

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

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Item 6 of the provisional agenda

LISTING, CLASSIFICATION AND PACKING

Fuel cell cartridges containing Division 2.1 or 4.3 or Class 8 substances

Transmitted by the Dangerous Goods Advisory Council (DGAC)
and the US Fuel Cell Council (USFCC)

Introduction

1. The Dangerous Goods Advisory Council (DGAC) and the US Fuel Cell Council (USFCC) offer the following comments and responses to questions raised by the experts from France and the United States of America in their document (ST/SG/AC.10/C.3/2006/50) on entries for fuel cell cartridges. In addition, we note with appreciation and fully support the comments and proposals pertaining to fuel cell cartridges containing hydrogen in a metal hydride made by the expert from Canada in her information paper (INF 11).

Separate Shipping Names for Fuel Cell Cartridges and Fuel Cell Cartridges Packed With or In Equipment

2. Document ST/SG/AC.10/C.3/2006/50 raises the question of whether to have separate entries or a single entry for each class of fuel cell cartridges and cartridges contained in equipment or packed with equipment. Having a single entry, simplifies the proposal and simplifies compliance. This approach is consistent with the Sub-Committee's decision at its 28th session on UN 3468. From an emergency response perspective, the initial response will be the same for an incident involving a cartridge or one involving a cartridge installed in equipment. Therefore, we recommend a single entry for each class of dangerous goods contained in a cartridge.

Note: At least one DGAC member felt that it would be advantageous to have separate proper shipping names for fuel cell cartridges and fuel cell cartridges contained in or with equipment. They contend that a cartridge not in equipment only poses the danger of the fuel whereas a cartridge in equipment may pose an additional hazard as an energy source. The Sub-Committee is invited to consider this matter in its deliberations.

3. We also believe it important to clarify that a cartridge installed in or integral to a fuel cell device should be regarded as a cartridge installed in equipment.

Requirement to subject fuel cell cartridges to a 1.2 meter drop test.

4. Under the proposal in ST/SG/AC.10/C.3/2006/50, all fuel cell cartridges would be required to withstand a drop test of 1.2 meters unpacked and in addition fuel cell cartridges containing more than the

limited quantity amount would be required to be transported in packing group III performance packaging. We question the application of the 1.2 meter drop test requirement, particularly when one considers that most of the fuels contained in cartridges in the same quantity may be transported in glass inner packagings in strong outer packagings without a requirement to survive an unpackaged drop test. Further, a similar requirement is not applied to other articles such as aerosols or receptacles small containing gas. We recommend deletion of the 1.2 meter drop test requirement.

Limited quantity values for cartridges containing liquefied flammable gases

5. We believe a limited quantity value should be assigned to cartridges containing liquefied gases. Containment systems for small fuel cell cartridges containing liquefied gas are similar to the containment systems for aerosols (UN 1950) and receptacles small containing gas (UN 2037) which are both assigned a limited quantity value of 1 liter and may both contain a flammable gas. Further, both aerosols and receptacles small containing a flammable gas with a capacity of less than 50 ml may be transported as not subject to the Model Regulations. While the Model Regulations do not contain requirements covering the integrity of aerosols or receptacles small containing gas, the ICAO Technical Instructions do contain such provisions. Under the ICAO TI, aerosols and receptacles small containing a flammable gas with a limiting capacity of 1000 ml and with a pressure of not more than 1245 kPa at 55 °C are authorized for transport as limited quantities. The proposed pressure limit of 1000 kPa at 55 °C in ST/SG/AC.10/C.3/2006/50 for liquefied gas fuel cell cartridges is more conservative than that for UN 1950 and UN 2037 under ICAO. In addition, we propose that liquefied gas cartridges be designed to withstand twice the maximum pressure at 55 °C consistent with IEC 62282-6-1. This is more conservative than the ICAO 1.5 times the maximum pressure for aerosols and receptacles small containing gas. We propose a limited quantity value of 120 ml, which is again more conservative than 1000ml ICAO limited quantity provision for similar articles. The ST/SG/AC.10/C.3/2006/50 proposal references to the lack of a limited quantity provision for liquefied gas substances, does not properly take into account the small quantity of material in these articles or the integrity provided by the receptacles designed to this strict criteria. This is also in conflict with the premise stated in paragraph 3 of ST/SG/AC.10/C.3/2006/50, which highlights the importance and the intent of viewing fuel cell cartridges as articles, not substances.

Upper limit of 200 ml for liquefied gas fuel cell cartridges

6. It is not clear why document ST/SG/AC.10/C.3/2006/50 proposes a limit of 200 ml for cartridges containing liquefied gases. No similar limit is applied to aerosols and receptacles small containing gas which have similar containment systems. For practical reasons, we anticipate fuel for large fuel cell systems utilizing a liquefied flammable gas would be transported in a cylinder in accordance with P200. IEC 62282-6-1 which specifies requirements applicable to fuel cell cartridges suitable for use by consumers covers cartridges with a capacity not exceeding one liter (1L). We believe a one liter limit (1L) is reasonable practical limit.

Proposed Special Provision 3EE

7. Fuel cell cartridges of the types YYYY and ZZZZ may contain an activator (e.g., water or dilute aqueous solutions of class 8 substances or metal salts) that is mixed with the fuel during fuel cell operation. This should be allowed when the cartridge is fitted with two independent means to prevent unintended mixing of the fuel and activator. SP3EE is proposed for this purpose. In the case where an activator meets the criteria of class 8 and the fuel is of Division 4.3, the quantity would be limited to 30 ml.

Proposals

8. Based on the above comments and the proposals made by the expert from Canada in INF 11, the proposal in ST/SG/AC.10/C.3/2006/50 should be amended to read as follows:

- (a) New entries would be added to the Dangerous Goods List in Chapter 3.2 of the Model

Regulations and the existing entry for UN 3473 would be amended as follows:

The following new entries would be added:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
WWWW	FUEL CELL CARTRIDGE; or FUEL CELL CARTRIDGE CONTAINED IN EQUIPMENT; or FUEL CELL CARTRIDGE PACKED WITH EQUIPMENT containing liquefied flammable gas	2.1			3AA 3BB	120ml	P004			
XXXX	FUEL CELL CARTRIDGE; or FUEL CELL CARTRIDGE CONTAINED IN EQUIPMENT; or FUEL CELL CARTRIDGE PACKED WITH EQUIPMENT containing hydrogen in metal hydride	2.1			3AA 3DD	120ml	P2XX			
YYYY	FUEL CELL CARTRIDGE; or FUEL CELL CARTRIDGE CONTAINED IN EQUIPMENT; or FUEL CELL CARTRIDGE PACKED WITH EQUIPMENT containing water-reactive substance	4.3			3AA 3EE	500ml or 500g	P004			
ZZZZ	FUEL CELL CARTRIDGE ; or FUEL CELL CARTRIDGE CONTAINED IN EQUIPMENT; or FUEL CELL CARTRIDGE PACKED WITH EQUIPMENT containing corrosive substance	8			3AA 3EE	1 L or 1 kg	P004			

The existing entry for UN 3473 would be amended as follows:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
3473	FUEL CELL CARTRIDGE; or FUEL CELL CARTRIDGE CONTAINED IN EQUIPMENT; or FUEL CELL CARTRIDGE PACKED WITH EQUIPMENT containing flammable liquids	3			3AA	1 L	P004			

- (b) Four new Special Provisions (including SP 3DD from INF 11) would be added in Chapter 3.3 of the Model Regulations to read:

SP 3AA: This entry applies to fuel cell cartridges including when contained in equipment or packed with equipment. Fuel cell cartridges installed in or integral to a fuel cell system are regarded as contained in equipment. Fuel cell cartridge means a container that stores fuel for

discharge into the fuel cell through a valve(s) that controls the discharge of fuel into the fuel cell. Fuel cell cartridges shall be designed and constructed to prevent fuel leakage under normal conditions of transport.

Fuel cell cartridge design types that are designed for liquid fuels shall pass an internal pressure test at a pressure of 100 kPa (gauge).

SP 3BB: Fuel cell cartridges transported under this entry shall contain no more than 1000 ml of liquefied flammable gas with a vapor pressure not exceeding 1000 kPa at 55 °C.

Each fuel cell cartridge that is designed to contain a gas shall be capable of withstanding a pressure of at least 2 times the equilibrium pressure of the contents at 55 °C.

SP3DD: Fuel cell cartridges containing hydrogen in a metal hydride and transported as limited quantities of dangerous goods shall be in compliance with the requirements of packing instruction P2XX.

SP 3EE: A fuel cell cartridge may contain an activator provided it is fitted with two independent means of preventing unintended mixing with the fuel during transport. For Division 4.3 cartridges, up to 30 ml of a Class 8 activator may be included.

- (c) Add the following new packing instructions in 4.1.4.1:

P004	PACKING INSTRUCTION	P004
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This instruction applies to fuel cell cartridges, and fuel cell cartridges contained in equipment or packed with equipment.

The following packagings are authorized provided the general provisions of 4.1.1, with the exception of the orientation requirement in 4.1.1.5, and 4.1.3 are met:

- (1) For fuel cell cartridges, packagings conforming to the Packing Group III performance level; and
- (2) For fuel cell cartridges contained in equipment or packed with equipment, strong outer packagings. Large robust equipment containing fuel cell cartridges may be transported unpackaged. When fuel cell cartridges are packed with equipment, they shall be packed in inner packagings or placed in the outer packaging with cushioning material or divider so that the fuel cell cartridges are protected against damage that may be caused by the movement or placement of the contents within the outer packaging. Fuel cell cartridges that are installed in equipment shall be protected against short circuit and the entire system shall be protected against inadvertent operation.

P2XX	PACKING INSTRUCTION	P2XX
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See INF 11 by the expert from Canada.
