DANGEROUS GOODS PANEL (DGP)
MEETING OF THE WORKING GROUP OF THE WHOLE

Auckland, New Zealand, 4 to 8 May 2009

Agenda Item 5: Resolution, where possible, of the non-recurrent work items identified by the Air Navigation Commission or the panel
5.4: Reformatting of the packing instructions

CLASS 2 PACKING INSTRUCTIONS

(Presented by R. Richard)

SUMMARY

The purpose of this paper is to provide further information and discussion on the reformatted Packing Instructions for Classes 2.

1. INTRODUCTION

1.1 . While actions to align the Packing Instructions in the Technical Instructions for the Safe Transport of Dangerous Goods by Air for Class two in the reformatted structure for the 2011 -2012 edition have been underway, discussion on specific portions is still needed.

2. REFORMATTED PACKING INSTRUCTIONS

2.1 Below are the Class 2 reformatted packing instructions for the Technical Instructions.

CLASS 2 – GASES

Parts of this Chapter are affected by State Variations CA 17, US6, US 15; see Table A-1

4.1Special Packing Provisions for Dangerous Goods of Class 2

4.1 General requirements

4.1.1.1 This section provides general requirements applicable to the use of cylinders and closed cryogenic receptacles for the transport of Class 2 gasses (e.g. UN 1072 **Oxygen, compressed**). Cylinders and closed cryogenic receptacles must be constructed and closed so as to prevent any loss of contents which might be caused under normal conditions of transport, including by vibration, or by changes in temperature, humidity or pressure (resulting from change in altitude, for example).

4.1.1.2 Parts of cylinders and closed cryogenic receptacles that are in direct contact with dangerous goods must not be affected or weakened by those dangerous goods and must not cause a dangerous effect (e.g. catalysing a reaction or reacting with the dangerous goods). In addition to the requirements specified in the relevant packing instruction, which take precedence, the applicable provisions of ISO 11114-1:1997 and ISO 11114-2:2000 must be met.

4.1.1.3 Cylinders and closed cryogenic receptacles, including their closures, must be selected that are able to contain a gas or a mixture of gases according to the requirements or 6;5.1.2 and the requirements or the specific packing instructions of this Part.

4.1.1.4 Refillable cylinders must not be filled with a gas or gas mixture different from that previously contained unless the necessary operations for change of gas service have been performed. The change of service for compressed and liquefied gases must be accordance with ISO 11621:1997, as applicable. In addition, a cylinder that previously contained a Class 8 corrosive substance or a substance of another class with a corrosive subsidiary risk must not be authorized for the transport of a Class 2 substance unless the necessary inspection and testing as specified in 6;5.1.6 have been performed .

4.1.1.5 Prior to filling, the filler must perform an inspection of the cylinder or closed cryogenic receptacle and ensure that the cylinder or closed cryogenic receptacle is authorized for the gas to be transported and that the provisions of these Instructions have been met. Shut off valves must be closed after filling and remain closed during transport. The shipper must verify that the closures and equipment are not leaking.

4.1.1.6 Cylinders and closed cryogenic receptacles must be filled according to the working pressures, filling ratios and provisions specified in the appropriate packing instruction for the specific substance. Reactive gases and gas mixtures must be filled to a pressure such that if complete decomposition of the gas occurs, the working pressure of the cylinder must not be exceeded.

4.1.1.7 Cylinders and closed cryogenic receptacles, including their closures, must conform to the design, construction, inspection and testing requirements detailed in 6;5. When outer packagings

are prescribed, the cylinders must be firmly secured therein. Unless otherwise specified in the detailed packing instructions, one or more inner packaging may be enclosed in an outer packaging.

4.1.1.8 Valves must be designed and constructed in such a way that they are inherently able to withstand damage without release of the contents or must be protected from damage, which could cause inadvertent release of the contents of the cylinder and closed cryogenic receptacle, by one of the following methods:

a) Valves are placed inside the neck of the cylinder and closed cryogenic receptacles and protected by a threaded plug or cap;
b) Valves are protected by caps. Caps must possess vent holes of a sufficient cross-sectional area to evacuate the gas if leakage occurs at the valves;
c) Valves are protected by shrouds or guards,
d) Not used; or
e) Cylinders and closed cryogenic receptacles are transported in an outer packaging. The packaging as prepared for transport must be capable of meeting the drop test specified in 6;4.3 at the Packing Group I performance level.

For cylinders and closed cryogenic receptacles with valves as described in b) and c), the requirements of ISO 11117:1998 must be met; for valves with inherent protection, the requirements of Annex B of ISO 10297:1999 must be met.

4.1.1.9 Non refillable cylinder and closed cryogenic receptacles must:

a) be transported in an outer packaging, such as a box, or crate, or in shrink – wrapped trays or stretch – wrapped trays;
b) not used;
c) not be repaired after being put into service.

4.1.1.10 Refillable cylinders, other than closed cryogenic receptacles, must be periodically inspected according to the provisions of 6;5.1.6 and Packing Instruction 200. Cylinders and closed cryogenic receptacles must not be filled after they become due for periodic inspection but may be transported after the expiry of the time limit.

4.1.1.11 Repairs must be consistent with the fabrication and testing requirements of the applicable design and construction standards and are only permitted as indicated in the relevant periodic inspection standards specified in 6;5.2.4. Cylinders, other than the jacket of closed cryogenic receptacles, must not be subject to repairs of any of the following:

a) weld cracks or other weld defects;
b) cracks in walls
c) leaks or defects in the material of the wall, head or bottom.

4.1.1.12 Cylinders and closed cryogenic receptacles must not be offered for filling:

a) when damaged to such an extent that the integrity of the cylinder and closed cryogenic

receptacle or it service equipment may be affected;
b) unless the cylinder and closed cryogenic receptacle and its service equipment have been examined and found to be in good working order; or
c) unless the required certification, retest, and filling markings are legible.

4.1.1.13 Filled cylinders and closed cryogenic receptacles must not be offered for transport:

a) when leaking
b) when damaged to such an extent that the integrity of the cylinder and closed cryogenic receptacle or its service equipment may be affected;
c) unless the cylinder and closed cryogenic receptacle and its service equipment have been examined and found to be in good working order; or
d) unless the required certification, retest, and filling markings are legible.

**** Below is the reformatted Packing Instruction 200. It should only contain the current information in PI 200 in the ICAO TI. No changes were intended.**

Packing Instruction 200
Passenger and cargo aircraft
General requirements For cylinders, Part 1, Chapter 1 and Part 4, Chapter 1.1 requirements must be met, 1) **Compatibility requirements** — Cylinders, constructed as specified in 6;5 are authorised for the transport of a specific substance when specified in the following tables (Table 1 and Table 2). Cylinders other than UN marked and certified cylinders may be used if the design, construction, testing, approval and markings conform to the requirements of the appropriate national authority in which they are approved and filled. The substances contained must be permitted in cylinders and permitted for air transport according to these Instructions. Cylinders for which prescribed periodic tests have become due must not be charged and offered for transport until such retests have been successfully completed. Valves must be suitably protected or must be designed and constructed in such a manner that they are able to withstand damage without leakage as specified in Annex B of ISO 10297:1999. Cylinders with capacities of one litre or less must be packaged in outer packaging constructed of suitable material of adequate strength and design in relation to the packaging capacity and its intended use, and secured or cushioned so as to prevent significant movement within the outer packaging during normal conditions of transport. For some substances, the special packing provisions may prohibit a particular type of cylinder. — Cylinders must be fitted with a pressure relief device if specified by the appropriate national authority of the country of use. The type pressure relief device, the set to discharge pressure and relief capacity of pressure relief devices, if required, must be specific by the appropriate national authority of the country of use. Manifolding of cylinders is not permitted.

— Gas mixtures containing any of the following gases must not be offered for transport in aluminium alloy cylinders unless approved by the appropriate national authority of the State of Origin:

UN1037 **Ethyl Chloride**
UN 1063 **Methyl Chloride**
UN 1063 **Refrigerant gas R 40**
UN 1085 **Vinyl bromide, stabilized**
UN 1086 **Vinyl chloride, stabilized**
UN 1060 **Vinyl fluoride, stabilized**
UN 1912 **Methyl chloride and methylene chloride mixture**

— The Tables at the end of the Packing Instruction 200 cover compressed gases (Table 1) and liquefied and dissolved gases (Table 2). They provide

1) the UN number, name and description, and classification of the substance
2) the LC50 for toxic substances
3) the types of cylinders authorized for the substance, shown by the letter "X"
4) the maximum teat period for periodic inspection of the cylinders
5) the minimum test pressure of the cylinders
6) the maximum working pressure of the cylinders for compressed gases (where no value is given , the working pressure must not exceed two –thirds of the test pressure) or the maximum filling ratio (s) dependent on the test pressure (s) for liquefied and dissolved gases,
7) special packing provisions that are specific to a substance

Cylinder Gas Pressure Restrictions at specific temperatures

Packaging Conditions	*Filling Factor*	*Temperature*
Low Pressure Liquefied Gases	Maximum mass of contents per litre of water capacity (filling factor) must equal .95 times the density of the liquid phase	Must be at 50ºC
	In the liquid phase it cannot fill the cylinder at the stated temperature	60ºC
	The test pressure of the cylinder must be at least equal to the vapour pressure (absolute) of the liquid at the stated temperature minus 100 kPa (1 bar).	65ºC
High Pressure Liquefied Gases	Filling ratio must be such that the settled pressure at the stated temperature does not exceed the test pressure of the cylinders	65ºC
Compressed Gases	In no case must the internal pressure exceed the test pressure at the stated temperature	65ºC

ADDITIONAL REQUIREMENTS for CYLINDER GAS PRESSURE RESTRICTIONS at SPECIFIC TEMPERATURES

a) In no case must cylinders be filled in excess of the limit permitted in the requirements listed
b) The use of test pressures and filling ratios other than those in the table is permitted provided that the criteria in the above chart is met, except where special provision f).
c) For high pressure liquefied gases and gas mixtures for which relevant data are not available, the maximum filling ratio (FR) must be determined as follows:

$$FR = 8.5 \times 10^{-4} \times d_g \times P_h$$

Where FR = maximum filling ratio
d_g = gas density (at 15° C, 1 bar) (in g/l)
P_h = minimum test pressure (in bar)

If the density of the gas is unknown, the maximum filling ratio must be determined as follows:

$$FR = \frac{P_h \times MM \times 10^{-3}}{R \times 338}$$

Where FR = maximum filling ratio
P_h = minimum test pressure (in bar)
MM = molecular mass (in g/mol)
R = 8.31541 x 10^{-2} bar.l/mol.K (gas constant)

For gas mixtures, the average molecular mass is to be taken, taking into account the volumetric concentrations of the various components

d) For low pressure liquefied gases for which filling data is not provided in the table, the maximum filling ratio must be determined as follows:

$FR = (0.0032 \times BP - 0.24) \times d_l$ Where FR = maximum filling ratio
BP = boiling point (in Kelvin)
d_l = density of the liquid at boiling point (in kg/l)

e) For UN 1001, **Acetylene, dissolved**, and UN3374 **Acetylene, solvent free**, g).

Ethylene Oxide – UN 1040

Packaging of Ethylene Oxide – UN 1040

Packaging Material	*Maximum Inner Quantity*	*Maximum Outer quantity*
Glass	30g	2.5 kg
Metal	200g	
Cylinder		25 kg

ADDITIONAL REQUIREMENTS for ETHYLENE OXIDE – UN 1040

After filling, each inner packaging must be determined to be leak – tight by placing the inner packaging in a hot water bath at a temperature, and for a period of time sufficient to ensure that an internal pressure equal to the vapour pressure of ethylene oxide at 55°C is achieved.

When cylinders are used, they must be tested for leakage with an inert gas before each refilling and must be insulated with three coats of heat retardant paint or in any equally efficient manner.

OUTER PACKAGINGS FOR ETHYLENE OXIDE

Packing Group I

Boxes
Fibreboard
Wooden
Metal

SPECIAL PROVISONS FOR GASES - Key for the column "Special packing provisions"

a) Aluminium alloy cylinders are forbidden
b) Copper valves are forbidden
c) Metal parts in contact with the contents must not contain more than 65 percent copper
d) When steel cylinders are used, only those bearing the "H" mark are permitted
e) Cylinders must be filled to a working pressure not exceeding 5 bar
f) In no case must the working pressure or filling ratio shown in the table be exceeded

g) For UN1001 **Acetylene, dissolved**, and UN 3374 **Acetylene, solvent free**: cylinders must be filled with a homogeneous monolithic porous mass, the working pressure and the quantity of acetylene must not exceed the values prescribed in the approval or in ISO 3807 – 1:2000 or ISO 3807 – 2:2000, as applicable

For UN1001 **Acetylene, dissolved**, cylinders must contain a quantity of acetone or suitable solvent as specified in the approval (see ISO 3807 – 1:2000 or ISO 3807 – 2:2000, as applicable); cylinders fitted with pressure relief devices must be transported vertically

The test pressure of 52 bar applies only to cylinders conforming to ISO 3807 – 2:2000

h) Aluminium alloy cylinders must be:
- equipped only with brass or stainless steel valves;
- cleaned in accordance with ISO 11621:1997 and not contaminated with oil

i) the interval between periodic tests may be extended to 10 years for aluminium alloy cylinders when the alloy of the cylinder has be subjected to stress corrosion testing as specified in ISO 7866:1999

j) the interval between periodic inspections for steel cylinders may be extended to 15 years if approved by the appropriate national authority of the country of use

k) ethyl chloride may be carried in securely sealed glass ampoules (IP.8) containing not more than 5g of ethyl chloride with a usage of not less than 7.5 per cent at 21° C. Ampoules must be cushioned with efficient non- combustible material in partitioned cartons with not more than 12 ampoules per carton. The cartons must be tightly packed to prevent movement in wooden boxes (4C1, 4C2), Plywood boxes (4F), fibreboard (4G) or plastic boxes (4H1, 4H2) that meet the performance testing requirements of 6;4 at the Packing Group II performance level. Not more than 300g ethyl chloride is permitted per package.

l) Pressure relief devices must be fitted on cylinders used for transport of UN 1013 **Carbon dioxide** and UN 1070 **Nitrous Oxide**

m) Requirements for N.O.S. descriptions and for mixtures
- The construction materials of the cylinders and their accessories must be compatible with the contents and must not react to form harmful or dangerous compounds therewith.
- The test pressure and filling ratio must be calculated in accordance with the relevant requirements of PI200. The necessary steps must be taken to prevent dangerous reactions (i.e. polymerization or decomposition) during transport. If necessary, stabilization or addition of an inhibitor may be required.
- For the carriage of oxygen to provide life support to aquatic animals, see Note 7 of the Introductory Notes to this Part.

CHART HERE

If the above packing instruction is chosen the following changes need to be made to the chart

Old	New
M	E
O	F
P	G
S	H
U	I
V	J
W	K
Z	M
-	L (this was added)

Packing Instruction 201

Passenger and cargo aircraft

For UN 1057 lighters and lighter refills

General requirements

Part 4, Chapter 1 requirements must be met

1) **Compatibility requirements**

— Hydrocarbon gas-powered small devices, including replacement cartridges, and lighters for cigarettes and lighters refills must comply with the requirements of the country in which they are filled. They must be provided with protection against inadvertent discharge. Lighters must not contain more than 10g of liquefied petroleum gas. Hydrocarbon gas – powered small devices and lighter refills must not contain more than 65g liquefied petroleum gas. The liquid portion of gas must not exceed 1500kpa at 55ºC.

2) **Closure requirements**

— The articles, including closures, must be capable of withstanding an internal pressure of twice the pressure in the fuel vessel at 55ºC.

Packaging

Total quantity per package -- passenger	*Total quantity per package --- Cargo*
1 Kg	*15 Kg*

ADDITIONAL PACKING REQUIREMENTS

— Where refill cartridges are in the form of aerosol dispensers, the pressure in the aerosol must not exceed 1500kPa at 55ºC and the requirements of Part 6 3.2.7 must be met.

— Articles which meet the above requirements are permitted only when the valve and ignition mechanism are designed or securely sealed, taped or otherwise fastened to prevent operation of leakage of contents during transport

— Articles permitted under this packing instruction may also include, within the same outer packaging, replacement cartridges exceeding 65g each, containing liquefied petroleum gas, provided such cartridge comply with all the requirements of Packing Instruction 200, they are not manifold or connected to the article and they cannot cause the failure of functioning of the article during transport. Such consignments must be carried on cargo aircraft.

OUTER PACKAGINGS

Packing Group II

Boxes

Fibreboard (4G)

Natural wood (4C1, 4C2) Plastics (4H1, 4H2) Plywood (4D) Reconstituted wood (4F)

****PI 202 includes parts of the new UN P203. See ST/SG/AC.10/36/Add.1**

Packing Instruction 202

Passenger and cargo aircraft

General requirements

This instruction applies to Class 2 refrigerated liquefied gases in open and closed cryogenic receptacles.

For closed cryogenic receptacles, the general requirements of 4;1 and 4;4 must be met

1) **Compatibility requirements (open cryogenic receptacles)**

— Open cryogenic receptacles must be metal or glass vacuum insulated vessels or flasks vented to the atmosphere to prevent any increase in pressure within the package and must be designed and constructed to permit the release of the gas.
— The use of safety relief valves, check valves, frangible discs or similar devices in the vent lies is not permitted
— The open receptacle must have a secure base and must be designed so that it will remain stable and will not topple under normal conditions of transport
— Receptacles must be equipped with devices which prevent the release of liquid
— Fill and discharge openings must be protected against the entry of foreign materials which might increase the internal pressure
— The capacity shall be not more than 450 litres
— The receptacle shall have a double wall construction with the space between the inner and outer wall being evacuated (vacuum insulation). The insulation shall prevent the formation of hoar frost on the exterior of the receptacle

2) **Compatibility requirements (closed cryogenic receptacles)**

— Closed cryogenic receptacles constructed as specified in 6;5 are authorized for the transport of refrigerated liquefied gases
— The closed cryogenic receptacles must be so insulated that they do not become coated with frost
— Air, argon, carbon dioxide, helium, krypton, nitrogen, nitrous oxide, oxygen, trifluoromethane and xenon refrigerated liquids may be carried to the extent permitted in these Instructions and in packaging meeting the requirements as set. These requirements also apply to empty packaging unless all parts are at ambient temperatures.
— Test Pressure
  - Refrigerate liquids must be filled in closed cryogenic receptacles with the following minimum test pressures:
    a) For closed cryogenic receptacles with vacuum insulation, the test pressure must not be less than 1.3 times the sum of the maximum internal pressure of the filled receptacle, including during filling and discharge, plus 100 kPa(1 bar);
    b) For other closed cryogenic receptacles, the test must not be less than 1.3 times the maximum internal pressure of the filled receptacle taking into account the pressure developed during filling and discharge
— Degree of Filling
  - For flammable refrigerated liquefied gases the degree of filling shall remain below the level at which, if the contents were raised to the temperature at which the vapour pressure equalled the opening pressure of the relief valve, the volume of liquid phase would reach 98 percent of the water capacity at that temperature
  - For non flammable, non toxic refrigerated liquefied gases the volume of liquid phase at the filling temperature and at a pressure of 100 kPa (1 bar) shall not exceed 98 percent of the water capacity of the pressure receptacle.

— Pressure – relief devices
- Every closed cryogenic receptacle, having a nominal capacity in excess of 550L, must be provided with at least 2 pressures – relief devices. The pressure – relief device must be of the type that will resist dynamic forces including surge.
- Closed cryogenic receptacles, having a nominal capacity of 550L or less, must be provided with at least 1 pressure- relief device, and may in addition have a frangible disc in parallel with the spring loaded device in order to meet the requirements of 6;5.1.3.6.5. the pressure – relief device must be of the type that will resist dynamic forces including surge.

3) **Closure requirements (closed cryogenic receptacles)**

— Materials used to ensure the leakproofness of the joints or for the maintenance of the closure must be compatible with the contents. In the case of receptacles intended for the transport of oxidizing gases (i.e. with a subsidiary risk of 5.1), these materials must not react with these gases in a dangerous manner.

Open Cryogenic receptacles

Packaging Material	*Maximum water Capacity*
Metal	50L
Glass	5L

ADDITIONAL PACKING REQUIREMENTS FOR OPEN CRYOGENIC RECEPTACLES

— The glass vessel or flask must be protected by shock absorbent material or structure and placed in a strong outer packaging that permits the release of the gas. The package must be designed so that the upright position of the glass vessel or flask is guaranteed under normal conditions of transport. Packaging must conform to the requirements of 6;3.1 and meet Packing Group II performance test requirements in accordance with 6;4 and be marked in compliance with 6;2

— Materials which are in direct contact with the dangerous goods shall not be affected or weakened by the dangerous goods intended to be transported and shall not cause a dangerous effect, e.g. catalysing a reaction or reacting with the dangerous goods.

ADDITIONAL PACKING REQUIREMENTS FOR CLOSED CRYOGENIC RECEPTACLES

— The pressure –relief devices must meet the requirements of 6;5.1.3.6.4 and 6;5.1.3.6.5

— Insulated packaging containing refrigerated liquid nitrogen fully absorbed in a porous material and intended for transport, at low temperature, of non dangerous products are not subject to these Instructions provided the design of the insulated packaging would not allow the build – up pressure within the container and would not permit the release of any refrigerated liquid nitrogen irrespective of the orientation of the insulted packaging.

Packing Instruction 203

Passenger and cargo aircraft for UN 1950 and 2037

General requirements

Part 4, Chapter 1 requirements must be met

1) **Compatibility requirements (metal aerosols and non –refillable receptacles containing gas (gas cartridges)**

The receptacles must be constructed and tested in accordance with the requirements of Part6; 3.2.7 and 8

2) **Closure requirements**

— the liquid content must not completely fill the closed receptacle at 55ºC

1) **Compatibility requirements (Plastic Aerosols (IP.7C))**

—The pressure in the container may not exceed 970 kPa at 55ºC
—Each receptacle must be leak tested in accordance with the provisions of 6;3.2.8.1.6.

2) **Closure requirements**

— The contents must not completely fill the closed receptacle at 55ºC

1) **Compatibility requirements (All aerosols)**

—the valves, if fitted must be protected by a cap or other suitable means during transport
—receptacles must be tightly packed, so as to prevent movement

PACKAGING		**SINGLE PACKAGING**
Packaging Material	*Maximum Quantity*	
Non- refillable metal aerosols and non –refillable receptacles containing gas (gas cartridge)	1000ml	
Non –refillable plastic aerosols	120ml	
Non –refillable plastic aerosols when propellant is a non flammable, non toxic gas and the contents are not dangerous goods in accordance with the provisions of the Technical Instructions	500ml	NO

ADDITIONAL PACKING REQUIREMENTS FOR ALL AEROSOLS

—Packagings must meet the Packing Group II

OUTER PACKAGINGS

Boxes

Fibreboard (4G)
Natural wood (4C1, 4C2)
Plastics (4H1, 4H2)
Plywood (4D)
Reconstituted wood (4F)

Packing Instruction Y203
Limited quantities
Passenger and cargo aircraft for UN 1950 and 2037
General requirements

Part 3, Chapter 4 requirements must be met

1) **Compatibility requirements (Metal aerosols and non –refillable receptacles containing gas (gas cartridges)**
The receptacles must be constructed and tested in accordance with the requirements of Part6; 3.2.7 and 8

2) **Closure requirements**

— the liquid content must not completely fill the closed receptacle at 55ºC

1) **Compatibility requirements (Plastic Aerosols (IP.7C))**
—The pressure in the container may not exceed 970 kPa at 55ºC
—Each receptacle must be leak tested in accordance with the provisions of 6;3.2.8.1.6.

2) **Closure requirements**
— The contents must not completely fill the closed receptacle at 55ºC

1) **Compatibility requirements (All aerosols)**
—the valves, if fitted must be protected by a cap or other suitable means during transport
—receptacles must be tightly packed, so as to prevent movement

PACKAGING		**SINGLE PACKAGING**
Packaging Material	*Maximum Quantity*	
Non- refillable metal aerosols and non –refillable receptacles containing gas (gas cartridge)	1000ml	
Non –refillable plastic aerosols	120ml	
Non –refillable plastic aerosols when propellant is a non flammable, non toxic gas and the contents are not dangerous goods in accordance with the provisions of the Technical Instructions	500ml	NO

ADDITIONAL PACKING REQUIREMENTS FOR ALL AEROSOLS

—receptacles must be tightly packed, so as to prevent movement, in wooden boxes (4C1, 4C2), plywood boxes (4D), reconstituted wood boxes (4F), fibreboard boxes (4G) or plastic boxes (4H1, 4H2) of Packing Group II

OUTER PACKAGINGS

Boxes

Wooden
Fibreboard
Plastics
Plywood
Reconstituted wood

Packing Instruction 204

Passenger and cargo aircraft

General requirements

Part 4, Chapter 1 requirements must be met

1) **Compatibility requirements**

- the pressure in the aerosol must not exceed 970 kPa at 55ºC
- the liquid contents must not completely fill the closed receptacle at 55ºC
- one aerosol out of each lot of 500 or less must be heated until the pressure in the aerosol is equivalent to the equilibrium pressure of the contents at 55ºC, without evidence of leakage, distortion or other defect.
- The valves must be protected by a cap or other suitable means during transport
- Aerosols must be tightly packed, so as to prevent movement

Packaging

Packing Conditions	*Inner packaging*	*Quantity*
Aerosols, non flammable, containing biological products or a medical preparation, which will be deteriorated by a heat test	Inner non – refillable receptacles	575 ml

OUTER PACKAGINGS

Packing Group II

Boxes

Fibreboard (4G)
Natural wood (4C1, 4C2)
Plastics (4H1, 4H2)
Plywood (4D)
Reconstituted wood (4F)

Packing Instruction Y204

Limited quantities

Passenger and cargo aircraft

General requirements

Part 3, Chapter 4 requirements must be met, including:

1) **Compatibility requirements**

- the pressure in the aerosol must not exceed 970 kPa at 55ºC

—the liquid contents must not completely fill the closed receptacle at 55ºC
—one aerosol out of each lot of 500 or less must be heated until the pressure in the aerosol is equivalent to the equilibrium pressure of the contents at 55ºC, without evidence of leakage, distortion or other defect.

2) **Closure requirements**

—the valves must be protected by a cap or other suitable means during transportation

	Packaging		**SINGLE PACKAGING**
Packing Conditions	*Inner packaging*	*Quantity*	
Aerosols, non flammable, containing biological products or a medical preparation, which will be deteriorated by a heat test	Inner non – refillable receptacles	575 ml	NO

ADDITIONAL PACKING REQUIREMENTS

Aerosols must be tightly packed and, so as to prevent movement, in one of the boxes listed below

OUTER PACKAGINGS

Packing Group II

Boxes

Fibreboard
Wooden
Plastics
Plywood
Reconstituted wood

Packing Instruction 206

Passenger and cargo aircraft

General requirements

Part 4, Chapter 1 requirements must be met, including:

1) **Compatibility requirements**

— A gas sample may only be accepted for transport as a non – pressurized gas providing it is at

a pressure corresponding to ambient atmospheric pressure at the time the containment system is closed and this must not exceed 105 kPa absolute

Packaging

Packaging Conditions	*Inner Material*	*Inner quantity*
Non pressurized gas – must be contained in hermetically sealed glass or metal	Glass	1L .5L
	Metal	1L 1L
"Gas sample, non - pressurized ,flammable, n.o.s" shipped as **CARGO ONLY**	Glass or Metal	2.5 L

ADDITIONAL PACKING REQUIREMENTS

Inner packaging(s) must be packed so as to prevent movement

OUTER PACKAGINGS

Packing Group II

Boxes	*Drums*
Fibreboard (4G)	Aluminium (1B2)
Natural wood (4C1, 4C2)	Steel (1A2)
Plastics (4H1, 4H2)	
Plywood (4D)	
Reconstituted wood (4F)	

Packing Instruction 208

Passenger and cargo aircraft

UN3164

General requirements

Part 4, Chapter 1 requirements must be met, including:

1) **Compatibility requirements**

— Articles, pressurized pneumatic or hydraulic containing a non –flammable, non – liquefied and non- toxic gas and constructed from materials which will not fragment under pressure must follow the flowing requirements.

a) when installed in construction equipment and assembled machinery, articles must be designed and constructed with a burst of pressure not less than 5 times their charged pressure at 21º C when shipped

b) when tightly packed to prevent movement in strong outer packagings and charged to not more than 1380 kPa at 21ºC, the following conditions also apply
   1) each article must have a fluid space not exceeding 41 L under stored pressure
   2) each article must be tested without failure or damage to at least 3 times its charged pressure at 21º C but not less than 830 kPa before each refilling and re-shipment
c) when tightly packed to prevent movement in strong outer packaging and charged with a pressure exceeding 1380 kPa at21ºC the following conditions also apply:
   1) each article must have a fluid space not exceeding 41L under stored pressure
   2) each article must be tested without failure or damage to at least 3 times its charged pressure at 21ºC, but not less than 830 kPa before initial shipment and before each refilling and re-shipment
   3) each article must be designed and constructed with a burst pressure of not less than 5 times its charged pressure at 21ºC when shipped

ADDITIONAL PACKING REQUIREMENTS

Labelling, marking, dangerous goods transport documentation and information to pilot- in-command are not required

Packing Instruction 211

Passenger and cargo aircraft

UN2857

General requirements

Part 4, Chapter 1 requirements must be met, including:

1) **Compatibility requirements**

—Refrigerating machines or components containing non – toxic liquefied gases or Ammonia Solution (UN2672) must meet the following requirements:
—each cylinder must be equipped with a safety device meeting the requirements of a recognized national standard
—cylinders must be manufactured, inspected and tested in accordance with a recognized UN or national standard
—all parts subject to refrigerant pressure during shipment must be tested in accordance with a recognized UN or national standard
—the liquid portion of the refrigerant, if any, must not completely fill any pressure vessel at 55ºC
—the amount of refrigerant, if liquefied, must not exceed the filling density prescribed by applicable State regulations

2) **Closure requirements**

— Each cylinder must be equipped with a shut off valve at watch opening except openings used for safety devices and with no other connection. These valves must be closed prior to and during transport

Packaging

Packaging Conditions	*Inner Quantity*	*Total Net Quantity*
Non toxic liquefied gases-Division 2.2 gas without subsidiary risk	450 Kg	910 Kg
Ammonia (UN2672)	25 Kg	45 Kg

Packing Instruction 212

Passenger and cargo aircraft

UN1950 Tear gas devices

General requirements

Part 4, Chapter 1 requirements must be met, including:

1) **Compatibility requirements**

- the liquid content must not completely fill the closed receptacle at 55ºC
- each aerosol must have been heated until the pressure in the aerosol is equivalent to the equilibrium pressure of the contents at 55ºC, without evidence of leakage, distortion or other defect.

2) **Closure requirements**

- the valves must be protected by a cap or other suitable means during transport

Packaging

Packaging conditions	*Temperature*	*Inner Quantity*	*Pressure*	*Packaging material*	*Net Outer Quantity*
Aerosols, non-flammable, which are tear gas devices are permitted in inner non-refillable metal receptacles	55ºC	1000 ml	1500k Pa	Must withstand without bursting a pressure of at least 1.5 times the equilibrium pressure of the contents at 55ºC	50 Kg
			<1105 kPa	IP.7, IP.7A,IP.B metal receptacle	
			1105kPa >1245kPa	IP.7A, IP.7B metal receptacle	
			>1245kPa	IP.7B metal receptacle	

ADDITIONAL PACKING REQUIREMENTS

IP.7B metal receptacle having a minimum burst pressure of 1800 kPa may be equipped with an inner capsule charged with a non- flammable, non- toxic compressed gas to provide the propellant function. In this case, the pressures indicated in a),b),c), or d) do not apply to the pressure with the capsule. The quantity of gas contained in the capsule must be so limited such that the minimum burst pressure of the receptacle would not be exceeded if the entire gas content of the capsule were released into an aerosol.

Aerosols must be individually placed into spiral wound tubes fitted with metal ends or a double – faced fibreboard box with suitable padding, which must be tightly packed in outer packagings

OUTER PACKAGINGS

Packing Group II

Boxes

Fibreboard (4G)
Natural wood (4C1, 4C2)
Plastics (4H1, 4H2)
Plywood (4D)
Reconstituted wood (4F)

Packing Instruction 213
Passenger and cargo aircraft
UN1044

General requirements

Part 4, Chapter 1 requirements must be met, including:

1) **Compatibility requirements**

— Fire extinguishers with compressed or liquefied gas must be packed in strong outer packaging so that they cannot be accidentally activated.
— Fire extinguishers may include installed actuating cartridges (cartridges, power devices of Division 1.4C or 1.4S), without changing the classification of Division 2.2, provided the total quantity of deflagrating (propellant) explosives does not exceed 3.2 g per extinguishing unit.

Packing Instruction 214

Passenger and cargo aircraft for UN 3468

General requirements

This instruction applies to storage system containing hydrogen absorbed in a metal hydride (UN3468) individually or when combined in equipment and apparatus when transported on cargo aircraft.

1) **Compatibility requirements**

- The storage systems must be constructed and marked by the manufacturer indicating they meet the requirements of Annex B of IEC PAS 62282-6-1.
- Storage systems employing cylinders other than UN marked and certified cylinders may be used if the design, construction, testing, approval and markings conform to the requirements of the appropriate national authority of the State in which they are approved and filled.
- Storage systems for which prescribed periodic tests have become due must not be filled and offered for transport unit such retests have been successfully completed.
- Storage systems with a water capacity of less than 1 L must be packaged in ridged outer packaging constructed of suitable material of adequately secured or cushioned so as to prevent damage during normal conditions of transport.
- Storage systems must be filled in accordance with procedures provided by the manufacturer of the system in accordance with clause B4.17.2 of IEC PAS 62282-6-1

Packing Instruction 215

Passenger and cargo aircraft for UN3478 and 3479

General requirements

Part 4, Chapter 1.1.1, 1.1.2, and 1.1.7 requirements must be met, including:

1) **Compatibility requirements**

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

Packaging

UN number and proper shipping name	*Quantity - Passenger*	*Quantity - Cargo*
UN3478 Fuel Cell cartridges containing Liquefied flammable gas UN3479 Fuel Cell cartridges containing hydrogen in metal hydride	1Kg of fuel cell cartridges	15 Kg of fuel cell cartridges

ADDITIONAL PACKING REQUIREMENTS

- Fuel cell cartridges must be securely cushioned in the outer packaging
- Packaging must meet the Packing Group II performance requirements

OUTER PACKAGINGS

Packing Group II

Boxes	*Drums*	*Jerricans*
Aluminium (4B)	Aluminium (1B2)	Steel (3A2)
Fibreboard (4G)	Fibreboard (1G)	Plastics (3H2)
Natural wood (4C1,4C2)	Plastic (1H2)	Aluminium (3B2)
Plastic (4H2)	Plywood (1D)	
Plywood (4D)	Steel (1A2)	
Reconstituted wood (4F)		
Steel (4A)		

Packing Instruction 216

Passenger and cargo aircraft for UN3478 and 3479 (contained in equipment) only

General requirements

Part 4, Chapter 1.1.1, 1.1.2, and 1.1.7 requirements must be met, including:

1) **Compatibility requirements**

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

Packaging

UN number and proper shipping name	*Quantity - Passenger*	*Quantity - Cargo*
UN3478 Fuel Cell cartridges contained in equipment , containing liquefied flammable gas	1Kg of fuel cell cartridges	15 Kg of fuel cell cartridges
UN3479 Fuel Cell cartridges contained in equipment, containing hydrogen in metal hydride		

ADDITIONAL PACKING REQUIREMENTS

- Fuel cell cartridges that are contained in equipment must be protected against short circuit and the equipment must be protected against inadvertent operation
- Equipment must be securely cushioned in the outer packaging
- Fuel cell systems must not charge batteries during transportation
- On passenger aircraft, each fuel cell system and each fuel cell cartridge must conform to IEC PAS 62282-6-1 Ed. 1 pr a standard approved by the appropriate authority of the State of Origin

OUTER PACKAGINGS

Packing Group II

Boxes	*Drums*	*Jerricans*
	Strong outer packaging	

— END —