

Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

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Transport of gases: miscellaneous

Provisions for closures of pressure receptacles

Transmitted by the European Industrial Gases Association (EIGA)

Introduction

1. In 2014 the Joint Meeting of RID/ADR/ADN established a working group lead by EIGA with the following terms of reference concerning pressure receptacles:

(a) Clarification of the meaning of the term of the term “pressure receptacle” to include or exclude their closures;

(b) Investigation of the completeness of requirements on the design, conformity assessment and marking of closures of pressure receptacles.

2. The background to this work is that Chapter 6.2 refers to “pressure receptacles and their closures” in some places and “pressure receptacles” elsewhere, thereby creating ambiguity in the term. Also, since it is practice for closures to be conformity assessed separately from cylinders, pressure drums and tubes, there is a need to specify the requirements to be met at the initial inspection and test of closures.

3. The working group has completed its work on the above terms of reference apart from one small item and since most of its output concerns the text of the UN Model Regulations, the Joint Meeting has asked EIGA to present the relevant proposals to the UN Sub Committee of Experts on the Transport of Dangerous Goods.

4. The purpose of this paper is to give advance notice that a formal paper will be presented at the forty-ninth session setting out all the proposed amendments. In order for Experts to judge the volume of work involved, the Annex of this paper gives the proposed amendments to the Model Regulations. It is suggested that a working group composed of experts in gases will be needed to review these proposals and made recommendations to the plenary meeting.

Summary of the proposals

5. In brief the revisions include the following:

(a) Definitions for all pressure receptacles to include their closures. Pressure receptacles without closures are called “pressure receptacle shells”, e.g. “cylinder

shell”. The inconsistent use of the word ‘transportable’ in the pressure receptacle definitions is rationalised.

(b) Definitions were also created for the service equipment of a pressure receptacle and for the working pressure of an acetylene cylinder. The current definition of “cryogenic receptacle” describes a closed cryogenic receptacle so the defined phrase was corrected accordingly and consequential amendments made in Parts 4 and 5 where the phrase ‘cryogenic receptacle’ is used.

(c) Provisions are given specifying the pressure receptacles for which separate conformity assessment of shell and closure is permitted and the pressure receptacles for which a final conformity assessment is required even when the closures or in the case of bundles of cylinders, cylinder shells, have been previously conformity assessed.

(d) The procedures for conformity assessment of completed acetylene cylinders when the cylinder shell has been previously conformity assessed either by the same inspection body or by a different inspection body. New marking requirements to cover such separate conformity assessment and some additional operational marks are also given.

(e) The initial inspections and tests for closures and the requirements for their marking.

(f) Miscellaneous changes to make the requirements more accurate and to modify requirements that are inappropriate.

Annex

NOTE: This Annex is not intended for detailed study at this time; it is reproduced to give an idea of the nature and extent of the task of developing agreed text for inclusion in the UN Model Regulations.

Proposal 1 – Definitions in 1.2.1

In this proposal new text is shown underlined and deleted text is shown with a strikethrough.

Bundle of cylinders means a pressure receptacle comprising an assembly of cylinders or cylinder shells that are fastened together and which are interconnected by a manifold and carried as a unit. The total water capacity shall not exceed 3 000 litres except that bundles intended for the transport of gases of Division 2.3 shall be limited to 1 000 litres water capacity;

Closure means a device which closes an opening in a receptacle;

NOTE: For pressure receptacles, closures are e.g. valves, pressure relief devices, pressure gauges, level indicators.

Closed cryogenic receptacle means a ~~transportable~~ thermally insulated pressure receptacle for refrigerated liquefied gases of a water capacity of not more than 1 000 litres;

Cylinder means a ~~transportable~~ pressure receptacle of a water capacity not exceeding 150 litres;

Metal hydride storage system means a single complete hydrogen storage system, including a pressure receptacle shell, metal hydride, pressure relief device, shut-off valve, service equipment and internal components used for the carriage of hydrogen only;

Pressure drum means a welded ~~transportable~~ pressure receptacle of a water capacity exceeding 150 litres and of not more than 1 000 litres, (e.g. cylindrical receptacles equipped with rolling hoops, spheres on skids);"

Pressure receptacle means a transportable receptacle intended for holding substances under pressure including its closure(s) and other service equipment and is a collective term that includes cylinders, tubes, pressure drums, closed cryogenic receptacles, metal hydride storage systems, bundles of cylinders and salvage pressure receptacles;

Pressure receptacle shell means a cylinder, a tube a pressure drum or a salvage pressure receptacle without its closures or other service equipment, but including any permanently attached device(s) (e.g. neck ring, foot ring, etc.);

NOTE: The terms "cylinder shell", "pressure drum shell" and "tube shell" are also used.

Service equipment of a pressure receptacle means closure(s), manifold(s), piping, porous, absorbent or adsorbent material and any structural devices, e.g. for handling;

Tube means a ~~transportable~~ pressure receptacle of seamless or composite construction having a water capacity exceeding 150 litres and of not more than 3 000 litres;

Working pressure

(a) For a compressed gas means the settled pressure ~~of a compressed gas~~ at a reference temperature of 15 °C in a full pressure receptacle;

- (b) For acetylene means the calculated settled pressure at a uniform reference temperature of 15 °C in an acetylene cylinder containing the specified solvent content and the maximum acetylene content;

Proposal 2 – Amendments to the UN Model Regulations in 4.1.6, 5.2.1.9 and 5.4.1.2.2 (b)

In this Proposal and Proposal 3, only the amendments are shown, not the consolidated text. Sentences shown in a box give an explanation for the amendment which precedes it.

4.1.6.1 6 Add to the end of the first sentence “and taking into account the lowest pressure rating of any component”.

Insert a new second sentence. “Service equipment having a pressure rating lower than other components shall nevertheless comply with 6.2.1.3.1.”

Delete the final sentence “Bundles of cylinders shall not be filled in excess of the lowest working pressure of any given cylinder in the bundle.”

The addition to the first sentence makes the principle of taking into account the lowest pressure rating of a cylinder in a bundle when filling, a general requirement applicable to all components in all pressure receptacles, such as a 200 bar valve fitted to a 300 bar cylinder. The final sentence on bundles then becomes redundant and is deleted.

4.1.6.1.10 In the first sentence, insert “closed” before “cryogenic receptacle”.

5.2.1.7.1 At the third indent, replace “Cryogenic receptacles” by “Closed and open cryogenic receptacles”.

5.2.1.7.2 (a) Replace “cryogenic receptacles” by “closed and open cryogenic receptacles”.

These three amendments result from the change of the definition for cryogenic receptacles.

Proposal 3 – Amendments to the UN Model Regulations text in 6.2.1 and 6.2.2

6.2.1.1.1 After “Pressure receptacles” delete “and their closures”.

6.2.1.1.4 At the end of the sentence replace “used” by “welded”.

Service equipment may not need welding so non-weldable metals should not be forbidden.

6.2.1.1.5 In the first sentence replace “cylinders, tubes, pressure drums” by “pressure receptacle shells”.

In the final sentence after “The test pressure of a cylinder” insert “shell”.

6.2.1.1.6 At the beginning of the first and the second sentences replace “Pressure receptacle” by “Cylinders”.

In the final sentence replace “pressure receptacle” by “cylinder” three times and replace “an isolation valve” by “a valve”.

6.2.1.1.8.2 In the third and fourth sentences replace “pressure receptacle” by “inner vessel”.

At the end of the fourth sentence replace “fittings” by service equipment.

6.2.1.1.9 At the end of the heading replace “*pressure receptacles for acetylene*” by “*acetylene cylinders*”.

In the first sentence replace “Pressure receptacles” by “Cylinder shells”.

In (a) replace “pressure receptacle” by “cylinder shell”.

In the final sentence replace “compatible with the pressure receptacle” by “compatible with those parts of the cylinder that are in contact with it.

6.2.1.2.1 After “Construction materials of pressure receptacles” delete “and their closures”.

6.2.1.2.2 At the beginning of the first sentence, after “Pressure receptacles”, delete “and their closures”.

6.2.1.3.1 Replace “Valves, piping and other fittings” by “Service equipment” and replace “excluding pressure relief devices” by “excluding porous, absorbent or adsorbent material, pressure relief devices, pressure gauges or indicators”.

6.2.1.3.2 Replace the entire paragraph by the following:

“6.2.1.3.2 Service equipment shall be configured or designed to prevent damage and unintended opening that could result in the release of the pressure receptacle contents during normal conditions of handling and transport. Closures shall be protected in the same manner as is required for valves in 4.1.6.8. Manifold piping leading to shut-off valves shall be sufficiently flexible to protect the shut-off valves and the piping from shearing or releasing the pressure receptacle contents.”

The final sentence requiring valves to be capable of being secured against unintended opening was unrealistic and is replaced by the more general requirement “configured or designed to prevent ... unintended opening”.

6.2.1.3.3 Replace “shall be fitted with devices” by “shall be fitted with handling devices”.

6.2.1.4.2 At the end, insert a new provision 6.2.1.4.3 as follows:

6.2.1.4.3 For refillable cylinders, pressure drums and tubes the conformity assessment of the shell and the closure(s) may be carried out separately. In these cases an additional assessment of the final assembly is not required.

For bundles of cylinders, the cylinder shells and the valve(s) may be assessed separately, but an additional assessment of the complete assembly is required.

For cryogenic receptacles, the closures may be assessed separately, but an additional assessment of the complete assembly is required.

For acetylene cylinders, conformity assessment shall comprise either:

- (a) one assessment of conformity covering both the cylinder shell and the contained porous material; or
- (b) a separate assessment of conformity for the empty cylinder shell and an additional assessment of conformity for the cylinder shell with the contained porous material.

The above provisions clarify separate assessment.

6.2.1.5.1 In the first sentence replace “closed cryogenic receptacles and metal hydride storage systems,” by “closed cryogenic receptacles, metal hydride storage systems and bundles of cylinders,” and after “the applicable standards” insert “or recognised technical codes”.

In the line before (a), replace “pressure receptacles” by “pressure receptacle shells”.

(d) At the end delete “of the pressure receptacles”.

(e) Replace “neck threads” by “threads used to fit closures”.

In the line after (f), replace “pressure receptacles” by “pressure receptacle shells”.

(g) Replace “pressure receptacles” by “pressure receptacle shells”.

(h) In both sentences replace “pressure receptacles” by “pressure receptacle shells”.

(i) Replace “pressure receptacles” by “pressure receptacle shells”.

(j) Replace “pressure receptacles” by “cylinder shells”.

After (j) insert the following new provisions.

“On an adequate sample of closures:

(k) Verification of metallic and non-metallic materials;

(l) Verification of dimensions;

(m) Verification of cleanliness;

(n) Inspection of completed assembly;

(o) Verification of conformity of marks

For all closures:

(p) Testing for leakproofness;

(q) Verification of the presence of marks.”

6.2.1.5.2 Replace the first sentence by “For closed cryogenic receptacles, the inspections and tests specified in 6.2.1.5.1 (a), (b), (d), (f), (k), (l), (m), (n) and (o) shall be performed on an adequate number of samples.”

At the end of the second paragraph insert the sentence “All closures shall undergo testing for leakproofness.”.

6.2.1.5.3 In the first sentence replace “receptacles” by “pressure receptacle shells”.

6.2.1.5.3 At the end, insert the following new paragraph 6.2.1.5.4 including a new Note.

“6.2.1.5.4 For bundles of cylinders all cylinder shells and closures shall be subjected to the initial inspection and tests specified in 6.2.1.5.1. An adequate sample of frames shall be proof load tested to two times the maximum gross weight of the bundles of cylinders.

Additionally, all manifolds of bundle of cylinders shall undergo a hydraulic pressure test and all the completed bundles of cylinders shall undergo a leakproofness test. The closures shall be tested in accordance with 6.2.1.5.1.

NOTE: *With the agreement of the competent authority, the hydraulic pressure test may be replaced by a test using a gas, where such an operation does not entail any danger.*”

6.2.1.6.1 Replace (c) and (d) by the following.

“(c) Checking of the threads either:

(i) if there is evidence of corrosion; or

(ii) if the closures or other service equipment are removed;

- (d) A hydraulic pressure test of the pressure receptacle shell and, if necessary, verification of the characteristics of the material by suitable tests;”

In NOTE 2: Replace “pressure test of cylinders or tubes” by “pressure test of cylinder shells or tube shells

In NOTE 3: Replace “aluminium alloy gas cylinders” by aluminium alloy cylinder shells” and replace “steel gas cylinders” by “steel cylinder shells.

After **NOTE 3:** Insert a new **NOTE 4.**

NOTE 4: For bundles of cylinders the hydraulic test specified in (d) above shall be carried out on the cylinder shells and on the manifold.”

Replace (e) by the following:

- “(e) Check of service equipment, if to be reintroduced into service;
(f) A leakproofness test of bundles of cylinders after reassembly.”

6.2.1.6.2 Replace “Pressure receptacles” by “Cylinders”.

6.2.2.1.1 In the first sentence replace “UN cylinders” by UN cylinder shells”.

In the table delete the entire row beginning ISO 11118:1999

The standard is proposed to be listed in a new paragraph 6.2.2.1.8 along with the relevant valve standard ISO 13340:2001

In NOTE 1 Replace “composite cylinders” by “composite cylinder shells”.

In NOTE 2 Replace “composite cylinders” by “composite cylinder shells” twice.

6.2.2.1.2 In the first sentence replace “UN tubes” by “UN tube shells”.

In NOTE 1 Replace “composite tubes” by “composite tube shells”.

In NOTE 2 Replace “composite tubes” by “composite tube shells” twice.

6.2.2.1.3 In the line before the second table replace “For the porous material in the cylinder:” by “For acetylene cylinders”.

6.2.2.1.4 Replace “UN cryogenic receptacles” by “UN closed cryogenic receptacles”.

6.2.2.1.6 In the first sentence, replace “The standard shown below” by “The following standard”.

In the second sentence replace “UN cylinder by “UN cylinder or UN cylinder shell”.

NOTE Replace the Note by

NOTE: Changing one or more cylinders or cylinder shells of the same design type, including the same test pressure, in an existing UN bundle of cylinders does not require a new conformity assessment of the existing bundle. Service equipment of the bundle of cylinders can also be replaced without requiring a new conformity assessment if it complies with the design type approval.”

6.2.2.1.7 At the end, insert a new paragraph and table 6.2.2.1.8 as follows.

“6.2.2.1.8 The following standards apply to the design, construction and initial inspection and test of non-refillable UN cylinders except that the inspection requirements related to the conformity assessment system and approval shall be in accordance with 6.2.2.5.

“Reference	Title	Applicable for manufacture
ISO 11118:1999	Gas cylinders – Non-refillable metallic gas cylinders – Specification and test methods	Until further notice
ISO 13340:2001	Transportable gas cylinders – Cylinder valves for non-refillable cylinders – Specification and prototype testing	Until further notice”

6.2.2.2 In the first line delete “pressure receptacle”.

6.2.2.3 Replace the first sentence by “The following standards apply to the design, construction, and initial inspection and test of closures and their protection.”

Delete the entire last row of the first table starting “ISO 13340:2001”.

Delete the complete sentence starting “For UN metal hydride storage ...” and the entire table containing the reference to “ISO 16111:2008”

The requirements for the closures of metal hydride storage systems are already included in 6.2.2.1.5 and do not need to be included here.

6.2.2.4 Amend the first sentence to read “The following standards apply to periodic inspection and testing:”

6.2.2.5.1 At the end, after the definition of “Verify”, insert a new Note.

“NOTE: When separate conformity assessment is used (see 6.2.1.4.3) references to pressure receptacle in 6.2.2.5 shall mean either pressure receptacle shell or closure as appropriate.”

6.2.2.7 Amend the Note by replacing “6.2.2.9 and marking” by “6.2.2.9, marking” and inserting at the end “and marking requirements for closures are given in 6.2.2.11”.

6.2.2.7.1 In the first sentence replace “pressure receptacles” by “pressure receptacle shells and closed cryogenic receptacles”.

At the end of the second sentence, delete “on the pressure receptacle”.

In the third sentence, after “neck of the pressure receptacle” insert “shell”.

6.2.2.7.2 At the end of (b) insert the following new Note.

“NOTE: For acetylene cylinders the standards for the manufacture of the cylinder shell (e.g. ISO 9809-1) and acetylene cylinder (e.g. ISO 3807) shall be marked.”

At the end of 6.2.2.7.2 insert the following new Note.

NOTE: When an acetylene cylinder is conformity assessed in accordance with 6.2.1.4.3 (b) and the inspection bodies for the cylinder shell and the acetylene cylinder are different, their respective marks (d) and initial inspection dates (e) shall be applied, and a second mark (c) if the countries of approval of the inspection bodies are different.

6.2.2.7.3 In (g), in the second sentence, replace “mass of valve, valve cap” by “mass of closure(s), valve cap”.

6.2.2.7.3 (i) At the end insert the following NOTE.

NOTE: When a cylinder shell is intended for use as an acetylene cylinder (including the porous material), the working pressure mark is not required until the acetylene cylinder is completed.

6.2.2.7.3 (j) In the first sentence replace “liquefied gases and refrigerated liquefied gases” by “liquefied gases, refrigerated liquefied gases and dissolved gases”.

6.2.2.7.3 (k) and (l) Replace paragraphs (k) and (l) with the following.

- (k) In the case of cylinders for UN 1001 acetylene, dissolved:
- (i) the tare in kilograms consisting of the total of the mass of the empty cylinder shell, service equipment (including porous material) not removed during filling, any coating, the solvent and the saturation gas expressed to three significant figures rounded down to the last digit followed by the letters "KG". At least one decimal shall be shown after the decimal point. For pressure receptacles of less than 1 kg, the mass shall be expressed to two significant figures rounded down to the last digit;
 - (ii) the identity of the porous material; and
 - (iii) the total mass of the filled acetylene cylinder in kilograms followed by the letters "KG";
- (l) In the case of cylinders for UN 3374 acetylene, solvent free:
- (i) the tare in kg consisting of the total of the mass of the empty cylinder shell, service equipment (including porous material) not removed during filling, any coating expressed to three significant figures rounded down to the last digit followed by the letters "KG". At least one decimal shall be shown after the decimal point. For pressure receptacles of less than 1 kg, the mass shall be expressed to two significant figures rounded down to the last digit;
 - (ii) the identity of the porous material; and
 - (iii) the total mass of the filled acetylene cylinder in kilograms followed by the letters "KG";

The amendments to (j), (k) and (l) introduce marks necessary for the filling and periodic inspection of acetylene cylinders.

6.2.2.7.4 (n) After the existing text insert a new **NOTE**

NOTE: *If the manufacturer of the acetylene cylinder and the manufacturer of the cylinder shell are different, the mark of both manufacturers shall be applied.*

6.2.2.8 In the title replace "**pressure receptacles**" by "**cylinders**".

6.2.2.8.1 In the first sentence replace "pressure receptacles" by "cylinders".

In the second sentence replace "pressure receptacle" by "cylinder".

In the third sentence replace "pressure receptacle" at the first occurrence by "cylinder shell" and at the second occurrence by "cylinder".

In the fifth (penultimate) sentence replace "pressure receptacles" by "cylinders" twice.

6.2.2.8.3 In the **NOTE** replace "pressure receptacles" by "cylinders".

Cylinders are the only non-refillable UN pressure receptacle allowed by the Regulations and other types of non-refillable pressure receptacle are very unlikely to be required.

6.2.2.10.1 Replace "cylinders" by "cylinder shells". Insert a new second sentence as follows. "Individual closures in a bundle of cylinders shall be marked in accordance with 6.2.2.11."

6.2.2.10.3 (b) In the first sentence replace the phrase in brackets by "cylinder shells and service equipment".

In the second sentence after "tare" delete "mass".

At the end (after 6.2.2.10.4 (c)) insert a new subsection 6.2.2.11 as follows.

“6.2.2.11 Marking of closures for refillable UN pressure receptacles

For closures the following permanent marks shall be applied clearly and legibly, (e.g. stamped, engraved or etched):

- (a) Manufacturer’s identification mark
- (b) Design standard or design standard designation
- (c) Date of manufacture, (year and month or year and week)

The valve test pressure shall be marked when it is less than the test pressure which is indicated by the shape of the valve filling connection.

Closures which are conformity assessed separately shall be marked in addition with the UN packaging symbol as specified in 6.2.2.7.2 (a) with a minimum size of 5 mm.”
