



**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-seventh session**

Geneva, 21–30 June 2010

Item 4 of the provisional agenda

Electric storage systems**Fuel cells containing dangerous goods****Transmitted by the International Electrotechnical Commission (IEC)¹****Introduction**

1. The five entries for fuel cell cartridges (UN 3473, 3476, 3477, 3478 and 3479), which appear in the United Nations Model Regulations, refer to fuel cell cartridges or fuel cell cartridges contained in equipment or fuel cell cartridges packed with equipment. The following dangerous goods are currently permitted in fuel cell cartridges: “Flammable liquids” UN 3473, “Water reactive substances” UN 3476, “Corrosive substances” UN 3477, “Liquefied flammable gas” UN 3478, and “Hydrogen in metal hydride” UN 3479. No reference is made in the Model Regulations on how to classify and transport fuel cells containing dangerous goods permitted in fuel cell cartridges. Such fuel cells are currently commercially available and a demonstration of some of these products is proposed. A fuel cell differs from a fuel cell cartridge in its capacity of generating an electrical current once activated. A fuel cell usually consists of a few internal parts which might include an integral reservoir for the fuel, stacks, tubes, pipes, control system, etc. Provided proper precaution is taken to prevent unintended activation during transport, the hazard inherent to a fuel cell containing a specific fuel is equivalent to the hazard inherent to a cartridge containing the same fuel. This assumes that both the fuel cell and the cartridges meet the same minimum design and construction criteria.

¹ In accordance with the programme of work of the Sub-Committee for 2009–2010 approved by the Committee at its fourth session (refer to ST/SG/AC.10/C.3/68, para. 118 (d) and ST/SG/AC.10/36, para. 14).

2. Special provision 328 applies to the five fuel cell cartridges entries which appear in the Model Regulations. The third sentence of Special provision 328 explains that a fuel cell cartridge is an article that store fuel for discharge into a fuel cell through a valve(s) that control the discharge of fuel into the fuel cell. It could be argued that since a fuel cell meets the definition of a fuel cell cartridge it is considered as a fuel cell cartridge and therefore should be transported as such. This interpretation is open to debate and not universally accepted. A fuel cell is a more sophisticated article than a cartridge and its purpose is to generate electricity when activated. Furthermore, a fuel cell often contains a battery used for the controls and /or activation of the fuel cell. This hazard will need to be taken into account during transport.

3. This paper proposes to expand the current provisions for fuel cell cartridges to permit the safe transport of fuel cells or/and fuel cell cartridges, containing one of the permitted dangerous goods. To achieve the above objective, the following amendments are proposed:

- Expand the proper shipping name of UN 3473, 3476, 3477, 3478 and 3479, appearing in Chapter 3.2, “Dangerous Goods List”, Column 2, under “Name and description”, as indicated in Proposal A thereafter;
- Amend Special provisions 328 and 339, appearing in Chapter 3.3, paragraph 3.3.1, as indicated in Proposal B;
- Amend packing instruction P004 as indicated in Proposal C;
- Amend the “Alphabetical list of the substances and articles” as indicated in proposal D.

Proposal A

4. Expand the proper shipping name of UN 3473, 3476, 3477, 3478 and 3479, appearing in Chapter 3.2, “Dangerous Goods List”, Column 2, under “Name and description”, as indicated in the following section:

1	2	3	6	7a	7b	8
-	3.1.2	2.0	3.3	3.4	3.5	4.1.4
3473	FUEL CELL or FUEL CELL CARTRIDGES or FUEL CELL CARTRIDGES CONTAINED IN EQUIPMENT or FUEL CELL CARTRIDGES PACKED WITH EQUIPMENT, containing flammable liquids	3	328	1L	E0	P004
3476	FUEL CELL or FUEL CELL CARTRIDGES or FUEL CELL CARTRIDGES CONTAINED IN EQUIPMENT or FUEL CELL CARTRIDGES PACKED WITH EQUIPMENT, containing water-reactive substances	4.3	328 334	500 ml or 500 g	E0	P004
3477	FUEL CELL or FUEL CELL CARTRIDGES or FUEL CELL CARTRIDGES CONTAINED IN EQUIPMENT or FUEL CELL CARTRIDGES PACKED WITH EQUIPMENT, containing corrosive substances	8	328 338	120 ml	E0	P004

3478	FUEL CELL or FUEL CELL CARTRIDGES or FUEL CELL CARTRIDGES CONTAINED IN EQUIPMENT or FUEL CELL CARTRIDGES PACKED WITH EQUIPMENT, containing liquefied flammable gas	2.1	328	120 ml	E0	P004
3479	FUEL CELL or FUEL CELL CARTRIDGES or FUEL CELL CARTRIDGES CONTAINED IN EQUIPMENT or FUEL CELL CARTRIDGES PACKED WITH EQUIPMENT, containing hydrogen in metal hydride	2.1	328 339	120 ml	E0	P004

Proposal B

Amend Special provisions 328 and 339, appearing in Chapter 3.3, paragraph 3.3.1, as indicated below:

328 This entry applies to fuel cells and 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 an article that stores fuel for discharge into the fuel cell through a valve(s) that controls the discharge of fuel into the fuel cell. Fuel cells and fuel cell cartridges, including when contained in equipment, shall be designed and constructed to prevent fuel leakage under normal conditions of transport.

Fuel cell and fuel cell cartridge design types using liquids as fuels shall pass an internal pressure test at a pressure of 100 kPa (gauge) without leakage.

Except for fuel cells and fuel cell cartridges containing hydrogen in metal hydride which shall be in compliance with special provision 339, each fuel cell and fuel cell cartridge design type shall be shown to pass a 1.2 meter drop test onto an unyielding surface in the orientation most likely to result in failure of the containment system with no loss of contents.

339 In this special provision, replace all reference to “fuel cell cartridges” with “fuel cells and fuel cell cartridges”.

Proposal C

Amend packing instruction P004 as indicated below:

P004	PACKING INSTRUCTION	P004
This instruction applies to UN Nos. 3473, 3476, 3477, 3478 and 3479.		
The following packagings are authorized provided that the general provisions of 4.1.1.1, 4.1.1.2, 4.1.1.3, 4.1.1.6 and 4.1.3 are met:		
(1) For <u>fuel cells and</u> fuel cell cartridges, packagings conforming to the packing group II performance level; and		
(2) For fuel cell cartridges contained in equipment or packed with equipment, strong outer packagings. Large robust equipment (see 4.1.3.8) containing fuel cell <u>or fuel cell</u> cartridges may be transported unpackaged. When fuel cells <u>or fuel cell</u> cartridges are packed with equipment, they shall be packed in inner packagings or placed in the outer packaging with cushioning material or divider(s) so that the fuel cell <u>or fuel cell</u> cartridges are protected against damage that may be caused by the movement or placement of the contents within the outer packaging. Fuel cells <u>and fuel cell</u> cartridges which are installed in equipment shall be protected against short circuit and the entire system shall be protected against inadvertent operation.		
(3) <u>Only cells and batteries meeting the requirements of SP 188 may be installed in the fuel cell.</u>		

Proposal D

In the alphabetical list of substances and articles insert the following new entries:

<u>FUEL CELLS containing corrosive substances</u>	<u>8</u>	<u>3477</u>
<u>FUEL CELLS containing flammable liquids</u>	<u>3</u>	<u>3473</u>
<u>FUEL CELLS containing hydrogen in metal hydride</u>	<u>2.1</u>	<u>3479</u>
<u>FUEL CELL CONTAINED IN EQUIPMENT containing liquefied flammable gas</u>	<u>2.1</u>	<u>3478</u>
<u>FUEL CELLS containing water-reactive substances</u>	<u>4.3</u>	<u>3476</u>