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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

Thirty-fourth session  
Geneva, December 1-9, 2008  
Item 4 of the provisional agenda

**LISTING, CLASSIFICATION AND PACKING**

Amendment to UN 3468, Hydrogen in a metal hydride storage system

Transmitted by the US Fuel Cell Council (USFCC)<sup>1</sup>

**Background**

1. As the utilization of gaseous hydrogen evolves from the chemical industry into various emerging applications, such as fuel for fuel cells and other specialty hydrogen applications, the importance of new and improved storage techniques has become essential. One of these techniques employs the absorption of hydrogen into specially formulated alloys. The material can be stored and transported in a solid form, and the hydrogen later released and used under specific thermodynamic conditions. This document proposes, for UN 3468 “Hydrogen in a metal hydride storage system”, the amendment of some parts of Part 6, Chapter 6.2, the adoption of a new packing instruction P205 in replacement to current P099 and the adoption of a new special provision 32x.

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<sup>1</sup> In accordance with the programme of work of the Sub-Committee for 2007-2008 approved by the Committee at its third session (refer to ST/SG/AC.10/C.3/60, para. 100 and ST/SG/AC.10/34, para. 14).

2. At the 33<sup>rd</sup> session of the Sub-Committee of Experts on the Transport of Dangerous Goods held in July 2008, ISO submitted an informal paper (UN/SCETDG/33/INF.72) which advised:

- (a) That the joint ISO/TC 197 and ISO/TC 58/SC 3 Working Group 10 has further advanced the development of the international standard ISO/WI 16111 “Transportable gas storage devices – Hydrogen absorbed in reversible metal hydrides”. The document has reached the final approval stage (FDIS) and was circulated for approval among the membership of ISO<sup>2</sup>;
- (b) The ISO Central Secretariat is putting in a special effort to make sure that this international standard is published in time for the 34<sup>th</sup> session of the Sub-Committee of Experts on the Transport of Dangerous Goods in December 2008 to make it possible to refer to the standard in the UN Model Regulations and associated packing instructions being developed.

3. Gases (Class 2 substances) are currently grouped in the UN Model Regulations into three packing instructions:

- (a) P200, covering the majority of class 2 substances (compressed, liquefied and dissolved gases, i.e. more than a hundred articles) in pressure receptacles including UN 1001 acetylene dissolved;
- (b) P201, covering non-pressurized toxic gases such as UN 3171, 3168 and 3169; and
- (c) P203, covering refrigerated liquefied gases in closed cryogenic containers.

4. A paper from the United Kingdom (ST/SG/AC.10/C.3/2007/42), submitted at the 32<sup>nd</sup> session of the Sub-Committee, proposed the adoption of a new packing instruction P204 for Division 2.2, non oxidising, refrigerated liquefied gases in open cryogenic receptacles.

5. P099, which applies to UN 3468 (Hydrogen in a metal hydride storage system) states:

“Only packagings which are approved by the competent authority for these goods may be used (see 4.1.3.7). A copy of the competent authority approval shall accompany each consignment or, the transport document shall include an indication that the package was approved by the competent authority.”

6. The USFCC submitted to the 33<sup>rd</sup> session of the Sub-Committee held in July 2008 the document ST/SG/AC.10/C.3/2008/35 proposing new provisions for UN 3468. During the discussion of the paper several suggestions and proposals for improvements were offered. This new paper takes into account these proposals and suggestions as well as some made subsequently during the development of the following alternative.

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<sup>2</sup> The FDIS is being circulated for approval until 22 October 2008.

**Proposal**

7. In the Dangerous Goods List of Chapter 3.2.

In column (6) for UN 3468, add special provision 32x and, in column (8) replace P099 with P205:

8. Insert in section 3.3.1 the following new special provisions.

“32x A metal hydride storage system is a single complete hydrogen storage system, including shell (receptacle), metal hydride, pressure relief device, shut-off valve, other appurtenances and internal components. Metal hydride storage system intended to be used as fixed fuel storage onboard hydrogen fuelled vehicles must be approved by the competent authority for these goods, before acceptance for transport. A copy of the competent authority approval shall accompany each consignment or, the transport document shall include an indication that the package was approved by the competent authority.”.

9. Insert the following new packing instruction in sub-section 4.1.4.1:

<b>P205</b>	<b>PACKING INSTRUCTION</b>	<b>P205</b>
	<p>This instruction applies to UN 3468.</p> <p>For metal hydride storage systems, the general packing requirements of 4.1.6.1 shall be met.</p> <p>Metal hydride storage systems meeting the applicable requirements for the construction and testing of pressure receptacles containing gas of Chapter 6.2 are authorised for the transport of hydrogen.</p> <p>Only receptacles not exceeding 150 litres in water capacity and having a maximum developed pressure not exceeding 25 MPa, where hydrogen is the only transferred media, are covered by this packing instruction.</p> <p>When steel pressure receptacles and composite pressure receptacles with steel liners are used, only those bearing the “H” mark shall be authorized.</p> <p>Metal hydride storage systems shall be certified under ISO 16111:2008 and meet the service conditions, design criteria, type tests, batch tests and routine tests for transportable hydride-based hydrogen storage systems specified in ISO 16111:2008.</p> <p>The test pressure and pressure relief devices of a metal hydride storage system shall be in accordance with ISO 16111:2008</p>	

10. Amendments to Chapter 4.1:

4.1.6.1.8 In (d), delete “or” at the end;

In (e), add “; or” at the end;

Add a new sub-paragraph “(f)” to read as follows:

“(f) For hydrogen in a metal hydride storage system, UN 3468, the valve protections requirements specified in ISO 16111:2008 shall be met.”.

4.1.6.1.10 Insert “or P205” after “P250”, at the end of the first sentence.

11. **Amendments to Chapter 6.2:**

“6.2.1.1.5 Add the following sentence at the end:

“The test pressure of a metal hydride storage system shall be in accordance with P205.”.

6.2.1.2.3 Insert a new paragraph to read as follows:

“Metal hydride storage system components shall be made of materials that are suitable for the range of conditions expected over the life of the metal hydride storage system. Components that are in contact with gaseous hydrogen or metal hydride material shall be sufficiently resistant to their chemical and physical action under normal service conditions to maintain operational and pressure containment integrity. Hydrogen absorbing alloys or metal hydride materials that are classified as Type I explosive materials according to the UN Recommendations on the Transport of Dangerous Goods shall not be used in a metal hydride storage system.”.

6.2.1.3.4 In the first sentence, insert “P205” after “P200 (1)”.

6.2.2.1.5 Insert a new paragraph to read as follows:

“The following standards apply for the design, construction, and initial inspection and test of hydrogen in a metal hydride storage system, UN 3468, except that inspection requirements related to the conformity assessment system and approval shall be in accordance with 6.2.2.5,

ISO 16111:2008	Transportable gas storage devices – Hydrogen absorbed in reversible metal hydride
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”

6.2.2.2 In the introductory paragraph, insert “, P205” after “P200” in the text between brackets.

6.2.2.3 Insert the following sentence and table at the end of current text:

“For hydrogen in a metal hydride storage system, UN 3468, the requirements specified in the following standard apply to closures and their protection:

ISO 16111:2008	Transportable gas storage devices – Hydrogen absorbed in reversible metal hydride
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”

6.2.2.4 In the introductory sentence, insert:

“gas storage devices containing hydrogen absorbed in reversible metal hydride and” after “transportable” and add the following row at the end of the table:

ISO 16111:2008	Transportable gas storage devices – Hydrogen absorbed in reversible metal hydride
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