel gas containment system of 50 l in total, 200 bar”.

Example 2: “UN 1965 hydrocarbon gas mixture, liquefied, n.o.s., 2.1, 3 fuel gas containment systems, each of 15 kg net mass of gas”.

Option 2 (same text, but standards are listed in a table)

Chapter 3.2 Dangerous Goods List

For UN No 1011, 1049, 1075, 1954, 1965, 1969, 1971, 1978 add special provision xxx in column 6

Add the following special provision "xxx" to Chapter 3.3:

"xxx For the transport of fuel gas containment systems designed and approved to be fitted in motor vehicles containing this gas the provisions of sub-section 4.1.4.1 and Chapter 6.2 of these Regulations need not be applied when transported for disposal, recycling, repair, inspection, maintenance or from where they are manufactured to a vehicle assembly plant, provided the following conditions are met:

- (a) The fuel gas containment systems shall meet the requirements of the standards for fuel tanks for vehicles, as applicable. Applicable standards are

| LPG Tanks | |
|----------------------------------|---|
| ECE Regulation No. 67 Revision 2 | Uniform provisions concerning: I. Approval of specific equipment of motor vehicles using liquefied petroleum gases in their propulsion systems; II. Approval of a vehicle fitted with specific equipment for the use of liquefied petroleum gases in its propulsion system with regard to the installation of such equipment |
| ECE Regulation No. 115 | Uniform provisions concerning the approval of: I. Specific LPG (liquefied petroleum gases) retrofit systems to be installed in motor vehicles for the use of LPG in their propulsion systems; II Specific CNG (compressed natural gas) retrofit systems to be installed in motor vehicles for the use of CNG in their propulsion system |
| CNG Tanks | |
| ECE Regulation No. 110 | Uniform provisions concerning: I. Specific components of motor vehicles using compressed natural gas (CNG) in their propulsion system; II. Vehicles with regard to the installation of specific components of an approved type for the use of compressed natural gas (CNG) in their propulsion system |
| ECE Regulation No. 115 | (Uniform provisions concerning the approval of: I. Specific LPG (liquefied petroleum gases) retrofit systems to be installed in motor vehicles for the use of LPG in their propulsion systems; II Specific CNG (compressed natural gas) retrofit systems to be installed in motor vehicles for the use of CNG in their propulsion system) |
| ISO 11439:2013 | Gas cylinders — High pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles and ISO 15500 Road vehicles - Compressed natural gas (CNG) fuel systems |
| ISO 15500-1:2015 | ISO 15500-1:2015 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 1: General requirements and definitions |
| ISO 15500-2:2012 | ISO 15500-2:2012 Road vehicles - Compressed natural gas (CNG) fuel system components - Part 2: Performance and general test methods |
| ISO 15500-3:2013 | ISO 15500-3:2013 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 3: Check valve |
| ISO 15500-4:2012 | ISO 15500-4:2012 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 4: Manual valve |

| | |
|--|--|
| ISO 15500-5:2012 | ISO 15500-5:2012 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 5: Manual cylinder valve |
| ISO 15500-6:2012 | ISO 15500-6:2012 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 6: Automatic valve |
| ISO 15500-7:2015 | ISO 15500-7:2015 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 7: Gas injector |
| ISO 15500-8:2015 | ISO 15500-8:2015 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 8: Pressure indicator |
| ISO 15500-9:2012 | ISO 15500-9:2012 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 9: Pressure regulator |
| ISO 15500-10:2015 | ISO 15500-10:2015 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 10: Gas-flow adjuster |
| ISO 15500-11:2015 | ISO 15500-11:2015 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 11: Gas/air mixer |
| ISO 15500-12:2015 | ISO 15500-12:2015 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 12: Pressure relief valve (PRV) |
| ISO 15500-13:2012 Pressure relief device (PRD) | ISO 15500-13:2012 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 13: Pressure relief device (PRD) |
| ISO 15500-14:2012 | ISO 15500-14:2012 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 14: Excess flow valve |
| ISO 15500-15:2015 | ISO 15500-15:2015 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 15: Gas-tight housing and ventilation hose |
| ISO 15500-16:2012 | ISO 15500-16:2012 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 16: Rigid fuel line in stainless steel |
| ISO 15500-17:2012 | ISO 15500-17:2012 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 17: Flexible fuel line |
| ISO 15500-18:2012 | ISO 15500-18:2012 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 18: Filter |
| ISO 15500-19:2012 | ISO 15500-19:2012 Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 19: Fittings |
| ISO 15500-20:2015 | Road vehicles -- Compressed natural gas (CNG) fuel system components -- Part 20: Rigid fuel line in material other than stainless steel |
| ANSI NGV 2 | Compressed natural gas vehicle fuel containers |
| CSA B51 Part 2 | Boiler, pressure vessel, and pressure piping code Part 2 Requirements for high-pressure cylinders for on-board storage of fuels for automotive vehicles |
| Hydrogen pressure tanks | |
| Global Technical Regulation (GTR) No. 13 | Global technical regulation on hydrogen and fuel cell vehicles (ECE/TRANS/180/Add.13). |
| ISO/TS 15869:2009 | Gaseous hydrogen and hydrogen blends - Land vehicle fuel tanks and ISO |
| Regulation (EC) No.79/2009 | Regulation (EC) No. 79/2009 of the European Parliament and of the Council of 14 January 2009 on type approval of hydrogen-powered motor vehicles, and amending Directive |

| | |
|------------------------------|--|
| | 2007/46/EC |
| Regulation (EU) No. 406/2010 | Commission Regulation (EU) No 406/2010 of 26 April 2010 implementing Regulation (EC) No 79/2009 of the European Parliament and of the Council on type-approval of hydrogen-powered motor vehicles. |
| ECE Regulation No. 134 | Hydrogen and fuel cell vehicles (HFCV) |

Gas tanks designed and constructed in accordance with previous versions of these standards which were applicable at the time of the certification of the vehicles for which the gas tanks were designed and constructed may be continued to be transported.

(b) The fuel gas containment systems shall be leakproof and shall not exhibit any signs of external damage which may affect their safety.

NOTE 1: Criteria may be found in standard ISO 11623:2015 Transportable gas cylinders – Periodic inspection and testing of composite gas cylinders (or ISO 19078:2013 Gas cylinders – Inspection of the cylinder installation, and requalification of high pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles).

NOTE 2: If the fuel gas containment systems are not leakproof or overfilled or if they exhibit damage that could affect their safety, they shall only be carried in salvage pressure receptacles in conformity with these Regulations.

(c) If a fuel gas containment system is equipped with two valves or more integrated in line, two valves shall be closed as to be gastight under normal conditions of transport. If only one valve exists or only one valve works all openings with the exception of the opening of the pressure relief device shall be closed as to be gastight under normal conditions of transport.

(d) Fuel gas containment systems shall be transported in such a way as to prevent obstruction of the pressure relief device or any damage to the valves and any other pressurised part of the fuel gas containment systems and unintentional release of the gas under normal conditions of transport. The fuel gas containment system shall be secured in order to prevent slipping, rolling or vertical movement.

(e) Valves shall be protected by one of the methods described in 4.1.6.1.8 (a) to (e).

(f) Fuel gas containment systems transported from where they are manufactured to a vehicle assembly plant shall be filled with not more than 20 % of their nominal filling ratio or nominal working pressure, as applicable.

(g) Notwithstanding chapter 5.2, when fuel gas containment systems are consigned in a handling device, markings and labels may be affixed to the handling device.

(h) Notwithstanding 5.4.1.5 the information on the total quantity of dangerous goods may be replaced by the following information:

- (i) The number of fuel gas containment systems;
- (ii) In the case of liquefied gases the total mass (kg) of gas of each fuel gas containment system and, in the case of compressed gases, the total water capacity (l) of each fuel gas containment system followed by the nominal working pressure.

Examples for information in the transport document:

Example 1: “UN 1971 natural gas, compressed, 2.1, 1 fuel gas containment system of 50 l in total, 200 bar”.

Example 2: “UN 1965 hydrocarbon gas mixture, liquefied, n.o.s., 2.1, 3 fuel gas containment systems, each of 15 kg net mass of gas”.
