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**ECONOMIC COMMISSION FOR EUROPE**

INLAND TRANSPORT COMMITTEE

Working Party on the Transport of Dangerous Goods

Joint Meeting of the RID Safety Committee and the  
Working Party on the Transport of Dangerous Goods  
(Geneva, 13-23 September 2005)

**REPORTS OF INFORMAL WORKING GROUPS**

**Report of the informal working group on the revision of Chapter 6.2**

**Transmitted by the European Industrial Gases Association (EIGA) \*/**

**Introduction**

The following is the outcome of the deliberations of the informal working group acting on the instructions in TRANS/WP.15/AC.1/96 paragraphs 39 to 41 and TRANS/WP.15/AC.1/98 paragraphs 63 to 66.

**Report from the Working Group**

1. The working group met on 18 April, 20 May and 9-10 June and representatives of Belgium, France, Germany, Sweden, Switzerland, the United Kingdom, the European Commission, the European Cylinder Makers Association (ECMA), the European Liquefied Petroleum Gas Association (AEGPL), the Independent Controllers Association (ACI) and the European Industrial Gases Association (EIGA) participated.

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\* / Circulated by the Central Office for International Carriage by Rail (OCTI) under the symbol OCTI/RID/GT-III/2005/47.

2. Considering the revised remit from the Joint Meeting, it was decided to split the work into two phases. The first phase would restructure the chapter into the format agreed by the Joint Meeting and the second would be to develop a complete proposal for incorporating European Directive 99/36/EC on Transportable Pressure Equipment (TPED). During the first phase, technical changes would be considered as necessary, but procedural requirements for conformity assessment would be unchanged. The rationalisation of the procedural parts and the incorporation of the procedures of the TPED were deferred to a second phase.

3. The proposal contained in this document is the outcome of the first restructuring phase. It is ready for adoption into RID/ADR 2007, and the consensus in the working group was that this revised Chapter 6.2 should be approved now. However, the majority view was its implementation should be deferred until the next biennium, when the full proposal incorporating the TPED is available. This should reduce re-training costs by concentrating these significant changes into one biennium.

4. The working group will continue its work on 18-19 July and an INF. Paper will be issued after this meeting giving an update. The paper will possibly include some further comments on and minor amendments to this proposal.

5. The working group asks for a decision from the Joint Meeting to agree to the principle of incorporating the TPED into the 2009 editions of the RID/ADR. Apart from the convenience to EU member countries of incorporating the TPED, the project will be generally beneficial since it should:

- reduce the complications caused by the several conformity assessment systems,
- and
- clarify the roles and responsibilities of competent authorities.

The working group has already identified many places in Chapter 6.2 where competent authority prerogatives can create disharmony between countries and inhibit free transport of dangerous goods, and these are highlighted in the proposal text.

6. If the Joint Meeting decides to adopt the TPED into the RID/ADR, there will need to be a parallel project covering transport in tanks by revising Chapters 6.7 and 6.8. The working group suggests that one possible outcome could be the development of a Chapter 6.12 which defines a conformity assessment system suitable for all forms of tanks, battery vehicles, battery wagons, MEGCs and pressure receptacles.

7. The working group requests the Joint Meeting to set up second working group (not chaired by EIGA) to develop a proposal covering also Chapters 6.7 and 6.8. The group should include tank experts and members of the Chapter 6.2 working group.

8. The proposal below gives the full text with comments from the working group shown in boxes at the relevant points, but some issues require further explanation to enable decisions from the Joint Meeting.

9. Paragraph 6.2.1.3.4, suggested amendment to P200 (2) concerning pressure relief devices. The bracketed UN text presents the following problems:

- Which is the country of use, the country where the pressure receptacle is filled or where emptied?
- If individual countries specify that PRDs shall or shall not be used, it will prevent transport of the pressure receptacles in countries which apply differing rules.
- If competent authority prescriptions are allowed, then the free use objective of the TPED will be frustrated.

The working group proposes that the existing RID/ADR situation is preserved by deleting the text in square brackets.

10. The above example of the difficulty identifying the relevant competent authority is only one of many concerning competent authority decisions and this issue will become more acute as the TPED is incorporated. The working group has highlighted the words competent authority to enable it to conduct a thorough review of issues and to develop suitable solutions. A typical example occurs in 6.2.1.4.1 (g) where the competent authority has to decide on the use of a hydraulic or gas pressure test. Is this the competent authority for worker safety at the place of test or the competent authority responsible for appointing the inspection body who may be in another country? The working group will develop clarification for Section 6.2.3.

11. The country of approval is specified in paragraph 6.2.2.7.1. Is this the country whose competent authority approved the inspection body which approved the design type or is it the country which approved the inspection body which approved the individual receptacle at time of manufacture? Is country marking necessary when the TPED is operative? The working group will also address these questions.

12. The European Commission indicated that the gas cylinder directives 85/527/EEC, 85/526/EEC and 85/527/EEC will be revoked. The competent authorities and industry should inform the members of the working group if this will present difficulties and what transitional measures would be required.

13. Standards present a further set of issues and the working group requests that the Joint Meeting commissions its Standards Working Group to examine the following issues:

- (a) Paragraph 6.2.2 NOTE; this permits the competent authority to authorise more recently published versions of the listed standards. Is this satisfactory for RID/ADR or should we adopt a more uniform approach in which more recent editions are permitted only when adopted by the Joint Meeting for reference in the next edition of the regulations?
- (b) Paragraph 6.2.3.1 refers to the EN 45000 series. The Chapter 6.2 working group recommends that a specific list of relevant standards be developed. It also noted that complementary standards in the ISO 17000 standards exist or are being developed and would like these also to be considered for inclusion in this list.
- (c) The Chapter 6.2 working group has proposed that all standards in 6.2.2 are applicable for non-UN pressure receptacles; the standards working group should endorse

this. Also, it should consider restricting the list of standards in paragraph 6.2.4 only to those standards which are additional to those in 6.2.2. If this is agreed, then it should develop a definitive list of standards for section 6.2.4 taking into account any European annexes in EN ISO standards which restrict or modify the choices in the ISO standard. Also some EN standards may be generally equivalent to the ISO standard (e.g. EN 849 and ISO 10297) but contain more stringent requirements and should therefore take precedence for non-UN receptacles in RID/ADR.

### **Proposal**

In Sections 6.2.1 and 6.2.2, the text is from the 14<sup>th</sup> revised edition of the UN Recommendations on the Transport of Dangerous Goods and departures from the text of the UN are shown underlined. In Sections 6.2.3 to 6.2.5 the text is from RID/ADR 2005, again with underlining showing the changes. An appendix shows text discarded from RID/ADR with reasons for its discontinuance. There are no changes in the 12 pages of UN text from paragraph 6.2.2.1 to 6.2.2.6.6, but it is shown for completeness.

CHAPTER 6.2 .....	5
6.2.1 General requirements.....	5
6.2.2 Requirements for UN pressure receptacles .....	13
6.2.3 General Requirements for non-UN pressure receptacles .....	32
6.2.4 Requirements for <u>non-UN</u> pressure receptacles designed, constructed and tested according to standards .....	38
6.2.5 Requirements for <u>non-UN</u> pressure receptacles not designed, constructed and tested according to standards .....	42
6.2.6 General requirements for aerosol dispensers and small receptacles containing gas (gas cartridges) .....	48
Appendix .....	49

## CHAPTER 6.2

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

#### 6.2.1 General requirements

*NOTE: ~~For aerosol dispensers and small receptacles containing gas (gas cartridges) are subject only to the requirements of 6.2.6 see 6.2.4.~~*

#### 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~~ carriage and use.

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 Regulations may be used if approved by the competent authorities in the countries of transport and use. (Reserved)~~

1. The Note is amended to clarify that aerosol dispensers and gas cartridges are uniquely not subject to the sections preceding 6.2.6.
2. Carriage replaces transport as is customary in RID/ADR.
3. The working group considered it important to specify that these regulations cover design for safe use, as they already do in RID/ADR. The UK will make a proposal to the UN.
4. 6.2.1.1.2 is deleted since this point is covered in the existing ADR 6.2.3 and is more appropriately placed in the new 6.2.5

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.

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

6.2.1.1.6 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 toxic liquefied gases, means shall be provided to ensure that each pressure receptacle can be filled separately and that no interchange of pressure receptacle contents can occur during ~~transport~~-carriage.

*NOTE: Toxic liquefied gases have the classification codes 2T, 2TF, 2TC, 2TO, 2TFC or 2TOC*

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.

*NOTE: With regard to the impact strength, 6.8.5.3 gives details of test requirements which may be used.*

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 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 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~~-carriage of refrigerated liquefied gases having a boiling point below  $-182^{\circ}\text{C}$  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.

**6.2.1.2        *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~~carriage 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.

The exact meaning of the text of 6.2.1.3.1 is not clear. EIGA will make a proposal for change at the UN. This is a new requirement for RID/ADR, but it is known that valves and bundle manifolds made to current standards meet this requirement.

- 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~~carriage. 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 4.1.6.4-8.

**Additional amendments to RID/ADR 4.1.6.8 to align with the UN Model Regulations**

- (i) Delete '(d) Valves are placed in a protective frame;' and renumber (e) and (f) accordingly. This text, which appears in RID/ADR only, allows a technical solution believed not to be used any more. The use of a 'frame' protecting a valve would come within the meaning of a guard or shroud and as such shall be subject to the drop test specified in EN 962 or ISO 11117.
- (ii) Add a new sentence to the new (e); 'For UN pressure receptacles the packaging as prepared for carriage shall be capable of meeting the drop test specified in 6.1.5.3 at the packing group I performance level.'

Explanatory note: The use of PG I packagings was discussed at previous Joint Meetings when UN pressure receptacle text was adopted and it was agreed that such a robust packaging has not been found necessary in European land transport.

- 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 pressure relief devices as specified in P200 (1-2) or 6.2.1.3.6.4 and 6.2.1.3.6.5. 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 air in such a manner as to prevent any impingement of escaping gas upon the pressure receptacle itself under normal conditions of ~~transport~~ carriage.

An additional amendment to RID/ADR P200 (2) to align it with the UN Model Regulations. Add the following text to P200 (2):

The following requirements in this paragraph shall be applied to UN pressure receptacles: Pressure relief devices shall be fitted on pressure receptacles used for the transport of UN No. 1013 carbon dioxide and UN No. 1070 nitrous oxide. [Other pressure receptacles shall be fitted with a pressure relief device if specified by the **competent authority of the country of use**. The type of pressure relief device, the set to discharge pressure and relief capacity of pressure relief devices, if required, shall be specified by the **competent authority of the country of use**.]

The working group recommends deviating from the Un Model Regulations by excluding the text between square brackets; the reasons are explained in the report of the working group paragraph 9.

NOTE: The format of UN Numbers has been changed from UN format (UN 1013) to the current RID/ADR format (UN No. 1013). The working group asks the Secretariat to decide which format should be used.

- 6.2.1.3.5 Pressure receptacles whose filling is measured by volume shall be provided with a level indicator.
- 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~~ carriage 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 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, maximum allowable working pressure (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.*

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| <ol style="list-style-type: none"><li>1. Maximum allowable working pressure is written in full for user-friendliness.</li><li>2. A consequential amendment is required in ADR/RID 1.2.1 for the reference in the <b>NOTE 2</b> in the definition of <i>maximum working pressure</i> as follows.</li></ol> |
|---|

***NOTE 2:** For closed cryogenic receptacles, see NOTE to ~~6.2.1.3.3.5~~ 6.2.1.3.6.5.*

- 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**<sup>1</sup>.

#### **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;
- (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 **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

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<sup>1</sup> See for example CGA Publications S-1.2-2003 "Pressure Relief Device Standards-Part 2-Cargo and Portable Tanks for Compressed Gases" and S-1.1-2003 "Pressure Relief Device Standards-Part 1-Cylinders for Compressed Gases".

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~~-carriage of UN No. 1001 acetylene, dissolved, and UN No. 3374 acetylene, solvent free, shall be inspected to ensure proper installation and condition of the porous material 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 jacket.

Additionally, all closed cryogenic receptacles shall undergo the initial 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 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. internal inspection, verification of minimum wall thickness);
- (c) Checking of the threads if there is evidence of corrosion or 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 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 or tubes may be replaced by an equivalent method based on acoustic emission testing, ultrasonic*

*examination or a combination of acoustic emission testing and ultrasonic examination.*

**NOTE 3:** *For periodicities see P200.*

NOTE 3 is added for user-friendliness.

A consequential amendment is required in 4.1.4.1 P200 (8) and 4.1.6.10; change the reference from 6.2.1.6 to 6.2.1.5. The existing reference to 6.2.1.5 in 4.1.6.4 is wrong, but becomes correct with this the change of number of the periodic inspection paragraph. This correction to the reference in sub-section 4.1.6.4 RID/ADR should be included in the next corrigendum.

6.2.1.5.2 For pressure receptacles intended for the ~~transport-carriage~~ of UN No. 1001 acetylene, dissolved and UN No. 3374 acetylene, solvent free, only the external condition (corrosion, deformation) and the condition of the porous material (loosening, settlement) shall be required to be examined.

**6.2.1.6** *Approval of pressure receptacles*

6.2.1.6.1 The conformity of pressure receptacles shall be assessed at time of manufacture as required by the **competent authority**. Pressure 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.

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

**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 proficiency test of a manufacturer shall in all instances be carried out by an inspection body approved by the **competent authority** of the country of approval.

**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.

**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.

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

**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 UN cylinders, except that inspection requirements related to the conformity assessment system and approval shall be in accordance with 6.2.2.5:

ISO 9809-1:1999	Gas cylinders – Refillable seamless steel gas cylinders – Design, construction and testing – Part 1: Quenched and tempered steel cylinders with tensile strength less than 1100 MPa <i>NOTE: The note concerning the F factor in section 7.3 of this standard shall not be applied for UN cylinders.</i>
ISO 9809-2:2000	Gas cylinders – Refillable seamless steel gas cylinders – Design, construction and testing – Part 2: Quenched and tempered steel cylinders with tensile strength greater than or equal to 1100 MPa
ISO 9809-3:2000	Gas cylinders – Refillable seamless steel gas cylinders – Design, construction and testing – Part 3: Normalized steel cylinders
ISO 7866:1999	Gas cylinders – Refillable seamless aluminium alloy gas cylinders – Design, construction and testing <i>NOTE: The note concerning the F factor in section 7.2 of this standard shall not be applied for UN cylinders. Aluminium alloy 6351A – T6 or equivalent shall not be authorized.</i>
ISO 11118:1999	Gas cylinders – Non-refillable metallic gas cylinders – Specification and test methods
ISO 11119-1:2002	Gas cylinders of composite construction – Specification and test methods – Part 1: Hoop wrapped composite gas cylinders

ISO11119-2:2002	Gas cylinders of composite construction – Specification and test methods – Part 2: Fully wrapped fibre reinforced composite gas cylinders with load-sharing metal liners
ISO11119-3:2002	Gas cylinders of composite construction – Specification and test methods – Part 3: Fully wrapped fibre reinforced composite gas cylinders with non-load-sharing metallic or non-metallic liners

**NOTE 1:** *In the above referenced standards composite cylinders shall be designed for unlimited service life.*

**NOTE 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.*

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

ISO 11120:1999	Gas cylinders – Refillable seamless steel tubes for compressed gas transport, of water capacity between 150 l and 3000 l – Design, construction and testing <b>NOTE:</b> <i>The note concerning the F factor in section 7.1 of this standard shall not be applied for UN tubes</i>
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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:

ISO 9809-1:1999	Gas cylinders – Refillable seamless steel gas cylinders – Design, construction and testing – Part 1: Quenched and tempered steel cylinders with tensile strength less than 1100 MPa <b>NOTE:</b> <i>The note concerning the F factor in section 7.3 of this standard shall not be applied for UN cylinders.</i>
ISO 9809-3:2000	Gas cylinders – Refillable seamless steel gas cylinders – Design, construction and testing – Part 3: Normalized steel cylinders
ISO 11118:1999	Gas cylinders – Non-refillable metallic gas cylinders – Specification and test methods

For the porous material in the cylinder:

ISO 3807-1:2000	Cylinders for acetylene – Basic requirements – Part 1: Cylinders without fusible plugs
ISO 3807-2:2000	Cylinders for acetylene – Basic requirements – Part 2: Cylinders with fusible plugs

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

ISO 21029-1:2004	Cryogenic vessels – Transportable vacuum insulated vessels of not more than 1000 l volume – Part 1: Design, fabrication, inspection and tests
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### 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 ~~transported~~ carried (e.g. packing instruction P200), the following standards apply to material compatibility:

ISO 11114-1:1997	Transportable gas cylinders – Compatibility of cylinder and valve materials with gas contents – Part 1: Metallic materials
ISO 11114-2:2000	Transportable gas cylinders – Compatibility of cylinder and valve materials with gas contents – Part 2: Non-metallic materials

### 6.2.2.3 *Service equipment*

The following standards apply to closures and their protection:

ISO 11117:1998	Gas cylinders – Valve protection caps and valve guards for industrial and medical gas cylinders – Design, construction and tests
ISO 10297:1999	Gas cylinders – Refillable gas cylinder valves – Specification and type testing

**6.2.2.4**      *Periodic inspection and test*

The following standards apply to the periodic inspection and testing of UN cylinders:

ISO 6406:1992	Periodic inspection and testing of seamless steel gas cylinders
ISO 10461:1993	Seamless aluminium – alloy gas cylinders – Periodic inspection and testing
ISO 10462:1994	Cylinders for dissolved acetylene – Periodic inspection and maintenance
ISO 11623:2002	Transportable gas cylinders – Periodic inspection and testing of composite gas cylinders

**6.2.2.5**      *Conformity assessment system and approval for manufacture of pressure receptacles*6.2.2.5.1      *Definitions*

For the purposes of this 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;

6.2.2.5.2      *General requirements****Competent Authority***

6.2.2.5.2.1      The competent authority that approves the pressure receptacle shall approve the conformity assessment system for the purpose of ensuring that pressure receptacles conform to the requirements of these Regulations. In instances where the competent authority that approves a pressure receptacle is not the competent authority in the country of manufacture, the marks of the approval country and the country of manufacture shall be indicated in the pressure receptacle marking (see 6.2.2.7 and 6.2.2.8).

The competent authority of the country of approval shall supply, upon request, evidence demonstrating compliance to this conformity assessment system to its counterpart in a country of use.

6.2.2.5.2.2 The competent authority may delegate its functions in this conformity assessment system in whole or in part.

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

*Inspection body*

6.2.2.5.2.4 The inspection body shall be approved by the competent authority for the inspection of pressure receptacles 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 of the commercial and proprietary activities of the manufacturer and other bodies;
- (e) maintain clear demarcation between actual inspection body functions and unrelated functions;
- (f) operate a documented quality system;
- (g) ensure that the tests and inspections specified in the relevant pressure receptacle standard and these Regulations are performed; and
- (h) maintain an effective and appropriate report and record system in accordance with 6.2.2.5.6.

6.2.2.5.2.5 The inspection body shall perform design type approval, pressure receptacle production testing and inspection, and certification to verify conformity with the relevant pressure receptacle standard (see 6.2.2.5.4 and 6.2.2.5.5).

*Manufacturer*

6.2.2.5.2.6 The manufacturer shall:

- (a) operate a documented quality system in accordance with 6.2.2.5.3;
- (b) apply for design type approvals in accordance with 6.2.2.5.4;

- (c) select an inspection body from the list of approved inspection bodies maintained by the competent authority in the country of approval; and
- (d) maintain records in accordance with 6.2.2.5.6.

*Testing laboratory*

6.2.2.5.2.7 The testing laboratory shall have:

- (a) staff with an organisational structure, sufficient in number, competence, and skill; and
- (b) suitable and adequate facilities and equipment to perform the tests required by the manufacturing standard to the satisfaction of the inspection body.

6.2.2.5.3 *Manufacturer's quality system*

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

The contents shall in particular include adequate descriptions of:

- (a) the organisational structure and responsibilities of personnel with regard to design and product quality;
- (b) the design control and design verification techniques, processes, and procedures that will be used when designing the pressure receptacles;
- (c) the relevant pressure receptacle manufacturing, quality control, quality assurance and process operation instructions that will be used;
- (d) quality records, such as inspection reports, test data and calibration data;
- (e) management reviews to ensure the effective operation of the quality system arising from the audits in accordance with 6.2.2.5.3.2;
- (f) the process describing how customer requirements are met;
- (g) the process for control of documents and their revision;
- (h) the means for control of non-conforming pressure receptacles, purchased components, in - process and final materials; and
- (i) training programmes and qualification procedures for relevant personnel.

6.2.2.5.3.2 Audit of the quality system

The quality system shall be initially assessed to determine whether it meets the requirements in 6.2.2.5.3.1 to the satisfaction of the competent authority.

The manufacturer shall be notified of the results of the audit. The notification shall contain the conclusions of the audit and any corrective actions required.

Periodic audits shall be carried out, to the satisfaction of the competent authority, to ensure that the manufacturer maintains and applies the quality system. Reports of the periodic audits shall be provided to the manufacturer.

6.2.2.5.3.3 Maintenance of the quality system

The manufacturer shall maintain the quality system as approved in order that it remains adequate and efficient. The manufacturer shall notify the competent authority that approved the quality system, of any intended changes. The proposed changes shall be evaluated in order to determine whether the amended quality system will still satisfy the requirements in 6.2.2.5.3.1.

6.2.2.5.4 *Approval process*

*Initial design type approval*

6.2.2.5.4.1 The initial design type approval shall consist of approval of the manufacturer's quality system and approval of the pressure receptacle design to be produced. An application for an initial design type approval shall meet the requirements of 6.2.2.5.4.2 to 6.2.2.5.4.6 and 6.2.2.5.4.9.

6.2.2.5.4.2 A manufacturer desiring to produce pressure receptacles in accordance with a pressure receptacle standard and these Regulations shall apply for, obtain, and retain a design type approval certificate issued by the competent authority in the country of approval for at least one pressure receptacle design type in accordance with the procedure given in 6.2.2.5.4.9. This certificate shall, on request, be submitted to the competent authority of the country of use.

6.2.2.5.4.3 An application shall be made for each manufacturing facility and shall include:

- (a) the name and registered address of the manufacturer and in addition, if the application is submitted by an authorised representative, its name and address;
- (b) the address of the manufacturing facility (if different from the above);
- (c) the name and title of the person(s) responsible for the quality system;

- (c) the designation of the pressure receptacle and the relevant pressure receptacle standard;
- (e) details of any refusal of approval of a similar application by any other competent authority;
- (f) the identity of the inspection body for design type approval;
- (g) documentation on the manufacturing facility as specified under 6.2.2.5.3.1; and
- (h) the technical documentation required for design type approval, which shall enable verification of the conformity of the pressure receptacles with the requirements of the relevant pressure receptacle design standard. The technical documentation shall cover the design and method of manufacture and shall contain, as far as is relevant for assessment, at least the following:
  - (i) pressure receptacle design standard, design and manufacturing drawings, showing components and subassemblies, if any;
  - (ii) descriptions and explanations necessary for the understanding of the drawings and intended use of the pressure receptacles;
  - (iii) a list of the standards necessary to fully define the manufacturing process;
  - (iv) design calculations and material specifications; and
  - (v) design type approval test reports, describing the results of examinations and tests carried out in accordance with 6.2.2.5.4.9.

6.2.2.5.4.4 An initial audit in accordance with 6.2.2.5.3.2 shall be performed to the satisfaction of the competent authority.

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

6.2.2.5.4.6 Following approval, changes to the information submitted under 6.2.2.5.4.3 relating to the initial approval shall be provided to the competent authority.

*Subsequent design type approvals*

6.2.2.5.4.7 An application for a subsequent design type approval shall encompass the requirements of 6.2.2.5.4.8 and 6.2.2.5.4.9, provided a manufacturer is in the possession of an initial design type approval. In such a case, the manufacturer's quality system according to 6.2.2.5.3 shall have been approved during the initial design type approval and shall be applicable for the new design.

6.2.2.5.4.8 The application shall include:

- (a) the name and address of the manufacturer and in addition, if the application is submitted by an authorised representative, its name and address;
- (b) details of any refusal of approval of a similar application by any other competent authority;
- (c) evidence that initial design type approval has been granted; and
- (d) the technical documentation, as described in 6.2.2.5.4.3 (h).

*Procedure for design type approval*

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) select pressure receptacles from a prototype production lot and 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.

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

6.2.2.5.4.10 Modifications to approved design types

The manufacturer shall either:

- (a) inform the issuing competent authority of modifications to the approved design type, where such modifications do not constitute a new design, as specified in the pressure receptacle standard; or
- (b) request a subsequent design type approval where such modifications constitute a new design according to the relevant pressure receptacle standard. This additional approval shall be given in the form of an amendment to the original design type approval certificate.

6.2.2.5.4.11 Upon request, the competent authority shall communicate to any other competent authority, information concerning design type approval, modifications of approvals and withdrawn approvals.

6.2.2.5.5 *Production inspection and certification*

*General requirements*

An inspection body, or its delegate, shall carry out the inspection and certification of each pressure receptacle. The inspection body selected by the manufacturer for inspection and testing during production may be different from the inspection body used for the design type approval testing.

Where it can be demonstrated to the satisfaction of the inspection body that the manufacturer has trained competent inspectors, independent of the manufacturing operations, inspection may be performed by those inspectors. In such a case, the manufacturer shall maintain training records of the inspectors.

The inspection body shall verify that the inspections by the manufacturer, and tests performed on those pressure receptacles, fully conform to the standard and the requirements of these Regulations. Should non-conformance in conjunction with this inspection and testing be determined, the permission to have inspection performed by the manufacturer's inspectors may be withdrawn.

The manufacturer shall, after approval by the inspection body, make a declaration of conformity with the certified design type. The application of the pressure receptacle certification marking shall be considered a declaration that the pressure receptacle complies with the applicable pressure receptacle standards and the requirements of this conformity assessment system and these Regulations. The inspection body shall affix or delegate the manufacturer to affix the pressure receptacle certification marking and the registered mark of the inspection body to each approved pressure receptacle.

A certificate of compliance, signed by the inspection body and the manufacturer, shall be issued before the pressure receptacles are filled.

6.2.2.5.6 *Records*

Design type approval and certificate of compliance records shall be retained by the manufacturer and the inspection body for not less than 20 years.

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

6.2.2.6.1 *Definition*

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 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).

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 met 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 pressure receptacle 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 6.2.2.7.6).

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.

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

Refillable UN pressure 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 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.

6.2.2.7.1 The following certification marks shall be applied:

- (a) The United Nations packaging symbol  ;

This symbol shall only be marked on pressure receptacles which conform to the requirements of these Regulations for UN 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;

Country of approval needs clarification; see working group report paragraph 11

- (d) The identity mark or stamp of the inspection body that is registered with the **competent authority of the country authorizing the marking**;

Note: This requirement to be clarified in 6.2.3 in the frame of integrating TPED  
month (two digits) separated by a slash (i.e. “/”);

6.2.2.7.2 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 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 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”;
- (j) In the case of pressure receptacles for liquefied gases and refrigerated liquefied gases, the water capacity in litres expressed to three significant digits 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, the total of the mass of the empty receptacle, the fittings and accessories 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;
- (l) In the case of pressure receptacles for UN No. 3374 acetylene, solvent free, the total of the mass of the empty receptacle, the fittings and accessories not removed during filling any coating, and the porous material 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;

6.2.2.7.3 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;

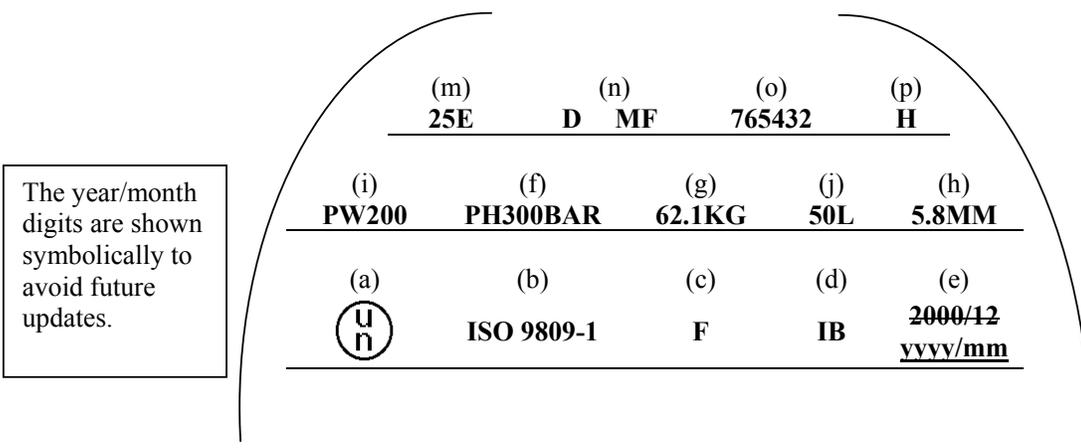
This text to be clarified when integrating the TPED

- (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~~-carriage of gases with a risk of hydrogen embrittlement, the letter "H" showing compatibility of the steel (see ISO 11114-1:1997);

6.2.2.7.4 The above marks shall be placed in three groups:

- Manufacturing marks shall be the top grouping and shall appear consecutively in the sequence given in 6.2.2.7.3.
- The operational marks in 6.2.2.7.2 shall be the middle grouping and the test pressure (f) 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 6.2.2.7.1.

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



6.2.2.7.5 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.

6.2.2.7.6 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;

When integrating the TPED section 6.2.3 could clarify that country marking is not necessary for  $\pi$ -marked cylinders.

- (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 order is different in TPED; to be clarified when integrating the TPED

6.2.2.7.7 For acetylene cylinders, with the agreement of the **competent authority**, the date of the most recent periodic inspection and the stamp of the body performing the periodic inspection and test may be engraved on a ring held on the cylinder by the valve. The ring shall be configured so that it can only be removed by disconnecting the valve from the cylinder.

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

Non-refillable UN pressure receptacles 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. Except when stencilled, 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). 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 with a diameter greater than or equal to 140 mm and 5 mm for

pressure receptacles with a diameter less than 140 mm. The minimum size of the “DO NOT REFILL” mark shall be 5 mm.

6.2.2.8.1 The marks listed in 6.2.2.7.1 to 6.2.2.7.3 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.

6.2.2.8.2 The requirements of 6.2.2.7.4 shall apply.

*NOTE: Non-refillable pressure receptacles may, on account of their size, substitute this marking by a label.*

6.2.2.8.3 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.

### **6.2.3 General requirements for non-UN pressure receptacles**

#### **6.2.3.1 Design and construction**

6.2.3.1.1 Pressure receptacles and their closures not designed, constructed, inspected, tested and approved according to the requirements of 6.2.2 shall be designed, constructed, inspected, tested and approved in accordance with the general requirements of 6.2.1 as amended by the requirements of this section and those of 6.2.4 or 6.2.5.

6.2.3.1.2 ~~Normally~~Whenever possible the wall thickness shall be determined by calculation, accompanied, if needed, by experimental stress analysis. Otherwise the wall thickness may be determined by experimental means.

Appropriate design calculations for the pressure envelope and supporting components shall be used to ensure the safety of the pressure receptacles concerned.

The minimum wall thickness to withstand pressure shall be calculated in particular with regard to:

- the calculation pressures, which shall not be less than the test pressure;
- the calculation temperatures allowing for appropriate safety margins;
- the maximum stresses and peak stress concentrations where necessary;
- factors inherent to the properties of the material.

The Working Group decided to clarify that calculation is the preferred method.
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- 6.2.3.1.3 For welded pressure receptacles, only metals of weldable quality whose adequate impact strength at an ambient temperature of  $-20\text{ }^{\circ}\text{C}$  can be guaranteed shall be used.

When integrating the TPED the working group will propose the insertion of a separate clause to allow contracting parties of countries with extremely low winter temperatures to specify lower ambient temperatures as permitted in Article 7 of the TPED.

- 6.2.3.1.4 For cryogenic receptacles, the impact strength to be established as required by 6.2.1.1.8.1 shall be tested as laid down in 6.8.5.3.

**6.2.3.2** *(Reserved)*

**6.2.3.3** *Service equipment*

- 6.2.3.3.1 Service equipment shall comply with 6.2.1.3.

6.2.3.3.2 *Openings*

Pressure drums may be provided with openings for filling and discharge and with other openings intended for level gauges, pressure gauges or relief devices. The number of openings shall be kept to a minimum consistent with safe operations. Pressure drums may also be provided with an inspection opening, which shall be closed by an effective closure.

6.2.3.3.3 *Fittings*

- (a) If cylinders are fitted with a device to prevent rolling, this device shall not be integral with the valve cap;
- (b) Pressure drums which are capable of being rolled shall be equipped with rolling hoops or be otherwise protected against damage due to rolling (e.g. by corrosion resistant metal sprayed on to the pressure receptacle surface);
- (~~c~~) Bundles of cylinders shall be fitted with appropriate devices ensuring that they can be handled and carried safely. The manifold shall have at least the same test pressure as the cylinders. The manifold and the master ~~cock~~-valve shall be situated so as to be protected against any damage;

EIGA will propose additional UN text to cover the requirements of these 2<sup>nd</sup> and 3<sup>rd</sup> sentences.

- (~~d~~) If level gauges, pressure gauges or relief devices are installed, they shall be protected in the same way as is required for valves in 4.1.6.8;

**6.2.3.4 Initial inspection and test**

6.2.3.4.1 New pressure receptacles shall be subjected to testing and inspection during and after manufacture in accordance with the requirements of 6.2.1.4 except that 6.2.1.4.1 (g) shall be replaced by the following:

- (g) A hydraulic pressure test. Pressure receptacles shall withstand the test pressure without undergoing permanent deformation or exhibiting cracks;

**6.2.3.5 Periodic inspection and test**

6.2.3.5.1 Periodic inspection and test shall be in accordance with 6.2.1.5.1

***NOTE-3:** With the agreement of the testing and certifying body approved by the competent authority of the country of approval<sup>2</sup>, the hydraulic pressure test of each welded steel cylinder intended for the carriage of gases of UN No. 1965, hydrocarbon gas mixture liquefied, n.o.s., with a capacity below 6,5 l may be replaced by another test ensuring an equivalent level of safety.*

6.2.3.5.2 ~~By derogation from 6.2.1.6.1 (d) e~~Closed cryogenic receptacles shall be subjected to periodic inspections and tests by a body authorised by the competent authority in accordance with the periodicity defined in P203 to verify external conditions, condition and operation of pressure relief devices and be subjected to a leakproofness test [at 90% of the maximum working pressure]. The leakproofness test shall be carried out with the gas contained in the pressure receptacle or with an inert gas. Checking shall be performed by means of a pressure gauge or by vacuum measurement. The thermal insulation need not be removed.

The above text is from RID/ADR 6.2.1.6.3 but introduces the periodic inspection body as described in the new (UN) 6.2.1.5 1. The NOTE is from RID/ADR 6.2.1.6.1. A consequential amendment to P203 (9) is necessary; the reference to 6.2.1.6 need to be changed to 6.2.3.5.2.

The Joint Meeting is invited to consider adopting the text in square brackets. The proposed value of the pressure used in the leakproofness test is in accordance with the requirement of 6.8.3.4.9.

**6.2.3.6 Approval of pressure receptacles**

This section will be reviewed as part of the integration of the TPED

6.2.3.6.1 The conformity of pressure receptacles, having a test pressure capacity product of more than 150 MPa.litre (1 500 bar.litre) with the provisions of Class 2, shall be assessed by one of the following methods:

- (a) Single pressure receptacles shall be examined, tested and approved by a ~~testing and certifying body~~ an inspection body approved by the **competent authority** of the country of approval<sup>2</sup>, on the basis of the technical documentation and declaration of the manufacturer on compliance with the relevant provisions of Class 2.

The technical documentation shall include full specifications on design and construction, and full documentation on the manufacturing and testing; or

- (b) The construction of the pressure receptacles shall be tested and approved by a ~~testing and certifying body~~ an inspection body approved by the **competent authority** of the country of approval<sup>2</sup> on the basis of the technical documentation with regard to their compliance with the relevant provisions of Class 2.

Pressure receptacles shall furthermore be designed, manufactured and tested according to a comprehensive quality assurance programme for design, manufacture, final inspection and testing. The quality assurance programme shall guarantee the conformity of the pressure receptacles with the relevant provisions of Class 2 and shall be approved and supervised by a ~~testing and certifying body~~ an inspection body approved by the **competent authority** of the country of approval<sup>2</sup>; or

- (c) The design type of the pressure receptacles shall be approved by a ~~testing and certifying body~~ an inspection body approved by the **competent authority** of the country of approval<sup>2</sup>. Any pressure receptacle of this design shall be manufactured and tested according to a quality assurance programme for production, final inspection and testing, which shall be approved and supervised by a ~~testing and certifying body~~ an inspection body approved by the **competent authority** of the country of approval<sup>2</sup>; or
- (d) The design type of the pressure receptacles shall be approved by a ~~testing and certifying body~~ an inspection body approved by the **competent authority** of the country of approval<sup>2</sup>. Any receptacle of this design shall be tested under the supervision of a ~~testing and certifying body~~ an inspection body approved by the **competent authority** of the country of approval<sup>2</sup> on the basis of a declaration of the manufacturer on compliance with the approved design and the relevant provisions of Class 2.

6.2.3.6.2 The conformity of pressure receptacles having a test pressure capacity product of more than 30 MPa.litre (300 bar.litre) and not more than 150 MPa.litre (1 500 bar.litre) with the provisions of Class 2 shall be assessed by one of the methods described in ~~6.2.1.4.1~~ 6.2.3.6.1 or by one of the following methods:

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<sup>2</sup> If the **country of approval** is not a contracting party to ADR, the **competent authority** of a contracting party to ADR.

- (a) The pressure receptacles shall be designed, manufactured and tested according to a comprehensive quality assurance programme for their design, manufacture, final inspection and testing, approved and supervised by a ~~testing and certifying body~~ an inspection body approved by the **competent authority** of the country of approval<sup>2</sup>; or
- (b) The design type of the pressure receptacle shall be approved by a ~~testing and certifying body~~ an inspection body approved by the **competent authority** of the country of approval<sup>2</sup>. The compliance of any pressure receptacle with the approved design shall be declared in writing by the manufacturer on the basis of his quality assurance programme for final inspection and testing of pressure receptacles, approved and supervised by a ~~testing and certifying body~~ an inspection body approved by the **competent authority** of the country of approval<sup>2</sup>; or
- (c) The design type of the pressure receptacle shall be approved by a ~~testing and certifying body~~ an inspection body approved by the **competent authority** of the country of approval<sup>2</sup>. The compliance of any pressure receptacle with the approved design shall be declared in writing by the manufacturer and all pressure receptacles of this type shall be tested under the supervision of a ~~testing and certifying body~~ an inspection body approved by the **competent authority** of the country of approval<sup>2</sup>;

6.2.3.6.3 The conformity of pressure receptacles, having a test pressure capacity product of not more than 30 MPa.litre (300 bar.litre) with the provisions for Class 2 shall be assessed by one of the methods described in ~~6.2.1.4.1 or 6.2.1.4.2~~ 6.2.3.6.1 or 6.2.3.6.2 or by one of the following methods:

- (a) The compliance of any pressure receptacle with a design, fully specified in technical documentation, shall be declared in writing by the manufacturer and pressure receptacles of this design shall be tested under the supervision of a ~~testing and certifying body~~ an inspection body approved by the **competent authority** of the country of approval<sup>2</sup>; or
- (b) The design type of the pressure receptacles shall be approved by a ~~testing and certifying body~~ an inspection body approved by the **competent authority** of the country of approval<sup>2</sup>. The compliance of all pressure receptacles with the approved design shall be declared in writing by the manufacturer and all pressure receptacles of this type shall be tested individually.

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<sup>2</sup> If the country of approval is not a contracting party to ADR, the **competent authority** of a contracting party to ADR.

- 6.2.3.6.4 The requirements of ~~6.2.1.4.1~~6.2.3.6.1 to ~~6.2.1.4.3~~6.2.3.6.3 shall be deemed to be complied with:
- (a) as regards the quality assurance systems mentioned in ~~6.2.1.4.1~~6.2.3.6.1 and ~~6.2.1.4.2~~6.2.3.6.2, if they conform to the relevant European Standard of the EN ISO 9000 series;
  - (b) in their entirety, if the relevant conformity assessment procedures of Council Directive 99/36/EC<sup>3</sup> have been complied with as follows:
    - (i) for the pressure receptacles listed under ~~6.2.1.4.1~~6.2.3.6.1, the modules G, or H1, or B in combination with D, or B in combination with F;
    - (ii) for the pressure receptacles listed under ~~6.2.1.4.2~~6.2.3.6.2, the modules H, or B in combination with E, or B in combination C1, or B1 in combination with F, or B1 in combination with D;
    - (iii) for the pressure receptacles listed under ~~6.2.1.4.3~~6.2.3.6.3, the modules A1, or D1, or E1.

**6.2.3.7**        *Requirements for manufacturers*

6.2.3.7.1        (*Reserved*) ( – for possible inclusions of TPED provisions)

**6.2.3.8**        *Requirements for inspection bodies*

6.2.3.8.1        The requirements for inspection bodies of 6.2.1.8 shall be deemed to be met if the bodies have been approved on the basis of an accreditation procedure in accordance with the relevant European standards of series EN 45000.

See working group report paragraph 13 (b).
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**6.2.3.9**        *Marking of refillable pressure receptacles*

6.2.3.9.1        Markings shall be in accordance with 6.2.2.7, except that the United Nations packaging symbol specified in 6.2.2.7.1 (a) shall not be applied.

6.2.3.9.2        The marks specified in 6.2.2.7.2 (g), 6.2.2.7.2 (h) and 6.2.2.7.3 (m) are not required for pressure receptacles for UN No. 1965 hydrocarbon gas mixture, liquefied, n.o.s.

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<sup>3</sup> Council Directive 99/36/EC concerning transportable pressure equipment (Official Journal of the European Communities, No. L 138 of 1.06.1999).

6.2.3.9.3 When marking the date required by 6.2.2.7.6 (c), the month need not be indicated for gases for which the interval between periodic inspections is 10 years or more (see 4.1.4.1 packing instructions P200 and P203).

6.2.3.9.4 With the agreement of the **competent authority**, the date of the most recent periodic inspection and the stamp of the expert may be engraved on a ring of an appropriate material affixed to the cylinder when the valve is installed and which is removable only by disconnecting the valve from the cylinder.

These final three paragraphs reflect the decisions of the Joint Meeting in March 2005 and are adaptations of text in RID/ADR 6.2.1.7.

**6.2.3.10 *Marking of non-refillable pressure receptacles***

6.2.3.10.1 Markings shall be in accordance with 6.2.2.8, except that the United Nations packaging symbol specified in 6.2.2.7.1 (a) shall not be applied.

**6.2.4 Requirements for non-UN pressure receptacles designed, constructed and tested according to standards**

The requirements of 6.2.1 and 6.2.3 are considered to have been complied with if the following standards, as relevant, are applied:

***NOTE 1:*** The standards listed in 6.2.2 may also be used provided the general requirements of 6.2.3 are also complied with.

NOTE 1 is the proposal of the working group, but the Standards Working Group of the Joint Meeting should decide whether to adopt this and resolve the issues set out in the report, paragraph 13 (c).

***NOTE 2:*** *Persons or bodies identified in standards as having responsibilities in accordance with RID/ADR shall meet the requirements of RID/ADR.*

Reference	Title of document	Applicable sub-sections and paragraphs
<i>for materials</i>		
EN 1797:2001	Cryogenic vessels - Gas/material compatibility	6.2.1.2
EN ISO 11114-1: 1997	Transportable gas cylinders – Compatibility of cylinder and valve materials with gas contents – Part 1: Metallic materials.	6.2.1.2
EN ISO 11114-2: 2000	Transportable gas cylinders - Compatibility of cylinder and valve materials with gas contents – Part 2: Non-metallic materials.	6.2.1.2
<i>for design and construction</i>		
Annex I, Parts 1 to 3 to 84/525/EEC	Council directive on the approximation of the laws of the Member States relating to seamless steel gas cylinders.	<u>6.2.3.1 and 6.2.3.4</u>
Annex I, Parts 1 to 3 to 84/526/EEC	Council directive on the approximation of the laws of the Member States relating to seamless, unalloyed aluminium and aluminium alloy gas cylinders.	<u>6.2.3.1 and 6.2.3.4</u>
Annex I, Parts 1 to 3 to 84/527/EEC	Council directive on the approximation of the laws of the Member States relating to welded unalloyed steel gas cylinders.	<u>6.2.3.1 and 6.2.3.4</u>
Note for information of the Joint Meeting: See working group report paragraph 12 concerning the future of the above directives.		
EN 1442:1998	Transportable refillable welded steel cylinders for liquefied petroleum gas (LPG) – Design and construction.	<u>6.2.3.1 and 6.2.3.4</u>
EN 1964-1:1999	Transportable gas cylinders – Specifications for the design and construction of refillable transportable seamless steel gas cylinders of capacity from 0.5 litres up to 150 litres – Part 1: Cylinders made of seamless steel with a Rm value of less than 1 100 MPa.	<u>6.2.3.1 and 6.2.3.4</u>
EN 1975:1999 + A1:2003	Transportable gas cylinders – Specifications for the design and construction of refillable transportable seamless aluminium and aluminium alloy gas cylinders of capacity from 0.5 litres up to 150 litres.	<u>6.2.3.1 and 6.2.3.4</u>
EN ISO 11120:1999	Gas cylinders – Refillable seamless steel tubes for compressed gas transport of water capacity between 150 litres and 3 000 litres – Design, construction and testing.	<u>6.2.3.1 and 6.2.3.4</u>

Reference	Title of document	Applicable sub-sections and paragraphs
EN 1964-3: 2000	Transportable gas cylinders – Specifications for the design and construction of refillable transportable seamless steel gas cylinders of capacity from 0.5 litre up to 150 litres – Part 3: Cylinders made of stainless steel.	<u>6.2.3.1</u> and <u>6.2.3.4</u>
EN 12862: 2000	Transportable gas cylinders – Specifications for the design and construction of refillable transportable welded aluminium alloy gas cylinders.	<u>6.2.3.1</u> and <u>6.2.3.4</u>
EN 1251-2: 2000	Cryogenic vessels- Transportable, vacuum insulated, of not more than 1 000 litres volume – Part 2: Design, fabrication, inspection and testing	<u>6.2.3.1</u> and <u>6.2.3.4</u>
EN 12257:2002	Transportable gas cylinders – Seamless, hoop wrapped composite cylinders	<u>6.2.3.1</u> and <u>6.2.3.4</u>
EN 12807:2001 (except Annex A)	Transportable refillable brazed steel cylinders for liquefied petroleum gas (LPG) – Design and construction	6.2.1.1 and 6.2.1.5
EN 1964-2:2001	Transportable gas cylinders – Specification for the design and construction of refillable transportable seamless steel gas cylinders of water capacities from 0.5 litre up to and including 150 litre – Part 2: Cylinders made of seamless steel with a $R_m \geq 1100$ MPa	<u>6.2.3.1</u> and <u>6.2.3.4</u>
EN 13293:2002	Transportable gas cylinders – Specification for the design and construction of refillable transportable seamless normalised carbon manganese steel gas cylinders of water capacity up to 0.5 litre for compressed, liquefied and dissolved gases and up to 1 litre for carbon dioxide	<u>6.2.3.1</u> and <u>6.2.3.4</u>
EN 13322-1:2003	Transportable gas cylinders – Refillable welded steel gas cylinders – Design and construction – Part 1: Welded steel	<u>6.2.3.1</u> and <u>6.2.3.4</u>
EN 13322-2:2003	Transportable gas cylinders – Refillable welded stainless steel gas cylinders – Design and construction – Part 2: Welded stainless steel	<u>6.2.3.1</u> and <u>6.2.3.4</u>
EN 12245:2002	Transportable gas cylinders – Fully wrapped composite cylinders	<u>6.2.3.1</u> and <u>6.2.3.4</u>
EN 12205:2001	Transportable gas cylinders – Non refillable metallic gas cylinders	<u>6.2.3.1</u> , <u>6.2.3.4</u> and <u>6.2.3.9</u>

Reference	Title of document	Applicable sub-sections and paragraphs
EN 13110:2002	Transportable refillable welded aluminium cylinders for liquefied petroleum gas (LPG). Design and construction	<u>6.2.3.1, 6.2.3.4 and 6.2.3.9</u>
EN 14427:2004	Transportable refillable fully wrapped composite cylinders for liquefied petroleum gases – Design and construction <i>NOTE: This standard applies only to cylinders equipped with pressure relief valves.</i>	<u>6.2.3.1, 6.2.3.4 and 6.2.3.9</u>
EN 14208:2004	Transportable gas cylinders – Specification for welded pressure drums up to 1000 litres capacity for the transport of gases – Design and construction	<u>6.2.3.1, 6.2.3.4 and 6.2.3.9</u>
EN 14140:2003	Transportable refillable welded steel cylinders for Liquefied Petroleum Gas (LPG) – Alternative design and construction	<u>6.2.3.1, 6.2.3.4 and 6.2.3.9</u>
EN 13769:2003	Transportable gas cylinders – Cylinder bundles – Design, manufacture, identification and testing	<u>6.2.3.1, 6.2.3.4 and 6.2.3.9</u>
<i>for closures</i>		
EN 849:1996/A2:2001	Transportable gas cylinders – Cylinder valves: Specification and type testing	<u>6.2.3.1</u>
EN 13152:2001	Specifications and testing of LPG – cylinder valves – Self closing	<u>6.2.3.1</u>
EN 13153:2001	Specifications and testing of LPG – cylinder valves – Manually operated	<u>6.2.3.1</u>
<i>for periodic inspection and test</i>		
EN 1251-3: 2000	Cryogenic vessels – Transportable, vacuum insulated, of not more than 1 000 litres volume – Part 3: Operational requirements	<u>6.2.3.5</u>
EN 1968:2002 (except Annex B)	Transportable gas cylinders – Periodic inspection and testing of seamless steel gas cylinders	<u>6.2.3.5</u>
EN 1802:2002 (except Annex B)	Transportable gas cylinders – Periodic inspection and testing of seamless aluminium alloy gas cylinders	<u>6.2.3.5</u>
EN 12863:2002	Transportable gas cylinders – Periodic inspection and maintenance of dissolved acetylene cylinders <i>NOTE: In this standard "initial inspection" is to be understood as the "first periodic inspection" after final approval of a new acetylene cylinder.</i>	<u>6.2.3.5</u>
EN 1803:2002 (except Annex B)	Transportable gas cylinders – Periodic inspection and testing of welded steel gas cylinders	<u>6.2.3.5</u>

Reference	Title of document	Applicable sub-sections and paragraphs
EN ISO 11623:2002 (except clause 4)	Transportable gas cylinders – Periodic inspection and testing of composite gas cylinders	<u>6.2.3.5</u>
EN 14189:2003	Transportable gas cylinders – Inspection and maintenance of cylinder valves at time of periodic inspection of gas cylinders	<u>6.2.3.5</u>

The following standard should be transferred to the table in 4.1.6.14 since the requirements are no longer in 6.2.1.

EN 1800:1998/AC:1999	Transportable gas cylinders – Acetylene cylinders – Basic requirements and definitions.	<del>6.2.1.1.2</del> <u>4.1.6.2</u>
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## 6.2.5 Requirements for non-UN pressure receptacles not designed, constructed and tested according to standards

In recognition of scientific and technological advances, pressure receptacles and their closures which cannot be designed, constructed and tested according to standards listed in the table of 6.2.2-4 shall be designed, constructed and tested in accordance with the provisions of a technical code providing the same level of safety and recognised by the competent authority. However, ~~the~~ requirements of 6.2.1, 6.2.3 and the following requirements ~~however~~ shall be met:

*NOTE: For this section, the references to technical standards in 6.2.1 shall be considered as references to technical codes.*

The opening requirement has been reworded to clarify that listed standards shall be used whenever possible and 6.2.5 is not a means of continuing to construct new equipment according to national standards. At the July meeting of the working group the UK may propose extending this text to clarify this intention.

Transitional provisions will be needed to allow time for the phasing out of non-listed standards having the same scope as listed standards.

The Note is added to cover the references to standards in 6.2.1.1.3, 6.2.1.2.2, 6.2.1.4.1, etc.

### 6.2.5.1 *Materials*

The following provisions contain examples of materials that may be used to comply with the requirements for materials in 6.2.1.2:

- (a) carbon steel for compressed, liquefied, refrigerated liquefied gases and dissolved gases as well as for substances not in Class 2 listed in Table 3 of packing instruction P200 in 4.1.4.1;
- (b) alloy steel (special steels), nickel, nickel alloy (such as monel) for compressed, liquefied, refrigerated liquefied gases and dissolved gases as well as for substances not in Class 2 listed in Table 3 of packing instruction P200 in 4.1.4.1;
- (c) copper for:
  - (i) gases of classification codes 1A, 1O, 1F and 1TF, whose filling pressure referred to a temperature of 15 °C does not exceed 2 MPa (20 bar);
  - (ii) gases of classification code 2A and also UN No. 1033 dimethyl ether; UN No. 1037 ethyl chloride; UN No. 1063 methyl chloride; UN No. 1079 sulphur dioxide; UN No. 1085 vinyl bromide; UN No. 1086 vinyl chloride; and UN No. 3300 ethylene oxide and carbon dioxide mixture with more than 87% ethylene oxide;
  - (iii) gases of classification codes 3A, 3O and 3F;
- (d) aluminium alloy: see special requirement "a" of packing instruction P200 (10) in 4.1.4.1;
- (e) composite material for compressed, liquefied, refrigerated liquefied gases and dissolved gases;
- (f) synthetic materials for refrigerated liquefied gases; and
- (g) glass for the refrigerated liquefied gases of classification code 3A other than UN No. 2187 carbon dioxide, refrigerated, liquid or mixtures thereof, and gases of classification code 3O.

#### **6.2.5.2**      *Service equipment*

6.2.5.2.1      The requirements of 6.2.1.3.1 shall be deemed to be complied with if the burst pressure of the specified service equipment is at least 1.5 times the test pressure of the pressure receptacle to which it is fitted.

#### **6.2.5.3**      *Metal cylinders, tubes, pressure drums and bundles of cylinders*

At the test pressure, the stress in the metal at the most severely stressed point of the pressure receptacle shall not exceed 77% of the guaranteed minimum yield stress (Re).

"Yield stress" means the stress at which a permanent elongation of 2 per thousand (i.e. 0.2%) or, for austenitic steels, 1% of the gauge length on the test-piece, has been produced.

***NOTE:** In the case of sheet-metal the axis of the tensile test-piece shall be at right angles to the direction of rolling. The permanent elongation at fracture, shall be measured on a test-piece of circular cross-section in which the gauge length "l" is equal to five times the diameter "d" (l=5d); if test pieces of rectangular cross-section are used, the gauge length "l" shall be calculated by the formula:*

$$l = 5.65 \sqrt{F_0}$$

*where  $F_0$  indicates the initial cross-sectional area of the test-piece.*

Pressure receptacles and their closures shall be made of suitable materials which shall be resistant to brittle fracture and to stress corrosion cracking between – 20 °C and +50 °C.

Welds shall be skilfully made and shall afford the fullest safety.

**6.2.5.4 Additional provisions relating to aluminium-alloy pressure receptacles for compressed gases, liquefied gases, dissolved gases and non pressurized gases subject to special requirements (gas samples) as well as articles containing gas under pressure other than aerosol dispensers and small receptacles containing gas (gas cartridges)**

The European Cylinder Makers Association (ECMA) will propose updated text for this sub-section on aluminium alloys.

**6.2.5.4.1 The materials of aluminium-alloy pressure receptacles which are to be accepted shall satisfy the following requirements:**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
Tensile strength, Rm, in MPa (=N/mm <sup>2</sup> )	49 to 186	196 to 372	196 to 372	343 to 490
Yield stress, Re, in MPa (=N/mm <sup>2</sup> ) (permanent set λg = 0.2%)	10 to 167	59 to 314	137 to 334	206 to 412
Permanent elongation at fracture (l = 5d) in per cent	12 to 40	12 to 30	12 to 30	11 to 16
Bend test (diameter of former d = n × e, where e is the thickness of the test piece)	n=5(Rm ≤ 98)  n=6(Rm > 98)	n=6(Rm ≤ 325) n=7(Rm > 325)	n=6(Rm ≤ 325)  n=7(Rm > 325)	n=7(Rm ≤ 392) n=8(Rm > 392)
Aluminium Association Series Number <sup>a</sup>	1 000	5 000	6 000	2 000

<sup>a</sup> See "Aluminium Standards and Data", Fifth edition, January 1976, published by the Aluminium Association, 750 Third Avenue, New York.

The actual properties will depend on the composition of the alloy concerned and on the final treatment of the pressure receptacle, but whatever alloy is used the thickness of the pressure receptacle shall be calculated by one of the following formulae:

$$e = \frac{P_{\text{MPa}} D}{\frac{2Re}{1.3} + P_{\text{MPa}}} \quad \text{or} \quad e = \frac{P_{\text{bar}} D}{\frac{20Re}{1.3} + P_{\text{bar}}}$$

where e = minimum thickness of pressure receptacle wall, in mm  
P<sub>MPa</sub> = test pressure, in MPa  
P<sub>bar</sub> = test pressure, in bar

D = nominal external diameter of the pressure receptacle, in mm;  
and  
Re = guaranteed minimum proof stress with 0.2% proof stress,  
in MPa (=N/mm<sup>2</sup>)

In addition, the value of the minimum guaranteed proof stress (Re) introduced into the formula is in no case to be greater than 0.85 times the guaranteed minimum tensile strength (Rm), whatever the type of alloy used.

**NOTE 1:** *The above characteristics are based on previous experience with the following materials used for pressure receptacles:*

*Column A: Aluminium, unalloyed, 99.5 g pure;*

*Column B: Alloys of aluminium and magnesium;*

*Column C: Alloys of aluminium, silicon and magnesium, such as ISO/R209-Al-Si-Mg (Aluminium Association 6351);*

*Column D: Alloys of aluminium, copper and magnesium.*

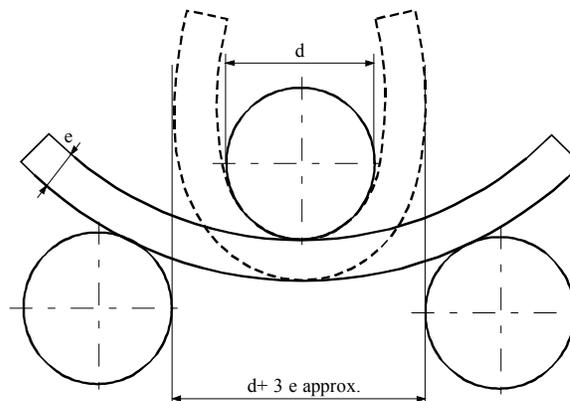
**NOTE 2:** *The permanent elongation at fracture is measured by means of test-pieces of circular cross-section in which the gauge length "l" is equal to five times the diameter "d" (l= 5d); if test-pieces of rectangular section are used the gauge length shall be calculated by the formula:*

$$l = 5.65 \sqrt{F_0}$$

*where  $F_0$  is the initial cross-section area of the test-piece.*

- NOTE 3:** (a) *The bend test (see diagram) shall be carried out on specimens obtained by cutting into two equal parts of width 3e, but in no case less than 25 mm, an annular section of a cylinder. The specimens shall not be machined elsewhere than on the edges;*
- (b) *The bend test shall be carried out between a mandrel of diameter (d) and two circular supports separated by a distance of (d + 3e). During the test the inner faces shall be separated by a distance not greater than the diameter of the mandrel;*
- (c) *The specimen shall not exhibit cracks when it has been bent inwards around the mandrel until the inner faces are separated by a distance not greater than the diameter of the mandrel;*
- (d) *The ratio (n) between the diameter of the mandrel and the thickness of the specimen shall conform to the values given in the table.*

Diagram of bend test



6.2.5.4.2 A lower minimum elongation value is acceptable on condition that an additional test approved by the **competent authority** of the country in which the pressure receptacles are made proves that safety of carriage is ensured to the same extent as in the case of pressure receptacles constructed to comply with the characteristics given in the table in 6.2.3.2.1-6.2.5.4.1 (see also EN 1975:1999 + A1:2003).

6.2.5.4.3 The wall thickness of the pressure receptacles at the thinnest point shall be the following:

- where the diameter of the pressure receptacle is less than 50 mm: not less than 1.5 mm;
- where the diameter of the pressure receptacle is from 50 to 150 mm: not less than 2 mm; and
- where the diameter of the pressure receptacle is more than 150 mm: not less than 3 mm.

6.2.5.4.4 The ends of the pressure receptacles shall have a semicircular, elliptical or "basket-handle" section; they shall afford the same degree of safety as the body of the pressure receptacle.

#### **6.2.5.5 *Pressure receptacles in composite materials***

For composite cylinders, tubes, pressure drums and bundles of cylinders which make use of composite materials ~~i.e. comprising a liner hoop wrapped or fully wrapped with reinforcement material~~, the construction shall be such that a minimum burst ratio (burst pressure divided by test pressure) is:

- 1.67 for hoop wrapped pressure receptacles;
- 2.00 for fully wrapped pressure receptacles.

Explanation deleted since it is no longer necessary and pressure receptacles of composite construction without liners are also covered.

#### **6.2.5.6      *Closed cryogenic receptacles***

The following requirements apply to the construction of closed cryogenic receptacles for refrigerated liquefied gases:

- 6.2.5.6.1      If non-metallic materials are used, they shall resist brittle fracture at the lowest working temperature of the pressure receptacle and its fittings;
- 6.2.5.6.2      ~~Pressure receptacles shall be fitted with a safety valve which shall be capable of opening at the working pressure shown on the pressure receptacle.~~ The safety valves shall be so constructed as to work perfectly even at their lowest working temperature. Their reliability of functioning at that temperature shall be established and checked by testing each valve or a sample of valves of the same type of construction;

The first sentence deleted, since this requirement is already covered by 6.2.1.3.6.4/5

- 6.2.5.6.3      The vents and safety valves of pressure receptacles shall be so designed as to prevent the liquid from splashing out;

#### **6.2.6      *General requirements for aerosol dispensers and small receptacles containing gas (gas cartridges)***

*Text of the existing RID/ADR 6.2.4 to be inserted by the Secretariat with the section numbering changed.*

## APPENDIX

The following is text from RID/ADR 2005 which has not been transposed into this proposal and for which there is no UN text covering the requirement. Reasons are given in boxes. The paragraph numbering refers to RID/ADR 2005.

6.2.1.1.1 In the design of pressure receptacles, all relevant factors shall be taken into account such as:

- internal pressure;
- ambient and operational temperatures, including during carriage;
- dynamic loads.

P200 and the new 6.2.1 will cover this

Material characteristics to be considered are, when applicable:

- yield stress;
- tensile strength;
- time-dependent strength;
- fatigue data;
- Young's modulus (modulus of elasticity);
- appropriate amount of plastic strain;
- impact strength;
- fracture resistance.

This text was discarded since it only gave a non-binding interpretation of the general requirement of new 6.2.1.

6.2.1.1.2 Pressure receptacles for UN No. 1001, acetylene, dissolved, shall be filled entirely with a porous mass, uniformly distributed, of a type approved by the competent authority and which:

- (a) does not attack the pressure receptacles or form harmful or dangerous compounds either with the acetylene or with the solvent;
- (b) is capable of preventing the spread of decomposition of the acetylene in the porous mass.

The solvent shall not attack the pressure receptacles.

The above requirements, excluding those for the solvent, apply equally to pressure receptacles for UN No. 3374 acetylene, solvent free.

These requirements are already covered by P200 (10) "p" and 4.1.6.2.

- 6.2.1.3.2 (c) Pressure drums and cryogenic receptacles, which are not capable of being 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 wall of the pressure receptacle;

Covered more generally by new 6.2.1.3.3

- 6.2.1.4.5 The particular certification process the manufacturer intends to apply shall be taken into consideration.

This is an obvious feature of the assessment of a manufacturer's proficiency and it is unnecessary to state it.

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