Submitted by the expert from the Netherlands

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Agenda item 7 (b))

Supplement 1 to the 05 of Amendments to UN Regulation No. 110 (CNG and LNG vehicles)

Submitted by the expert from the Netherlands *

The text reproduced below was prepared by the expert from the Netherlands, aiming to update the existing requirements for compressed natural gas/liquified natural gas (CNG/LNG) fuelled components. It is based on GRSG-119-16 distributed at the 119th session of the Working Party on General Safety (GRSG) (see ECE/TRANS/WP.29/GRSG/98, paragraphs 44 and 45).

The modifications to the current text of the UN Regulation are marked in bold for new or strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2022 as outlined in proposed programme budget for 2022 (A/76/6 (part V, sect. 20) para. 20.76), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

I. Proposal

Paragraph 8.4. – 8.11., amend to read:

"8.4.-8.11. Provisions on other CNG components

The components shown shall be type approved pursuant to the provisions laid down in the annexes which can be determined from the table below:

Paragraph	*Component*	*Annex*
8.4.	Automatic valve Check valve or non-return valve Pressure relief valve Pressure relief device (temperature triggered) **Manual valve** Excess flow valve Pressure relief device (pressure triggered)	4A
8.5.	Flexible fuel line-hose	4B
8.6.	CNG filter	4C
8.7.	CNG Pressure regulator CNG Compressor	4D
8.8.	Pressure and temperature sensors	4E
8.9.	Filling unit or receptacle	4F
8.10.	Gas flow adjuster and gas/air mixer, injector or fuel rail	4G
8.11.	Electronic control unit	4H

"

Annex 3A – Appendix A, amend to read:

"A.24. Pressure relief device requirements

Pressure relief device specified by the manufacturer shall be shown to be compatible with the service conditions listed in paragraph 4. of Annex 3A and through the following qualification tests:

(a) One specimen shall be held at a controlled temperature of not less than 95 °C and a pressure not less than test pressure (30 MPa) for 24 hours. At the end of this test there shall be no leakage or visible sign of extrusion of any fusible metal used in the design.

(b) One specimen shall be fatigue tested at a pressure cycling rate not to exceed 4 cycles per minute as follows:

(i) Held at 82 °C while pressured for 10,000 cycles between 2 MPa and 26 MPa;

(ii) Held at -40 °C while pressure for 10,000 cycles between 2 MPa and 20 MPa.

At the end of this test there shall be no leakage, or any visible sign of extrusion of any fusible metal used in the design.

(c) Exposed brass pressure retaining components of pressure relief devices shall withstand, without stress corrosion cracking, **immersion in ammonia** ~~a mercurous nitrate test as described in ASTM B154. The pressure relief device shall be immersed for 30 minutes in an aqueous mercurous nitrate solution containing 10 g of mercurous nitrate and 10 ml of nitric acid per litre of solution.~~ Following the immersion, the pressure relief device shall be leak tested by applying an aerostatic pressure of 26 MPa for one minute during which time the component shall be checked for external leakage; Any leakage shall not exceed 200 cm^3/h.

(i) Subject each test sample to the physical stresses normally imposed on, or within, a part as a result of its assembly with other components. Apply these stresses to the sample prior to testing and maintain them throughout the test. Samples with thread, intended to be used for installing the product in the field, shall have the threads engaged and tightened to the torque specified in the instruction manual of the sample or specified by the manufacturer. Polytetrafluorethylene (PTFE) tape or pipe compounds shall not be used on the threads.

(ii) Degrease three samples and expose them continuously for 10 days at a set position to a moist ammonia–air mixture, maintained in a glass chamber of approximately 30 l in capacity with a glass cover. Aqueous ammonia having a specific gravity of 0.94 shall be maintained at the bottom of the glass chamber, below the samples, at a concentration of 21.2 ml/l of chamber volume. ~~Maintain approximately 600 cm^3 of aqueous ammonia, with a relative density (specific gravity) of 0.94, at the bottom of the glass chamber, below the samples.~~ Position the samples 40 mm above the aqueous ammonia solution, supported by an inert tray. Maintain the moist ammonia–air mixture in the chamber at atmospheric pressure and at a temperature of 34 °C ± 2 °C.

~~After being subjected to the conditions of this procedure, samples shall show no evidence of cracking when examined at a magnification factor of 25.~~

(d) Exposed stainless steel pressure retaining components of pressure relief devices shall be made of an alloy type resistant to chloride induced stress corrosion cracking."

Annex 4A, paragraph 3.2.3., amend to read:

"3.2.3. The non-return valve, being in the normal position of use specified by the manufacturer, is submitted to 20,000 operations; then it is deactivated. **Following 20,000 cycles of operation, subject the check valve to 240 h of chatter flow at a flow rate that causes the most chatter. Failure in any sense during the procedure shall constitute a failure of the check valve. All parts shall remain in position and function properly after this test.** The non-return valve shall remain leak-proof (external) at a pressure of 1.5 times the working pressure (MPa) (see Annex 5B)."

Annex 5L, amend to read:

"Annex 5L

Durability test (continued operation)

1. Test method for CNG components

1.1. The component shall be connected to a source of pressurized dry air or nitrogen by means of a suitable fitting and subjected to the number of cycles specified for that specific component. A cycle shall consist of one opening and one closing of the component within a period of not less than 10 ± 2 seconds.

(a) Room temperature cycling

The component shall be operated through 96 per cent of the total cycles at room temperature and at rated service pressure. During the off cycle the downstream pressure of the test fixture should be allowed to decay to 50 per cent of the test pressure. After that, the components shall

comply with the leakage test of Annex 5B at room temperature. It is allowed to interrupt this part of the test at 20 per cent intervals for leakage testing.

(b) High temperature cycling

The component shall be operated through 2 per cent of the total cycles at the appropriate maximum temperature specified at rated service pressure. The component shall comply with the leakage test of Annex 5B at the appropriate maximum temperature at the completion of the high temperature cycles.

(c) Low temperature cycling

The component shall be operated through 2 per cent of the total cycles at the appropriate minimum temperature specified at rated service pressure. The component shall comply with the leakage test of Annex 5B at the appropriate minimum temperature specified at the completion of the low temperature cycles.

Following cycling and leakage re-test, the component shall be capable of completely opening and closing when a torque not greater than that specified in Table 5.3 below is applied to the component handle in a direction to open it completely and then in the reverse direction. **For a lever operated valve the appropriate maximum torque is to be determined by applying a pull force up to 150 N to the end of the handle operating mechanism.**

Table 5.3
Table Title?

Component inlet size [mm]	*Maximum torque [Nm]*
6	1.7
8 or 10	2.3
12	2.8

1.2. This test shall be conducted at the appropriate maximum temperature specified, and shall be repeated at a temperature of -40 °C.

1.3. Durability test for LNG products are mentioned in their specific Annex 4I up to Annex 4O, where applicable."

II. Justification

1. The above proposal is intended to:

(a) Correct errors/mistakes in the current UN Regulation No. 110.

(b) Update paragraphs to be in line with the requirements coming from ISO15500 and NGV3.1 (industry standards for CNG):

(i) Annex 3A test A.24. the current mentioned mercurous nitrate test is replaced by a 10 day ammonia immersion. Mercurous nitrate is known as a carcinogenic, mutagenic and reprotoxic chemicals (CMR) substance and therefore needs to be replaced.

(ii) Annex 4A, after the duration test on a check valve it is common to perform a chatter flow. This chatter flow is something that can occur in practice at a filling station. To determine the closing function this test is added after the duration test. (being in line with ISO15500 and NGV3.1).

(iii) Annex 5L durability test on a manual valve is updated with the distinctions between a wheel style valve and lever operated valve. In the current text there is no distinction in requirements between the two versions. Having the new proposed wording will give a more dedicated requirement.

2. By introducing the above given requirements, the expert from the Netherlands aims to make this UN Regulation up to date and at the same time ensure an adequate safety level.