



WORKING PAPER

DANGEROUS GOODS PANEL (DGP)

TWENTY-SECOND MEETING

Montréal, 5 to 16 October 2009

- Agenda Item 2:** Development of recommendations for amendments to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284) for incorporation in the 2011-2012 Edition
- Agenda Item 5:** Resolution, where possible, of the non-recurrent work items identified by the Air Navigation Commission or the panel:
- Agenda Item 5.4:** Reformatting of the packing instructions

LIMITED QUANTITIES PROVISIONS FOR FUEL CELL CARTRIDGES

(Presented by USFCC)

SUMMARY

This paper proposes the adoption of new provisions in the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284) to allow the carriage of fuel cell cartridges under the provisions of limited quantities.

Action by the DGP: The panel is invited to amend the various entries for fuel cell cartridges appearing in Part 3;2, Table 3.1 as indicated in Appendix A and to add new Packing Instructions Y215, Y374, Y495, Y873 to Part 4 as indicated in Appendix B. The proposal is based on discussions at DGP-WG09.

1. INTRODUCTION

1.1 A proposal to adopt new provisions to allow the carriage of fuel cell cartridges under the provisions of limited quantities was discussed at the DGP Working Group of the Whole Meeting in Auckland (DGP-WG09, 4 to 8 May 2009). The proposal was made by the USFCC on the basis that the UN Model Regulations currently provide for limited quantity exceptions for all types of fuel cell cartridges (Chapter 3.2) as summarized in the table below:

UN #	Proper Shipping Name	Classification	Limited Quantity*
UN 3473	Fuel cell cartridges <i>containing flammable liquids</i>	3	1 L
UN 3476	Fuel cell cartridges <i>containing water-reactive substances</i>	4.3	500 ml or 500 g

UN #	Proper Shipping Name	Classification	Limited Quantity*
UN 3477	Fuel cell cartridges <i>containing corrosive substances</i>	8	1 L or 1 kg
UN 3478	Fuel cell cartridges <i>containing liquefied flammable gas</i>	2.1	120 ml
UN 3479	Fuel cell cartridges <i>containing hydrogen in metal hydride</i>	2.1	120 ml

*Maximum quantity per inner packaging as per column 7a, chapter 3.2 of the UN Model Regulations.

1.2 The UN Model Regulations permits limited quantities of such articles to be placed in suitable outer packagings, provided the gross mass of the package does not exceed 30 kg G. At DGP-WG09, it was argued that fuel cell cartridges are inherently robust packaging, designed and constructed to withstand conditions of normal use and transport and that Special Provisions A146, A161 and A162 place additional requirements on the design and construction of fuel cell cartridges providing more safety. Allowing the shipment of limited quantities by air would improve multimodal harmonization, provide for the efficient and rapid transport of consumer and emergency services applications for micro fuel cell cartridges, and remove the competitive disadvantage fuel cell technology has with other portable sources of electric power which could negatively affect their development as an alternative energy source.

1.3 Discussion centred at DGP-WG09 around the quantity limits which were proposed. It was noted that although the limits proposed were consistent with those in the UN Model Regulations, quantity limits in the Technical Instructions were generally smaller. It was also explained at the working group meeting that if the limit is reduced below the allowable cartridge size for carry-on, this would make the limited quantity provision useless since the smallest cartridge is likely to be the cartridge size permitted to be carried by a passenger in carry-on baggage. It was suggested this could have serious implications for the affected industry and careful consideration should be given to reductions in quantity, especially as fuel cell cartridges had to withstand a 1.2m drop test when unpackaged as distinct to the standard limited quantities 1.2m drop test on the outer packaging. Some members questioned the fact that some of the chemicals contained in fuel cells were not permitted in limited quantities but it was pointed out that these chemicals were part of articles rather than chemicals contained in combination packagings. It was agreed a new proposal would be prepared for DGP/22 based on the discussion.

APPENDIX A

AMENDMENT TO PART 3 OF THE TECHNICAL INSTRUCTIONS

Part 3

**DANGEROUS GOODS LIST,
SPECIAL PROVISIONS AND
LIMITED AND EXCEPTED QUANTITIES**

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Chapter 2

**ARRANGEMENT OF THE
DANGEROUS GOODS LIST (TABLE 3-1)**

Parts of this Chapter are affected by State Variations AU 1, AU 2, AU 3, BE 3, CA 7, CA 8, CA 10, CA 11, CA 13, GB 3, IR 3, JP 21, NL 1, US 2, US 3, US 6, US 15, ZA 1; see Table A-1

**2.1 ARRANGEMENT OF THE DANGEROUS GOODS LIST
(TABLE 3-1)**

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Name	UN No.	Class or division	Subsidiary risk	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger aircraft		Cargo aircraft	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4	5	6	7	8	9	10	11	12	13
Fuel cell cartridges, containing corrosive substances	3477	8		Corrosive		A146 A157		E0	873 <u>Y873</u>	5 kg <u>2.5 kg</u>	873	50 kg
Fuel cell cartridges, containing flammable liquids	3473	3		Liquid flammable		A146		E0	374 <u>Y374</u>	5 kg <u>2.5 kg</u>	374	50 kg
Fuel cell cartridges, containing hydrogen in metal hydride	3479	2.1		Gas flammable		A146 A162		E0	215 <u>Y215</u>	1 kg <u>0.5 kg</u>	215	15 kg
Fuel cell cartridges, containing liquefied flammable gas	3478	2.1		Gas flammable		A146 A161		E0	215 <u>Y215</u>	1 kg <u>0.5 kg</u>	215	15 kg

Name	UN No.	Class or division	Subsidiary risk	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger aircraft		Cargo aircraft	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4	5	6	7	8	9	10	11	12	13
Fuel cell cartridges, containing water reactive substances	3476	4.3		Danger if wet		A146 A157		E0	495 Y495	5 kg 2.5kg	495	50 kg
Fuel cell cartridges contained in equipment, containing corrosive substances	3477	8		Corrosive		A146 A157		E0	874	5 kg	874	50 kg
Fuel cell cartridges contained in equipment, containing flammable liquids	3473	3		Liquid flammable		A146		E0	375	5 kg	375	50 kg
Fuel cell cartridges contained in equipment, containing hydrogen in metal hydride	3479	2.1		Gas flammable		A146 A162		E0	216	1 kg	216	15 kg
Fuel cell cartridges contained in equipment, containing liquefied flammable gas	3478	2.1		Gas flammable		A146 A161		E0	216	1 kg	216	15 kg
Fuel cell cartridges contained in equipment, containing water reactive substances	3476	4.3		Danger if wet		A146 A157		E0	496	5 kg	496	50 kg
Fuel cell cartridges packed with equipment, containing corrosive substances	3477	8		Corrosive		A146 A157		E0	875	5 kg	875	50 kg
Fuel cell cartridges packed with equipment, containing flammable liquids	3473	3		Liquid flammable		A146		E0	376	5 kg	376	50 kg

Name	UN No.	Class or division	Subsidiary risk	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger aircraft		Cargo aircraft	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4	5	6	7	8	9	10	11	12	13
Fuel cell cartridges packed with equipment, containing hydrogen in metal hydride	3479	2.1		Gas flammable		A146 A162		E0	217	1 kg	217	15 kg
Fuel cell cartridges packed with equipment, containing liquefied flammable gas	3478	2.1		Gas flammable		A146 A161		E0	217	1 kg	217	15 kg
Fuel cell cartridges packed with equipment, containing water reactive substances	3476	4.3		Danger if wet		A146 A157		E0	497	5 kg	497	50 kg

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APPENDIX B

AMENDMENT TO PART 4 OF THE TECHNICAL INSTRUCTIONS

Part 4

PACKING INSTRUCTIONS

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PACKING INSTRUCTION Y215

Limited quantities for UN 3478 and 3479 only

General requirements

Part 3;4 requirements must be met.

Single packagings are not permitted for limited quantities.

For the purpose of this packing instruction, a fuel cell cartridge is considered an inner packaging.

1) Compatibility requirements

— Substances must be compatible with their packagings as required by 4:1.1.3.

<u>UN number and proper shipping name</u>	<u>Maximum quantity per package</u>
<u>UN 3478 Fuel cell cartridges containing liquefied flammable gas</u>	<u>0.5 kg of fuel cell cartridges</u>
<u>UN 3479 Fuel cell cartridges containing hydrogen in metal hydride</u>	<u>0.5 kg of fuel cell cartridges</u>

ADDITIONAL PACKING REQUIREMENTS

— Fuel cell cartridges must be securely cushioned in the outer packagings.

— Fuel cell cartridges must not exceed 120 ml water capacity each.

OUTER PACKAGINGS

Boxes

Aluminium
Fibreboard
Natural wood
Plastic
Plywood
Reconstituted wood
Steel

Drums

Aluminium
Fibreboard
Plastic
Plywood
Steel

Jerricans

Steel
Plastics
Aluminium

PACKING INSTRUCTION Y374

Limited quantities for UN 3473 only

General requirements

Part 3:4 requirements must be met.

Single packagings are not permitted for limited quantities.

For the purpose of this packing instruction, a fuel cell cartridge is considered an inner packaging.

1) Compatibility requirements

— Substances must be compatible with their packagings as required by 4:1.1.3.

<u>UN number and proper shipping name</u>	<u>Maximum quantity per package</u>
<u>UN 3473 Fuel cell cartridges</u>	<u>2.5 kg of fuel cell cartridges</u>

ADDITIONAL PACKING REQUIREMENTS

— Fuel cell cartridges must be securely cushioned in the outer packagings.

— Fuel cell cartridges must not exceed **0.5 L** of flammable liquid fuel.

OUTER PACKAGINGS

Boxes

Aluminium
Fibreboard
Natural wood
Plastic
Plywood
Reconstituted wood
Steel

Drums

Aluminium
Fibreboard
Plastic
Plywood
Steel

Jerricans

Steel
Plastics
Aluminium

PACKING INSTRUCTION Y495Limited quantities for UN 3476 only**General requirements**Part 3:4 requirements must be met.Single packagings are not permitted for limited quantities.For the purpose of this packing instruction, a fuel cell cartridge is considered an inner packaging.Fuel cell cartridges containing liquid water reactive fuels are not permitted in limited quantities.**1) Compatibility requirements**— Substances must be compatible with their packagings as required by 4:1.1.3.

<u>UN number and proper shipping name</u>	<u>Maximum quantity per package</u>
<u>UN 3476 Fuel cell cartridges</u>	<u>2.5 kg of fuel cell cartridges</u>

ADDITIONAL PACKING REQUIREMENTS— Fuel cell cartridges must be securely cushioned in the outer packagings.— Fuel cell cartridges containing solid water reactive fuels must not exceed 0.2 kg solid water reactive fuel per cartridge.**OUTER PACKAGINGS OF COMBINATION PACKAGINGS (see 6:3.1)**Boxes

Aluminium
Fibreboard
Natural wood
Plastic
Plywood
Reconstituted wood
Steel

Drums

Aluminium
Fibreboard
Plastic
Plywood
Steel

Jerricans

Steel
Plastics
Aluminium

PACKING INSTRUCTION Y873

Limited quantities for UN 3477 only

General requirements

Part 3;4 requirements must be met.

Single packagings are not permitted for limited quantities.

For the purpose of this packing instruction, a fuel cell cartridge is considered an inner packaging.

1) Compatibility requirements

— Substances must be compatible with their packagings as required by 4;1.1.3.

<u>UN number and proper shipping name</u>	<u>Maximum quantity per package</u>
<u>UN 3477 Fuel cell cartridges</u>	<u>2.5 kg of fuel cell cartridges</u>

ADDITIONAL PACKING REQUIREMENTS

— Fuel cell cartridges must be securely cushioned in the outer packagings.

— Fuel cell cartridges must not exceed 0.2 L of liquid corrosive fuel or 0.2 kg of solid corrosive fuel per cartridge.

OUTER PACKAGINGS OF COMBINATION PACKAGINGS (see 6;3.1)

Boxes

Aluminium
Fibreboard
Natural wood
Plastic
Plywood
Reconstituted wood
Steel

Drums

Aluminium
Fibreboard
Plastic
Plywood
Steel

Jerricans

Steel
Plastics
Aluminium