

## 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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### Sub-Committee of Experts on the Transport of Dangerous Goods

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Transport of gases: miscellaneous

## Provisions for pressure receptacles and their closures

**Transmitted by the European Industrial Gases Association (EIGA), the Compressed Gases Association (CGA) and the European Cylinder Makers Association (ECMA)**

### Introduction

1. This informal paper repeats in English the text proposals set out in document ST/SG/AC.10/C.3/2019/21. However, in this paper the text is shown together with adjacent relevant text which is unchanged. It is intended that this will allow an easier understanding of the impact of the text proposals for those who are familiar with the text in English.
2. The key features are:
  - (a) Pressure receptacles are defined to include closures and other service equipment;
  - (b) The requirements for the initial inspection and test and marking of closures is defined;
  - (c) The scope of separate assessment is specified;
  - (d) For UN pressure receptacles, the competent authority may allow conformity assessment to be carried out in accordance with national requirements not specified in 6.2.2.5 for closures and certain other parts of some pressure receptacles.
3. Explanations of some of the proposals are given in boxes. Each box relates to the text immediately preceding it. Boxes are also used to indicate the text which has not been reproduced. New text is shown underlined and deleted text is shown by ~~striketrough~~.

### Proposal 1 – Definitions in 1.2.1

*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;

The present definition of *cryogenic receptacle* includes both closed and open cryogenic receptacles while there is also a separate definition for *open cryogenic receptacle*. Also the current UN definition applies to 1 000 litres but P203 limits open cryogenic receptacles to 450 litres. Furthermore, the closed cryogenic receptacle is a pressure receptacle and the open cryogenic receptacle is not. Therefore separation is necessary.

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

Inner vessel, for a closed cryogenic receptacle, means the pressure vessel intended to contain the refrigerated liquefied gas;

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 transport 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 UN 1001 acetylene, dissolved 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;
- (c) For UN 3374 acetylene, solvent free the working pressure corresponds to the working pressure which was calculated for the equivalent cylinder for UN 1001 acetylene, dissolved.

## Proposal 2 – Amendments of 4.1.6.1 and 5.2.1.7

4.1.6.1.6 Pressure receptacles and open cryogenic receptacles shall be filled according to the working pressures, filling ratios and provisions specified in the appropriate packing instruction for the specific substance being filled and taking into account the lowest pressure rating of any component. Service equipment having a pressure rating lower than other components shall nevertheless comply with 6.2.1.3.1. Reactive gases and gas mixtures shall be filled to a pressure such that if complete decomposition of the gas occurs, the working pressure of the pressure receptacle shall not be exceeded. ~~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 establishes the principle of taking into account the lowest pressure rating of a cylinder in a bundle when filling. The final sentence on bundles then becomes redundant and is deleted. The proposed new second sentence gives a general requirement applicable to all components in all pressure receptacles, such as a 200-bar valve fitted to a 300-bar cylinder.

4.1.6.1.10 Refillable pressure receptacles, other than closed cryogenic receptacles, shall be periodically inspected according to the provisions of 6.2.1.6, and packing instruction P200, P205, ~~or P206 or P208~~, as applicable. Pressure relief valves for closed cryogenic receptacles shall be subject to periodic inspections and tests according to the provisions of 6.2.1.6.3 and packing instruction P203. Pressure receptacles shall not be filled after they become due for periodic inspection but may be transported after the expiry of the time-limit.

The frequency of periodic inspection for absorbed gas is given in P208.

### 5.2.1.7 *Orientation arrows*

5.2.1.7.1 Except as provided in 5.2.1.7.2:

- combination packagings having inner packagings containing liquids;
- single packagings fitted with vents;
- closed and open cryogenic receptacles intended for the transport of refrigerated liquefied gases; and
- machinery or apparatus containing liquid dangerous goods when it is required to ensure the liquid dangerous goods remain in their intended orientation (see special provision 301 of Chapter 3.3);

shall be legibly marked with package orientation arrows which are similar to the illustration shown below or with those meeting the specifications of ISO 780:1997. The orientation arrows shall appear on two opposite vertical sides of the package with the arrows pointing in the correct upright direction. They shall be rectangular and of a size that is clearly visible commensurate with the size of the package. Depicting a rectangular border around the arrows is optional.

Figure 5.2.1.10.1.1

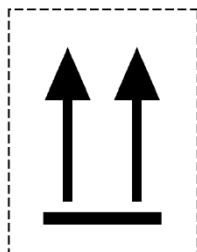
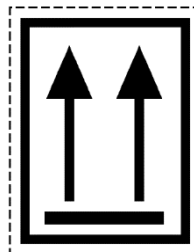


Figure 5.2.1.0.1.2



or

Two black or red arrows on white or suitable contrasting background.

The rectangular border is optional.

All features shall be in approximate proportion to those shown.

5.2.1.7.2 Orientation arrows are not required on:

- (a) Outer packagings containing pressure receptacles except closed and open cryogenic receptacles;

The remainder of 5.2.1.7 is unchanged. These amendments result from the changed definition of cryogenic receptacles.

## Proposal 3 – Amendments to 6.2.1

### CHAPTER 6.2

#### REQUIREMENTS FOR THE CONSTRUCTION AND TESTING OF PRESSURE RECEPTACLES, AEROSOL DISPENSERS, SMALL RECEPTACLES CONTAINING GAS (GAS CARTRIDGES) AND FUEL CELL CARTRIDGES CONTAINING LIQUEFIED FLAMMABLE GAS

**NOTE:** *Aerosol dispensers, small receptacles containing gas (gas cartridges) and fuel cell cartridges containing liquefied flammable gas are not subject to the requirements of 6.2.1 to 6.2.3.*

#### 6.2.1 General requirements

##### 6.2.1.1 Design and construction

6.2.1.1.1 Pressure receptacles ~~and their closures~~ shall be designed, manufactured, tested and equipped in such a way as to withstand all conditions, including fatigue, to which they will be subjected during normal conditions of transport and use.

It is important for safety that pressure receptacles shall withstand the normal conditions of use e.g. filling frequency as well as conditions of transport.

6.2.1.1.2 In recognition of scientific and technological advances, and recognizing that pressure receptacles other than those that bear “UN” certification marks may be used on a national or regional basis, pressure receptacles conforming to requirements other than those specified in these Regulations may be used if approved by the competent authorities in the countries of transport and use.

6.2.1.1.3 In no case shall the minimum wall thickness be less than that specified in the design and construction technical standards.

6.2.1.1.4 For welded pressure receptacles, only metals of weldable quality shall be ~~used~~ welded.

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

6.2.1.1.5 The test pressure of ~~cylinders, tubes, pressure drums~~ pressure receptacle shells and bundles of cylinders shall be in accordance with packing instruction P200, or, for a chemical under pressure, with packing instruction P206. The test pressure for closed cryogenic receptacles shall be in accordance with packing instruction P203. The test pressure of a metal hydride storage system shall be in accordance with packing instruction P205. The test pressure of a cylinder shell for an adsorbed gas shall be in accordance with packing instruction P208.

6.2.1.1.6 ~~Pressure receptacles~~ Cylinders or cylinder shells assembled in bundles shall be structurally supported and held together as a unit. ~~Pressure receptacles~~ Cylinders or cylinder shells shall be secured in a manner that prevents movement in relation to the structural assembly and movement that would result in the concentration of harmful local stresses. Manifold assemblies (e.g. manifold, valves, and pressure gauges) shall be designed and constructed such that they are protected from impact damage and forces normally encountered in transport. Manifolds shall have at least the same test pressure as the cylinders. For toxic liquefied gases, each ~~pressure receptacle~~ cylinder shell shall have an isolation valve to ensure that each ~~pressure receptacle~~ cylinder can be filled separately and that no interchange of ~~pressure receptacle~~ cylinder contents can occur during transport.

Only cylinders and cylinder shells are allowed in bundles.

6.2.1.1.7 Contact between dissimilar metals which could result in damage by galvanic action shall be avoided.

6.2.1.1.8 *Additional requirements for the construction of closed cryogenic receptacles for refrigerated liquefied gases*

6.2.1.1.8.1 The mechanical properties of the metal used shall be established for each pressure receptacle, including the impact strength and the bending coefficient.

6.2.1.1.8.2 The pressure receptacles shall be thermally insulated. The thermal insulation shall be protected against impact by means of a jacket. If the space between the ~~pressure receptacle~~ inner vessel and the jacket is evacuated of air (vacuum-insulation), the jacket shall be designed to withstand without permanent deformation an external pressure of at least 100 kPa (1 bar) calculated in accordance with a recognised technical code or a calculated critical collapsing pressure of not less than 200 kPa (2 bar) gauge pressure. If the jacket is so closed as to be gas-tight (e.g. in the case of vacuum-insulation), a device shall be provided to prevent any dangerous pressure from developing in the insulating layer in the event of inadequate gas-tightness of the ~~pressure receptacle~~ inner vessel or its  ~~fittings~~ service equipment. The device shall prevent moisture from penetrating into the insulation.

6.2.1.1.8.3 Closed cryogenic receptacles intended for the transport of refrigerated liquefied gases having a boiling point below  $-182\text{ }^{\circ}\text{C}$  at atmospheric pressure shall not include materials which may react with oxygen or oxygen enriched atmospheres in a

dangerous manner, when located in parts of the thermal insulation where there is a risk of contact with oxygen or with oxygen enriched liquid.

6.2.1.1.8.4 Closed cryogenic receptacles shall be designed and constructed with suitable lifting and securing arrangements.

6.2.1.1.9 *Additional requirements for the construction of ~~pressure receptacles for acetylene cylinders~~*

~~Pressure receptacles~~ Cylinder shells for UN 1001 acetylene, dissolved, and UN 3374 acetylene, solvent free, shall be filled with a porous material, uniformly distributed, of a type that conforms to the requirements and testing specified by a standard or technical code recognised by the competent authority and which:

- (a) Is compatible with the ~~pressure receptacle~~ cylinder shell and does not form harmful or dangerous compounds either with the acetylene or with the solvent in the case of UN 1001; and
- (b) Is capable of preventing the spread of decomposition of the acetylene in the porous material.

In the case of UN 1001, the solvent shall be compatible with the ~~pressure receptacle~~ those parts of the cylinder that are in contact with it.

Acetylene is always carried in cylinders or bundles of cylinders, not other pressure receptacles.

#### **6.2.1.2 Materials**

6.2.1.2.1 Construction materials of pressure receptacles ~~and their closures~~ which are in direct contact with dangerous goods shall not be affected or weakened by the dangerous goods intended to be carried and shall not cause a dangerous effect e.g. catalysing a reaction or reacting with the dangerous goods.

6.2.1.2.2 Pressure receptacles ~~and their closures~~ shall be made of the materials specified in the design and construction technical standards and the applicable packing instruction for the substances intended for transport in the pressure receptacle. The materials shall be resistant to brittle fracture and to stress corrosion cracking as indicated in the design and construction technical standards.

#### **6.2.1.3 Service equipment**

6.2.1.3.1 ~~Valves, piping and other fittings~~ Service equipment subjected to pressure, excluding ~~pressure relief devices~~ porous, absorbent or adsorbent material, pressure relief devices pressure gauges or indicators, shall be designed and constructed so that the burst pressure is at least 1.5 times the test pressure of the pressure receptacle.

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. All closures shall be protected in the same manner as is required for valves 4.1.6.1.8. 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 filling and discharge valves and any protective caps shall be capable of being secured against unintended opening. Valves shall be protected as specified in 4.1.6.8.~~

The penultimate 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 Pressure receptacles which are not capable of being handled manually or rolled, shall be fitted with handling devices (skids, rings, straps) ensuring that they can be safely handled by mechanical means and so arranged as not to impair the strength of, nor cause undue stresses in, the pressure receptacle.

There are no changes proposed for 6.2.1.3.4 through 6.2.1.3.6.5.4

#### **6.2.1.4 Approval of pressure receptacles**

6.2.1.4.1 The conformity of pressure receptacles shall be assessed at time of manufacture as required by the competent authority. Pressure receptacles shells and the inner vessels of closed cryogenic receptacles shall be inspected, tested and approved by an inspection body. The technical documentation shall include full specifications on design and construction, and full documentation on the manufacturing and testing.

6.2.1.4.2 Quality assurance systems shall conform to the requirements of the competent authority.

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 closed cryogenic receptacles, the inner vessels and 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. This paragraph does not define who is responsible for conformity assessment. This is covered in 6.2.2.5.1.

#### **6.2.1.5 Initial inspection and test**

6.2.1.5.1 New pressure receptacles, other than closed cryogenic receptacles, ~~and~~ metal hydride storage systems and bundles of cylinders, shall be subjected to testing and inspection during and after manufacture in accordance with the applicable design standards or recognized technical codes including the following:

On an adequate sample of pressure receptacles shells:

- (a) Testing of the mechanical characteristics of the material of construction;
- (b) Verification of the minimum wall thickness;
- (c) Verification of the homogeneity of the material for each manufacturing batch;

- (d) Inspection of the external and internal conditions ~~of the pressure receptacles~~;
- (e) Inspection of the ~~neck~~ threads used to fit closures;
- (f) Verification of the conformance with the design standard;

For all pressure receptacles shells:

- (g) A hydraulic pressure test. Pressure receptacles shells shall meet the acceptance criteria specified in the design and construction technical standard or technical code;

*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.*

- (h) Inspection and assessment of manufacturing defects and either repairing them or rendering the pressure receptacles shells unserviceable. In the case of welded pressure receptacles shells, particular attention shall be paid to the quality of the welds;
- (i) An inspection of the marks on the pressure receptacles shells;
- (j) In addition, ~~pressure receptacles~~ cylinder shells intended for the transport of UN 1001 acetylene, dissolved, and UN 3374 acetylene, solvent free, shall be inspected to ensure proper installation and condition of the porous material and, if applicable, the quantity of solvent.

On an adequate sample of closures:

- (k) Verification of materials;
- (l) Verification of dimensions;
- (m) Verification of cleanliness;
- (n) Inspection of completed assembly;
- (o) Verification of the presence of marks;

For all closures:

- (p) Testing for leakproofness.

6.2.1.5.2 ~~On an adequate sample of~~ For closed cryogenic receptacles, the inspections and tests specified in 6.2.1.5.1 (a), (b), (d), ~~and (f), (k), (l), (m), (n), and (o)~~ shall be performed on an adequate number of samples. In addition, welds shall be inspected by radiographic, ultrasonic or another suitable non-destructive test method on a sample of closed cryogenic receptacles according to the applicable design and construction standard. This weld inspection does not apply to the jacket.

Additionally, all closed cryogenic receptacles shall undergo the initial inspections and tests specified in 6.2.1.5.1 (g), (h) and (i), as well as a leakproofness test and a test of the satisfactory operation of the service equipment after assembly. All closures shall undergo testing for leakproofness.

6.2.1.5.3 For metal hydride storage systems, it shall be verified that the inspections and tests specified in 6.2.1.5.1 (a), (b), (c), (d), (e) if applicable, (f), (g), (h) and (i) have been performed on an adequate sample of the pressure receptacles shells used in the metal hydride



storage system. In addition, on an adequate sample of metal hydride storage systems, the inspections and tests specified in 6.2.1.5.1 (c) and (f) shall be performed, as well as 6.2.1.5.1 (e), if applicable, and inspection of the external conditions of the metal hydride storage system.

Additionally, all metal hydride storage systems shall undergo the initial inspections and tests specified in 6.2.1.5.1 (h) and (i), as well as a leakproofness test and a test of the satisfactory operation of the service equipment.

6.2.1.5.4 For bundles of cylinders the cylinder shells and closures shall be subjected to 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.

**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 Periodic inspection and test**

6.2.1.6.1 Refillable pressure receptacles, other than cryogenic receptacles, shall be subjected to periodic inspections and tests by a body authorised by the competent authority, in accordance with the following:

- (a) Check of the external conditions of the pressure receptacle and verification of the equipment and the external marks;
- (b) Check of the internal conditions of the pressure receptacle (e.g. internal inspection, verification of minimum wall thickness);
- (c) Checking of the threads either:
  - (i) if there is evidence of corrosion; or
  - (ii) if the fittings 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;

**NOTE 1:** *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.*

**NOTE 2:** *For seamless steel cylinders ~~shells~~ and tubes ~~shells~~ the check of 6.2.1.6.1 (b) and hydraulic pressure test of 6.2.1.6.1 (d) may be replaced by a procedure conforming to ISO 16148:2016 "Gas cylinders – Refillable seamless steel gas cylinders and tubes – Acoustic emission examination (AT) and follow-up ultrasonic examination (UT) for periodic inspection and testing".*

**NOTE 3:** *The check of 6.2.1.6.1 (b) and the hydraulic pressure test of 6.2.1.6.1 (d) may be replaced by ultrasonic examination carried out in accordance with ISO 10461:2005+A1:2006 for seamless aluminium alloy ~~gas cylinders~~ shells and in accordance with ISO 6406:2005 for seamless steel ~~gas cylinders~~ shells.*

**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.

(e) Check of service equipment, ~~other accessories and pressure relief devices~~, if to be reintroduced into service. This check may be carried out separately from the inspection of the pressure receptacle shell.

(f) A leakproofness test of bundles of cylinders after reassembly.

6.2.1.6.2 ~~Pressure receptacles~~ Cylinders intended for the transport of UN No. 1001 acetylene, dissolved and UN No. 3374 acetylene, solvent free, shall be examined only as specified in 6.2.1.6.1 (a), (c) and (e). In addition the condition of the porous material (e.g. cracks, top clearance, loosening, settlement) shall be examined.

6.2.1.6.3 Pressure relief valves for closed cryogenic receptacles shall be subject to periodic inspections and tests.

#### **6.2.1.7 Requirements for manufacturers**

6.2.1.7.1 The manufacturer shall be technically able and shall possess all resources required for the satisfactory manufacture of pressure receptacles; this relates in particular to qualified personnel:

- (a) To supervise the entire manufacturing process;
- (b) To carry out joining of materials; and
- (c) To carry out the relevant tests.

6.2.1.7.2 ~~The~~ A proficiency test of the manufacturers of pressure receptacle shells and the inner vessels of closed cryogenic receptacles shall in all instances be carried out by an inspection body approved by the competent authority of the country of approval. This test shall be carried out either during design type approval or during production inspection and certification.

It was not clear when to carry out the proficiency test. Manufactures of closures, completed bundles of cylinders and completed closed cryogenic receptacles are not subject to proficiency testing.

#### **6.2.1.8 Requirements for inspection bodies**

6.2.1.8.1 Inspection bodies shall be independent from manufacturing enterprises and competent to perform the tests, inspections and approvals required.

## **Proposal 4 – Amendments to 6.2.2**

### **6.2.2 Requirements for UN pressure receptacles**

In addition to the general requirements of section 6.2.1, UN pressure receptacles shall comply with the requirements of this section, including the standards, as applicable. Manufacture of new pressure receptacles or service equipment according to any particular standard in 6.2.2.1 and 6.2.2.3 is not permitted after the date shown in the right hand column of the tables.

*NOTE1: With the agreement of the competent authority, more recently published versions of standards, if available, may be used.*

**NOTE2:** *UN pressure receptacles ~~and service equipment~~ constructed according to standards applicable at the date of manufacture may continue in use subject to the periodic inspection provisions of these Regulations.*

Service equipment is included in the definition of a pressure receptacle.

#### **6.2.2.1 Design, construction and initial inspection and test**

6.2.2.1.1 The following standards apply for the design, construction, and initial inspection and test of refillable UN cylinders shells, except that inspection requirements related to the conformity assessment system and approval shall be in accordance with 6.2.2.5:

The table of standards has been omitted but the entire rows beginning ISO 11118:1999 and ISO 11118:2015 shall be deleted. These shall be listed in a new paragraph 6.2.2.1.9 along with the relevant valve standard ISO 13340:2001.

**NOTE 1:** *In the above referenced standards composite cylinders shells shall be designed for a design life of not less than 15 years.*

**NOTE 2:** *Composite cylinders shells with a design life longer than 15 years shall not be filled after 15 years from the date of manufacture, unless the design has successfully passed a service life test programme. The programme shall be part of the initial design type approval and shall specify inspections and tests to demonstrate that cylinders shells manufactured accordingly remain safe to the end of their design life. The service life test programme and the results shall be approved by the competent authority of the country of approval that is responsible for the initial approval of the cylinder design. The service life of a composite cylinder shell shall not be extended beyond its initial approved design life.*

6.2.2.1.2 The following standards apply for the design, construction, and initial inspection and test of UN tubes shells, except that inspection requirements related to the conformity assessment system and approval shall be in accordance with 6.2.2.5:

The table of standards has been omitted.

**NOTE 1:** *In the above referenced standards composite tubes shells shall be designed for a design life of not less than 15 years.*

**NOTE 2:** *Composite tubes shells with a design life longer than 15 years shall not be filled after 15 years from the date of manufacture, unless the design has successfully passed a service life test programme. The programme shall be part of the initial design type approval and shall specify inspections and tests to demonstrate that tubes shells manufactured accordingly remain safe to the end of their design life. The service life test programme and the results shall be approved by the competent authority of the country of approval that is responsible for the initial approval of the tube design. The service life of a composite tube shell shall not be extended beyond its initial approved design life.*

6.2.2.1.3 The following standards apply for the design, construction and initial inspection and test of UN acetylene cylinders, except that inspection requirements related to the conformity assessment system and approval shall be in accordance with 6.2.2.5:

For the cylinder shell:

The table of standards has been omitted.

For the acetylene cylinder including the porous material:

The table of standards has been omitted

6.2.2.1.4 The following standard applies for the design, construction, and initial inspection and test of UN closed cryogenic receptacles, except that inspection requirements related to the conformity assessment system and approval shall be in accordance with 6.2.2.5:

The table of standards and all of 6.2.2.1.5 has been omitted.

6.2.2.1.6 The following standard ~~shown below~~ applies to the design, construction and initial inspection and test of UN bundles of cylinders. Each cylinder in a UN bundle of cylinders shall be a UN cylinder complying with the requirements of 6.2.2. The inspection requirements related to the conformity assessment system and approval for UN bundles of cylinders shall be in accordance with 6.2.2.5.

Reference	Title	Applicable for manufacture
ISO 10961:2010	Gas cylinders – Cylinder bundles – Design, manufacture, testing and inspection	Until further notice

*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 ~~re-certification~~ 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 The following standards apply to the design, construction and initial inspection and test of UN cylinders for adsorbed gases except that the inspection requirements related to the conformity assessment system and approval shall be in accordance with 6.2.2.5.

The table of standards has been omitted.

6.2.2.1.8 The following standards apply for the design, construction and initial inspection and test of UN pressure drums, except that inspection requirements related to the conformity assessment system and approval shall be in accordance with 6.2.2.5:

The table of standards has been omitted.

6.2.2.1.9 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
<u>ISO 11118:1999</u>	<u>Gas cylinders – Non-refillable metallic gas cylinders – Specification and test methods</u>	<u>Until 31 December 2020</u>
<u>ISO 13340:2001</u>	<u>Transportable gas cylinders – Cylinder valves for non-refillable cylinders – Specification and prototype testing</u>	<u>Until 31 December 2020</u>
<u>ISO 11118:2015</u>	<u>Gas cylinders – Non-refillable metallic gas cylinders – Specification and test methods</u>	<u>Until further notice</u>

**6.2.2.2 Materials**

In addition to the material requirements specified in the ~~pressure receptacle~~ design and construction standards, and any restrictions specified in the applicable packing instruction for the gas(es) to be carried (e.g. packing instruction P200 or P205), the following standards apply to material compatibility:

The table of standards has been omitted.

**6.2.2.3 ~~Service equipment~~ Closures and their protection**

The new definition of service equipment does not include valve protection caps and valve guards

The following standards apply to the design, construction and initial inspection and test of closures and their protection:

The first table of standards has been omitted but the entire row starting ISO 13340:2001 shall be deleted since it appears in the new paragraph 6.2.2.1.9

~~For UN metal hydride storage systems, the requirements specified in the following standard apply to closures and their protection:~~

Reference	Title	Applicable
ISO 16111:2008	<del>Transportable gas storage devices — Hydrogen absorbed in reversible metal hydride</del>	Until further notice

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

**6.2.2.4 Periodic inspection and test**

The following standards apply to ~~the~~ periodic inspection and testing of UN ~~cylinders and their closures~~ pressure receptacles:

The rest of this paragraph has no other changes and is omitted.

**6.2.2.5 Conformity assessment system and approval for manufacture of pressure receptacles****6.2.2.5.40 Definitions**

For the purposes of this sub-section:

*Conformity assessment system* means a system for competent authority approval of a manufacturer, by pressure receptacle design type approval, approval of manufacturer's quality system and approval of inspection bodies;

*Design type* means a pressure receptacle design as specified by a particular pressure receptacle standard;

*Verify* means confirm by examination or provision of objective evidence that specified requirements have been fulfilled.

*NOTE: In this subsection when separate assessment is used the term pressure receptacle shall refer to pressure receptacle, pressure receptacle shell, inner vessel of the closed cryogenic receptacle or closure, as appropriate.*

6.2.2.5.1 The requirements of 6.2.2.5 shall be used for the conformity assessments of pressure receptacles. Paragraph 6.2.1.4.3 gives details of which parts of pressure receptacles may be conformity assessed separately. However, the requirements of 6.2.2.5 may be replaced by requirements specified by the competent authority in the following cases:

- a) conformity assessment of closures;
- b) conformity assessment of the complete assembly of bundles of cylinders provided the cylinder shells have been conformity assessed in accordance with the requirements of 6.2.2.5;
- c) conformity assessment of the complete assembly of closed cryogenic receptacles provided the inner vessel has been conformity assessed in accordance with the requirements of 6.2.2.5.

The alternative conformity assessment system differing from the requirements of 6.2.2.5 is only applicable to establishing conformity to the standards listed in 6.2.2.3 for closures, in 6.2.2.1.4 for closed cryogenic receptacles and 6.2.2.1.6 for bundles. A manufacturer's declaration of conformity could be acceptable.

There are no changes proposed to paragraphs 6.2.2.5.2 through 6.2.2.5.4.8.

6.2.2.5.4.9 The inspection body shall:

- (a) Examine the technical documentation to verify that:
  - (i) the design is in accordance with the relevant provisions of the standard, and
  - (ii) the prototype lot has been manufactured in conformity with the technical documentation and is representative of the design;
- (b) Verify that the production inspections have been carried out as required in accordance with 6.2.2.5.5;
- (c) As required by the pressure receptacle standard or technical code ~~Select pressure receptacles from a prototype production lot and carry out or supervise the tests of these pressure receptacles as required for design type approval;~~
- (d) Perform or have performed the examinations and tests specified in the pressure receptacle standard to determine that:
  - (i) the standard has been applied and fulfilled, and
  - (ii) the procedures adopted by the manufacturer meet the requirements of the standard; and
- (e) Ensure that the various type approval examinations and tests are correctly and competently carried out.

After prototype testing has been carried out with satisfactory results and all applicable requirements of 6.2.2.5.4 have been satisfied, a design type approval certificate shall be issued, which shall include the name and address of the manufacturer, results and conclusions

of the examination, and the necessary data for identification of the design type. A reservation shall be included in the design type approval certificate if it was not possible to evaluate exhaustively the compatibility of the materials of construction with the contents of the pressure receptacle when the certificate was issued.

Very often the customer for a pressure receptacle does not specify what gases are to be transported. In such cases it is not possible for the check on compatibility as required by 6.2.1.2.1 to be carried out at time of manufacture. The proposed reservation in the certificate will ensure that the customer is aware that a compatibility check is required.

If the manufacturer is denied a design type approval, the competent authority shall provide written detailed reasons for such denial.

There are no changes proposed to paragraphs 6.2.2.5.4.10 through 6.2.2.6.6.

### **6.2.2.7 Marking of refillable UN pressure receptacles**

**NOTE:** *Marking requirements for UN metal hydride storage systems are given in 6.2.2.9, ~~and~~ marking requirements for UN bundles of cylinders are given in 6.2.2.10 and marking requirements for closures are given in 6.2.2.11.*

6.2.2.7.1 Refillable UN pressure receptacles shells and closed cryogenic receptacles shall be marked clearly and legibly with certification, operational and manufacturing marks. These marks shall be permanently affixed (e.g. stamped, engraved, or etched) ~~on the pressure receptacle~~. The marks shall be on the shoulder, top end or neck of the pressure receptacle shell or on a permanently affixed component of the pressure receptacle (e.g. welded collar or corrosion resistant plate welded on the outer jacket of a closed cryogenic receptacle). Except for the UN packaging symbol, the minimum size of the marks shall be 5 mm for pressure receptacles with a diameter greater than or equal to 140 mm and 2.5 mm for pressure receptacles with a diameter less than 140 mm. The minimum size of the UN packaging symbol shall be 10 mm for pressure receptacles with a diameter greater than or equal to 140 mm and 5 mm for pressure receptacles with a diameter less than 140 mm.

6.2.2.7.2 The following certification marks shall be applied:

- (a) The United Nations packaging symbol



;

This symbol shall not be used for any purpose other than certifying that a packaging, a flexible bulk container, a portable tank or a MEGC complies with the relevant requirements in Chapter 6.1, 6.2, 6.3, 6.5, 6.6, 6.7 or 6.11. This symbol shall not be used for pressure receptacles which only conform to the requirements of 6.2.3 to 6.2.5 (see 6.2.3.9);

- (b) The technical standard (e.g. ISO 9809-1) used for design, manufacture and testing;

**NOTE:** *For acetylene cylinders the standard ISO 3807 shall also be marked*

- (c) The character(s) identifying the country of approval as indicated by the distinguishing sign used on vehicles in international road traffic<sup>2</sup>;

*NOTE: For the purpose of this mark the country of approval means the country of the competent authority that authorized the initial inspection and test of the individual receptacle at time of manufacture.*

- (d) The identity mark or stamp of the inspection body that is registered with the competent authority of the country authorizing the marking;
- (e) The date of the initial inspection, the year (four digits) followed by the month (two digits) separated by a slash (i.e. "/");

*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) are required. Only the initial inspection date (e) of the completed acetylene cylinder is required. If the country of approval of the inspection body responsible for the initial inspection and test is different a second mark (c) shall be applied.*

6.2.2.7.3 The following operational marks shall be applied:

- (f) The test pressure in bar, preceded by the letters "PH" and followed by the letters "BAR";
- (g) The mass of the empty pressure receptacle including all permanently attached integral parts (e.g. neck ring, foot ring, etc.) in kilograms, followed by the letters "KG". This mass shall not include the mass of ~~valve~~ closure(s), valve protection cap or valve guard, any coating or porous material for acetylene. The mass shall be expressed to three significant figures rounded up to the last digit. For cylinders of less than 1 kg, the mass shall be expressed to two significant figures rounded up to the last digit. In the case of pressure receptacles for UN No. 1001 acetylene, dissolved and UN No. 3374 acetylene, solvent free, at least one decimal shall be shown after the decimal point and two digits for pressure receptacles of less than 1 kg;
- (h) The minimum guaranteed wall thickness of the pressure receptacle in millimetres followed by the letters "MM". This mark is not required for pressure receptacles with a water capacity less than or equal to 1 litre or for composite cylinders or for closed cryogenic receptacles;
- (i) In the case of pressure receptacles for compressed gases, UN No. 1001 acetylene, dissolved, and UN No. 3374 acetylene, solvent free, the working pressure in bar, preceded by the letters "PW". In the case of closed cryogenic receptacles, the maximum allowable working pressure preceded by the letters "MAWP";

*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*

<sup>2</sup> *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*



- (j) In the case of pressure receptacles for liquefied gases, ~~and~~ refrigerated liquefied gases ~~and dissolved gases~~, the water capacity in litres expressed to three significant figures rounded down to the last digit, followed by the letter "L". If the value of the minimum or nominal water capacity is an integer, the figures after the decimal point may be neglected;
- (k) In the case of pressure receptacles for UN No. 1001 acetylene, dissolved;
- (i) ~~the tare in kilograms consisting of the total of the mass of the empty receptacle cylinder shell, the fittings and accessories service equipment (including porous material) not removed during filling, any coating, the porous material, 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 pressure receptacles for UN No. 3374 acetylene, solvent free;
- (i) ~~the tare in kg consisting of the total of the mass of the empty receptacle cylinder shell, the fittings and accessories service equipment (including porous material) not removed during filling; and 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 The following manufacturing marks shall be applied:

- (m) Identification of the cylinder thread (e.g. 25E). This mark is not required for closed cryogenic receptacles;

**NOTE:** *Information on marks that may be used for identifying threads for cylinders is given in ISO/TR 11364, Gas cylinders – Compilation of national and international valve stem/gas cylinder neck threads and their identification and marking system.*

- (n) The manufacturer's mark registered by the competent authority. When the country of manufacture is not the same as the country of approval, then the manufacturer's mark shall be preceded by the character(s) identifying the country of manufacture as indicated by the distinguishing sign used on vehicles in international road

traffic<sup>2</sup>. The country mark and the manufacturer's mark shall be separated by a space or slash;

*NOTE: If the manufacturer of the acetylene cylinder and the manufacturer of the cylinder shell are different, only the mark of the manufacturer of the completed acetylene cylinder is required.*

- (o) The serial number assigned by the manufacturer;
- (p) In the case of steel pressure receptacles and composite pressure receptacles with steel liner intended for the transport of gases with a risk of hydrogen embrittlement, the letter "H" showing compatibility of the steel (see ISO 1114-1:2012);
- (q) For composite cylinders and tubes having a limited design life, the letters "FINAL" followed by the design life shown as the year (four digits) followed by the month (two digits) separated by a slash (i.e. "/");
- (r) For composite cylinders and tubes having a limited design life greater than 15 years and for composite cylinders and tubes having non-limited design life, the letters "SERVICE" followed by the date 15 years from the date of manufacture (initial inspection) shown as the year (four digits) followed by the month (two digits) separated by a slash (i.e. "/").

*NOTE: Once the initial design type has passed the service life test programme requirements in accordance with 6.2.2.1.1 NOTE 2 or 6.2.2.1.2 NOTE 2, future production no longer requires this initial service life mark. The initial service life mark shall be made unreadable on cylinders and tubes of a design type that has met the service life test programme requirements.*

There are no changes proposed to paragraphs 6.2.2.7.5 through 6.2.2.7.9.

#### **6.2.2.8 Marking of non-refillable UN ~~pressure receptacles~~ cylinders**

6.2.2.8.1 Non-refillable UN ~~pressure receptacles~~ cylinders shall be marked clearly and legibly with certification and gas or pressure receptacle specific marks. These marks shall be permanently affixed (e.g. stencilled, stamped, engraved, or etched) on the ~~pressure receptacle~~ cylinder. Except when stencilled, the marks shall be on the shoulder, top end or neck of the ~~pressure receptacle~~ cylinder shell or on a permanently affixed component of the ~~pressure receptacle~~ cylinder (e.g. welded collar). Except for the UN packaging symbol and the "DO NOT REFILL" mark, the minimum size of the marks shall be 5 mm for pressure receptacles with a diameter greater than or equal to 140 mm and 2.5 mm for pressure receptacles with a diameter less than 140 mm. The minimum size of the UN packaging symbol shall be 10 mm for ~~pressure receptacles~~ cylinders with a diameter greater than or equal to 140 mm and 5 mm for ~~pressure receptacles~~ cylinders with a diameter less than 140 mm. The minimum size of the "DO NOT REFILL" mark shall be 5 mm.

6.2.2.8.2 The marks listed in 6.2.2.7.2 to 6.2.2.7.4 shall be applied with the exception of (g), (h) and (m). The serial number (o) may be replaced by the batch number. In addition, the words "DO NOT REFILL" in letters of at least 5 mm in height are required.

<sup>2</sup> Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.

6.2.2.8.3 The requirements of 6.2.2.7.5 shall apply.

**NOTE:** *Non-refillable ~~pressure receptacles~~ cylinders may, on account of their size, substitute a label for these permanent marks.*

6.2.2.8.4 Other marks are allowed provided they are made in low stress areas other than the side wall and are not of a size and depth that will create harmful stress concentrations. Such marks shall not conflict with required marks.

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.

There are no changes proposed to paragraphs 6.2.2.9 through 6.2.2.9.4

#### **6.2.2.10 Marking of UN bundles of cylinders**

6.2.2.10.1 Individual cylinders shells in a bundle of cylinders shall be marked in accordance with 6.2.2.7. Individual closures in a bundle of cylinders shall be marked in accordance with 6.2.2.11.

6.2.2.10.2 Refillable UN bundles of cylinders shall be marked clearly and legibly with certification, operational, and manufacturing marks. These marks shall be permanently affixed (e.g. stamped, engraved, or etched) on a plate permanently attached to the frame of the bundle of cylinders. Except for the UN packaging symbol, the minimum size of the marks shall be 5 mm. The minimum size of the UN packaging symbol shall be 10 mm.

6.2.2.10.3 The following marks shall be applied:

- (a) The certification marks specified in 6.2.2.7.2 (a), (b), (c), (d) and (e);
- (b) The operational marks specified in 6.2.2.7.3 (f), (i), (j) and the total of the mass of the frame of the bundle and all permanently attached parts (cylinders, ~~manifold, fittings and valves~~ shells and service equipment). Bundles intended for the transport of UN 1001 acetylene, dissolved and UN 3374 acetylene, solvent free shall bear the tare ~~mass~~ as specified in clause B.4.2 of ISO 10961:2010; and
- (c) The manufacturing marks specified in 6.2.2.7.4 (n), (o) and, where applicable, (p).

6.2.2.10.4 The marks shall be placed in three groups:

- (a) The manufacturing marks shall be the top grouping and shall appear consecutively in the sequence given in 6.2.2.10.3 (c);
- (b) The operational marks in 6.2.2.10.3 (b) shall be the middle grouping and the operational mark specified in 6.2.2.7.3 (f) shall be immediately preceded by the operational mark specified in 6.2.2.7.3 (i) when the latter is required;
- (c) Certification marks shall be the bottom grouping and shall appear in the sequence given in 6.2.2.10.3 (a).

#### **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) and
- (d) The identity mark of the inspection body responsible for the initial inspection and test, if applicable.

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

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