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Item 4.2.10. of the provisional agenda

1958 AGREEMENT

Consideration of draft amendments to existing Regulations

Proposal for Supplement 7 to Regulation No. 110
(Specific components for CNG)

Submitted by the Working Party on Pollution and Energy (GRPE)

The text reproduced below was adopted by GRPE at its fifty-third session. It is based on ECE/TRANS/WP.29/GRPE/2007/3, as amended by para. 26 to the report, and on ECE/TRANS/WP.29/GRPE/2007/6, not amended, and by Annex 5 of the report. It is submitted to WP.29 and AC.1 for consideration (ECE/TRANS/WP.29/GRPE/53, paras. 26, 27 and 28).

Insert a new paragraph 17.9.3., to read (including the insertion of a new footnote */):

"17.9.3. For vehicles of classes M₁ and N₁ the filling unit (receptacle) shall comply with the drawing specifications detailed in Figure 1 of Annex 4F.

*/ As defined in Annex 7 to the Consolidated Resolution on the Construction of Vehicles (R.E.3) (TRANS/WP.29/78/Rev.1/Amend.2)."

Annex 3

Paragraph 1., amend to read:

"1. SCOPE

This annex sets out minimum requirements for light-weight refillable gas cylinders. The cylinders are intended only for the onboard storage of high pressure compressed natural gas as a fuel for automotive vehicles to which the cylinders are to be fixed. Cylinders may be of any steel, aluminium or non-metallic material, design or method of manufacture suitable for the specified service conditions. This annex also covers stainless steel metal liners of seamless or welded construction. Cylinders covered by this annex are classified in Class 0, as described in paragraph 2. of this Regulation, and are:
....."

Paragraph 2., amend to read (inserting two new references):

"2. REFERENCES

.....

BS 7448-91 Fracture Mechanics Structures; Metallic Materials.

EN 13322-2 2003 Transportable gas cylinders – Refillable welded steel gas cylinders
- Design and construction – Part 2: Stainless steel

EN ISO 5817 2003 Arc-welded joints in steel; guidance on quality levels for imperfections

ISO Standards 3/

....."

Insert new paragraphs 6.3.2.4. and 6.3.2.5., to read:

"6.3.2.4. Bending properties

The bending properties of the welded stainless steel in the finished liner shall be determined in accordance with paragraph A.3. (Appendix A).

6.3.2.5. Macroscopic weld examination

A macroscopic weld examination for each type of welding procedure shall be performed. It shall show complete fusion and shall be free of any assembly faults or unacceptable defects as specified according to level C in EN ISO 5817."

Paragraph 6.3.2.4. (former), renumber as paragraph 6.3.2.6.

Table 6.1., amend to read:

"Table 6.1. - Material design qualification test

	Relevant paragraph of this annex				
	Steel	Aluminium	Resins	Fibres	Plastic liners
Tensile properties	6.3.2.2.	6.3.3.4.		6.3.5.	6.3.6.
Impact properties	6.3.2.3.				
Bending properties	6.3.2.4.				
Weld examination	6.3.2.5.				
Sulfide stress cracking resistance	6.3.2.6.				
Sustained load crack resistance		6.3.3.3.			
Stress corrosion cracking		6.3.3.2.			
Shear strength			6.3.4.2.		
Glass transition temperature			6.3.4.3.		
Softening/Melting temperature					6.3.6.
Fracture mechanics*/	6.7.	6.7.			
*/ Not required if flawed cylinder test approach in paragraph A.7. of Appendix A is used					

"

Annex 3, Appendix A

Paragraphs A.1. and A.2., amend to read:

"A.1. Tensile tests, steel and aluminium

A tensile test shall be carried out on the material taken from the cylindrical part of the finished cylinder using a rectangular test piece shaped in accordance with the method described in ISO 9809 for steel and ISO 7866 for aluminium. For cylinders with welded stainless steel liners, tensile tests shall be also carried out on material taken from the welds in accordance with the method described in paragraph 8.4. of EN 13322-2. The two faces

of the test pieces representing the inside and outside surface of the cylinder shall not be machined. The tensile test shall be carried out in accordance with ISO 6892.

NOTE - Attention is drawn to the method of measurement of elongation described in ISO 6892, particularly in cases where the tensile test piece is tapered, resulting in a point of fracture away from the middle of the gauge length.

A.2. Impact test, steel cylinders and steel liners

The impact test shall be carried out on the material taken from the cylindrical part of the finished cylinder on three test pieces in accordance with ISO 148. The impact test pieces shall be taken in the direction as required in table 6.2 of Annex 3 from the wall of the cylinder. For cylinders with welded stainless steel liners, impact tests shall be also carried out on material taken from the weld in accordance with the method described in paragraph 8.6. of EN 13322-2. The notch shall be perpendicular to the face of the cylinder wall. For longitudinal tests the test piece shall be machined all over (on six faces), if the wall thickness does not permit a final test piece width of 10 mm, the width shall be as near as practicable to the nominal thickness of the cylinder wall. The test pieces taken in transverse direction shall be machined on four faces only, the inner and outer face of the cylinder wall unmachined."

Insert a new paragraph A.29., to read:

"A.29. Bend test, welded stainless steel liners

Bend tests shall be carried out on material taken from the cylindrical part of a welded stainless steel liner and tested in accordance with the method described in paragraph 8.5. of EN 13322-2. The test piece shall not crack when bent inwards around a former until the inside edges are not further apart than the diameter of the former."

Annex 4D

Insert a new paragraph 2.4., to read:

"2.4. Durability test (continued operation) of pressure regulator:

The regulator shall be able to withstand 50,000 cycles without any failure when tested according to the following procedure. Where the stages of pressure regulation are separate, the service pressure in sub-paragraphs (a) to (f) is considered to be the working pressure of the upstream stage.

- (a) Recycle the regulator for 95 per cent of the total number of cycles at room temperature and at the service pressure. Each cycle shall consist of flow until stable outlet pressure has been obtained, after which the gas flow shall be shut off by a downstream valve within 1 s, until the downstream lock-up pressure has stabilized. Stabilized outlet pressures are defined as set pressure ± 15 per cent for at least 5 s.

- (b) Cycle the inlet pressure of the regulator for 1 per cent of the total number of cycles at room temperature from 100 per cent to 50 per cent of the service pressure. The duration of each cycle shall be no less than 10 s.
- (c) Repeat the cycling procedure of (a) at 120 °C at the service pressure for 1 per cent of the total number of cycles.
- (d) Repeat the cycling procedure of (b) at 120 °C at the service pressure for 1 per cent of the total number of cycles.
- (e) Repeat the cycling procedure of (a) at -40 °C or -20 °C as applicable and 50 per cent of service pressure for 1 per cent of the total number of cycles.
- (f) Repeat the cycling procedure of (b) at -40 °C or -20 °C as applicable and 50 per cent of service pressure for 1 per cent of the total number of cycles.
- (g) At the completion of all tests indicated in sub-paragraphs (a), (b), (c), (d), (e) and (f), the regulator shall be leak proof (see Annex 5B) at the temperatures of -40 °C or -20 °C, as applicable, and at the room temperature and at the temperature of +120 °C."

Annex 4F, amend to read:

"Annex 4F

PROVISIONS REGARDING THE APPROVAL OF THE FILLING UNIT (Receptacle)

1. Scope

The purpose of this annex is to determine the provisions regarding the approval of the filling unit.

2. The filling unit

2.1. The filling unit shall comply with the requirements laid down in paragraph 3. and shall have the dimensions of paragraph 4., if applicable.

2.2. Filling units designed in accordance with ISO 14469-1 first edition 2004-11-01 1/ and meeting all the requirements therein are deemed to fulfil the requirements of paragraphs 3. and 4. of this annex.

3. The filling unit test procedures

3.1. The filling unit shall be conform to the requirements of Class 0 and follow the test procedures in Annex 5 with the following specific requirements.

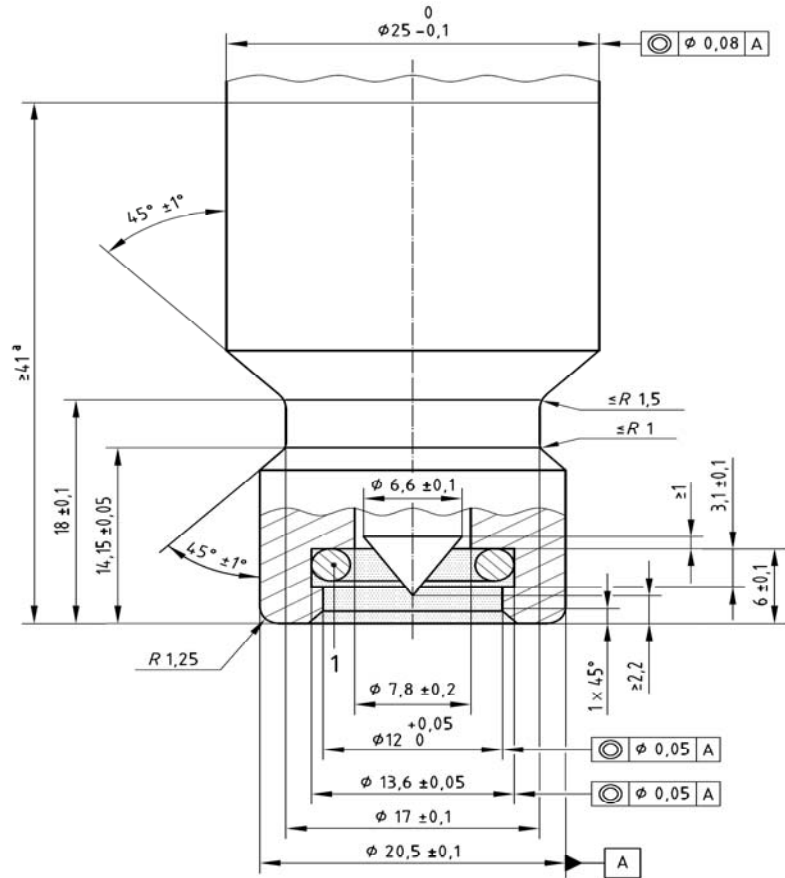
1/ Road Vehicles compressed Natural Gas (CNG) refuelling connector - part 1: 20 MPa (200 bar) connector.

- 3.2. The material constituting the filling unit which is in contact with the CNG when the device is in service shall be compatible with the CNG. In order to verify this compatibility, the procedure of Annex 5D shall be used.
- 3.3. The filling unit shall be free from leakage at a pressure of 1.5 times the working pressure (MPa) (see Annex 5B).
- 3.4. The filling unit shall withstand a pressure of 33 MPa.
- 3.5. The filling unit shall be so designed as to operate at temperatures as specified in Annex 5O.
- 3.6. The filling unit shall withstand a number of 10,000 cycles in the durability test specified in Annex 5L.


4. Filling unit dimensions

4.1. Figure 1 shows the dimensions of the filling unit for vehicles of categories M₁ and N₁. 2/

Fig. 1: 20 MPa Filling unit (receptacle) for M₁ and N₁ vehicles



Key

 This area shall be kept free of all components.

1 Sealing surface equivalent to No. 110 O-ring of dimensions:

9.19 mm ± 0.127 mm ID


2.62 mm ± 0.076 mm width

Sealing surface finish: 0.8 μm to 0.05 μm

Material hardness: 75 Rockwell (HRB 75) minimum

a Minimum length of the receptacle which is clear of provisions for attachment of receptacle or protective caps.

Dimensions in millimetres

Surface roughness $Ra 3.2$ 

2/ As defined in Annex 7 to the Consolidated Resolution on the Construction of Vehicles (R.E.3) (TRANS/WP.29/78/Rev.1/Amend.2)."