

COMMITTEE OF EXPERTS ON THE TRANSPORT OF DANGEROUS GOODS AND ON THE GLOBALLY HARMONIZED SYSTEM OF CLASSIFICATION AND LABELLING OF CHEMICALS

Sub-Committee of Experts on the
Transport of Dangerous Goods
(Twenty-second session, 2-6 December 2002,
agenda item 2)

ADDITIONAL PROVISIONS FOR THE TRANSPORT OF GASES

Report of the Working Group

General

1. The Working Group on Additional Provisions for the Transport of Gases met on 2 December under the chairmanship of Mr. H. Puype (EIGA). Representatives of Canada, France, Germany, Switzerland, the United Kingdom, the United States of America, International Organization for Standardization (ISO), European Liquefied Petroleum Gas Association (AEGPL), Compressed Gas Association (CGA) and the European Industrial Gases Association (EIGA) participated.
2. The objective of the Working Group was to review the following documents: the base text in ST/SG/AC.10/C.3/42/Add.1 and informal documents INF.7 (EIGA), INF.9 (CGA), INFs.10, 40, 43 (ISO), INFs.17, 18, 37 (United Kingdom) and INF.33 (United States of America).

ST/SG/AC.10/C.3/42/Add.1

3. The annex to this report gives the text agreed by the Working Group. It is based on the ST/SG/AC.10/C.3/42/Add.1 and is divided into 8 proposals. This report will draw attention only to substantive changes to the above draft.
4. The working group considered ST/SG/AC.10/C.3/Add.1 page by page, adopting editorial changes and taking into account the INF. papers relevant to each part.
5. The proposed check on pressure every 2.5 years in special packing provision 'w' applying to UN 1052 HYDROGEN FLUORIDE, ANHYDROUS was rejected as being inappropriate for transport regulations. Instead, a special provision requiring a pressure check before the receptacle is transported was inserted. However, the routine checking of pressure during storage should be required and the industry is asked to add such a warning in the Storage section of the Safety Data Sheets which it must supply to users.
6. The hazard concern raised in INF. 17 was deemed to be an issue that could also be raised for other classes (aerosols, lighters, plastic drums, flammable liquids, etc) and was related more to filling operations than to transport. The matter should be dealt with in wider and different context. The bracketed text on earthing pressure receptacles was therefore deleted as being unnecessary and

inappropriate for transport regulations.

7. The Working Group agreed to add text as proposed in INF.9 (CGA), clarifying that the conformity assessment of the regulations must be used when UN marking is applied, overriding the options in the standards.
8. Differing viewpoints were expressed on the need to restrict the lives of composite receptacles as stated in INF.7 (EIGA), INF.18 (UK) and verbal contributions. After a long discussion, the UK proposed a compromise which set the initial life of composite cylinders at 15 years, but allowed for subsequent discretionary prolongation by the competent authority in the light of accumulated experience. The references to the ISO standards were annotated accordingly and the text specifying the marking of the limited life was deleted.
9. The reference to ISO 11119-3: 2002 Gas cylinders of composite construction – Specification and test methods – Part 3: Fully wrapped fibre reinforced composite gas cylinders with non-metallic and non-load-sharing liners was not retained because of the fundamental reservations expressed by the USA.
10. The square brackets around the reference to ISO 11623: 2002 Transportable gas cylinder – Periodic inspection and testing of composite gas cylinders were lifted. However, the Working Group was of the opinion that this standard will need to be revised in the coming years to take into account new research and development being undertaken in several countries.
11. The AEGPL asked for the following minute to be included in this report.

The AEGPL expressed reservations about the inclusion of LPG in ISO composite cylinder standards ISO 1119-2 and –3 as the following requirements are missing:

- adequate impact tests for prototypes
- mechanical resistance at low temperatures
- repetitive shock testing
- earthing.

The Association was asked to make a formal proposal for including special requirements for these cylinders in the Model Regulations.

12. Text was added to the P200 to ensure that composite pressure receptacles were not to be periodically inspected and tested at the frequency specified for metal receptacles. Their test periods will be determined by the competent authority which approved the receptacle.

INF.33 (USA)

13. The proposal to add the special tank provision allowing a waiver of the 4g impact test for portable tanks carrying UN 1963 HELIUM, was accepted with minor modifications. It was considered that this provision was also applicable to UN 1966 HYDROGEN, REFRIGERATED LIQUID. Also the marking should be repeated on the tank plate. The text can be found in proposal 9 annexed to this report.

INF.37 (UK)

14. The Working Group agreed that this proposal described a significant safety issue. There were, however, reservations that the problem should be solved by transport regulations. Transport checks could not determine whether residual pressure valves had been fitted. Similarly, the pre-fill operational checks of the valve could not be verified. The option to create a new UN Number was not favoured. Since some of the mixtures would, under current definitions of compressed and liquefied gases, classify as UN 3163 LIQUEFIED GAS, N.O.S., the special packing provision would also need to be added to this entry. It is recommended that Experts and Observers review the controls of safe filling practice of these mixtures in their respective countries.
15. The Working Group took note of developments in ISO TC 58 and ISO TC 220. ISO advised that comments on standards should be made during the ISO Draft International Standards stage. Delegates were reminded to contact their national standardization bodies to obtain copies and to register their comments.

* * * * *

Annex

The agreed text is as follows; items for further discussion are shown in square brackets.

Proposal 1

Revise the text as follows; new text is shown underlined and deletions are shown by stikethrough.

4.1.6 Special packing provisions for dangerous goods of Class 2**4.1.6.1 General requirements**

4.1.6.1.1 This section provides general requirements applicable to the use of pressure receptacles for the transport of Class 2 gases and other dangerous goods that are transported in pressure receptacles (e.g. UN 1051 hydrogen cyanide, stabilized.). Pressure receptacles shall be constructed and closed so as to prevent any loss of contents which might be caused under normal conditions of transport, including by vibration, or by changes in temperature, humidity or pressure (resulting from change in altitude, for example).

4.1.6.1.2 Parts of pressure receptacles which are in direct contact with dangerous goods shall not be affected or weakened by those dangerous goods and shall not cause a dangerous effect (e.g. catalysing a reaction or reacting with the dangerous goods). The provisions of ISO 11114-1:1997 and ISO 11114-2:2000 shall be met as applicable. Pressure receptacles for UN 1001 acetylene, dissolved, and UN 3374 acetylene, solvent free, shall be filled with a porous ~~material~~ mass, uniformly distributed, of a type that conforms to the requirements and testing specified by the competent authority and which:

- (a) is compatible with the pressure receptacle 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 mass.

In the case of UN 1001, the solvent shall be compatible with the pressure receptacles.*(format change only)*

4.1.6.1.3 Pressure receptacles, including their closures, shall be selected to contain a gas or a mixture of gases according to the requirements of 6.2.1.2 ("Materials") and the requirements of the specific packing instructions of section 4.1.4.1. This section also applies to pressure receptacles which are elements of MEGCs.

4.1.6.1.4 Refillable pressure receptacles shall not be filled with a gas or gas mixture different from that previously contained unless the necessary operations for change of gas service have been performed. The change of service for compressed or liquefied gases shall be in accordance with ISO 11621:1997, as applicable. In addition, a pressure receptacle that previously contained a Class 8 corrosive substance or a substance of another class with a corrosive subsidiary risk shall not be authorized for the transport of a Class 2 substance unless the necessary inspection and testing as specified in 6.2.1.5 have been performed.

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4.1.6.1.5 Prior to filling, the filler shall perform an inspection of the pressure receptacle and ensure that the pressure receptacle is authorized for the gas to be transported and that the provisions of these Model Regulations have been met. Shut-off valves shall be closed after filling and remain closed during transport. The shipper shall verify that the closures and equipment are not leaking.

4.1.6.1.56 Pressure 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. 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.

4.1.6.1.67 Pressure receptacles, including their closures, shall conform to the design, construction, inspection and testing requirements detailed in section 6.2. When outer packagings are prescribed, the pressure receptacles shall be firmly secured therein. Unless otherwise specified in the detailed packing instructions, one or more inner packagings may be enclosed in an outer packaging.

4.1.6.1.78 Valves shall be designed and constructed in such a way that they are inherently able to withstand damage without release of the contents or shall be protected from damage which could cause inadvertent release of the contents of the pressure receptacle, by one of the following methods:

- (a) Valves are placed inside the neck of the pressure receptacle and protected by a threaded plug or cap;
- (b) Valves are protected by caps. Caps shall possess vent-holes of sufficient cross-sectional area to evacuate the gas if leakage occurs at the valves;
- (c) Valves are protected by shrouds or guards;
- ~~(d) Valves are designed and constructed in such a way that they are inherently able to withstand damage without leakage of product;~~
- (d) Pressure receptacles are transported in frames, (e.g. bundles); or
- (e) Pressure receptacles are transported in an outer packaging. The packaging as prepared for transport shall be capable of meeting the drop tests specified in 6.1.5.3 at the PG I performance level.

For pressure receptacles with valves as described in (b) and (c), the requirements of ISO 11117:1998 shall be met; for ~~unprotected~~ valves with inherent protection as described in (d), the requirements of annex B of ISO 10297:1999 shall be met.

4.1.6.1.89 Non-refillable pressure receptacles shall:

- (a) be transported in an outer packaging, such as a box or crate, or in shrink-wrapped trays or stretch-wrapped trays;
- (b) be of a water capacity less than or equal to 1.25 litres when filled with flammable or toxic gas;
- (c) not be used for toxic gases with an LC₅₀ less than or equal to 200 ml/m³; and

- (d) not be repaired after being put into service.

4.1.6.1.910 Refillable pressure receptacles, other than cryogenic receptacles, shall be periodically inspected according to the provisions of 6.2.1.5 and P200 or P203 as applicable. Pressure receptacles shall not be ~~charged or~~ filled after they become due for periodic inspection but may be transported after the expiry of the time limit.

4.1.6.1.1011 Repairs shall be consistent with the fabrication and testing requirements of the applicable design and construction standards and are only permitted as indicated in the relevant periodic inspection standards specified in 6.2.2.4, ~~consistent with the applicable design and construction standards~~. Pressure receptacles, other than the jacket of closed cryogenic receptacles, shall not be subjected to repairs of any of the following;

- (a) weld cracks or other weld defects;
- (b) cracks in walls;
- (c) leaks or defects in the material of the wall, head or bottom.

4.1.6.1.1112 Pressure receptacles shall not be offered for filling:

- (a) when damaged to such an extent that the integrity of the pressure receptacle or its service equipment may be affected;
- (b) unless the pressure receptacle and its service equipment has been examined and found to be in good working order; ~~and or~~
- (c) unless the required certification, retest, and filling markings are legible.

4.1.6.1.1213 ~~Charged~~ Filled pressure receptacles shall not be offered for transport;

- (a) when leaking;
- (b) when damaged to such an extent that the integrity of the pressure receptacle or its service equipment may be affected;
- (c) unless the pressure receptacle and its service equipment has been examined and found to be in good working order; ~~and or~~
- (d) unless the required certification, retest, and filling markings are legible.

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Proposal 2

Make the following changes in **4.1.4.1 P200**:

- *Insert a note under (2) (d) as follows:*
Note: For pressure receptacles which make use of composite materials, the periodic inspection frequencies shall be as determined by the competent authority which approved the receptacles.’
- *Delete all asterisks on LC₅₀ values and delete the associated footnote.*
- *Change the LC₅₀ value for UN 1050 HYDROGEN CYANIDE STABILIZED from 140 to 40.*
- *Change the LC₅₀ value for UN 1746 BROMINE PENTAFLUORIDE from 180 to 50.*
- *Add ‘Between 3760 and 5000’ to the LC₅₀ column for the entry UN 2600 CARBON MONOXIDE AND HYDROGEN MIXTURE, COMPRESSED.*
- *Add ‘≤ 5000’ to the LC₅₀ column for the following toxic gas N.O.S. entries.*

UN 1953	COMPRESSED GAS, TOXIC, FLAMMABLE, N.O.S.
UN 1955	COMPRESSED GAS, TOXIC, N.O.S.
UN 3160	LIQUEFIED GAS, TOXIC, FLAMMABLE, N.O.S.
UN 3162	LIQUEFIED GAS, TOXIC, N.O.S.
UN 3303	COMPRESSED GAS, TOXIC, OXIDIZING, N.O.S.
UN 3304	COMPRESSED GAS, TOXIC, CORROSIVE, N.O.S.
UN 3305	COMPRESSED GAS, TOXIC, FLAMMABLE, CORROSIVE, N.O.S.
UN 3306	COMPRESSED GAS, TOXIC, OXIDIZING, CORROSIVE, N.O.S.
UN 3307	LIQUEFIED GAS, TOXIC, OXIDIZING, N.O.S.
UN 3308	LIQUEFIED GAS, TOXIC, CORROSIVE, N.O.S.
UN 3309	LIQUEFIED GAS, TOXIC, FLAMMABLE, CORROSIVE, N.O.S.
UN 3310	LIQUEFIED GAS, TOXIC, OXIDIZING, CORROSIVE, N.O.S.

- *Delete Special packing provision ‘k’ from the entry UN 3083 PERCHLORYL FLUORIDE.*
- *Add Special packing provision ‘t’ to the entry in Table 3 for UN 1052 HYDROGEN FLUORIDE, ANHYDROUS.*
- *Insert in paragraph (4) under Gas specific provisions the following text*
‘t: (i) The wall thickness of pressure receptacles shall be not less than 3 mm..
(ii) Prior to transport it shall be ensured that the pressure has not risen due to potential hydrogen generation.’
- *Rearrange the order of the columns in Tables 2 and 3 according to the sequence in Table 1, i.e. Cylinders, Tubes, Pressure drums, Bundles of cylinders, MEGCs.*
- *Delete P202 entirely and reserve it.*

Proposal 3

Replace the existing P203 with the following new packing instruction:

P203	PACKING INSTRUCTION	P203
	<p>This instruction applies to Class 2 refrigerated liquefied gases in closed cryogenic receptacles. Refrigerated liquefied gases in open cryogenic receptacles shall conform to the construction, testing and filling requirements approved by the competent authority.</p> <p>For closed cryogenic receptacles, the general requirements of 4.1.6.1 shall be met.</p> <p>Closed cryogenic receptacles constructed as specified in 6.2 are authorized for the transport of refrigerated liquefied gases.</p> <p>The closed cryogenic receptacles shall be so insulated that they do not become coated with frost.</p> <p>1. <u>Test pressure</u></p> <p>Refrigerated liquefied gases shall be filled in closed cryogenic receptacles with the following minimum test pressures:</p> <p>(a) For closed cryogenic receptacles with vacuum insulation, the test pressure shall not be less than 1.3 times the sum of the maximum internal pressure of the filled receptacle, taking into account the pressure developed during filling and discharge, plus 100 kPa (1 bar);</p> <p>(b) For other closed cryogenic receptacles, the test pressure shall be not less than 1.3 times the maximum internal pressure of the filled receptacle, taking into account the pressure developed during filling and discharge.</p> <p>2. <u>Degree of filling</u></p> <p>For non-flammable, non-toxic refrigerated liquefied gases the volume of the liquid phase at the filling temperature and at a pressure of 100 kPa (1 bar) shall not exceed 98% of the water capacity of the pressure receptacle.</p> <p>For flammable refrigerated liquefied gases the degree of filling shall remain below the level at which the volume of the liquid phase would reach 98% of the water capacity at that temperature, if the contents were raised to the temperature at which the vapour pressure equalled the set pressure of the relief valve.</p> <p>3. <u>Pressure-relief devices</u></p> <p>Closed cryogenic receptacles shall be fitted with at least one pressure-relief device.</p> <p>4. <u>Compatibility</u></p> <p>Materials used to ensure the leakproofness of the joints or for the maintenance of the closures shall be compatible with the contents. In the case of receptacles intended for the transport of oxidizing gases, (i.e. with a subsidiary risk of 5.1) these materials shall not react with these gases in a dangerous manner.</p>	

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In 3.2.2, insert the Packing Instruction “P203” in Column 8 of the Dangerous Goods List for the following 19 substances:

UN No.	Name and description
1003	AIR, REFRIGERATED LIQUID
1038	ETHYLENE, REFRIGERATED LIQUID
1073	OXYGEN, REFRIGERATED LIQUID
1913	NEON, REFRIGERATED LIQUID
1951	ARGON, REFRIGERATED LIQUID
1961	ETHANE, REFRIGERATED LIQUID
1963	HELIUM, REFRIGERATED LIQUID
1966	HYDROGEN, REFRIGERATED LIQUID
1970	KRYPTON, REFRIGERATED LIQUID
1972	METHANE, REFRIGERATED LIQUID or NATURAL GAS, REFRIGERATED LIQUID, with high methane content
1977	NITROGEN, REFRIGERATED LIQUID
2187	CARBON DIOXIDE, REFRIGERATED LIQUID
2201	NITROUS OXIDE, REFRIGERATED LIQUID
2591	XENON, REFRIGERATED LIQUID
3136	TRIFLUOROMETHANE, REFRIGERATED LIQUID
3138	ETHYLENE, ACETYLENE AND PROPYLENE MIXTURE, REFRIGERATED LIQUID, containing at least 71.5% ethylene with not more than 22.5% acetylene and not more than 6% propylene
3158	GAS, REFRIGERATED LIQUID, N.O.S.
3311	GAS, REFRIGERATED LIQUID, OXIDIZING, N.O.S.
3312	GAS, REFRIGERATED LIQUID, FLAMMABLE, N.O.S.

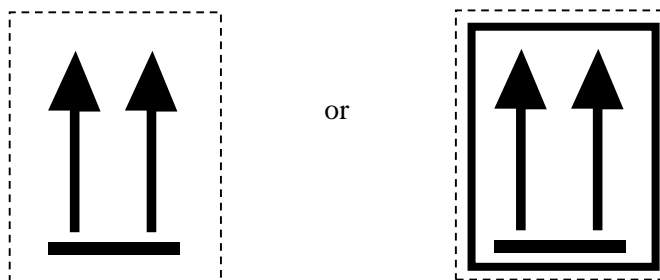
Insert the Packing Instruction “P099” in Column 8 of the Dangerous Goods List for the following substance:

UN 2186 HYDROGEN CHLORIDE, REFRIGERATED LIQUID

Proposal 4

Add a new provision to Chapter 5.2 as follows:

5.2.2.1.13 The following orientation label shall be displayed on two opposite sides of cryogenic receptacles intended for the transport of refrigerated liquefied gases. They shall be rectangular, of standard format 74 x 105 mm (A7). If the size of the package so requires, the dimensions of the labels may be changed, provided that they remain clearly visible.



Two black or red arrows on white
or suitable contrasting background

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Proposal 5

Adopt the editorial changes proposed in UN/SCETDG/21/INF.49 by the Secretariat in Chapters 6.2 and 6.7 except for 6.7.5.4.3.

Revise the text of 6.2.1 as follows: (new text is shown underlined and deletions are shown by strikethrough)

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.

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

6.2.1.1.3 ~~Any additional thickness used for the purpose of providing a corrosion allowance shall not be taken into consideration in calculating the thickness of the walls.~~ 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.

6.2.1.1.65 The test pressure of cylinders, tubes, pressure drums and bundles of cylinders shall be in accordance with P200. The test pressure for closed cryogenic receptacles shall be in accordance with P203.

6.2.1.1.76 Pressure receptacles assembled in bundles shall be structurally supported and held together as a unit. Pressure receptacles 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. Manifolds shall be designed such that they are protected from impact. For ~~Division 2.3~~ toxic liquefied gases, means shall be provided to ensure that each pressure receptacle can be filled separately ~~charged~~ and that no interchange of pressure receptacle contents can occur during transport.

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

6.2.1.1.58 The following additional requirements apply to the construction of closed cryogenic ~~pressure~~ 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 ~~at the initial inspection~~, 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 ~~continuous sheathing~~ a jacket. If the space between the pressure receptacle and the ~~sheathing~~ jacket is evacuated of air (vacuum-insulation), the ~~protective sheathing~~

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 ~~sheathing~~ 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 or its fittings. 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 °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

The above text has been re-ordered; the Secretariat is asked to check and correct any cross- references.

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 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 Except for pressure-relief devices, valves, piping, fittings and other equipment subjected to pressure, shall be designed and constructed to withstand at least 1.5 times the test pressure of the pressure receptacles.

6.2.1.3.2 Service equipment shall be configured or designed to prevent damage that could result in the release of the pressure receptacle contents during normal conditions of handling and transport. Manifold piping leading to shut-off valves shall be sufficiently flexible to protect the 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 section 4.1.6.1.8. (*Editorial note: this reference is correct now that the paragraph has been renumbered*)

6.2.1.3.3 Pressure receptacles which are not capable of being handled manually or rolled, shall be fitted with 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.

6.2.1.3.4 Individual pressure receptacles shall be equipped with ~~approved~~ pressure-relief devices as ~~required specified in P200(1) or 6.2.1.3.6.4 and 6.2.1.3.6.5 as specified by the country of use.~~ Pressure-relief devices shall be designed to prevent the entry of foreign matter, the leakage of gas and the development of any dangerous excess pressure. When fitted, pressure-relief devices on manifolded horizontal pressure receptacles filled with flammable gas shall be arranged to discharge freely to the open

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air in such a manner as to prevent any impingement of escaping gas upon the pressure receptacles itself under normal conditions of transport.

6.2.1.3.5 Pressure receptacles whose filling is measured by volume shall be provided with a level indicator. *(Existing text formerly 6.2.1.3.6)*

6.2.1.3.6 Additional requirements for closed cryogenic receptacles

6.2.1.3.6.1 Each filling and discharge opening in a closed cryogenic receptacle used for the transport of flammable refrigerated liquefied gases shall be fitted with at least two mutually independent shut-off devices in series, the first being a stop-valve, the second being a cap or equivalent device.

6.2.1.3.6.2 For sections of piping which can be closed at both ends and where liquid product can be trapped, a method of automatic pressure-relief shall be provided to prevent excess pressure build-up within the piping.

6.2.1.3.6.3 Each connection on a closed cryogenic receptacle shall be clearly marked to indicate its function (e.g. vapour or liquid phase).

6.2.1.3.6.4 Pressure-relief devices

6.2.1.3.6.4.1 Every closed cryogenic receptacle shall be provided with at least one spring loaded pressure-relief device. The pressure-relief device shall be of the type that will resist dynamic forces including surge.

6.2.1.3.6.4.2 Closed cryogenic receptacles may, in addition, have a frangible disc in parallel with the spring loaded device(s) in order to meet the requirements of 6.2.1.3.6.5.

6.2.1.3.6.4.3 Connections to pressure-relief devices shall be of sufficient size to enable the required discharge to pass unrestricted to the pressure-relief device.

6.2.1.3.6.4.4 All pressure-relief device inlets shall under maximum filling conditions be situated in the vapour space of the closed cryogenic receptacle and the devices shall be so arranged as to ensure that the escaping vapour is discharged unrestrictedly.

6.2.1.3.6.5 Capacity and setting of pressure-relief devices

NOTE: In relation to pressure-relief devices of closed cryogenic receptacles, MAWP means the maximum effective gauge pressure permissible at the top of a loaded closed cryogenic receptacle in its operating position including the highest effective pressure during filling and discharge.

6.2.1.3.6.5.1 The pressure-relief device shall open automatically at a pressure not less than the MAWP and be fully open at a pressure equal to 110% of the MAWP. It shall, after discharge, close at a pressure not lower than 10% below the pressure at which discharge starts and shall remain closed at all lower pressures.

6.2.1.3.6.5.2 Frangible discs shall be set to rupture at a nominal pressure which is the lower of either the test pressure or 150% of the MAWP.

6.2.1.3.6.5.3 In the case of the loss of vacuum in a vacuum-insulated closed cryogenic receptacle the combined capacity of all pressure-relief devices installed shall be sufficient so that the pressure (including accumulation) inside the closed cryogenic receptacle does not exceed 120% of the MAWP.

6.2.1.3.6.5.4 The required capacity of the pressure-relief devices shall be calculated in accordance with an established technical code recognized by the competent authority*.

6.2.1.4 *Initial inspection and test*

6.2.1.4.1 New pressure receptacles, other than closed cryogenic receptacles, shall be subjected to testing and inspection during and after manufacture in accordance with the applicable design standards including the following:

On an adequate sample of pressure receptacles:

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

For all pressure receptacles:

- (g) A hydraulic pressure test. Pressure receptacles shall withstand the test pressure without expansion greater than that allowed in the design specification;

NOTE: With the agreement of the ~~inspection body~~ 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 unserviceable. In the case of welded pressure receptacles, particular attention shall be paid to the quality of the welds;
- (i) An inspection of the markings on the pressure receptacles;
- (j) In addition, pressure receptacles 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~~ mass and, if applicable, the quantity of solvent.

6.2.1.4.2 On an adequate sample of closed cryogenic receptacles, the inspections and tests specified in 6.2.1.4.1 (a), (b), (d), and (f) shall be performed. 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

* See for example CGA Publications S-1.2-1995 and S-1.1-2001.

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jacket.

Additionally, all closed cryogenic receptacles shall undergo the inspections and tests specified in 6.2.1.4.1 (g), (h), and (i), as well as a leakproofness test and a test of the satisfactory operation of the service equipment after assembly.

6.2.1.5 *Periodic inspection and test*

6.2.1.5.1 Refillable pressure receptacles, other than cryogenic receptacles, shall be subjected to periodic inspections and tests ~~under the supervision of an inspection~~ by a body authorized 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 markings;
- (b) Check of the internal conditions of the pressure receptacle (e.g. ~~by weighing,~~ internal inspection, ~~checks~~ verification of minimum wall thickness);
- (c) Checking of the ~~neck~~ threads if the fittings are removed;
- (d) A hydraulic pressure test and, if necessary, verification of the characteristics of the material by suitable tests.

***NOTE 1:** With the agreement of the ~~inspection body~~ 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:** With the agreement of the competent authority, the hydraulic pressure test of cylinders ~~and~~ or tubes may be replaced by an equivalent method based on acoustic emission or ultrasound.*

6.2.1.5.2 For pressure receptacles intended for the transport of UN 1001 acetylene, dissolved, and UN 3374 acetylene, solvent free, only the external condition (corrosion, deformation) and the condition of the porous mass (loosening, settlement) shall be required to be examined.

~~6.2.1.5.3 Closed cryogenic receptacles shall be inspected to verify external conditions, condition and operation of pressure relief devices and the legibility and adequacy of the markings. The thermal insulation need not be removed.~~

Proposal 6

Make the following changes to 6.2.2.1 to 6.2.2.5:

Insert the underlined text in 6.2.2.1.1, 6.2.2.1.2 and 6.2.2.1.3 as follows.

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

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

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

Insert the following standards and note in 6.2.2.1.1:

ISO 11119-1:2002	Gas cylinders of composite construction – Specification and test methods – Part 1: Hoop wrapped composite gas cylinders
ISO 11119-2:2002	Gas cylinders of composite construction – Specification and test methods – Part 2: Fully wrapped fibre reinforced composite gas cylinders with load-sharing metal liners

- Note:**
1. In the above referenced standards composite cylinders shall be designed for unlimited service life.
 2. After the first 15 years of service, composite cylinders manufactured according to these standards, may be approved for extended service by the competent authority which was responsible for the original approval of the cylinders and which will base its decision on the test information supplied by the manufacturer or owner or user.

Insert the following standard in 6.2.2.4

ISO 11623:2002	Transportable gas cylinders – Periodic inspection and testing of composite gas cylinders
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Modify 6.2.2.5 as follows:

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

6.2.2.5.2.4 (d) ensure commercial confidentiality of the commercial and proprietary activities of the manufacturer and other bodies;

6.2.2.5.3.1 (i) training programmes and qualification procedures for relevant personnel.

6.2.2.5.4.6 Following approval, changes to the information submitted under 6.2.2.5.4.2 3 relating to the initial approval shall be provided to the competent authority.

Annex

Proposal 7

Insert the following new text covering the approval system for periodic inspection and test as 6.2.2.6. Renumber the existing 6.2.2.6 and 6.2.2.7 as 6.2.2.7 and 6.2.2.8 respectively. The Secretariat is asked to check any cross-references (references within this proposal are correct for the text as amended).

6.2.2.6 *Approval system for periodic inspection and test of pressure receptacles*

6.2.2.6.1 *Definitions*

For the purposes of this section:

Approval system means a system for competent authority approval of a body performing periodic inspection and test of pressure receptacles (hereinafter referred to as “periodic inspection and test body”), including approval of that body’s quality system.

6.2.2.6.2 *General requirements*

Competent authority

6.2.2.6.2.1 The competent authority shall establish an approval system for the purpose of ensuring that the periodic inspection and test of pressure receptacles conform to the requirements of these regulations. In instances where the competent authority that approves a body performing periodic inspection and test of a pressure receptacle is not the competent authority of the country approving the manufacture of the pressure receptacle, the marks of the approval country of periodic inspection and test shall be indicated in the pressure receptacle marking (see 6.2.2.7).

The competent authority of the country of approval for the periodic inspection and test shall supply, upon request, evidence demonstrating compliance to this approval system including the records of the periodic inspection and test to its counterpart in a country of use.

The competent authority of the country of approval may terminate the approval certificate referred to in 6.2.2.6.4.1, upon evidence demonstrating non-compliance with the approval system.

6.2.2.6.2.2 The competent authority may delegate its functions in this approval system, in whole or in part.

6.2.2.6.2.3 The competent authority shall ensure that a current list of approved periodic inspection and test bodies and their identity marks is available.

Periodic inspection and test body

6.2.2.6.2.4 The periodic inspection and test body shall be approved by the competent authority and shall:

- (a) have a staff with an organisational structure, capable, trained, competent, and skilled, to satisfactorily perform its technical functions;
- (b) have access to suitable and adequate facilities and equipment;

- (c) operate in an impartial manner and be free from any influence which could prevent it from doing so;
- (d) ensure commercial confidentiality;
- (e) maintain clear demarcation between actual periodic inspection and test body functions and unrelated functions;
- (f) operate a documented quality system in accordance with 6.2.2.6.3;
- (g) apply for approval in accordance with 6.2.2.6.4;
- (h) ensure that the periodic inspections and tests are performed in accordance with 6.2.2.6.5; and
- (i) maintain an effective and appropriate report and record system in accordance with 6.2.2.6.6.

6.2.2.6.3 *Quality system and audit of the periodic inspection and test body*

6.2.2.6.3.1 *Quality system*

The quality system shall contain all the elements, requirements, and provisions adopted by the periodic inspection and test body. It shall be documented in a systematic and orderly manner in the form of written policies, procedures, and instructions.

The quality system shall include:

- (a) a description of the organisational structure and responsibilities;
- (b) the relevant inspection and test, quality control, quality assurance, and process operation instructions that will be used;
- (c) quality records, such as inspection reports, test data, calibration data and certificates;
- (d) management reviews to ensure the effective operation of the quality system arising from the audits performed in accordance with 6.2.2.6.3.2;
- (e) a process for control of documents and their revision;
- (f) a means for control of non-conforming pressure receptacles; and
- (g) training programmes and qualification procedures for relevant personnel.

6.2.2.6.3.2 *Audit*

The periodic inspection and test body and its quality system shall be audited in order to determine whether it meets the requirements of these regulations to the satisfaction of the competent authority.

An audit shall be conducted as part of the initial approval process (see 6.2.2.6.4.3). An audit may be required as part of the process to modify an approval (see 6.2.2.6.4.6).

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Periodic audits shall be conducted, to the satisfaction of the competent authority, to ensure that the periodic inspection and test body continues to meet the requirements of these regulations.

The periodic inspection and test body shall be notified of the results of any audit. The notification shall contain the conclusions of the audit and any corrective actions required.

6.2.2.6.3.3 *Maintenance of the quality system*

The periodic inspection and test body shall maintain the quality system as approved in order that it remains adequate and efficient.

The periodic inspection and test body shall notify the competent authority that approved the quality system, of any intended changes, in accordance with the process for modification of an approval in 6.2.2.6.4.6.

6.2.2.6.4 *Approval process for periodic inspection and test bodies*

Initial approval

6.2.2.6.4.1 A body desiring to perform periodic inspection and test of pressure receptacles in accordance with a pressure receptacle standard and these regulations shall apply for, obtain, and retain an Approval Certificate issued by the competent authority.

This written approval shall, on request, be submitted to the competent authority of a country of use.

6.2.2.6.4.2 An application shall be made for each periodic inspection and test body and shall include:

- (a) the name and address of the periodic inspection and test body and, if the application is submitted by an authorised representative, its name and address;
- (b) the address of each facility performing periodic inspection and test;
- (c) the name and title of the person(s) responsible for the quality system;
- (d) the designation of the pressure receptacles, the periodic inspection and test methods, and the relevant pressure receptacle standards encompassed by the quality system;
- (e) documentation on each facility, the equipment, and the quality system as specified under 6.2.2.6.3.1;
- (f) the qualifications and training records of the periodic inspection and test personnel; and
- (g) details of any refusal of approval of a similar application by any other competent authority.

6.2.2.6.4.3 The competent authority shall:

- (a) examine the documentation to verify that the procedures are in accordance with the requirements of the relevant pressure receptacle standards and these regulations; and

- (b) conduct an audit in accordance with 6.2.2.6.3.2 to verify that the inspections and tests are carried out as required by the relevant pressure receptacle standards and these regulations, to the satisfaction of the competent authority.

6.2.2.6.4.4 After the audit has been carried out with satisfactory results and all applicable requirements of 6.2.2.6.4 have been satisfied, an Approval Certificate shall be issued. It shall include the name of the periodic inspection and test body, the registered mark, the address of each facility, and the necessary data for identification of its approved activities (e.g. designation of pressure receptacles, periodic inspection and test method and pressure receptacle standards).

6.2.2.6.4.5 If the periodic inspection and test body is denied approval, the competent authority shall provide written detailed reasons for such denial.

Modifications to periodic inspection and test body approvals

6.2.2.6.4.6 Following approval, the periodic inspection and test body shall notify the issuing competent authority of any modifications to the information submitted under 6.2.2.6.4.2 relating to the initial approval.

The modifications shall be evaluated in order to determine whether the requirements of the relevant pressure receptacle standards and these regulations will be satisfied.

An audit in accordance with 6.2.2.6.3.2 may be required.

The competent authority shall accept or reject these modifications in writing, and an amended Approval Certificate shall be issued as necessary.

6.2.2.6.4.7 Upon request, the competent authority shall communicate to any other competent authority, information concerning initial approvals, modifications of approvals, and withdrawn approvals.

6.2.2.6.5 *Periodic inspection and test and certification*

The application of the periodic inspection and test marking to a pressure receptacle shall be considered a declaration that the pressure receptacle complies with the applicable periodic inspection and test standards and the requirements of these regulations. The periodic inspection and test body shall affix the periodic inspection and test marking, including its registered mark, to each approved pressure receptacle (see 6.2.2.7.7).

A record certifying that a pressure receptacle has passed the periodic inspection and test shall be issued by the periodic inspection and test body, before the pressure receptacle is filled.

6.2.2.6.6 *Records*

The periodic inspection and test body shall retain records of pressure receptacle periodic inspection and tests (both passed and failed) including the location of the test facility, for not less than 15 years.

The owner of the pressure receptacle shall retain an identical record until the next periodic inspection and test unless the pressure receptacle is permanently removed from service.

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Proposal 8

Amend the existing text in 6.2.2.6 as shown. The Secretariat is asked to re-number 6.2.2.7 as 6.2.2.8 and check cross-references.

6.2.2.67 Marking of refillable UN ~~certified-refillable~~ pressure receptacles

Refillable UN ~~certified-refillable~~ pressure receptacles shall be marked clearly and legibly with certification, operational and manufacturing ~~and gas or pressure receptacle specific~~ 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 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” mark-UN packaging symbol~~, the minimum size of the marks shall be 5mm 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” mark UN packaging symbol~~ shall be 10 mm for pressure receptacles with a diameter greater than or equal to 140 mm and 5mm for pressure receptacles with a diameter less than 140 mm.

6.2.2.67.1 The following certification marks shall be applied:

- (a) The UN packaging symbol



This symbol shall only be marked on pressure receptacles which conform to the requirements of these model regulations for UN ~~certified~~ pressure receptacles;

- (b) The technical standard (e.g. ISO 9809-1) used for design, manufacture and testing;
- (c) The character(s) identifying the country of approval as indicated by the distinguishing signs of motor vehicles in international traffic;
- (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. “/”).

6.2.2.67.2 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 ~~empty~~ 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, valve cap or valve guard, any coating, or porous mass for acetylene. The ~~empty~~ 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;

- (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 ~~intended for the transport of~~ compressed gases, UN 1001 acetylene, dissolved and UN 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 in bar preceded by the letters “MAWP”;
- (j) In the case of pressure receptacles for liquefied gases and refrigerated liquefied gases, the water capacity in litres expressed to three ~~digits~~ 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 digits after the decimal point may be neglected;
- (k) In the case of pressure receptacles for UN 1001 acetylene, dissolved, the total of the mass of the empty receptacle, the fittings and accessories not removed during filling, the porous ~~material~~ mass, the solvent and the saturation gas expressed to two significant figures rounded down to the last digit followed by the letters “KG”;
- (l) In the case of pressure receptacles for UN 3374 acetylene, solvent free, the total of the mass of the empty receptacle, the fittings and accessories not removed during filling and the porous ~~material~~ mass expressed to two significant figures rounded down to the last digit followed by the letters “KG”;

6.2.2.67.3 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;
- (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 signs of motor vehicles in international traffic. The country mark and the manufacturer’s mark shall be separated by a space or slash;
- (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 11114-1 :1997);

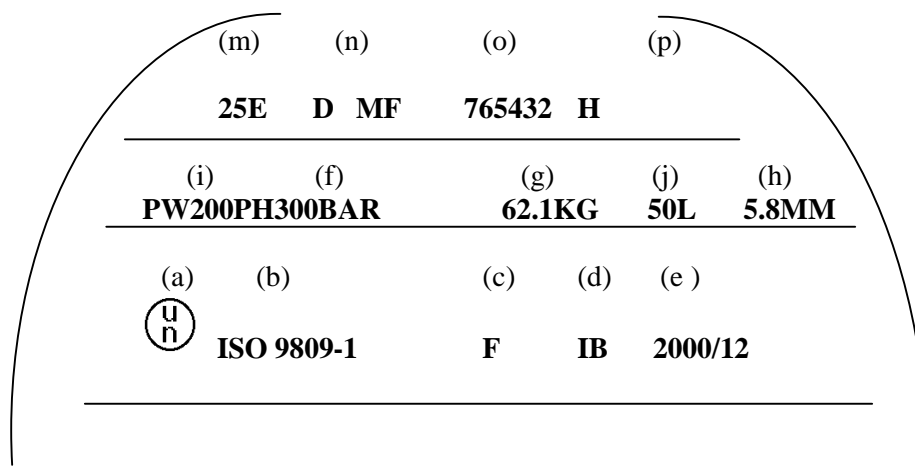
6.2.2.67.4 The above marks shall be placed in three groups ~~as shown in the example below~~:

- Manufacturing marks shall be the top grouping and shall appear consecutively in the sequence given in 6.2.2.67.3.

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- The operational marks in 6.2.2.7.2 shall be the middle grouping ~~shall include and the test pressure (f) which shall be immediately preceded by the working pressure (i) when the latter is required.~~
- Certification marks shall be the bottom grouping and shall appear in the sequence given in 6.2.2.67.1.

The following is an example of the markings applied to a cylinder.



6.2.2.67.5 Other marks are allowed in areas other than the side wall, provided they are made in low stress areas and are not of a size and depth that will create harmful stress concentrations. In the case of closed cryogenic receptacles, such marks may be on a separate plate attached to the outer jacket. Such marks shall not conflict with required marks.

6.2.2.67.6 In addition to the preceding marks, each refillable pressure receptacle that meets the periodic and test requirements of 6.2.2.4 shall be marked indicating:

- (a) the character(s) identifying the country authorizing the body performing the periodic inspection and test. This marking is not required if this body is approved by the competent authority of the country approving manufacture;
- (b) the registered mark of the body authorised by the competent authority for performing periodic inspection and test;
- (c) The date of the periodic inspection and test, the year (two digits) followed by the month (two digits) separated by a slash (i.e. “/”). Four digits may be used to indicate the year.

The above marks shall appear consecutively in the sequence given.

~~the date (year (two digits) followed by the and month) of the last periodic inspection and the registered mark of the inspection body authorized by the competent authority of the country of use.~~

The Secretariat is asked to change “UN non-refillable” to “non-refillable UN” in the renumbered 6.2.2.8.

Proposal 9

Insert under 4.2.5.3 a new TP3X as follows:

"TP3X Portable tanks need not be subjected to the impact test in 6.7.4.14.1 if the portable tank is marked "NOT FOR RAIL TRANSPORT" on the plate specified in 6.7.4.15.1 and also in letters of at least 10 cm high on both sides of the outer jacket."

Add "TP3X" in column 11 of the Dangerous Goods List for

- UN 1963, Helium, refrigerated liquid and
 - UN 1966, Hydrogen, refrigerated liquid.
-