



Economic and Social Council

Distr.: General
13 January 2022

Original: English

Economic Commission for Europe

Inland Transport Committee

World Forum for Harmonization of Vehicle Regulations

Working Party on General Safety Provisions

123rd session

Geneva, 28 March–1 April 2022

Item 7 (b) of the provisional agenda

Amendments to Gas-Fuelled Vehicle Regulations:

UN Regulation No. 110 (CNG and LNG vehicles)

Proposal for Supplement 4 to the 04 Series and for Supplement 1 to the 05 of Amendments to UN Regulation No. 110 (CNG and LNG vehicles)

Submitted by the expert from International Association for Natural Gas Vehicles *

The text reproduced below was prepared by the expert from International Association for Natural Gas Vehicles. It is based on informal document GRSG-122-28 distributed at the 122nd session of the Working Party on General Safety Provisions (GRSG). The modifications to the existing text 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 3., Figure 1-2, add reference to Annex 5R to read:

"Figure 1-2

Test Applicable to Specific Classes of Components (Excluding CNG Cylinders and LNG Tanks)

Test	Class 0	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Annex
Overpressure or strength	X	X	X	X	O	X	X	5A
External leakage	X	X	X	X	O	X	X	5B
Internal leakage	A	A	A	A	O	A	A	5C
Durability tests	A	A	A	A	O	A	A	5L
CNG/LNG compatibility	A	A	A	A	A	A	A	5D
Corrosion resistance	X	X	X	X	X	A	X	5E
Resistance to dry heat	A	A	A	A	A	A	A	5F
Ozone ageing	A	A	A	A	A	A	A	5G
Burst/destructive tests	X	O	O	O	O	A	X	5M
Temperature cycle	A	A	A	A	O	A	A	5H
Pressure cycle	X	O	O	O	O	A	X	5I
Vibration resistance	A	A	A	A	O	A	A	5N
Operating temperatures	X	X	X	X	X	X	X	5O
LNG low temperature	O	O	O	O	O	X	O	5P
Benchtop activation	A	O	A	A	O	O	A	5R
X = Applicable O = Not applicable A = As applicable								

"

Annex 4A, paragraph 4.2.5., amend to read:

"4.2.5. The pressure relief device shall be so designed to open the fuse at a temperature of 110 °C ± 10 °C **as specified in Annex 5R.**"

Annex 5, paragraph 2., Table 5.1, add reference to Annex 5R and amend to read:

"Table 5.1

Test	Class 0	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Annex
Overpressure or strength	X	X	X	X	O	X	X	5A
External leakage	X	X	X	X	O	X	X	5B
Internal leakage	A	A	A	A	O	A	A	5C
Durability tests	A	A	A	A	O	A	A	5L
CNG/LNG compatibility	A	A	A	A	A	A	A	5D
Corrosion resistance	X	X	X	X	X	A	X	5E
Resistance to dry heat	A	A	A	A	A	A	A	5F

Test	Class 0	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Annex
Ozone ageing	A	A	A	A	A	A	A	5G
Burst/destructive tests	X	O	O	O	O	A	X	5M
Temperature cycle	A	A	A	A	O	A	A	5H
Pressure cycle	X	O	O	O	O	A	X	5I
Vibration resistance	A	A	A	A	O	A	A	5N
Operating temperatures	X	X	X	X	X	X	X	5O
LNG low temperature	O	O	O	O	O	X	O	5P
Compatibility with heat exchange fluids of non-metallic part	A	A	A	A	A	A	A	5Q
Benchtop activation	A	O	A	A	O	O	A	5R
X = Applicable O = Not applicable A = As applicable								

Remarks:

- (a) Internal leakage: Applicable if the Class of the component consists of internal valve seats that are normally closed during engine "OFF" condition;

...

- (g) **Benchtop activation: Applicable if the class of the component is dependent upon temperature for activation."**

Add new Annex 5R, to read:

"Annex 5R

Benchtop Activation

1. **Benchtop activation – Temperature activated pressure relief device (PRD)**
 - 1.1. **The purpose of the test is to demonstrate that a PRD will consistently activate throughout its designed life.**
2. **Test set-up**
 - 2.1. **The test set-up shall consist of an oven, or chimney (test chamber) capable of maintaining a temperature of 600 °C ± 10 °C surrounding the test article. The PRD shall not be exposed to direct flame impingement.**
3. **Test samples**
 - 3.1. **Two virgin PRDs shall be tested and the averaged activation time shall establish a baseline activation time.**
 - 3.1.2. **One sample PRD that has been subjected to and passed the following design qualification tests: Annex 5E, Annex 5H, Annex 5L, and Annex 5N.**
4. **Test Procedure**
 - 4.1. **The test chamber temperature shall be in the temperature range for a minimum of two minutes prior to running the test.**
 - 4.2. **Place sample PRD that has been pressurized to 25 per cent of service pressure in the test chamber; record time to activation.**

5. **Acceptable results**
- 5.1. **The PRDs that have been tested according to the tests outline in paragraph 3.1.2., shall activate within two minutes of the recorded activation time of the samples listed in clause 3.1.**
6. **Benchtop activation batch testing**
- 6.1. **A PRD from each batch shall be subject to the benchtop activation test per paragraph 4.2., and may be conducted by the PRD manufacturer. Virgin components may be used for the test. The PRD shall activate within two minutes of the baseline activation time established in paragraph 3.1.**
- 6.2. **The batch size is limited to what can be produced from a single batch of system-critical components, or 1,000 units, whichever is less."**

II. Justification

1. Currently there are no design qualification tests within UN Regulation No. 110 to determine that a temperature activated Pressure Relief Device (PRD) will consistently activate in a timely manner. PRD are one of the primary safety tools that can prevent a container rupture during a thermal event. Ensuring that a PRD will activate when it reaches its designed activation temperature range is of utmost importance.
 2. Performing batch testing, also ensures that no minor change in process or material will be detrimental to the intended activation time.
 3. The addition of these tests also will harmonize UN Regulation No. 110 with ISO 15500-13 (2012), and the North American CSA/ANSI PRD 1 (2020).
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