

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

**Sub-Committee of Experts on the
Transport of Dangerous Goods**
(Twenty-third session, 30 June – 4 July 2003,
agenda item 2)

PROVISIONS FOR THE TRANSPORT OF GASES

Report of the Working Group

General

1. The Working Group on Provisions for the Transport of Gases met on 30 June and 1 July under the chairmanship of Mr. H. Puype (EIGA). Representatives of Canada, Germany, Spain, Sweden, Switzerland, the United Kingdom, the United States of America, International Organization for Standardization (ISO), European Liquefied Petroleum Gas Association (AEGPL), Compressed Gas Association (CGA), and the European Industrial Gases Association (EIGA) participated.
2. The objective of the Working Group was to review the following documents: 2003/4 (EIGA), 2003/9 (UK), 2003/12 (EIGA), 2003/21 (USA), 2003/28 (USA), and informal document INF.13 (CGA).

2003/4 (EIGA)

3. The basic proposition of proposal 1.1 in this document, that the restrictions imposed by the first paragraph special packing provision 'k' should not apply uniformly to all to all pressure receptacles, was accepted. It was, however, pointed out that the proposed wording had the effect of removing the minimum wall thickness requirement from pressure drums and it was agreed that pressure drums should also be subject to this provision. The thickness values appropriate to pressure drums need to be confirmed. The UK delegation also observed that existing provision for an overpack would, in theory, allow a cylinder to be transported in, for example, a flexible IBC. The words chosen to correct this latter problem were based upon an extract from the former P200 in the ICAO Technical Instructions. Accordingly, the working group agreed on the following words for the first paragraph of 'k'.

k: ~~Pressure receptacles~~ Cylinders and individual cylinders in a bundle shall (†) have a test pressure greater than or equal to 200 bar and a minimum wall thickness of 3.5 mm for aluminium alloy or 2 mm for steel. ~~or (ii) have~~ Individual cylinders not complying with this requirement shall be transported in a rigid an outer packaging that will adequately protect the cylinder and its fittings and meeting the PG I performance level. Pressure drums shall have a minimum wall thickness of [3.5] mm for aluminium alloy or [2] mm for steel.

4. UN 1067 Dinitrogen Tetroxide is not permitted for transport in pressure drums in the 13th Revision of the Model Regulations, despite the fact that modal regulations have hitherto allowed pressure drums for this substance. Furthermore, UN 1975 Nitric oxide and dinitrogen tetroxide mixture was also permitted in such receptacles in the 13th Revision. The working group recognized this omission of a cross in the pressure drum column of Table 2 as a mistake and the following correction was agreed.

In **P200**, table 2, for UN 1067, **add** a cross in the column "Pressure drums".

5. Proposal 1.2 was designed to remove the restriction of a maximum of 5 kg of UN 1045 Fluorine or UN2190 Oxygen difluoride applying to bundles as well as to individual cylinders. The working group agreed that this restriction of 5 kg. should apply to cylinders and to individual cylinders in a bundle, but not to a bundle as a whole.
6. The concept of groups (or assemblies) of 2 or 3 cylinders manifolded together within bundles was also introduced in proposal 1.2. This was debated at length and the working group did not accept that this idea could be incorporated into 'k' as a general rule. Germany described its current practice for the manufacture of fluorine/nitrogen mixtures. Bundles of 12 x 50 litres cylinders are constructed in four groups of three cylinders, each group being manifolded together with a pneumatically operated valve, so that the bundle has one master valve and four group valves. The bundle is filled with a maximum of 18 kg of fluorine (1.5 kg. per cylinder) and then transported to an industrial gas company where nitrogen is added to make the required mixture. This has been practice in Germany for about 15 years without adverse experience. The working group needed more time to consider this practice and decided to put text that would permit such a practice in square brackets for further consideration. The working group agreed the following:

n: ~~Pressure receptacles~~ Cylinders and individual cylinders in a bundle shall contain not more than 5 kg of the gas. [By derogation from special packing provision 'k', bundles containing UN 1045 Fluorine may be constructed with isolation valves on assemblies (groups) of cylinders not exceeding 150 litres total water capacity instead of valves on every cylinder. The content of such assemblies shall equally be limited to 5 kg of the gas.]

7. Again, the working group accepted the objective of proposal 1.3, but the wording of EIGA's proposal was thought to be confusing. All N.O.S. entries in P200 allow transport in pressure drums and special packing provision 'z' should remove this allowance for toxic gas mixtures with an LC₅₀ of 200 ml/m³ or less. By excepting all entries which specify that the transport is allowed, the provision would be confusing. Therefore, the working group decided to insert a derogation specifically for UN 1975, since this is the only mixture allowed in pressure drums whose LC₅₀ is less than 200 ml/m³. The change agreed by the working group is shown as follows.

z: The construction materials of the pressure receptacles and their accessories shall be compatible with the contents and shall not react to form harmful or dangerous compounds therewith.

The test pressure and filling ratio shall be calculated in accordance with the relevant requirements of (3).

Toxic substances with an LC50 less than or equal to 200 ml/m³ shall not be transported in tubes, pressure drums or MEGCs and shall meet the requirements of special packing provision 'k'. By derogation, UN 1975 Nitric oxide and dinitrogen tetroxide mixture may be transported in pressure drums.

For pressure receptacles containing pyrophoric gases or flammable mixtures of gases containing more than 1% pyrophoric compounds, the requirements of special packing provision q shall be met.

The necessary steps shall be taken to prevent dangerous reactions (i.e. polymerisation or decomposition) during transport. If necessary, stabilisation or addition of an inhibitor shall be required.

Mixtures containing diborane, UN 1911, shall be filled to a pressure such that, if complete decomposition of the diborane occurs, two thirds of the test pressure of the pressure receptacle shall not be exceeded.

8. EIGA explained that many types of steels, such as those used to manufacture welded steel cylinders are not susceptible to hydrogen embrittlement and were not given the 'H' mark. The working group pointed out that the marking provisions of 6.2.2.6 required this mark to be applied in all cases. There was also a view that fillers should have this guidance in all cases. EIGA provisionally withdrew the proposal but hoped to come back with more evidence after discussion with experts in ISO TC58 about actual practice, including the checks required in ISO 11621:1997 at change of service.
9. Proposal 3.1 was withdrawn since the concept of grouping cylinders in bundles had not been accepted.
10. The first part of proposal 3.2 on lifting the requirement to have individual valves on each cylinder in a bundle when transporting pyrophoric gases was withdrawn because it lacked majority support. Most members of the working group remained convinced that safety was best served by having a valve on every cylinder. During the discussion, EIGA pointed out that, to its knowledge, all the most serious accidents concerning the unintended release of pyrophoric gases had been due to the failure of pressure relief devices. The USA agreed to discuss this issue with CGA to consider a restriction in line with current European practice of not fitting PRDs when transporting these gases.
11. The working group agreed with the second part of proposal 3.2 and proposed that special packing provision 'q' should be added to UN 2192 Germane and to UN 2199 Phosphine since both are pyrophoric.

2003/9 (UK)

12. The working group acknowledged that there was a need to develop wording for the substances mentioned in the UK's document. The packing instructions for these substances when carried in

pressure receptacles needs to be developed further with the input of the relevant industries and the authorities. In particular, the procedures when changing from one product to another, the pre-fill inspection and the filling limits are all undefined. Periodic inspection, periodicity and procedure, should also be defined, but it was agreed that in the many cases of products which were transported not under pressure, the traditional hydraulic test had little relevance.

2003/12 (EIGA)

13. Germany stated that since the Butadienes listed under UN 1010 were different substances, they should each have their own separate UN number. Other delegates did not support this view and the consensus was that the UN numbers 1010 and 1012 should be unchanged. The proper shipping names, however, should show the different substances and isomers broadly as proposed in the EIGA document, but taking into account the changes made to UN1010 in the 13th Revision of the Model Regulations. The USA delegate hoped to be able to support this proposal, but he needed time to consult with his colleagues.

The working group proposed that the proper shipping names of UN 1010 and 1012 should appear in the Dangerous Goods List and the P200 as follows.

UN 1010	1,2-BUTADIENE, STABILIZED or 1,3-BUTADIENE, STABILIZED or BUTADIENES AND HYDROCARBON MIXTURE, STABILIZED containing more than 40% butadienes	UN 1012	BUTYLENES MIXTURES or 1-BUTYLENE or CIS-2-BUTYLENE or TRANS-2 BUTYLENE
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The working group observed that multiple entries under one UN number could lead to misreading the relevant filling ratio and/or the special packing provisions. It was suggested that in the P200 tables, dotted lines could be used to improve readability.

14. EIGA questioned the use and purpose of the following UN entries.

- 1014 Carbon dioxide and oxygen mixtures, compressed
- 1015 Carbon dioxide and nitrous oxide mixture
- 2600 Carbon monoxide and hydrogen mixture, compressed
- 1979 Rare gases mixture, compressed
- 1980 Rare gases and oxygen mixture, compressed
- 1981 Rare gases and nitrogen mixture, compressed.

These mixtures can be either liquefied or compressed, toxic or non-toxic, oxidizing or non-oxidizing. It is proposed to delete these entries and use the corresponding N.O.S. positions. CGA observed that as long as these entries exist, N.O.S. position could not be used for mixtures of the named gases. CGA will check the North American industry's position. EIGA was requested to file an official proposal so that all the relevant experts could advise.

2003/21 (USA)

15. Following the introduction of this paper by the USA, working group members became confused because the text was based upon the 12th Revision and not the 13th. The USA delegate therefore agreed to present this proposal again in December, using the latest text.

2003/28 (USA)

16. The expert from Germany congratulated the USA for the excellent work performed by NIST. He

looked forward to receiving the final report and hoped that Germany and the USA could make a joint proposal during this biennium. It was noted that the majority of the NIST values did not significantly differ from the UN P200 values. Values lower or higher than the UN values should be discussed with the industry before any further action at UN could be taken. Evaluation should be on a product by product basis. CGA requested, and it was confirmed that the tables in P200 could include filling ratios at test pressures reflecting North American practice. The USA is currently working on a formula for calculating filling ratios for any given test pressure.

INF. 13 (CGA)

17. CGA proposed to introduce the concept of limited lifetime for composite cylinders. It was pointed out to the CGA that UN cylinders were intended for global multi-modal transport of dangerous goods and as such, the working group had decided that only the periodic inspection and test or requalification should limit the lifetime. This did not prevent other cylinders from being marketed or used on a regional basis complying with local regulations. No support could be found for the CGA proposal so it was rejected and the existing notes were unchanged.

Miscellaneous

18. The USA expressed concern that the ISO standard for welded steel pressure drums, originally drafted for a maximum value of 1000 litres was changed to 3000 litres without any apparent additional design considerations. It was pointed out that the UN recommendations limit the volume to 1000 litres. In the event of the eventual referencing of this standard in the Model Regulations, it would be automatically limited to 1000 litres. The USA was invited to act at the ISO level to get this decision reversed, if needed.

19. Further refinement was brought to the section 6.2.1.5.1 on periodic inspection and test.

- 6.2.1.5.1 (c) Checking the threads if there is evidence of corrosion or if the fittings are removed.

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

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