

## Proposal for amendments to UN Regulation No. R.110

The text reproduced below has been prepared by the experts from NGV Global to introduce certain change of design criteria in Annex 3 of R.110. For the sake of clarity and readability the modifications to the current text of the Regulation are underlined, and highlighted in yellow within tables and figures.

### I. Proposal

Add new Annex for temperature activated pressure relief device (PRD).

#### 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  $600\text{ °C} \pm 10\text{ °C}$  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, & 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 % 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 clause 3.1.2, shall activate within 2 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 clause 4.2, and may be conducted by the PRD manufacturer. Virgin components may be used for the test. The PRD shall activate within 2 minutes of the baseline activation time established in clause 3.1

6.2 The batch size is limited to what can be produced from a single batch of system-critical components, or 1000 units, whichever is less.

Add reference to Annex 5R in Figure 1-2

Figure 1-2

**Test applicable to specific classes of components (excluding CNG cylinders and LNG tank)**

<i>Test</i>	<i>Class 0</i>	<i>Class 1</i>	<i>Class 2</i>	<i>Class 3</i>	<i>Class 4</i>	<i>Class 5</i>	<i>Class 6</i>	<i>Annex</i>
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
<b>Benchtop activation</b>	<b>A</b>	<b>O</b>	<b>A</b>	<b>A</b>	<b>O</b>	<b>O</b>	<b>A</b>	<b>5R</b>
X = Applicable O = Not applicable A = As applicable								

Add reference to Annex 5R in Table 5-1

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
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
<b>Benchtop activation</b>	<b>A</b>	<b>O</b>	<b>A</b>	<b>A</b>	<b>O</b>	<b>O</b>	<b>A</b>	<b>5R</b>
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;

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

Add reference to Annex 5R in Annex 4A, clause 4.2.5

**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.

## II Justification

1. Currently there are no design qualification tests within UN ECE R110 to determine that a temperature activated pressure relief device (PRD) will consistently activate in a timely manner. The PRD is 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 ECE R110 with ISO 15500-13 (2012), and the North American CSA/ANSI PRD 1 (2020).