

**Economic and Social Council**Distr.: General
28 July 2017

Original: English

Economic Commission for Europe**Inland Transport Committee****World Forum for Harmonization of Vehicle Regulations****Working Party on General Safety Provisions****113th session**

Geneva, 10-13 October 2017

Item 6(b) of the provisional agenda

Amendments to gas-fuelled vehicle**regulations – Regulation No. 110 (CNG and LNG vehicles)****Proposal for amendments to Regulation No. 110 (CNG and LNG vehicles)****Submitted by the expert from Italy***

The text reproduced below was prepared by the expert from Italy to amend Annex 3A of the Regulation on the test requirements for the periodic requalification of Compressed Natural Gas (CNG) cylinders to avoid structural failures during their service life. It is based on informal document GRSG-112-28 distributed during the 112th session of the Working Party on General Safety Provisions (GRSG) (see report ECE/TRANS/WP.29/GRSG/91, para. 32). The modifications to the current text of UN Regulation No. 110 are marked in bold characters for new and strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2016–2017 (ECE/TRANS/254, para. 159 and ECE/TRANS/2016/28/Add.1, cluster 3.1), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.



I. Proposal

Annex 3A

Paragraph 4.1.4., amend to read:

"4.1.4. Periodic requalification

Recommendations for periodic requalification ... conditions specified herein. Each cylinder shall be visually inspected at least every 48 months after the date of its entry into service on the vehicle (vehicle registration) and at the time of any reinstallation to verify the absence of damage and deterioration, including under the support straps **and under any ogive protective covers**. The visual inspection ..."

Paragraph 10.7.1., amend to read:

"10.7.1. General

Cylinder design qualification tests shall be in accordance with the requirements of paragraphs 8.6., 10.7.2., 10.7.3., ~~and~~ 10.7.4. **and 10.7.5.** of this annex, except that the LBB performance in paragraph 8.6.10. above is not required."

Add a new paragraph 10.7.5., to read:

"10.7.5. Impact damage test

One or more finished cylinders shall be subjected to an impact damage test according to Appendix A, paragraph A.20.

When ogive protective covers are fitted on the cylinder, this test shall be carried out in the absence of such covers."

Annex 3A, Appendix A

Paragraph A.20., amend to read:

"A.20. Impact damage test

One or more finished cylinders shall be drop tested at ambient temperature without internal pressurization, without **ogive protection covers or** attached valves. The surface ...

..."

II. Justification

1. In Italy, two cases of structural failure of CNG cylinders, fitted to in-use vehicles, occurred during the normal refueling operations. The cylinders of type CNG-4 were equipped with covers protecting the ogives. However, these covers were glued on the ogives so to cover them completely. The failure occurred on the ogive side valve in the centre of the area hidden by the protective cover. The thickness of the cylinder wall, in that area, was considerably reduced; about half of that of the cylindrical part.

2. UN Regulation No. 110 requires in Annex 3, paragraph 4.1.4., that cylinders should be checked by visual inspection to enable the detection of any damage. This requirement is even more compelling in the case that the manufacturer does not foresee any service test to be carried out for this purpose during the cylinder life.

3. For CNG-4 cylinders, especially in relation with their ogive, it is evident that any damage may affect also the fibers which are internally placed in the cylinder wall and, thus, are identifiable from colour variations of the ogive itself (e.g. see item 7.6.3. of standard ISO 19078).
 4. It is evident that any protective ogive cover or cap, if glued, would prevent the conduct of the inspection of the ogive as in the case of the occurred failures. However, UN Regulation No. 110 expressly requires visual inspections which are even indispensable especially in the absence of specific requalification tests prescribed by the manufacturer.
 5. Therefore, any protective cover intended to protect the cylinder during the handling phases should be removed at the time of fitting on the vehicle. Otherwise, any protective cover provided by the manufacturer should, nevertheless, be easily removable to allow the inspection of the ogives. The manufacturer should specify the need of removing protective cover(s) at the occasion of inspections, indicating the mode of execution, as required by Annex 3, paragraph 6.12.
 6. The material of the protective cylinder covers that show structural failure seems to present the characteristic of cracking after a short time of use, due to aging and deformation cycles resulting from normal refueling operations, therefore, reducing the resistance capacity of the cylinder to shocks in correspondence of ogives or leading to the scrapping of cylinders that have not been subjected to any impact or damage.
 7. For obvious safety reasons, UN Regulation No. 110 requires in Annex 3, paragraph 6.13. and Table 6.4. referred to, that CNG-3 and CNG-4 cylinders shall withstand shocks and falls. Thus, specific drop tests must be carried out according to the procedures described in a very precise manner in Annex 3, Appendix A, paragraph A.20. While this requirement is reiterated for CNG-3-type cylinders (see paragraph 9.6.), it is missing in paragraph 10.7. for CNG-4 type cylinders.
 8. Since it is not possible to exclude that any bumps on the ogives may occur when the protective covers have been removed or when they show reduced efficiency conditions due to the presence of cracks, Italy proposes that CNG-4 cylinders should pass the above-mentioned drop tests without the presence of the ogive protective covers to ensure the safety conditions laid down in UN Regulation No. 110.
-