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**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-fifth session, 5-14 July 2004
Item 2 of the provisional agenda

TRANSPORT OF GASES

Miscellaneous proposals to the requirements for pressure receptacles and MEGCs

Transmitted by the expert from the United State of America

Introduction

1. During the process of developing proposed amendments to the US Hazardous Materials Regulations to incorporate the requirements for UN pressure receptacles including specific requirements applicable to certain gases in packing instruction P200, the expert from the United States has developed several proposed amendments that should be addressed by the Working Group on Pressure Receptacles.

Proposals

2. The following amendments to P200 are proposed:

a. Currently in Table 1 of P200 a maximum working pressure of 30 is indicated for Fluorine, compressed, UN 1045 and a maximum working pressure of 50 bar is indicated for Nitric oxide, compressed, UN 1975. These maximum working pressures are critical to safety. These gases are known to be violently reactive at pressures higher than the maximum working pressures indicated in the table. The reactivity of these gases with the metallic components of cylinders such as valves and regulators will increase exponentially as pressure increases and filling of pressure receptacles to higher pressures may result in a violent explosion or fire. The explanation of the columns in the P200 tables (see P200 paragraph (2)(f)) indicates that the working pressure is the maximum working pressure for compressed gases. However, this is not entirely obvious to a user of the regulations. It is proposed that the column headings of Table 1 be revised to clearly indicate that the values in the columns are the maximum working pressures. In addition it is proposed that a note be added to Table 1 and associated with the Fluorine and Nitric oxide entries as follows:

“b Where maximum working pressures are indicated in the table these values shall not be exceeded.”

b. Nitrogen Trifluoride, UN 2451 is a reactive gas. Table 2 of P200 currently authorizes pressure receptacles with test pressures of 200 and 300 bar respectively. Nitrogen trifluoride when transported at pressures greater than 110 bar presents a safety concern due to adiabatic compression. The reactivity of NF_3 with components of cylinders such as valves and regulators will increase exponentially as pressure increases above 110 bar and filling of pressure receptacles to higher pressures may result in a violent explosion or fire. A sudden increase in the pressure of NF_3 will result in a rapid temperature increase, which could result in insufficient time for heat exchange with the materials in contact with NF_3 . The 300 bar value should be removed from the P200 table. A maximum filling ratio of 0.5 in a 50 litre 200 bar cylinder represents a maximum of 25 kg of NF_3 and the corresponding working pressure would be approximately 100 bar at 20 °C. We are aware of at least 5 incidents involving NF_3 where excessive working pressure was a factor. The working group should consider whether this matter should be addressed by a special provision since it is a critical safety issue. We note that EIGA has a safety publication that addresses the hazards of NF_3 .

c. Special provision ‘a’ should be added for Acetylene, Dissolved (UN 1001) and Acetylene, Solvent Free, UN 3373 to exclude aluminium pressure receptacles from being used. Aluminium used to manufacture pressure receptacles typically contains high percentages of copper. Copper can react violently with acetylene. Use of aluminium pressure receptacles should be prohibited for acetylene.

d. In P200 paragraph (3)(b) and (3)(c) the word shall appears prior to the filling formulas. It is proposed that in both instances the word “shall” be changed to “may” to clarify that any suitable means of calculating the filling ratio may be used as long as the permissible limit is not exceeded:

- (1) for compressed gases, the working pressure shall be not more than two thirds of the test pressure of the pressure receptacles;
- (2) for high pressure liquefied gases, the filling ratio shall be such that the settled pressure at 65 °C does not exceed the test pressure of the pressure receptacles;
- (3) for low pressure liquefied gases, the maximum mass of contents per litre of water capacity (filling factor) shall equal 0.95 times the density of the liquid phase at 50 °C; and
- (4) the liquid phase shall not fill the pressure receptacle at any temperature up to 60 °C.

e. Methyl bromide, UN 1062 is a broad-spectrum pesticide used in the control of pest insects, nematodes, weeds, pathogens, and rodents. It is a colorless and odorless gas at normal temperatures and pressures, but the liquefied gas can be handled as a liquid under moderate pressure. Its vapour pressure at 20 °C is 187 kPa. In the United States of America, about 19 million kilograms of methyl bromide are used annually in agriculture, primarily for soil fumigation (85%), as well as for commodity and quarantine treatment (10%), and structural fumigation (5%). Globally, about 65 million kilograms are used each year, with North American use the highest (38%), followed by Europe (28%), Asia (22% - includes Israel and the Mid-East), with South America and Africa combined using the least (12%). Although methyl bromide is being phased out due to its ozone depleting characteristics (100% reduction by 2005 for industrialized nations, developing nations' consumption of methyl bromide is frozen as of 2002 at the average of their 1995 to 1998 annual use, and in 2005 these same countries must reduce their consumption by 20%; pre-shipment and quarantine uses exempt, critical agricultural uses allocated after 2005 and emergency uses exempt after 2005) it is estimated that it will continue to be transported for a number of years until current stocks are depleted and adequate alternatives are developed.

Special provision 1 to P200 allows the transport of ethylene oxide in packagings other than pressure receptacles. Small quantities of methyl bromide are commonly transported in combination packagings consisting of metal cans within fibreboard boxes. This packaging has been used successfully for over twenty years and has proven to be a safe and effective means for transporting small quantities of methyl

bromide. In this paper we are proposing that a new special provision “r” be added in P200 to authorize methyl bromide to be transported in combination packagings. It is proposed that a new special provision “r” be added in paragraph (4) of P200 under the sub-heading “Gas specific provisions” and also be added to the Special Packing Provisions column in P200 for Methyl bromide, UN 1062 in the P200 Table:

“r: Methyl bromide mixtures containing up to 2% chloropicrin may be packaged in combination packagings which meet the packing group I performance level. 1A2, 1B2, 1N2, 1H2, 1D, 1G, 4A, 4B, 4C1, 4C2, 4D, 4F, 4G or 4H2 outer packagings are authorized with a maximum gross mass of 30 kg. Inner packagings shall be hermetically sealed metal receptacles of not more than 800 grams each that are cushioned within the outer packaging. The metal receptacles shall be constructed of steel and have concave or pressure resistant ends. The metal receptacles shall be capable of withstanding an internal pressure of 1000 kPa without leakage or permanent distortion. The metal receptacles shall be filled such that they will not be liquid full at 55 °C and the internal pressure shall not exceed 1000 kPa at 55 °C.”

f. In special provision z, it is stated, “The test pressure and filling ratio shall be calculated in accordance with the relevant requirements of (3).” Paragraph (3) does not provide information relevant to test pressure. Paragraph (3) only addresses filling limits. It is not clear what the maximum test pressure should be for these gas mixtures. On an editorial basis, the word “paragraph should be inserted before (3).

3. The following proposals apply to MEGCs:

a. In 6.7.5.13.1 an example should be included to show how the date and type of the most recent periodic tests should be shown. It is proposed that the text be revised as follows:

Date and type of most recent periodic tests

Year _____ Month _____ Type _____ (e.g. 2004-05, AE/UE)

b. Currently 6.7.5.13.1 requires that the test pressure be indicated on the MEGC marking plate. It is unclear why this is necessary and what it actually means. For filling, it is important to know the working pressure (service pressure) of the element with the lowest working pressure. This information should be included on the marking plate. A note should be added to indicate:

“In no case shall a MEGC be filled as a unit in excess of the lowest working pressure of any given element. A MEGC shall not be filled above its marked maximum permissible gross mass.”

c. It is recommended that sections 6.7.5.13.1 and 6.7.5.13.2 be consolidated into a single paragraph 6.7.5.13. It would be more user friendly to include all of the applicable marking requirements in a single paragraph. When combining these it is recommended that the order be rearranged so that similar items are grouped together.

The addition of two (2) new markings are recommended: “Name of the owner and Owner’s identification number. Please note that Test pressure and Working pressure are separated by several lines. That is intentional in order to avoid confusion on the part of persons filling the MEGC. We have also used the word “expert”, rather than authorized body for the last line of text. Expert is used for portable tanks and preferable wording in our opinion. Our recommendation for a revised listing follows:

“Country of Manufacture
 U Approval Approval
 N Country Number
 Manufacturer’s name or mark
 Manufacturer’s serial number
 Owner’s name
 Owner’s identification number
 Operator’s name
 Authorized body for the design approval
 Year of manufacture
 Working pressure at 15 C: _____ bar gauge
 Maximum permissible load mass: _____ kg
 Maximum permissible gross mass (MPGM): _____ kg
 Unladen (tare) mass: _____ kg
 Design temperature range: _____ C to _____ C
 Number of elements: _____
 Total water capacity: _____ litres
 Initial pressure test date and identification of the authorised body
 Date and type of most recent periodic tests
 Year: _____ Month: _____ Type _____ (e.g. 2004-05, AE/UE)
 Test pressure: _____ bar gauge
 Stamp of expert who performed or witnessed the most recent test

For Alternative Arrangements (see 6.7.1.2): “AA” should be included. ”

The applicability of the reference to 6.7.1.2, Alternative Arrangements, in this section 67.5.13 is not entirely necessary. While we do not want to see 6.7.1.2 removed from the Model regulations, the use of alternative arrangements should not necessarily mandate a marking requirement. This decision should be at the discretion of the competent authority.

d. In 6.7.5.8.1 it is proposed that the word “pyrophoric” be added after “flammable” and before “and oxidizing” in the penultimate sentence. Pyrophoric gases should also be directed away from the elements for obvious safety reasons.

e. In 6.7.5.3.2 the provision for Division 2.1 gases should be amended as follows: For the transport of gases of Division 2.1 and oxidizing gases which are assigning a Division 5.1 subsidiary risk in column 4 of the Dangerous Goods List, each element shall be either isolated by the use of a valve or the elements shall be isolated by a valve into assemblies of not more than 3000 litres.

The proposed text clarifies the two options available (i.e. a valve on the element or group of elements not exceeding 300 litres). The proposed text also addresses the need to limit the quantity of oxidizing gas which can be equally dangerous in a fire scenario.

4. The following proposals apply to UN pressure receptacle requirements in Chapter 6.2:

a. In 6.2.2.5.3.1 the following amendments are suggested to clarify the text:

- (1) Amend (a) to read “The organizational structure, and responsibilities of personnel with regard to design and product quality;” The words “power of management is confusing”. We also believe the responsibilities should not be limited to those of the managers.
- (2) It is not clear in paragraph (b) what is meant by “systematic action”.

b. It is proposed to amend 6.2.2.5.4.9 (inspection body responsibilities) for clarity as follows:

“The inspection body shall:

- (a) Review the manufacturer’s application for design type approval for completeness of the information required by 6.2.2.5.4.3. If an application is incomplete, it shall be returned to the applicant with an explanation why the application is not acceptable.
- (b) Review all technical documentation and verify that the design is in accordance with the requirements of the applicable UN pressure receptacle standard. The technical documentation shall show that the prototype lot meets the applicable UN pressure receptacle standard and is representative of the design type.
- (c) Verify the production inspections were performed in accordance with 6.2.2.5.5.
- (d) Select UN pressure receptacles from a prototype production lot and witness testing as required for the design type approval.
- (e) Witness all examinations and tests specified in the UN pressure receptacle standard to ensure compliance with the standard and that the procedures adopted by the manufacturer meet the requirements of the standard.
- (f) Ensure that the various type approval examinations and tests are performed accurately.”

c. 6.2.2.5.4.10 should be revised to include more precise details with respect to what should be required in order for a modification to an approved design type. Modification of an approved UN pressure receptacle should not be authorized without the approval of the competent authority. The following is proposed:

“6.2.2.5.4.10 *Modification of an approved UN pressure receptacle is not authorized without the approval of the competent authority. Prior to modification of a UN pressure receptacle , the manufacturer shall inform the issuing competent authority of modifications to the approved design type as specified in the pressure receptacle standard. A subsequent design type approval shall be requested 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 and shall include all relevant technical documentation required for the initial design type approval including information relative to the modification.*”
