



WORKING PAPER

DANGEROUS GOODS PANEL (DGP)

TWENTY-SIXTH MEETING

Montréal, 16 to 27 October 2017

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 2019-2020 Edition

DRAFT AMENDMENTS TO THE TECHNICAL INSTRUCTIONS TO ALIGN WITH THE UN RECOMMENDATIONS — PART 4

(Presented by the Secretary)

SUMMARY

This working paper contains draft amendments to Part 4 of the Technical Instructions to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals at its eighth session (Geneva, 9 December 2016). It also reflects amendments agreed by DGP-WG/16 (Montréal, 17 to 21 October 2017) and DGP-WG/17 (Montréal, 24 to 28 April 2017).

The DGP is invited to agree to the draft amendments in this working paper.

Part 4

PACKING INSTRUCTIONS

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Chapter 3

CLASS 1 — EXPLOSIVES

ICAO translators and editors of versions other than English: There may be a need for amendment to 2;3.3.1.7 for the sake of alignment with 4.1.5.12 of the UN Model Regulations (see ST/SG/AC.10/44/Add.1)

3.3.1.7 Packagings must be made of materials compatible with, and impermeable to, the explosives contained in the package, so that neither interaction between the explosives and the packaging materials, nor leakage, causes the explosive to become unsafe to transport, or the hazard division or compatibility group to change.

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Packing Instruction 101

Inner packagings

Intermediate packagings

Outer packagings

As specified by the appropriate national authority.

UN Model Regulations, Chapter 4.1, packing instruction P101 (see ST/SG/AC.10/44/Add.1)

The ~~State's~~ distinguishing sign ~~for motor~~ **used on** vehicles in international **road** traffic of the country for which the authority acts must be marked on the dangerous goods transport document as follows: "Packaging approved by the competent authority of ..."

Note 1.— In this instance the term "competent authority" is used for intermodal compatibility; it refers to the appropriate national authority.

Note 2.— The distinguishing sign used on vehicles in international road traffic is the distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.

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Chapter 4

CLASS 2 — GASES

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4.1 SPECIAL PACKING PROVISIONS FOR DANGEROUS GOODS OF CLASS 2

4.1.1 General requirements

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UN Model Regulations, 4.1.6.1.4 (see ST/SG/AC.10/44/Add.1)

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 in 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~~ **hazard** 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.

UN Model Regulations, 4.1.4.1, packing instruction P200 (see ST/SG/AC.10/44/Add.1)

Packing Instruction 200

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3) In no case must cylinders be filled in excess of the limit permitted in the following requirements:

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e) For liquefied gases charged with compressed gases, both components — the ~~liquid phase~~ **liquefied gas** and the compressed gas — have to be taken into consideration in the calculation of the internal pressure in the cylinder.

The maximum mass of contents per litre of water capacity must not exceed 0.95 times the density of the liquid phase at 50°C; in addition, the liquid phase must not completely fill the cylinder at any temperature up to 60°C.

When filled, the internal pressure at 65°C must not exceed the test pressure of the cylinders. The vapour pressures and volumetric expansions of all substances in the cylinders must be considered. When experimental data is not available, the following steps must be carried out:

- i) Calculation of the vapour pressure of the ~~liquid component~~ **liquefied gas** and of the partial pressure of the compressed gas at 15°C (filling temperature);
- ii) Calculation of the volumetric expansion of the liquid phase resulting from the heating from 15°C to 65°C and calculation of the remaining volume for the gaseous phase;
- iii) Calculation of the partial pressure of the compressed gas at 65°C considering the volumetric expansion of the liquid phase;

Note.— The compressibility factor of the compressed gas at 15°C and 65°C must be considered.

- iv) Calculation of the vapour pressure of the ~~liquid component~~ **liquefied gas** at 65°C;
- v) Calculation of the total pressure, which is the sum of the vapour pressure of the ~~liquid component~~ **liquefied gas** and the partial pressure of the compressed gas at 65°C;
- vi) Consideration of the solubility of the compressed gas at 65°C in the liquid phase.

The test pressure of the cylinder must not be less than the calculated total pressure minus 100 kPa (1bar).

If the solubility of the compressed gas in the ~~liquid component~~ **liquefied phase** is not known for the calculation, the test pressure can be calculated without taking the gas solubility (sub-paragraph (vi)) into account.

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Table 1. COMPRESSED GASES

UN No.	Name and description	Class or Division	Subsidiary risk hazard	LC ₅₀ ml/m ³	Cylinders	Test period, years	Test pressure, bar*	Maximum working pressure, bar*	Special packing provisions*
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Table 2. LIQUEFIED GASES AND DISSOLVED GASES

UN No.	Name and description	Class Or Division	Subsidiary risk hazard	LC ₅₀ ml/m ³	Cylinders	Test period, years	Test pressure, bar	Filling ratio	Special packing provisions
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Packing Instruction 202

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UN Model Regulations, 4.1.4.1, packing instruction P203 (see ST/SG/AC.10/44/Add.1)

7) Compatibility

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

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Packing Instruction 211

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The general packing requirements of 4;1 must be met.

Refrigerating machines or components containing non-toxic liquefied gases or Ammonia solutions (UN 2672) must meet the following requirements:

The following amendments are proposed in accordance with the agreement by the UN Sub-Committee that the word “risk” was inappropriately used in many paragraphs of the Model Regulations and should be replaced by the word “hazard” (see ST/SG/AC.10/C.3/98).

- a) each cylinder must not contain more than 450 kg of a Division 2.2 gas without subsidiary-~~risk~~ hazard or 25 kg of Ammonia solutions (UN 2672);
- b) machines or components having two or more charged cylinders may not contain an aggregate of more than 910 kg of a Division 2.2 gas without subsidiary-~~risk~~ hazard or more than 45 kg of Ammonia solutions (UN 2672);
- c) each cylinder must be equipped with a safety device meeting the requirements of a recognized national standard;
- d) each cylinder must be equipped with a shut-off valve at each opening except openings used for safety devices and with no other connection. These valves must be closed prior to and during transport;
- e) cylinders must be manufactured, inspected and tested in accordance with a recognized UN or national standard;
- f) all parts subject to refrigerant pressure during shipment must be tested in accordance with a recognized UN or national standard;
- g) the liquid portion of the refrigerant, if any, must not completely fill any pressure vessel at 55°C;
- h) the amount of refrigerant, if liquefied, must not exceed the filling density prescribed by applicable State regulations.

Packing Instruction 218

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UN Model Regulations, 4.1.4.1, packing instruction P206 (see ST/SG/AC.10/44/Add.1)

ADDITIONAL PACKING REQUIREMENTS

- a) Cylinders must be so filled that at 50°C the non-gaseous phase does not exceed 95% of their water capacity, and they are not completely filled at 60°C. When filled, the internal pressure at 65°C must not exceed the test pressure of the cylinders. The vapour pressures and volumetric expansion of all substances in the cylinders must be taken into account.
- b) Spray application equipment (such as a hose and wand assembly) must not be connected during transport.
- c) The minimum test pressure must be in accordance with Packing Instruction 200 for the propellant but must not be less than 20 bar.
- d) Non-refillable cylinders used may have a water capacity in litres not exceeding 1 000 litres divided by the test pressure expressed in bars provided capacity and pressure restrictions of the construction standard comply with ISO 11118:1999, which limits the maximum capacity to 50 litres.
- e) For liquids charged with a compressed gas, both components — the ~~liquid phase~~ **liquefied gas** and the compressed gas — have to be taken into consideration in the calculation of the internal pressure in the cylinder. When experimental data is not available, the following steps must be carried out:
 - i) Calculation of the vapour pressure of the ~~liquid component~~ **liquefied gas** and of the partial pressure of the compressed gas at 15°C (filling temperature);
 - ii) Calculation of the volumetric expansion of the liquid phase resulting from the heating from 15°C to 65°C and calculation of the remaining volume for the gaseous phase;
 - iii) Calculation of the partial pressure of the compressed gas at 65°C considering the volumetric expansion of the liquid phase;
Note.— The compressibility factor of the compressed gas at 15°C and 65°C must be considered.
 - iv) Calculation of the vapour pressure of the ~~liquid component~~ **liquefied gas** at 65°C;
 - v) Calculation of the total pressure, which is the sum of the vapour pressure of the ~~liquid component~~ **liquefied gas** and the partial pressure of the compressed gas at 65°C;
 - vi) Consideration of the solubility of the compressed gas at 65°C in the liquid phase.

The test pressure of the cylinders must not be less than the calculated total pressure minus 100 kPa (1 bar).

If the solubility of the compressed gas in the ~~liquid component~~ **phase** is not known for the calculation, the test pressure can be calculated without taking the gas solubility (sub-paragraph vi) into account.

OUTER PACKAGINGS

Boxes

Drums

Jerricans

Strong outer packagings

Packing Instruction 220

Cargo aircraft only for UN 3529 only

(See Packing Instruction 378 for flammable liquid-powered engines or machinery, Packing Instruction 950 for flammable liquid-powered vehicles, Packing Instruction 951 for flammable gas-powered vehicles, Packing Instruction 952 for battery-powered equipment and vehicles or Packing Instruction 972 for engines or machinery containing only environmentally hazardous fuels)

General requirements

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

Compatibility requirements

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

<i>UN number and proper shipping name</i>	<i>Quantity — passenger</i>	<i>Quantity — cargo</i>
UN 3529 Engine, internal combustion, flammable gas powered or Machinery, internal combustion, flammable gas powered or Engine, fuel cell, flammable gas powered or Machinery, fuel cell, flammable gas powered	Forbidden	No limit

ADDITIONAL PACKING REQUIREMENTS

General

UN Model Regulations, Chapter 3.3, Special Provision 363 (see ST/SG/AC.10/44/Add.1)

There may be an error in ST/SG/AC.10/44/Add.1. The renumbering of sub-paragraphs doesn't seem to make sense (i.e. delete first sub-paragraph, which is "(i)" then renumber existing "(i)" etc.

- ~~1) The engine or machinery, including the means of containment containing dangerous goods, must be in compliance with the construction requirements specified by the appropriate national authority;~~
- ~~2) The engines or machinery must be oriented to prevent inadvertent leakage of dangerous goods and secured by means capable of restraining the engines or machinery to prevent any movement during transport which would change the orientation or cause them to be damaged.~~

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UN Model Regulations, 4.1.4.1, Packing Instruction P006 (see ST/SG/AC.10/44/Add.1) and DGP-WG/17 (see paragraph paragraphs 3.2.2.1.2 and 3.2.2.1.3 of DGP/26-WP/3)

A dedicated working group at DGP-WG/17 determined that the articles assigned to P006 of the Model Regulations should be forbidden for transport by air under normal circumstances unless approval was granted by the State of Origin and the State of the Operator in accordance with Special Provision A2 (see paragraphs 3.2.2.1.2 and 3.2.2.1.3). A new packing instruction will be developed for inclusion in the Supplement for inclusion in the DGP/26 paper on UN harmonization. The packing instruction that was presented in DGP-WG/17-WP/13 for the purpose of discussion was therefore deleted.

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Chapter 5

CLASS 3 — FLAMMABLE LIQUIDS

The following amendment is proposed in accordance with the agreement by the UN Sub-Committee that the word “risk” was inappropriately used in many paragraphs of the Model Regulations and should be replaced by the word “hazard” (see ST/SG/AC.10/C.3/98).

Replace all references to “subsidiary risk” with “subsidiary hazard”

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Chapter 6

CLASS 4 — FLAMMABLE SOLIDS; SUBSTANCES LIABLE TO SPONTANEOUS COMBUSTION; SUBSTANCES WHICH, IN CONTACT WITH WATER, EMIT FLAMMABLE GASES

The following amendment is proposed in accordance with the agreement by the UN Sub-Committee that the word “risk” was inappropriately used in many paragraphs of the Model Regulations and should be replaced by the word “hazard” (see ST/SG/AC.10/C.3/98).

Replace all references to “subsidiary risk” with “subsidiary hazard”

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Packing Instruction 459

Passenger and cargo aircraft — self-reactive substances and polymerizing substances

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ADDITIONAL PACKING REQUIREMENTS FOR COMBINATION PACKAGINGS

- Cushioning materials must not be readily combustible.
- Packagings must meet the Packing Group II performance requirements.

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UN Model Regulations, 4.1.4.1, P520, new PP94 (see ST/SG/AC.10/44/Add.1)

DGP is invited to consider whether the following provisions belong in this packing instruction. Item 5 below is modified from UN Model Regulations to align with similar provisions in the Technical Instructions

UN 3223 or UN 3224

Very small amounts of energetic samples of Part 2, Introductory Chapter, paragraph 5.4 may be carried under UN 3223 or UN 3224, as appropriate, provided that:

1. Only combination packaging with outer packaging comprising boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1 and 4H2) are used;
2. The samples are carried in microtiter plates or multi-titer plates made of plastics, glass, porcelain or stoneware as inner packaging;
3. The maximum amount per individual inner cavity does not exceed 0.01 g for solids or 0.01 mL for liquids;
4. The maximum net quantity per outer packaging is 20 g for solids or 20 mL for liquids, or in the case of mixed packing the sum of grammes and millilitres does not exceed 20; and
5. When dry ice or liquid nitrogen is optionally used as a coolant for quality control measures, all applicable requirements of these Instructions must be met. Interior supports must be provided to secure the inner packagings in the original position after the ice or dry ice has dissipated. If ice is used, the outside packaging or overpack must be leakproof. If dry ice is used, the requirements in Packing Instruction 954 must be met. The inner and outer packagings must maintain their integrity at the temperature of the refrigerant used as well as the temperatures and the pressures which could result if refrigeration were lost.

UN Model Regulations, 4.1.4.1, P520, new PP95 (see ST/SG/AC.10/44/Add.1)

DGP is invited to consider whether the following provisions belong in this packing instruction. Item 6 below is modified from UN Model Regulations to align with similar provisions in the Technical Instructions

Small amounts of energetic samples of Part 2, Introductory Chapter, paragraph 5.4 may be carried under UN 3223 or UN 3224, as appropriate, provided that:

1. The outer packaging consists only of corrugated fibreboard of type 4G having minimum dimensions of 60 cm (length) by 40.5 cm (width) by 30 cm (height) and minimum wall thickness of 1.3 cm;
2. The individual substance is contained in an inner packaging of glass or plastics of maximum capacity of 30 mL placed in an expandable polyethylene foam matrix of at least 130 mm thickness having a density of 18 ± 1 g/L;
3. Within the foam carrier, inner packagings are segregated from each other by a minimum distance of 40 mm and from the wall of the outer packaging by a minimum distance of 70 mm. The package may contain up to two layers of such foam matrices, each carrying up to twenty-eight inner packagings;
4. The maximum content of each inner packaging does not exceed 1 g for solids or 1 mL for liquids;
5. The maximum net quantity per outer packaging is 56 g for solids or 56 mL for liquids, or in the case of mixed packing the sum of grammes and millilitres does not exceed 56; and
6. When dry ice or liquid nitrogen is optionally used as a coolant for quality control measures, all applicable requirements of these Instructions must be met. Interior supports must be provided to secure the inner packagings in the original position after the ice or dry ice has dissipated. If ice is used, the outside packaging or overpack must be leakproof. If dry ice is used, the requirements in Packing Instruction 954 must be met. The inner and outer packagings must maintain their integrity at the temperature of the refrigerant used as well as the temperatures and the pressures which could result if refrigeration were lost.

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Chapter 7

CLASS 5 — OXIDIZING SUBSTANCES; ORGANIC PEROXIDES

The following amendment is proposed in accordance with the agreement by the UN Sub-Committee that the word “risk” was inappropriately used in many paragraphs of the Model Regulations and should be replaced by the word “hazard” (see ST/SG/AC.10/C.3/98).

Replace all references to “subsidiary risk” with “subsidiary hazard”

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Chapter 8

CLASS 6 — TOXIC AND INFECTIOUS SUBSTANCES

The following amendment is proposed in accordance with the agreement by the UN Sub-Committee that the word “risk” was inappropriately used in many paragraphs of the Model Regulations and should be replaced by the word “hazard” (see ST/SG/AC.10/C.3/98).

Replace all references to “subsidiary risk” with “subsidiary hazard”

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Packing Instruction 620

This packing instruction applies to UN 2814 and UN 2900.

The following packagings are authorized provided the special packing provisions are met.

Packagings meeting the requirements of 6;6 and approved accordingly consisting of:

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- e) Whatever the intended temperature of the consignment, the primary receptacle or the secondary packaging must be capable of withstanding, without leakage, an internal pressure producing a pressure differential of not less than 95 kPa and temperatures in the range -40°C to $+55^{\circ}\text{C}$. This primary receptacle or secondary packaging must also be capable of withstanding temperatures in the range -40°C to $+55^{\circ}\text{C}$.

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ICAO translators and editors of versions other than English: There may be a need for amendment to the following provision for the sake of alignment with 4.1.8.1 of the UN Model Regulations (see ST/SG/AC.10/44/Add.1)

Special packing provisions

- a) Shippers of infectious substances must ensure that packages are prepared in such a manner that they arrive at their destination in good condition and present no hazard to persons or animals during transport.

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DGP-WG/16 (see paragraph 3.2.4.2 of DGP/26-WP/2):

Packing Instruction 650

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7) For liquid substances:

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- e) The primary receptacle or the secondary packaging must be capable of withstanding, without leakage, an internal pressure of 95 kPa (0.95 bar);
- f) The outer ~~package~~ packaging must not contain more than 4 litres. This quantity excludes ice, dry ice or liquid nitrogen when used to keep specimens cold.

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8) For solid substances:

...

- d) Except for packages containing body parts, organs or whole bodies, the outer ~~package~~ packaging must not contain more than 4 kg. This quantity excludes ice, dry ice or liquid nitrogen when used to keep specimens cold;
- e) If there is any doubt as to whether or not residual liquid may be present in the primary receptacle during transport, then a packaging suitable for liquids, including absorbent materials, must be used.

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Chapter 9

CLASS 7 — RADIOACTIVE MATERIAL

The following amendment is proposed in accordance with the agreement by the UN Sub-Committee that the word “risk” was inappropriately used in many paragraphs of the Model Regulations and should be replaced by the word “hazard” (see ST/SG/AC.10/C.3/98).

Replace all references to “subsidiary risk” with “subsidiary hazard”

Chapter 10

CLASS 8 — CORROSIVE SUBSTANCES

The following amendment is proposed in accordance with the agreement by the UN Sub-Committee that the word “risk” was inappropriately used in many paragraphs of the Model Regulations and should be replaced by the word “hazard” (see ST/SG/AC.10/C.3/98).

Replace all references to “subsidiary risk” with “subsidiary hazard”

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UN Model Regulations, 4.1.4.1, Packing Instruction P801 (see ST/SG/AC.10/44/Add.1)

There is an amendment to the additional requirements of P801 in the Model Regulations which are not included in the corresponding packing instructions of the Technical Instructions (Packing Instructions 870 and 871). DGP is invited to consider whether these provisions should be added to the Technical Instructions for the sake of harmonization. The provisions in the Model Regulations, including the amendment for the 19th revised edition are:

Additional requirements:

1. Batteries shall be protected against short circuits.
2. Batteries stacked shall be adequately secured in tiers separated by a layer of **electrically non-conductive material**.
3. Battery terminals shall not support the weight of other superimposed elements.
4. Batteries shall be packaged or secured to prevent inadvertent movement.

Packing Instruction 870				
Passenger and cargo aircraft for UN 2794 and 2795 only				
General requirements				
Part 4, Chapter 1 requirements must be met, including:				
1) Compatibility requirements				
<ul style="list-style-type: none"> — Substances must be compatible with their packagings as required by 4;1.1.3. — Metal packagings must be corrosion resistant or be protected against corrosion. 				
2) Closure requirements				
<ul style="list-style-type: none"> — Closures must meet the requirements of 4;1.1.4. 				
COMBINATION PACKAGINGS				SINGLE PACKAGINGS
<i>UN number and proper shipping name</i>	<i>Packing conditions</i>	<i>Total quantity per package — passenger</i>	<i>Total quantity per package — cargo</i>	
UN 2794 Batteries, wet, filled with acid UN 2795 Batteries, wet, filled with alkali	Batteries must be placed in an acid/alkali-proof liner of sufficient strength and adequately sealed to positively preclude leakage in the event of spillage. The batteries must be packed so that the fill openings and vents, if any, are upward; they must be incapable of short-circuiting and be securely cushioned in the packagings. The upright position of the package must be indicated on it by "Package orientation" labels (Figure 5-29) as required by 5;3. The words "This side up" or "This end up" may also be displayed on the top of the package. <i>Batteries installed in equipment</i> If batteries are shipped as an integral component of assembled equipment, they must be securely installed and fastened in an upright position and protected against contact with other articles so as to prevent short circuits. Batteries must be removed and packed according to this packing instruction if the assembled equipment is likely to be carried in other than an upright position.	30 kg	No limit	Unpackaged batteries No

ADDITIONAL PACKING REQUIREMENTS FOR COMBINATION PACKAGINGS

- Packagings must meet the Packing Group II performance requirements.
- For batteries, electric storage, packed with battery fluid in the same outer packaging, see UN 2796 and UN 2797.

OUTER PACKAGINGS OF COMBINATION PACKAGINGS (see 6;3.1)*Boxes*

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

Drums

Aluminium (1B2)
Fibre (1G)
Other metal (1N2)
Plastics (1H2)
Steel (1A2)

Jerricans

Aluminium (3B2)
Plastics (3H2)
Steel (3A2)

Packing Instruction 871

Passenger and cargo aircraft for UN 3028 only

General requirements

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

1) Compatibility requirements

- Substances must be compatible with their packagings as required by 4;1.1.3.
- Metal packagings must be corrosion resistant or be protected against corrosion.

2) Closure requirements

- Closures must meet the requirements of 4;1.1.4.

COMBINATION PACKAGINGS				SINGLE PACKAGINGS
<i>UN number and proper shipping name</i>	<i>Packing conditions</i>	<i>Total quantity per package — passenger</i>	<i>Total quantity per package — cargo</i>	
UN 3028 Batteries, dry, containing potassium hydroxide solid	The batteries must be securely cushioned in the packagings.	25 kg	230 kg	No

ADDITIONAL PACKING REQUIREMENTS FOR COMBINATION PACKAGINGS

- Packagings must meet the Packing Group II performance requirements.

OUTER PACKAGINGS OF COMBINATION PACKAGINGS (see 6;3.1)*Boxes*

Aluminium (4B)
Fibreboard (4G)
Natural wood (4C1, 4C2)
Plastics (4H2)
Plywood (4D)
Reconstituted wood (4F)
Steel (4A)

Chapter 11

CLASS 9 — MISCELLANEOUS DANGEROUS GOODS

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The following amendment is proposed in accordance with the agreement by the UN Sub-Committee that the word “risk” was inappropriately used in many paragraphs of the Model Regulations and should be replaced by the word “hazard” (see ST/SG/AC.10/C.3/98).

Replace all references to “subsidiary risk” with “subsidiary hazard”

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Packing Instruction 952

Passenger and cargo aircraft for UN 3171 only

(See Packing Instruction 220 for flammable gas-powered engines and machinery, Packing Instruction 378 for flammable liquid-powered engines and machinery, Packing Instruction 950 for flammable liquid-powered vehicles, Packing Instruction 951 for flammable gas-powered vehicles or Packing Instruction 972 for engines or machinery containing only environmentally hazardous fuels)

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ADDITIONAL PACKING REQUIREMENTS

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Where vehicles could possibly be handled in other than an upright position, the vehicle must be secured in a strong, rigid outer packaging of the type below. The vehicle must be secured by means capable of restraining the vehicle in the outer packaging to prevent any movement during transport which would change the orientation or cause the vehicle to be damaged.

Battery-powered vehicles, machines or equipment must meet the following requirements:

Batteries

All batteries must be installed and securely fastened in the battery holder of the vehicle, machine or equipment and must be protected in such a manner so as to prevent damage and short circuits. In addition:

- 1) if spillable batteries are installed, and it is possible for the vehicle, machine or equipment to be handled in such a way that batteries would not remain in their intended orientation, they must be removed and packed according to Packing Instruction 492 or 870 as applicable;

DGP-WG/17 (see paragraph 3.2.4.1 of DGP/26-WP/3):

- 2) if lithium batteries are installed in a vehicle, they must meet the provisions of subparagraphs a) to e) of Part 2;9.3.1, unless otherwise approved by the appropriate authority of the State of Origin, ~~must be securely fastened in the vehicle and must be protected in such a manner so as to prevent damage and short circuits~~ Where the lithium battery is removed from the vehicle and is packed separate from the vehicle in the same outer packaging, the package must be consigned as UN 3481 — Lithium ion batteries packed with equipment or UN 3091 — Lithium metal batteries packed with equipment and packed according to Packing Instruction 966 or 969 as applicable; and

- 3) if sodium batteries are installed they must conform to the requirements of Special Provision A94.

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Packing Instruction 955

Passenger and cargo aircraft for UN 2990 and UN 3072 only

The term "life-saving appliances" applies to articles such as life rafts, life vests, aircraft survival kits or aircraft evacuation slides.

The description "Life-saving appliances, self-inflating" (UN 2990) is intended to apply to life-saving appliances that present a hazard if the self-inflating device is activated accidentally.

General requirements

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

1) **Compatibility requirements**

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

2) **Closure requirements**

- Closures must meet the requirements of 4;1.1.4.

<i>UN number and proper shipping name</i>	<i>Quantity — passenger</i>	<i>Quantity — cargo</i>
UN 2990 Life-saving appliances, self-inflating UN 3072 Life-saving appliances, not self-inflating containing dangerous goods as equipment	No limit	No limit

ADDITIONAL PACKING REQUIREMENTS

Life-saving appliances may only contain the dangerous goods listed below:

- a) Division 2.2 gases, must be contained in cylinders which conform to the requirements of the appropriate national authority of the country in which they are approved and filled. Such cylinders may be connected to the life-saving appliance. These cylinders may include installed actuating cartridges (cartridges, power device of Division 1.4C and 1.4S) provided the aggregate quantity of deflagrating (propellant) explosives does not exceed 3.2 grams per unit. When the cylinders are shipped separately, they must be classified as appropriate for the Division 2.2 gas contained and need not be marked, labelled or described as explosive articles;
- b) signal devices (Class 1), which may include smoke and illumination signal flares; signal devices must be packed in plastic or fibreboard inner packagings;
- c) small quantities of flammable substances, corrosive solids and organic peroxides (Class 3, Class 8, Division 4.1 and 5.2), which may include a repair kit and not more than 30 strike-anywhere matches. The organic peroxide may only be a component of a repair kit and the kit must be packed in strong inner packaging. The strike-anywhere matches must be packed in a cylindrical metal or composition packaging with a screw-type closure and be cushioned to prevent movement;
- d) electric storage batteries (Class 8), which must be disconnected or electrically isolated and protected against short circuits;
- e) lithium batteries:
 - 1) must meet the applicable requirements of 2;9.3;
 - 2) must be disconnected or electrically isolated and protected against short circuits; and
 - 3) must be secured against movement within the appliance.
- f) first aid kits which may include flammable, corrosive and toxic articles or substances.

The appliances must be packed, so that they cannot be accidentally activated, in strong outer packagings and, except for life vests, the dangerous goods must be in inner packagings packed so as to prevent movement. The dangerous goods must be an integral part of the appliance without which it would not be operational and in quantities which do not exceed those appropriate for the actual appliance when in use.

Packing Instruction 955

UN Model Regulations, Chapter 3.3, Special Provision 296 (see ST/SG/AC.10/44/Add.1)

There may be an error in ST/SG/AC.10/44/Add.1 which specifies that the amendment to SP 296 does not apply to the English version. The last paragraph of SP 296 uses the term “subsidiary risk”. Suggest it needs to be replaced with “subsidiary hazard” as proposed below (the provisions in SP 296 are contained in this packing instruction instead of a special provision in the Technical Instructions).

Life-saving appliances packed in strong rigid outer packagings with a total maximum gross mass of 40 kg, containing no dangerous goods other than Division 2.2 compressed or liquefied gases with no subsidiary risk **hazard** in receptacles with a capacity not exceeding 120 mL, installed solely for the purpose of the activation of the appliance, are not subject to these Instructions when carried as cargo.

Life-saving appliances may also include articles and substances not subject to these Instructions which are an integral part of the appliance.

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Packing Instruction 961

Passenger and cargo aircraft for UN 3268 only

UN Model Regulations, Chapter 4.1.4.1, packing instruction P902 (see ST/SG/AC.10/44/Add.1)

• • •
ADDITIONAL PACKING REQUIREMENTS FOR COMBINATION PACKAGINGS

- Packagings must meet the Packing Group III performance requirements.
- The packagings must be designed and constructed to prevent movement of the articles and inadvertent operation during normal conditions of transport.
- Any pressure receptacle must be in accordance with the requirements of the appropriate national authority for the substance(s) contained therein.

Cargo aircraft only

Air bag inflators, air bag modules and seat-belt pretensioners may also be transported unpackaged on cargo aircraft in dedicated handling devices when transported ~~from where they are manufactured to vehicle assembly plants~~ to, from, or between where they are manufactured and an assembly plant including intermediate handling locations. When transported in handling devices, the following conditions must be met:

• • •

Packing Instruction 962

Passenger and cargo aircraft for UN 3363 only

...

ADDITIONAL PACKING REQUIREMENTS

UN Model Regulations, Chapter 3.3, Special Provision 301 (see ST/SG/AC.10/44/Add.1)

— If the machinery or apparatus contains more than one item of dangerous goods, the individual dangerous goods must be enclosed to prevent them reacting dangerously with one another during transport (see 4:1.1.3).

- Receptacles containing dangerous goods must be so secured or cushioned so as to prevent their breakage or leakage and so as to control their movement within the machinery or apparatus during normal conditions of transport. Cushioning material must not react dangerously with the contents of the receptacles. Any leakage of the contents must not substantially impair the protective properties of the cushioning material.
- "Package orientation" labels (Figure 5-29), or preprinted orientation labels meeting the same specification as either Figure 5-29 or ISO Standard 780-1997 must be affixed on at least two opposite vertical sides with the arrows pointing in the correct direction only when required to ensure liquid dangerous goods remain in their intended orientation.
- Irrespective of 5;3.2.10, machinery or apparatus containing magnetized material meeting the requirements of Packing Instruction 953 must also bear the "Magnetized material" label (Figure 5-27).
- For Division 2.2 gases, cylinders for gases, their contents and filling ratios must conform to the requirements of Packing Instruction 200.
- Dangerous goods in apparatus or machinery must be packed in strong outer packagings unless the receptacles containing the dangerous goods are afforded adequate protection by the construction of the apparatus or machinery.

Fuel system components

- Fuel system components must be emptied of fuel as far as practicable and all openings must be sealed securely. They must be packed:
 - 1) in sufficient absorbent material to absorb the maximum amount of liquid which may possibly remain after emptying. Where the outer packaging is not liquid tight, a means of containing the liquid in the event of leakage must be provided in the form of a leakproof liner, plastic bag or other equally efficient means of containment; and
 - 2) in strong outer packagings.

Packing Instruction Y963

DGP-WG/17 (see paragraph 3.2.4.3 of DGP/26-WP/3):

Limited quantities

Passenger and cargo aircraft for ID 8000 only

Consumer commodities are materials that are packaged and distributed in a form intended or suitable for retail sale for the purposes of personal care or household use. These include items administered or sold to patients by doctors or medical administrations. Except as otherwise provided below, dangerous goods packed in accordance with this packing instruction do not need to comply with 4;1 or Part 6 of these Instructions; they must, however, comply with all other applicable requirements.

- a) Each packaging must be designed and constructed to prevent leakage that may be caused by changes in altitude and temperature during air transport.

...

DGP-WG/16 (see paragraph 3.2.4.1 of DGP/26-WP/2):

- f) Inner packagings containing liquids, ~~excluding flammable liquids in inner packagings of 120 mL or less,~~ must be packed with their closures upward and the upright position of the package must be indicated by "Package orientation" labels (Figure 5-29). These labels, or pre-printed package orientation labels meeting the same specification as either Figure 5-29 or ISO Standard 780-1997, must be affixed to, or printed on, at least two opposite vertical sides of the package with the arrows pointing in the correct direction. The requirements of this sub-paragraph do not apply to:

1) dangerous goods in inner packagings each containing not more than 120 mL with sufficient absorbent material between the inner and outer packagings to completely absorb the liquid contents; or

2) dangerous goods in gas tight inner packagings such as tubes, bags or vials which are opened by breaking or puncturing.

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Packing Instruction 965

Cargo aircraft only for UN 3480

1. Introduction

This entry applies to lithium ion or lithium polymer batteries. This packing instruction is structured as follows:

- Section IA applies to lithium ion cells with a Watt-hour rating in excess of 20 Wh and lithium ion batteries with a Watt-hour rating in excess of 100 Wh, which must be assigned to Class 9 and are subject to all of the applicable requirements of these Instructions;
- Section IB applies to lithium ion cells with a Watt-hour rating not exceeding 20 Wh and lithium ion batteries with a Watt-hour rating not exceeding 100 Wh packed in quantities that exceed the allowance permitted in Section II, Table 965-II; and
- Section II applies to lithium ion cells with a Watt-hour rating not exceeding 20 Wh and lithium ion batteries with a Watt-hour rating not exceeding 100 Wh packed in quantities not exceeding the allowance permitted in Section II, Table 965-II.

A single cell battery as defined in Part III, sub-section 38.3.2.3 of the UN *Manual of Tests and Criteria* is considered a "cell" and must be transported according to the requirements for "cells" for the purpose of this packing instruction.

2. Lithium batteries forbidden from transport

The following applies to all lithium ion cells and batteries in this packing instruction:

Cells and batteries, identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport (e.g. those being returned to the manufacturer for safety reasons).

Waste lithium batteries and lithium batteries being shipped for recycling or disposal are forbidden from air transport unless approved by the appropriate national authority of the State of Origin and the State of the Operator.

IA. SECTION IA

Each cell or battery must meet all the provisions of 2;9.3.

IA.1 General requirements

- Part 4;1 requirements must be met.
- Lithium ion cells and batteries must be offered for transport at a state of charge not exceeding 30 per cent of their rated capacity. Cells and/or batteries at a state of charge greater than 30 per cent of their rated capacity may only be shipped with the approval of the State of Origin and the State of the Operator under the written conditions established by those authorities.

Note.— Guidance and methodology for determining the rated capacity can be found in sub-section 38.3.2.3 of the UN Manual of Tests and Criteria.

Table 965-IA

<i>UN number and proper shipping name</i>	<i>Net quantity per package</i>	
	<i>Passenger</i>	<i>Cargo</i>
UN 3480 Lithium ion batteries	Forbidden	35 kg

Packing Instruction 965

IA.2 Additional requirements

- Lithium ion cells and batteries must be protected against short circuits.
- Lithium ion cells and batteries must be placed in inner packagings that completely enclose the cell or battery then placed in an outer packaging. The completed package for the cells or batteries must meet the Packing Group II performance requirements.

DGP-WG/17 (see paragraph 3.5.3.1 of DGP/26-WP/3):

- Lithium ion cells and batteries must not be packed in the same outer packaging with substances and articles of Class 1 (explosives) other than Division 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers).
- Lithium ion batteries with a mass of 12 kg or greater and having a strong, impact-resistant outer casing, or assemblies of such batteries, may be transported when packed in strong outer packagings or protective enclosures (e.g. in fully enclosed or wooden slatted crates) not subject to the requirements of Part 6 of these Instructions, if approved by the appropriate authority of the State of Origin. A copy of the document of approval must accompany the consignment.
- Batteries manufactured after 31 December 2011 must be marked with the Watt-hour rating on the outside case.

IA.3 Outer packagings

Boxes

Aluminium (4B)
 Fibreboard (4G)
 Natural wood (4C1, 4C2)
 Other metal (4N)
 Plastics (4H1, 4H2)
 Plywood (4D)
 Reconstituted wood (4F)
 Steel (4A)

Drums

Aluminium (1B2)
 Fibre (1G)
 Other metal (1N2)
 Plastics (1H2)
 Plywood (1D)
 Steel (1A2)

Jerricans

Aluminium (3B2)
 Plastics (3H2)
 Steel (3A2)

IB. SECTION IB

Quantities of lithium ion cells or batteries that exceed the allowance permitted in Section II, Table 965-II are subject to all of the applicable provisions of these Instructions (including the requirements in paragraph 2 of this packing instruction and of this section) except for the provisions of Part 6.

Lithium ion cells or batteries shipped in accordance with the provisions of Section IB must be described on a dangerous goods transport document as set in Part 5;4. The packing instruction number "965" required by 5;4.1.5.8.1 a) must be supplemented with "IB". All other applicable provisions of Part 5;4 apply.

Lithium ion cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3.1 a) and e) and the following:

- 1) for lithium ion cells, the Watt-hour rating (see the Glossary of Terms in Attachment 2) is not more than 20 Wh;
- 2) for lithium ion batteries, the Watt-hour rating is not more than 100 Wh;
 - the Watt-hour rating must be marked on the outside of the battery case except for those batteries manufactured before 1 January 2009;

Packing Instruction 965

IB.1 General requirements

- Cells and batteries must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).
- Lithium ion cells and batteries must be offered for transport at a state of charge not exceeding 30 per cent of their rated capacity. Cells and/or batteries at a state of charge greater than 30 per cent of their rated capacity may only be shipped with the approval of the State of Origin and the State of the Operator under the written conditions established by those authorities.

Note.— *Guidance and methodology for determining the rated capacity can be found in sub-section 38.3.2.3 of the UN Manual of Tests and Criteria.*

Table 965-IB

Contents	Net quantity per package	
	Passenger	Cargo
Lithium ion cells and batteries	Forbidden	10 kg

IB.2 Additional requirements

- Cells and batteries must be packed in inner packagings that completely enclose the cell or battery then placed in a strong rigid outer packaging.

DGP-WG/17 (see paragraph 3.5.3.1 of DGP/26-WP/3):

- ~~Cells and batteries must not be packed in the same outer packaging with substances and articles of Class 1 (explosives) other than Division 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers).~~

UN Model Regulations, Chapter 3.3, Special Provision 188 (d) (see ST/SG/AC.10/44/Add.1)

- Cells and batteries must be protected so as to prevent short circuits. This includes protection against contact with **electrically** conductive materials within the same packaging that could lead to a short circuit.
- Each package must be capable of withstanding a 1.2 m drop test in any orientation without:
 - damage to cells or batteries contained therein;
 - shifting of the contents so as to allow battery to battery (or cell to cell) contact;
 - release of contents.
- Each package must be marked with the appropriate lithium battery mark (Figure 5-3) in addition to the appropriate Class 9 hazard label (Figure 5-26) and the cargo aircraft only label (Figure 5-28).

~~*Note.*— *The provisions for a lithium battery handling label as contained in the 2015-2016 Edition of these Instructions (Part 5;3.5.2 and Figure 5-32 of the 2015-2016 Edition) may continue to be used in lieu of the lithium battery mark until 31 December 2018.*~~

IB.3 Outer packagings

Boxes	Drums	Jerricans
Aluminium	Aluminium	Aluminium
Fibreboard	Fibre	Plastics
Natural wood	Other metal	Steel
Other metal	Plastics	
Plastics	Plywood	
Plywood	Steel	
Reconstituted wood		
Steel		

Packing Instruction 965

II. SECTION II

Lithium ion cells and batteries, when complying with Section II of this packing instruction, are only subject to the following additional provisions of these Instructions:

- Part 1;2.3 (General — Transport of dangerous goods by post);
- Part 5;1.1 g) and j) (Shipper's responsibilities — General requirements);

DGP-WG/16 (see paragraph 3.5.3.10 of DGP/26-WP/2) (incorporated in 2017-2018 Edition through Addendum/Corrigendum No. 1):

-
- Part 5;2.4.16 (Shipper's responsibilities — Special marking requirements for lithium batteries);
 - Part 7;2.1 (Operator's responsibilities — Loading restrictions on the flight deck and for passenger aircraft);
 - Part 7;2.4.1 (Operator's responsibilities — Loading of cargo aircraft);
 - Part 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);
 - Part 8;1.1 (Provisions concerning passengers and crew — Dangerous goods carried by passengers or crew); and
 - Paragraphs 1 and 2 of this packing instruction.

Lithium ion cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3.1 a) and e) and the following:

- 1) for lithium ion cells, the Watt-hour rating (see the Glossary of Terms in Attachment 2) is not more than 20 Wh;
- 2) for lithium ion batteries, the Watt-hour rating is not more than 100 Wh;
 - the Watt-hour rating must be marked on the outside of the battery case except for those batteries manufactured before 1 January 2009.

II.1 General requirements

- Cells and batteries must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).
- Lithium ion cells and batteries must be offered for transport at a state of charge not exceeding 30 per cent of their rated capacity.

Note.— Guidance and methodology for determining the rated capacity can be found in sub-section 38.3.2.3 of the UN Manual of Tests and Criteria.

Table 965-II

Contents	<i>Lithium ion cells and/or batteries with a Watt-hour rating not more than 2.7 Wh</i>	<i>Lithium ion cells with a Watt-hour rating more than 2.7 Wh, but not more than 20 Wh</i>	<i>Lithium ion batteries with a Watt-hour rating more than 2.7 Wh, but not more than 100 Wh</i>
1	2	3	4
Maximum number of cells / batteries per package	No limit	8 cells	2 batteries
Maximum net quantity (mass) per package	2.5 kg	n/a	n/a

The limits specified in columns 2, 3 and 4 of Table 965-II must not be combined in the same package.

Packing Instruction 965

II.2 Additional requirements

- Cells and batteries must be packed in inner packagings that completely enclose the cell or battery then placed in a strong rigid outer packaging.

DGP-WG/17 (see paragraph 3.5.3.1 of DGP/26-WP/3):

- Cells and batteries must not be packed in the same outer packaging with other dangerous goods.

UN Model Regulations, Chapter 3.3, Special Provision 188 (d) (see ST/SG/AC.10/44/Add.1)

- Cells and batteries must be protected so as to prevent short circuits. This includes protection against contact with **electrically** conductive materials within the same packaging that could lead to a short circuit.
- Each package must be capable of withstanding a 1.2 m drop test in any orientation without:
 - damage to cells or batteries contained therein;
 - shifting of the contents so as to allow battery to battery (or cell to cell) contact;
 - release of contents.
- Each package must be marked with the appropriate lithium battery mark (Figure 5-3) and the cargo aircraft only label (Figure 5-28).
 - the package must be of such size that there is adequate space to affix the mark on one side without the mark being folded.
 - the cargo aircraft only label must be located on the same surface of the package near the lithium battery mark, if the package dimensions are adequate.

~~Note. — The provisions for a lithium battery handling label as contained in the 2015-2016 Edition of these Instructions (Part 5.3.5.2 and Figure 5-32 of the 2015-2016 Edition) may continue to be used in lieu of the lithium battery mark until 31 December 2018.~~

- A shipper is not permitted to offer for transport more than one package prepared according to this section in any single consignment.
- The words “lithium ion batteries, in compliance with Section II of PI965” — cargo aircraft only” or “lithium ion batteries, in compliance with Section II of PI965 — CAO” must be placed on the air waybill, when an air waybill is used.
- Packages and overpacks of lithium ion batteries prepared in accordance with the provisions of Section II must be offered to the operator separately from cargo which is not subject to these Instructions and must not be loaded into a unit load device before being offered to the operator.
- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with their responsibilities.

II.3 Outer packagings

Boxes

Aluminium
Fibreboard
Natural wood
Other metal
Plastics
Plywood
Reconstituted wood
Steel

Drums

Aluminium
Fibre
Other metal
Plastics
Plywood
Steel

Jerricans

Aluminium
Plastics
Steel

Packing Instruction 965

II.4 Overpacks

Not more than one package prepared in accordance with this section may be placed into an overpack.

DGP-WG/17 (see paragraph 3.5.3.1 of DGP/26-WP/3):

Packages prepared in accordance with this section must not be placed into an overpack with packages containing substances and articles of Class 1 (explosives) other than Division 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers).

UN Model Regulations, Chapter 3.3, Special Provision 188 f) (see ST/SG/AC.10/44/Add.1)

DGP is invited to consider replacing “affixed” with “reproduced” for the sake of alignment with the UN Model Regulations and to consider the editorial amendments made to the new text in the Model Regulation with respect to the height of the overpack marking (aligns with similar provisions elsewhere in the Technical Instructions).

When the package is placed in an overpack, the lithium battery mark (Figure 5-3) and the cargo aircraft only label (Figure 5-28) required by this packing instruction must either be clearly visible or the mark and label must be reproduced on the outside of the overpack and the overpack must be marked with the word “Overpack” in lettering of at least 12 mm high.

Note.— For the purpose of Section II, an overpack is an enclosure used by a single shipper that contains no more than one package prepared in accordance with this section. For shipments prepared in accordance with Section IA and/or IB, this limit of one package of Section II batteries per overpack still applies.

Packing Instruction 966

Passenger and cargo aircraft for UN 3481 (packed with equipment) only

1. Introduction

This entry applies to lithium ion or lithium polymer batteries packed with equipment.

Section I of this packing instruction applies to lithium ion and lithium polymer cells and batteries that are assigned to Class 9. Certain lithium ion and lithium polymer cells and batteries offered for transport and meeting the requirements of Section II of this packing instruction, subject to paragraph 2 below, are not subject to other additional requirements of these Instructions.

A single cell battery as defined in Part III, sub-section 38.3.2.3 of the UN *Manual of Tests and Criteria* is considered a “cell” and must be transported according to the requirements for “cells” for the purpose of this packing instruction.

For the purpose of this packing instruction, “equipment” means apparatus for which the lithium cells or batteries will provide electrical power for its operation.

2. Lithium batteries forbidden from transport

The following applies to all lithium ion cells and batteries in this packing instruction:

Cells and batteries, identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport (e.g. those being returned to the manufacturer for safety reasons).

I. SECTION I

Each cell or battery must meet all the provisions of 2;9.3.

Packing Instruction 966

I.1 General requirements

Part 4;1 requirements must be met.

<i>UN number and proper shipping name</i>	<i>Package quantity (Section I)</i>	
	<i>Passenger</i>	<i>Cargo</i>
UN 3481 Lithium ion batteries packed with equipment	5 kg of lithium ion cells or batteries	35 kg of lithium ion cells or batteries

I.2 Additional requirements

- Lithium ion cells and batteries must be protected against short circuits.
- Lithium ion cells or batteries must:
 - be placed in inner packagings that completely enclose the cell or battery then placed in an outer packaging. The completed package for the cells or batteries must meet the Packing Group II performance requirements; or
 - be placed in inner packagings that completely enclose the cell or battery, then placed with equipment in a packaging that meets the Packing Group II performance requirements.
- The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.
- The number of cells or batteries in each package must not exceed the appropriate number for the equipment's operation, plus two spares.
- Batteries manufactured after 31 December 2011 must be marked with the Watt-hour rating on the outside case.

I.3 Outer packagings

Boxes

Aluminium (4B)
Fibreboard (4G)
Natural wood (4C1, 4C2)
Other metal (4N)
Plastics (4H1, 4H2)
Plywood (4D)
Reconstituted wood (4F)
Steel (4A)

Drums

Aluminium (1B2)
Fibre (1G)
Other metal (1N2)
Plastics (1H2)
Plywood (1D)
Steel (1A2)

Jerricans

Aluminium (3B2)
Plastics (3H2)
Steel (3A2)

II. SECTION II

Lithium ion cells and batteries packed with equipment, when complying with Section II of this packing instruction, are only subject to the following additional provisions of these Instructions:

- Part 1;2.3 (General — Transport of dangerous goods by post);

DGP-WG/16 (see paragraph 3.5.3.10 of DGP/26-WP/2) (incorporated in 2017-2018 Edition through Addendum/Corrigendum No. 1):

- Part 5;2.4.16 (Shipper's responsibilities — Special marking requirements for lithium batteries);
- Part 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);
- Part 8;1.1 (Provisions concerning passengers and crew — Dangerous goods carried by passengers or crew); and
- Paragraphs 1 and 2 of this packing instruction.

Lithium ion cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3.1 a) and e) and the following:

- 1) for lithium ion cells, the Watt-hour rating (see the Glossary of Terms in Attachment 2) is not more than 20 Wh;
- 2) for lithium ion batteries, the Watt-hour rating is not more than 100 Wh;
 - the Watt-hour rating must be marked on the outside case except for those batteries manufactured before 1 January 2009.

Packing Instruction 966

II.1 General requirements

Cells and batteries must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).

Contents	Package quantity (Section II)	
	Passenger	Cargo
Net quantity of lithium ion cells or batteries per package	5 kg	5 kg

II.2 Additional requirements

- Lithium ion cells and batteries must:
 - be placed in inner packagings that completely enclose the cell or battery, then placed in a strong rigid outer packaging; or
 - be placed in inner packagings that completely enclose the cell or battery, then placed with the equipment in a strong rigid outer packaging.

UN Model Regulations, Chapter 3.3, Special Provision 188 (d) (see ST/SG/AC.10/44/Add.1)

- Cells and batteries must be protected so as to prevent short circuits. This includes protection against contact with **electrically** conductive materials within the same packaging that could lead to a short circuit.
- The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.
- The number of cells or batteries in each package must not exceed the appropriate number for the equipment's operation, plus two spares.
- Each package of cells or batteries, or the completed package, must be capable of withstanding a 1.2 m drop test in any orientation without:
 - damage to cells or batteries contained therein;
 - shifting of the contents so as to allow battery to battery (or cell to cell) contact;
 - release of contents.
- Each package must be marked with the appropriate lithium battery mark (Figure 5-3).
 - the package must be of such size that there is adequate space to affix the mark on one side without the mark being folded.

Note. — The provisions for a lithium battery handling label as contained in the 2015-2016 Edition of these Instructions (Part 5.3.5.2 and Figure 5-32 of the 2015-2016 Edition) may continue to be used in lieu of the lithium battery mark until 31 December 2018.

- The words "lithium ion batteries, in compliance with Section II of PI966" must be placed on the air waybill, when an air waybill is used.
- Where a package contains a combination of lithium batteries contained in equipment and lithium batteries packed with equipment that meet the limits for lithium cells or batteries of Section II, the following additional requirements apply:
 - the shipper must ensure that all applicable parts of both packing instructions are met. The total mass of lithium batteries contained in any package must not exceed 5 kg;
 - the words "lithium ion batteries, in compliance with Section II of PI966" must be placed on the air waybill, when an air waybill is used.
- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with their responsibilities.

II.3 Outer packagings

Boxes	Drums	Jerricans
Aluminium	Aluminium	Aluminium
Fibreboard	Fibre	Plastics
Natural wood	Other metal	Steel
Other metal	Plastics	
Plastics	Plywood	
Plywood	Steel	
Reconstituted wood		
Steel		

Packing Instruction 966

II.4 Overpacks

UN Model Regulations, Chapter 3.3, Special Provision 188 f) (see ST/SG/AC.10/44/Add.1)

DGP is invited to consider replacing “affixed” with “reproduced” for the sake of alignment with the UN Model Regulations and to consider the editorial amendments made to the new text in the Model Regulation with respect to the height of the overpack marking (aligns with similar provisions elsewhere in the Technical Instructions).

When packages are placed in an overpack, the lithium battery mark (Figure 5-3) required by this packing instruction must either be clearly visible or the mark must be ~~affixed~~ reproduced on the outside of the overpack and the overpack must be marked with the word “Overpack” in lettering of at least 12 mm high.

Packing Instruction 967

Passenger and cargo aircraft for UN 3481 (contained in equipment) only

1. Introduction

This entry applies to lithium ion or lithium polymer batteries contained in equipment.

Section I of this packing instruction applies to lithium ion and lithium polymer cells and batteries that are assigned to Class 9. Certain lithium ion and lithium polymer cells and batteries offered for transport and meeting the requirements of Section II of this packing instruction, subject to paragraph 2 below, are not subject to other additional requirements of these Instructions.

A single cell battery as defined in Part III, sub-section 38.3.2.3 of the UN *Manual of Tests and Criteria* is considered a “cell” and must be transported according to the requirements for “cells” for the purpose of this packing instruction.

For the purpose of this packing instruction, “equipment” means apparatus for which the lithium cells or batteries will provide electrical power for its operation.

2. Lithium batteries forbidden from transport

The following applies to all lithium ion cells and batteries in this packing instruction:

Cells and batteries, identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport (e.g. those being returned to the manufacturer for safety reasons).

I. SECTION I

Each cell or battery must meet all the provisions of 2;9.3.

I.1 General requirements

Equipment must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).

UN number and proper shipping name	Package quantity (Section I)	
	Passenger	Cargo
UN 3481 Lithium ion batteries contained in equipment	5 kg of lithium ion cells or batteries	35 kg of lithium ion cells or batteries

Packing Instruction 967

I.2 Additional requirements

DGP-WG/16 (see paragraph 3.5.3.11 of DGP/26-WP/2):

- The equipment must be secured against movement within the outer packaging and be packed so as to prevent accidental operation during air transport.
- The equipment must be packed in strong rigid outer packagings constructed of suitable material of adequate strength and design in relation to the packaging's capacity and its intended use unless the battery is afforded equivalent protection by the equipment in which it is contained.
- Batteries manufactured after 31 December 2011 must be marked with the Watt-hour rating on the outside case.

I.3 Outer packagings

DGP-WG/16 (see paragraph 3.5.3.1.3 of DGP/26-WP/2) (incorporated in the 2017-2018 Edition of the Technical Instructions through Addendum/Corrigendum No. 1) (Steel, although not included in of DGP/26-WP/2, was also added under “boxes”):

Boxes

Aluminium
Fibreboard
Natural wood
Other metal
Plastics
Plywood
Reconstituted wood
Steel

Drums

Aluminium
Fibre
Other metal
Plastics
Plywood
Steel

Jerricans

Aluminium
Plastics
Steel

Strong outer packagings

II. SECTION II

Lithium ion cells and batteries contained in equipment, when complying with Section II of this packing instruction, are only subject to the following additional provisions of these Instructions:

- Part 1;2.3 (General — Transport of dangerous goods by post);

DGP-WG/16 (see paragraph 3.5.3.10 of DGP/26-WP/2) (incorporated in 2017-2018 Edition through Addendum/Corrigendum No. 1):

- Part 5;2.4.16 (Shipper's responsibilities — Special marking requirements for lithium batteries);
- Part 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);
- Part 8;1.1 (Provisions concerning passengers and crew — Dangerous goods carried by passengers or crew); and
- Paragraphs 1 and 2 of this packing instruction.

Lithium ion cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3.1 a) and e) and the following:

- 1) for lithium ion cells, the Watt-hour rating (see the Glossary of Terms in Attachment 2) is not more than 20 Wh;
- 2) for lithium ion batteries, the Watt-hour rating is not more than 100 Wh;
 - the Watt-hour rating must be marked on the outside of the battery case except for those batteries manufactured before 1 January 2009.

Devices such as radio frequency identification (RFID) tags, watches and temperature loggers, which are not capable of generating a dangerous evolution of heat, may be transported when intentionally active. When active, these devices must meet defined standards for electromagnetic radiation to ensure that the operation of the device does not interfere with aircraft systems. The devices must not be capable of emitting disturbing signals (such as buzzing alarms, strobe lights, etc.) during transport.

Packing Instruction 967

II.1 General requirements

Equipment must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).

<i>Contents</i>	<i>Package quantity (Section II)</i>	
	<i>Passenger</i>	<i>Cargo</i>
Net quantity of lithium ion cells or batteries per package	5 kg	5 kg

II.2 Additional requirements

- The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.
- Cells and batteries must be protected so as to prevent short circuits.
- The equipment must be packed in strong rigid outer packagings constructed of suitable material of adequate strength and design in relation to the packaging's capacity and its intended use unless the battery is afforded equivalent protection by the equipment in which it is contained.
- Each package must be marked with the appropriate lithium battery mark (Figure 5-3). The package must be of such size that there is adequate space to affix the mark on one side without the mark being folded.
 - This requirement does not apply to:
 - packages containing only button cell batteries installed in equipment (including circuit boards); and
 - packages containing no more than four cells or two batteries installed in equipment, where there are not more than two packages in the consignment.

Note. — The provisions for a lithium battery handling label as contained in the 2015-2016 Edition of these Instructions (Part 5;3.5.2 and Figure 5-32 of the 2015-2016 Edition) may continue to be used in lieu of the lithium battery mark until 31 December 2018.

- Where a consignment includes packages bearing the lithium battery mark, the words "lithium ion batteries, in compliance with Section II of PI967" must be placed on the air waybill, when an air waybill is used.
- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with their responsibilities.

II.3 Outer packagings

<i>Boxes</i>	<i>Drums</i>	<i>Jerricans</i>
Aluminium	Aluminium	Aluminium
Fibreboard	Fibre	Plastics
Natural wood	Other metal	Steel
Other metal	Plastics	
Plastics	Plywood	
Plywood	Steel	
Reconstituted wood		
Steel		

II.4 Overpacks

UN Model Regulations, Chapter 3.3, Special Provision 188 f) (see ST/SG/AC.10/44/Add.1)

DGP is invited to consider replacing "affixed" with "reproduced" for the sake of alignment with the UN Model Regulations and to consider the editorial amendments made to the new text in the Model Regulation with respect to the height of the overpack marking (aligns with similar provisions elsewhere in the Technical Instructions).

When packages are placed in an overpack, the lithium battery mark (Figure 5-3) required by this packing instruction must either be clearly visible or the mark must be ~~affixed~~ reproduced on the outside of the overpack and the overpack must be marked with the word "Overpack" in lettering of at least 12 mm high.

Packing Instruction 968
Cargo aircraft only for UN 3090

1. Introduction

This entry applies to lithium metal or lithium alloy batteries. This packing instruction is structured as follows:

- Section IA applies to lithium metal cells with a lithium metal content in excess of 1 g and lithium metal batteries with a lithium metal content in excess of 2 g, which must be assigned to Class 9 and are subject to all of the applicable requirements of these Instructions;
- Section IB applies to lithium metal cells with a lithium metal content not exceeding 1 g and lithium metal batteries with a lithium metal content not exceeding 2 g packed in quantities that exceed the allowance permitted in Section II, Table 968-II; and
- Section II applies to lithium metal cells with a lithium metal content not exceeding 1 g and lithium metal batteries with a lithium metal content not exceeding 2 g packed in quantities not exceeding the allowance permitted in Section II, Table 968-II.

A single cell battery as defined in Part III, sub-section 38.3.2.3 of the UN Manual of Tests and Criteria is considered a "cell" and must be transported according to the requirements for "cells" for the purpose of this packing instruction.

2. Lithium batteries forbidden from transport

The following applies to all lithium metal cells and batteries in this packing instruction:

Cells and batteries, identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport (e.g. those being returned to the manufacturer for safety reasons).

Waste lithium batteries and lithium batteries being shipped for recycling or disposal are forbidden from air transport unless approved by the appropriate national authority of the State of Origin and the State of the Operator.

IA. SECTION IA

Each cell or battery must meet all the provisions of 2;9.3.

IA.1 General requirements

Part 4;1 requirements must be met.

Table 968-IA

<i>UN number and proper shipping name</i>	<i>Net quantity per package</i>	
	<i>Passenger</i>	<i>Cargo</i>
UN 3090 Lithium metal batteries	Forbidden	35 kg

IA.2 Additional requirements

- Lithium metal cells and batteries must be protected against short circuits.
- Lithium metal cells and batteries must be placed in inner packagings that completely enclose the cell or battery, then placed in an outer packaging. The completed package for the cells or batteries must meet the Packing Group II performance requirements.

DGP-WG/17 (see paragraph 3.5.3.1 of DGP/26-WP/3):

- Lithium metal cells and batteries must not be packed in the same outer packaging with substances and articles of Class 1 (explosives) other than Division 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers).
- Lithium metal batteries with a mass of 12 kg or greater and having a strong, impact-resistant outer casing, or assemblies of such batteries, may be transported when packed in strong outer packagings or protective enclosures (e.g. in fully enclosed or wooden slatted crates) not subject to the requirements of Part 6 of these Instructions, if approved by the appropriate authority of the State of Origin. A copy of the document of approval must accompany the consignment.

IA.3 Outer packagings*Boxes*

Aluminium (4B)
 Fibreboard (4G)
 Natural wood (4C1, 4C2)
 Other metal (4N)
 Plastics (4H1, 4H2)
 Plywood (4D)
 Reconstituted wood (4F)
 Steel (4A)

Drums

Aluminium (1B2)
 Fibre (1G)
 Other metal (1N2)
 Plastics (1H2)
 Plywood (1D)
 Steel (1A2)

Jerricans

Aluminium (3B2)
 Plastics (3H2)
 Steel (3A2)

IB. SECTION IB

Quantities of lithium metal cells or batteries that exceed the allowance permitted in Section II, Table 968-II, are subject to all of the applicable provisions of these Instructions (including the requirements in paragraph 2 of this packing instruction and of this section) except for the provisions of Part 6.

Lithium metal cells or batteries shipped in accordance with the provisions of Section IB must be described on a dangerous goods transport document as set in Part 5;4. The packing instruction number "968" required by 5;4.1.5.8.1 a) must be supplemented with "IB". All other applicable provisions of Part 5;4 apply.

Lithium metal or lithium alloy cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3.1 a) and e) and the following:

- 1) for lithium metal cells, the lithium content is not more than 1 g;
- 2) for lithium metal or lithium alloy batteries, the aggregate lithium content is not more than 2 g.

IB.1 General requirements

Cells and batteries must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).

Table 968-IB

<i>Contents</i>	<i>Net quantity per package</i>	
	<i>Passenger</i>	<i>Cargo</i>
Lithium metal cells and batteries	Forbidden	2.5 kg

IB.2 Additional requirements

- Cells and batteries must be packed in inner packagings that completely enclose the cell or battery then placed in a strong rigid outer packaging.

DGP-WG/17 (see paragraph 3.5.3.1 of DGP/26-WP/3):

- ~~Cells and batteries must not be packed in the same outer packaging with substances and articles of Class 1 (explosives) other than Division 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers).~~

UN Model Regulations, Chapter 3.3, Special Provision 188 (d) (see ST/SG/AC.10/44/Add.1)

- Cells and batteries must be protected so as to prevent short circuits. This includes protection against contact with electrically conductive materials within the same packaging that could lead to a short circuit.
- Each package must be capable of withstanding a 1.2 m drop test in any orientation without:
 - damage to cells or batteries contained therein;
 - shifting of the contents so as to allow battery to battery (or cell to cell) contact;
 - release of contents.
- Each package must be marked with the appropriate lithium battery mark (Figure 5-3) in addition to the appropriate Class 9 hazard label (Figure 5-26) and the cargo aircraft only label (Figure 5-28).

~~Note. The provisions for a lithium battery handling label as contained in the 2015-2016 Edition of these Instructions (Part 5;3.5.2 and Figure 5-32 of the 2015-2016 Edition) may continue to be used in lieu of the lithium battery mark until 31 December 2018.~~

IB.3 Outer packagings

Boxes

Aluminium
Fibreboard
Natural wood
Other metal
Plastics
Plywood
Reconstituted wood
Steel

Drums

Aluminium
Fibre
Other metal
Plastics
Plywood
Steel

Jerricans

Aluminium
Plastics
Steel

II. SECTION II

Lithium metal or lithium alloy cells and batteries, when complying with Section II of this packing instruction, are only subject to the following additional provisions of these Instructions:

- Part 1;2.3 (General — Transport of dangerous goods by post);
- Part 5;1.1 g) and j) (Shipper's responsibilities — General requirements);

DGP-WG/16 (see paragraph 3.5.3.10 of DGP/26-WP/2) (incorporated in 2017-2018 Edition through Addendum/Corrigendum No. 1):

- ~~Part 5;2.4.16 (Shipper's responsibilities — Special marking requirements for lithium batteries):~~
- Part 7;2.1 (Operator's responsibilities — Loading restrictions on the flight deck and for passenger aircraft);
- Part 7;2.4.1 (Operator's responsibilities — Loading of cargo aircraft);
- Part 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);
- Part 8;1.1 (Provisions concerning passengers and crew — Dangerous goods carried by passengers or crew); and
- Paragraphs 1 and 2 of this packing instruction.

Lithium metal or lithium alloy cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3.1 a) and e) and the following:

- 1) for a lithium metal cell, the lithium content is not more than 1 g;
- 2) for a lithium metal or lithium alloy battery, the aggregate lithium content is not more than 2 g.

II.1 General requirements

Cells and batteries must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).

Table 968-II

Contents	Lithium metal cells and/or batteries with a lithium content not more than 0.3 g	Lithium metal cells with a lithium content more than 0.3 g but not more than 1 g	Lithium metal batteries with a lithium content more than 0.3 g but not more than 2 g
1	2	3	4
Maximum number of cells / batteries per package	No limit	8 cells	2 batteries
Maximum net quantity (mass) per package	2.5 kg	n/a	n/a

The limits specified in columns 2, 3 and 4 of Table 968-II must not be combined in the same package.

II.2 Additional requirements

- Cells and batteries must be packed in inner packagings that completely enclose the cell or battery, then placed in a strong rigid outer packaging.

DGP-WG/17 (see paragraph 3.5.3.1 of DGP/26-WP/3):

- ~~Cells and batteries must not be packed in the same outer packaging with other dangerous goods.~~

UN Model Regulations, Chapter 3.3, Special Provision 188 (d) (see ST/SG/AC.10/44/Add.1)

- Cells and batteries must be protected so as to prevent short circuits. This includes protection against contact with **electrically** conductive materials within the same packaging that could lead to a short circuit.
- Each package must be capable of withstanding a 1.2 m drop test in any orientation without:
 - damage to cells or batteries contained therein;
 - shifting of the contents so as to allow battery to battery (or cell to cell) contact;
 - release of contents.
- Each package must be marked with the appropriate lithium battery mark (Figure 5-3) and the cargo aircraft only label (Figure 5-28).
 - the package must be of such size that there is adequate space to affix the mark on one side without the mark being folded.
 - the cargo aircraft only label must be located on the same surface of the package near the lithium battery mark, if the package dimensions are adequate.

~~Note. — The provisions for a lithium battery handling label as contained in the 2015-2016 Edition of these Instructions (Part 5, 3.5.2 and Figure 5-32 of the 2015-2016 Edition) may continue to be used in lieu of the lithium battery mark until 31 December 2018.~~

- A shipper is not permitted to offer for transport more than one package prepared according to this section in any single consignment.
- The words "lithium metal batteries, in compliance with Section II of PI968 — cargo aircraft only" or "lithium metal batteries, in compliance with Section II of PI968 — CAO" must be placed on the air waybill, when an air waybill is used.
- Packages and overpacks of lithium metal batteries prepared in accordance with the provisions of Section II must be offered to the operator separately from cargo which is not subject to these Instructions and must not be loaded into a unit load device before being offered to the operator.
- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with their responsibilities.

II.3 Outer packagings

Boxes

Aluminium
Fibreboard
Natural wood
Other metal
Plastics
Plywood
Reconstituted wood
Steel

Drums

Aluminium
Fibre
Other metal
Plastics
Plywood
Steel

Jerricans

Aluminium
Plastics
Steel

II.4 Overpacks

Not more than one package prepared in accordance with this section may be placed into an overpack.

DGP-WG/17 (see paragraph 3.5.3.1 of DGP/26-WP/3):

Packages prepared in accordance with this section must not be placed into an overpack with packages containing substances and articles of Class 1 (explosives) other than Division 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers).

UN Model Regulations, Chapter 3.3, Special Provision 188 f) (see ST/SG/AC.10/44/Add.1)

DGP is invited to consider replacing “affixed” with “reproduced” for the sake of alignment with the UN Model Regulations and to consider the editorial amendments made to the new text in the Model Regulation with respect to the height of the overpack marking (aligns with similar provisions elsewhere in the Technical Instructions).

When the package is placed in an overpack, the lithium battery mark (Figure 5-3) and the cargo aircraft only label (Figure 5-28) required by this packing instruction must either be clearly visible or the mark and label must be ~~affixed~~ reproduced on the outside of the overpack and the overpack must be marked with the word “Overpack” in lettering of at least 12 mm high.

Note.— For the purpose of Section II, an overpack is an enclosure used by a single shipper that contains no more than one package prepared in accordance with this section. For shipments prepared in accordance with Section IA and/or IB, this limit of one package of Section II batteries per overpack still applies.

Packing Instruction 969

Passenger and cargo aircraft for UN 3091 (packed with equipment) only

1. Introduction

This entry applies to lithium metal or lithium alloy batteries packed with equipment.

Section I of this packing instruction applies to lithium metal and lithium alloy cells and batteries that are assigned to Class 9. Certain lithium metal and lithium alloy cells and batteries offered for transport and meeting the requirements of Section II of this packing instruction, subject to paragraph 2 below, are not subject to other additional requirements of these Instructions.

A single cell battery as defined in Part III, sub-section 38.3.2.3 of the UN Manual of Tests and Criteria is considered a “cell” and must be transported according to the requirements for “cells” for the purpose of this packing instruction.

For the purpose of this packing instruction, “equipment” means apparatus for which the lithium cells or batteries will provide electrical power for its operation.

2. Lithium batteries forbidden from transport

The following applies to all lithium metal cells and batteries in this packing instruction:

Cells and batteries, identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport (e.g. those being returned to the manufacturer for safety reasons).

I. SECTION I

Each cell or battery must meet all the provisions of 2;9.3.

Packing Instruction 969

I.1 General requirements

Part 4;1 requirements must be met.

<i>UN number and proper shipping name</i>	<i>Package quantity (Section I)</i>	
	<i>Passenger</i>	<i>Cargo</i>
UN 3091 Lithium metal batteries packed with equipment	5 kg of lithium metal cells or batteries	35 kg of lithium metal cells or batteries

I.2 Additional requirements

- Lithium metal cells and batteries must be protected against short circuits.
- Lithium metal cells or batteries must:
 - be placed in inner packagings that completely enclose the cell or battery, then placed in an outer packaging. The completed package for the cells or batteries must meet the Packing Group II performance requirements; or
 - be placed in inner packagings that completely enclose the cell or battery, then placed with equipment in a packaging that meets the Packing Group II performance requirements.
- The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.
- The number of cells or batteries in each package must not exceed the appropriate number for the equipment's operation, plus two spares.
- For lithium metal cells and batteries prepared for transport on passenger aircraft as Class 9:
 - cells and batteries offered for transport on passenger aircraft must be packed in intermediate or outer rigid metal packaging surrounded by cushioning material that is non-combustible and non-conductive and placed inside an outer packaging.

I.3 Outer packagings

<i>Boxes</i>	<i>Drums</i>	<i>Jerricans</i>
Aluminium (4B)	Aluminium (1B2)	Aluminium (3B2)
Fibreboard (4G)	Fibre (1G)	Plastics (3H2)
Natural wood (4C1, 4C2)	Other metal (1N2)	Steel (3A2)
Other metal (4N)	Plastics (1H2)	
Plastics (4H1, 4H2)	Plywood (1D)	
Plywood (4D)	Steel (1A2)	
Reconstituted wood (4F)		
Steel (4A)		

II. SECTION II

Lithium metal or lithium alloy cells and batteries packed with equipment, when complying with Section II of this packing instruction, are only subject to the following additional provisions of these Instructions:

- Part 1;2.3 (General — Transport of dangerous goods by post);

DGP-WG/16 (see paragraph 3.5.3.10 of DGP/26-WP/2) (incorporated in 2017-2018 Edition through Addendum/Corrigendum No. 1):

-
- Part 5;2.4.16 (Shipper's responsibilities — Special marking requirements for lithium batteries);
 - Part 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);
 - Part 8;1.1 (Provisions concerning passengers and crew — Dangerous goods carried by passengers or crew); and
 - Paragraphs 1 and 2 of this packing instruction.

Lithium metal cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3.1 a) and e) and the following:

- 1) for a lithium metal cell, the lithium content is not more than 1 g;
- 2) for a lithium metal or lithium alloy battery, the aggregate lithium content is not more than 2 g.

Packing Instruction 969

II.1 General requirements

Cells and batteries must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).

Contents	Package quantity (Section II)	
	Passenger	Cargo
Net quantity of lithium metal cells or batteries per package	5 kg	5 kg

II.2 Additional requirements

DGP-WG/16 (see paragraph 3.5.3.11 of DGP/26-WP/2):

- Lithium metal cells ~~or~~ **and** batteries must:
 - be placed in inner packagings that completely enclose the cell or battery, then placed in a strong rigid outer packaging; or
 - be placed in inner packagings that completely enclose the cell or battery, then placed with the equipment in a strong rigid outer packaging.

UN Model Regulations, Chapter 3.3, Special Provision 188 (d) (see ST/SG/AC.10/44/Add.1)

- Cells and batteries must be protected so as to prevent short circuits. This includes protection against contact with **electrically** conductive materials within the same packaging that could lead to a short circuit.
- The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.
- The number of cells or batteries in each package must not exceed the appropriate number for the equipment's operation, plus two spares.
- Each package of cells or batteries, or the completed package, must be capable of withstanding a 1.2 m drop test in any orientation without:
 - damage to cells or batteries contained therein;
 - shifting of the contents so as to allow battery to battery (or cell to cell) contact;
 - release of contents.
- Each package must be marked with the appropriate lithium battery mark (Figure 5-3).
 - the package must be of such size that there is adequate space to affix the mark on one side without the mark being folded.

~~Note. The provisions for a lithium battery handling label as contained in the 2015-2016 Edition of these Instructions (Part 5;3.5.2 and Figure 5-32 of the 2015-2016 Edition) may continue to be used in lieu of the lithium battery mark until 31 December 2018.~~

- The words "lithium metal batteries, in compliance with Section II of PI969" must be placed on the air waybill, when an air waybill is used.
- Where a package contains a combination of lithium batteries contained in equipment and lithium batteries packed with equipment that meet the limits for lithium cells or batteries of Section II, the following additional requirements apply:
 - the shipper must ensure that all applicable parts of both packing instructions are met. The total mass of lithium batteries contained in any package must not exceed 5 kg;
 - the words "lithium metal batteries, in compliance with Section II of PI969" must be placed on the air waybill, when an air waybill is used.
- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with their responsibilities.

II.3 Outer packagings

Boxes

Aluminium
Fibreboard
Natural wood
Other metal
Plastics
Plywood
Reconstituted wood
Steel

Drums

Aluminium
Fibre
Other metal
Plastics
Plywood
Steel

Jerricans

Aluminium
Plastics
Steel

Packing Instruction 969

II.4 Overpacks

UN Model Regulations, Chapter 3.3, Special Provision 188 f) (see ST/SG/AC.10/44/Add.1)

DGP is invited to consider replacing “affixed” with “reproduced” for the sake of alignment with the UN Model Regulations and to consider the editorial amendments made to the new text in the Model Regulation with respect to the height of the overpack marking (aligns with similar provisions elsewhere in the Technical Instructions).

When packages are placed in an overpack, the lithium battery mark (Figure 5-3) required by this packing instruction must either be clearly visible or the mark must be ~~affixed~~ reproduced on the outside of the overpack and the overpack must be marked with the word “Overpack” in lettering of at least 12 mm high.

Packing Instruction 970

Passenger and cargo aircraft for UN 3091 (contained in equipment) only

1. Introduction

This entry applies to lithium metal or lithium alloy batteries contained in equipment.

Section I of this packing instruction applies to lithium metal and lithium alloy cells and batteries that are assigned to Class 9. Certain lithium metal and lithium alloy cells and batteries offered for transport and meeting the requirements of Section II of this packing instruction, subject to paragraph 2 below, are not subject to other additional requirements of these Instructions.

A single cell battery as defined in Part III, sub-section 38.3.2.3 of the UN *Manual of Tests and Criteria* is considered a “cell” and must be transported according to the requirements for “cells” for the purpose of this packing instruction.

For the purpose of this packing instruction, “equipment” means apparatus for which the lithium cells or batteries will provide electrical power for its operation.

2. Lithium batteries forbidden from transport

The following applies to all lithium metal cells and batteries in this packing instruction:

Cells and batteries, identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport (e.g. those being returned to the manufacturer for safety reasons).

I. SECTION I

Each cell or battery must meet all the provisions of 2;9.3.

DGP-WG/16 (see paragraph 3.5.3.11 of DGP/26-WP/2):

I.1 General requirements

Equipment must be packed in strong-rigid outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).

Packing Instruction 970

UN number and proper shipping name	Package quantity (Section I)	
	Passenger	Cargo
UN 3091 Lithium metal batteries contained in equipment	5 kg of lithium metal cells or batteries	35 kg of lithium metal cells or batteries

I.2 Additional requirements

- The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.

DGP-WG/16 (see paragraph 3.5.3.11 of DGP/26-WP/2):

- The equipment must be packed in strong **rigid** outer packagings constructed of suitable material of adequate strength and design in relation to the packaging's capacity and its intended use unless the battery is afforded equivalent protection by the equipment in which it is contained.
- The quantity of lithium metal contained in any piece of equipment must not exceed 12 g per cell and 500 g per battery.

I.3 Outer packagings

Boxes

Aluminium
Fibreboard
Natural wood
Other metal
Plastics
Plywood
Reconstituted wood
Steel

Drums

Aluminium
Fibre
Other metal
Plastics
Plywood
Steel

Jerricans

Aluminium
Plastics
Steel

II. SECTION II

Error discovered and corrected through Addendum/Corrigendum No. 1 to 2017-2018 Edition):

Lithium metal or lithium alloy cells and batteries contained ~~with~~ **in** equipment, when complying with Section II of this packing instruction, are only subject to the following additional provisions of these Instructions:

- Part 1;2.3 (General — Transport of dangerous goods by post);

DGP-WG/16 (see paragraph 3.5.3.10 of DGP/26-WP/2) (incorporated in 2017-2018 Edition through Addendum/Corrigendum No. 1):

- **Part 5;2.4.16 (Shipper's responsibilities — Special marking requirements for lithium batteries);**
- Part 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);
- Part 8;1.1 (Provisions concerning passengers and crew — Dangerous goods carried by passengers or crew); and
- Paragraphs 1 and 2 of this packing instruction.

Lithium metal cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3.1 a) and e) and the following:

- 1) for a lithium metal cell, the lithium content is not more than 1 g;
- 2) for a lithium metal or lithium alloy battery, the aggregate lithium content is not more than 2 g.

Devices such as radio frequency identification (RFID) tags, watches and temperature loggers, which are not capable of generating a dangerous evolution of heat, may be transported when intentionally active. When active, these devices must meet defined standards for electromagnetic radiation to ensure that the operation of the device does not interfere with aircraft systems. The devices must not be capable of emitting disturbing signals (such as buzzing alarms, strobe lights, etc.) during transport.

Packing Instruction 970

II.1 General requirements

DGP-WG/16 (see paragraph 3.5.3.10 of DGP/26-WP/2)

Equipment containing batteries must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).

Contents	Package quantity (Section II)	
	Passenger	Cargo
Net quantity of lithium metal cells or batteries per package	5 kg	5 kg

II.2 Additional requirements

- The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.
- Cells and batteries must be protected so as to prevent short circuits.
- The equipment must be packed in strong rigid outer packagings constructed of suitable material of adequate strength and design in relation to the packaging's capacity and its intended use unless the battery is afforded equivalent protection by the equipment in which it is contained.
- Each package must be marked with the appropriate lithium battery mark (Figure 5-3). The package must be of such size that there is adequate space to affix the mark on one side without the mark being folded.
 - This requirement does not apply to:
 - packages containing only button cell batteries installed in equipment (including circuit boards); and
 - packages containing no more than four cells or two batteries installed in equipment, where there are not more than two packages in the consignment.

Note. — The provisions for a lithium battery handling label as contained in the 2015-2016 Edition of these Instructions (Part 5.3.5.2 and Figure 5-32 of the 2015-2016 Edition) may continue to be used in lieu of the lithium battery mark until 31 December 2018.

- Where a consignment includes packages bearing the lithium battery mark, the words "lithium metal batteries, in compliance with Section II of PI970" must be placed on the air waybill, when an air waybill is used.
- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with their responsibilities.

II.3 Outer packagings

Boxes

Aluminium
Fibreboard
Natural wood
Other metal
Plastics
Plywood
Reconstituted wood
Steel

Drums

Aluminium
Fibre
Other metal
Plastics
Plywood
Steel

Jerricans

Aluminium
Plastics
Steel

II.4 Overpacks

UN Model Regulations, Chapter 3.3, Special Provision 188 f) (see ST/SG/AC.10/44/Add.1)

DGP is invited to consider replacing "affixed" with "reproduced" for the sake of alignment with the UN Model Regulations and to consider the editorial amendments made to the new text in the Model Regulation with respect to the height of the overpack marking (aligns with similar provisions elsewhere in the Technical Instructions).

When packages are placed in an overpack, the lithium battery mark (Figure 5-3) required by this packing instruction must either be clearly visible or the mark must be reproduced on the outside of the overpack and the overpack must be marked with the word "Overpack" in lettering of at least 12 mm high.