International Civil Aviation Organization

DGP-WG/19-WP/14
18/3/19

WORKING PAPER

DANGEROUS GOODS PANEL (DGP)
WORKING GROUP MEETING (DGP-WG/19)

Montréal, 1 to 5 April 2019

Agenda Item 1: Harmonizing ICAO dangerous goods provisions with UN Recommendations on the Transport of Dangerous Goods

1.2: Develop proposals, if necessary, for amendments to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284) for incorporation in the 2021-2022 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 ninth session (Geneva, 7 December 2018). It also reflects amendments agreed by DGP-WG/18 (Montréal, 1 to 5 October 2019) under Agenda Item 1.2 of that meeting (Harmonizing ICAO dangerous goods provisions with UN Recommendations on the Transport of Dangerous Goods — Develop proposals, if necessary, for amendments to the Technical Instructions for incorporation in the 2021-2022 Edition).

Action by the DGP-WG: The DGP-WG is invited to agree to the draft amendments in this working paper.

Part 4

PACKING INSTRUCTIONS

Chapter 1

GENERAL PACKING REQUIREMENTS

. . .

1.1 GENERAL REQUIREMENTS APPLICABLE TO ALL CLASSES EXCEPT CLASS 7

. . .

UN Model Regulations, 4.1.1.3.1 (see ST/SG/AC.10/46/Add.1)

Secretariat Notes.—

1. The DGP is invited to consider whether the location of the new text below is appropriate, recognizing that the structure of these provisions in the UN Model Regulations is different.
2. References to IBCs and large packagings, which are included in the UN provision, are not included here since they are not normally permitted for transport by air and are not referred to elsewhere in this chapter other than in the Introductory note 12, the note under 1.2.2 and in 1.1.20.
3. A reference to 6;2 is added to the new provision since it is the first time the mark is referred to in this chapter.

1.1.2 New, remanufactured, reused or reconditioned packagings which are listed in Tables 6-2 and 6-3, must meet the applicable requirements of Part 6 of these Instructions. Such packagings must be manufactured and tested under a quality assurance programme which satisfies the appropriate national authority, in order to ensure that such packagings meet those applicable requirements. Packagings may conform to one or more than one successfully tested design type and may bear more than one mark required by 6;2. Where packagings are required to be tested in accordance with 6;4, their subsequent use must be as specified in the applicable test report and conform in all respects with the design type which was tested, including the method of packing and size and type of any inner packagings, except as provided for in 1.1.10.1 or 6;4.1.7. Before being filled and handed over for transport, every packaging must be inspected to ensure that it is free from corrosion, contamination or other damage. Any packaging which shows signs of reduced strength as compared with the approved design type must no longer be used or must be so reconditioned that it is able to withstand the design type tests.

Note.— ISO 16106:2006 Packaging — Transport packages for dangerous goods — Dangerous goods packagings, intermediate bulk containers (IBCs) and large packagings — Guidelines for the application of ISO 9001 provides acceptable guidance on procedures which may be followed.

. . .

Chapter 4

CLASS 2 — GASES

. . .

4.1 SPECIAL PACKING PROVISIONS FOR DANGEROUS GOODS OF CLASS 2

4.1.1 General requirements

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

UN Model Regulations, 4.1.6.1.2 (see ST/SG/AC.10/46/Add.1)

4.1.1.2 Parts of cylinders and closed cryogenic receptacles that are in direct contact with dangerous goods must not be affected or weakened by those dangerous goods and must not cause a dangerous effect (e.g. catalysing a reaction or reacting with the dangerous goods). In addition to the requirements specified in the relevant packing instruction, which take precedence, the applicable provisions of ~~ISO 11114-1:2012~~ ISO 11114-1:2012 + A1:2017 and ISO 11114-2:2013 must be met.

. . .

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

a) Valves are placed inside the neck of the cylinder and closed cryogenic receptacle and protected by a threaded plug or cap;

b) Valves are protected by caps. Caps must possess vent holes of a sufficient cross-sectional area to evacuate the gas if leakage occurs at the valves;

c) Valves are protected by shrouds or guards;

d) Not used; or

e) Cylinders and closed cryogenic receptacles are transported in an outer packaging. The packaging as prepared for transport must be capable of meeting the drop test specified in 6;4.3 at the Packing Group I performance level.

UN Model Regulations, 4.1.6.1.8 (see ST/SG/AC.10/46/Add.1)

For cylinders and closed cryogenic receptacles with valves as described in b) and c), the requirements of ISO 11117:1998 must be met; for valves with inherent protection, the requirements of ~~Annex A of ISO 10297:2006 or Annex A of ISO 10297:2014 must be met~~ Annex A of ISO 10297:2006, Annex A of ISO 10297:2014 or Annex A of ISO 10297 + A1:2017 must be met. For cylinders and closed cryogenic receptacles with self-closing valves with inherent protection, the requirements of Annex A of ISO 17879:2017 must be met. For metal hydride storage systems, the valve protection requirements specified in ISO 16111:2008 must be met.

. . .

4.2 PACKING INSTRUCTIONS

Packing Instruction 200

1.

For cylinders, the general packing requirements of 4;1.1 and 4;4.1.1 must be met.

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

. . .

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

. . .

UN Model Regulations, P200, paragraph 3) c) (see ST/SG/AC.10/46/Add.1)

c) For low pressure liquefied gases, the maximum mass of contents per litre of water capacity ~~(filling factor)~~ must equal 0.95 times the density of the liquid phase at 50°C; in addition, the liquid phase must not fill the cylinder at any temperature up to 60°C. The test pressure of the cylinder must be at least equal to the vapour pressure (absolute) of the liquid at 65°C, minus 100 kPa (1 bar).

. . .

5) The filling of cylinders must be carried out by qualified staff using appropriate equipment and procedures. The procedures should include checks of:

— the conformity of cylinders and accessories with these Instructions;
— their compatibility with the product to be transported;
— the absence of damage which might affect safety;
— compliance with the degree or pressure of filling, as appropriate;
— marks and identification.

UN Model Regulations, P200, paragraph 4) (see ST/SG/AC.10/46/Add.1)

These requirements are deemed to be met if the following standards are applied:

ISO 10691: 2004	Gas cylinders — Refillable welded steel cylinders for liquefied petroleum gas (LPG) — Procedures for checking before, during and after filling.
ISO 11372: 2011	Gas cylinders — Acetylene cylinders — Filling conditions and filling inspection
ISO 11755: 2005	Gas cylinders — Cylinder bundles for compressed and liquefied gases (excluding acetylene) — Inspection at time of filling
ISO 13088: 2011	Gas cylinders — Acetylene cylinder bundles — Filling conditions and filling inspection
ISO 24431:~~2006~~2016	Gas cylinders — Seamless, welded and composite ~~C~~cylinders for compressed and liquefied gases (excluding acetylene) — Inspection at time of filling

. . .

. . .

Packing Instruction 218

. . .

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 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 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 at 65°C;

v) Calculation of the total pressure, which is the sum of the vapour pressure of the liquid 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.

Secretariat Note.— The DGP is invited to consider including the following provisions as part of the letter list above as shown below.

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

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

UN Model Regulations, P206 (PP97) (see ST/SG/AC.10/46/Add.1)

Secretariat Note.— The provision for tubes included in the PP97 of the Model Regulations is not included since tubes are not permitted for transport of dangerous goods by air.

h) For fire extinguishing agents assigned to UN 3500, the maximum test period for periodic inspection must be ten years.

OUTER PACKAGINGS

Boxes	*Drums*	*Jerricans*
Strong outer packagings		

. . .

Packing Instruction 372

Cargo aircraft only for UN 3165 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.

2) **Closure requirements**

— Closures must meet the requirements of 4;1.1.4.

ADDITIONAL PACKING REQUIREMENTS

UN 3165 **Aircraft hydraulic power unit fuel tank** (containing a mixture of anhydrous hydrazine and methyl hydrazine) (M86 fuel) and designed for installation as complete units in aircraft are acceptable, subject to either of the following conditions:

UN Model Regulations, P301 (see ST/SG/AC.10/46/Add.1)

a) the unit must consist of an aluminium pressure receptacle made from tubing and having welded heads. Primary containment of the fuel within this receptacle must consist of a welded aluminium bladder having a maximum internal volume of 46 L. The outer receptacle must have a minimum design gauge pressure of 1 275 kPa and a minimum burst gauge pressure of 2 755 kPa. Each receptacle must be leak-checked during manufacture and before shipment and must be found leakproof. The complete inner unit must be securely packed in non-combustible cushioning material, such as vermiculite, in a strong outer tightly closed metal packaging which will adequately protect all fittings. Maximum quantity of fuel per ~~unit~~ primary containment and package is 42 L; or

b) the unit must consist of an aluminium pressure receptacle. Primary containment of the fuel within this receptacle must consist of a welded hermetically sealed fuel compartment with an elastomeric bladder having a maximum internal volume of 46 L. The pressure receptacle must have a minimum design gauge pressure of 2 860 kPa and a minimum burst gauge pressure of 5 170 kPa. Each receptacle must be leak-checked during manufacture and before shipment and must be found leakproof. The complete inner unit must be securely packed in non-combustible cushioning material, such as vermiculite, in a strong outer tightly closed metal packaging which will adequately protect all fittings. Maximum quantity of fuel per ~~unit~~ primary containment and package is 42 L.

Note.— This packing instruction is the same as UN packing instruction P301.

. . .

Chapter 6

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

. . .

Secretariat Note.— Amendments to P404 of the UN Model Regulations do not apply to the Technical Instructions as the text amended is not contained in the associated packing instructions in the Technical Instructions (Packing Instructions 467, 469, 470, 471 and 473). In looking at P404, it seems that the allowable outer packagings (no jerricans listed) and inner packagings (no plastic packagings listed) are more restrictive than in the Instructions. The DGP is invited to consider if there is a need for further harmonization. The substances assigned P404 of the UN Model Regulations are listed here, followed by an indication of either a packing instruction number for passenger and cargo aircraft or the letter "F" to indicate it is forbidden for transport on passenger or both aircraft:

UN 1383 — Pyrophoric metal, n.o.s.* (F/F)
UN 1383 — Pyrophoric alloy, n.o.s.* (F/F)
UN 1854 — Barium alloys, pyrophoric (F/F)
UN 1855 — Calcium alloys, pyrophoric (F/F)
UN 1855 — Calcium, pyrophoric (F/F)
UN 2008 — Zirconium powder, dry PG I (F/F)
UN 2008 — Zirconium powder, dry PG II (PI467/PI470)
UN 2008 — Zirconium powder, dry PG III (PI469/PI471)
UN 2441 — Titanium trichloride, pyrophoric (F/F)
UN 2441 — Titanium trichloride mixture, pyrophoric (F/F)
UN 2545 — Hafnium powder, dry PG I (F/F)
UN 2545 — Hafnium powder, dry PG II (467/470)
UN 2545 — Hafnium powder, dry PG III (469/471)
UN 2546 — Titanium powder, dry PG I (F/F)
UN 2546 — Titanium powder, dry PG II (467/470)
UN 2546 — Titanium powder, dry PG III (469/471)
UN 2846 — Pyrophoric solid, organic, n.o.s.* (F/F)
UN 2881 — Metal catalyst, dry* PG I (F/F)
UN 2881 — Metal catalyst, dry* PG II (F/PI473)
UN 2881 — Metal catalyst, dry* PG III (PI473/PI473)
UN 3200 — Pyrophoric solid, inorganic, n.o.s.* (F/F)
UN 3391 — Organometallic substance, solid, pyrophoric* (F/F)
UN 3393 — Organometallic substance, solid, pyrophoric, water reactive* (F/F)

. . .

Chapter 8

CLASS 6 — TOXIC AND INFECTIOUS SUBSTANCES

DGP-WG/18-WP/4 (see paragraph 3.1.2.1 of the DGP-WG/18 report):

Packing Instruction 620

This packing instruction applies to UN 2814 and UN 2900.

. . .

Special packing provisions

. . .

d) Before an empty packaging is returned to the shipper, or sent elsewhere, it must be disinfected or sterilized to nullify any hazard, and any label or mark indicating that it had contained an infectious substance must be removed or obliterated.

. . .

OUTER PACKAGINGS OF COMBINATION PACKAGINGS (see 6;3.1)

Boxes	*Drums*	*Jerricans*
Aluminium (4B)	Aluminium (1B1, 1B2)	Aluminium (3B1, 3B2)
Fibreboard (4G)	Fibre (1G)	Plastics (3H1, 3H2)
Natural wood (4C1, 4C2)	Other metal (1N1, 1N2)	Steel (3A1, 3A2)
Other metal (4N)	Plastics (1H1, 1H2)	
Plastics (4H1, 4H2)	Plywood (1D)	
Plywood (4D)	Steel (1A1, 1A2)	
Reconstituted wood (4F)		
Steel (4A)		

. . .

Secretariat Note.— Provisions for the transport of Category A medical waste without being subject to the specific packaging testing for Category A infectious substances were introduced into the UN Model Regulations. DGP is invited to consider whether these substances should be forbidden for transport by air, if they should be permitted subject to the approval of the appropriate authorities, or if they should be permitted on both passenger and cargo aircraft. The packing instruction below incorporates the UN provisions from new Packing instruction P622. The DGP is invited to consider whether the packing instruction is suitable for air transport either under normal conditions or with an approval. In the latter case, it will be moved to the Supplement. If included, quantity limitations will need to be established.

Background information on the need for these provisions is given in UN/SCETDG/51/INF.43.

UN Model Regulations, 4.1.4.1, P622 (see ST/SG/AC.10/46/Add.1)

Packing Instruction 682

Passenger and cargo aircraft for UN 3549 only

This instruction applies to waste of UN 3549 transported for disposal.

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**
UN number and proper shipping name	*Inner packaging (see 6;3.2)*	*Intermediate packaging*	*Total quantity per package*	
UN 3549 **Medical waste, Category A, affecting humans**, solid	Metal	Metal	[?]	No
	Plastics	Plastics		
UN 3549 **Medical waste, Category A, affecting animals** only, solid	Metal	Metal	[?]	No
	Plastics	Plastics		

ADDITIONAL PACKING REQUIREMENTS

— Outer packaging must meet Packing Group I performance requirements for solids.
— Fragile articles must be contained in either a rigid inner packaging or rigid intermediate packaging.
— Inner packagings containing sharp objects such as broken glass and needles must be rigid and resistant to puncture.
— The inner packaging, the intermediate packaging, and the outer packaging must be capable of retaining liquids. Outer packagings that are not capable of retaining liquids by design must be fitted with a liner or suitable measure of retaining liquids.
— The inner packaging and/or the intermediate packaging may be flexible. When flexible packagings are used, they must be capable of passing the impact resistance test to at least 165 g according to ISO 7765-1:1988 *Plastics film and sheeting — Determination of impact resistance by the free-falling dart method — Part 1: Staircase methods* and the tear resistance test to at least 480 g in both parallel and perpendicular planes with respect to the length of the bag in accordance with ISO 6383-2:1983 *Plastics — Film and sheeting — Determination of tear resistance — Part 2: Elmendorf method*. The maximum net mass of each flexible inner packaging must be 30 kg.
— Each flexible intermediate packaging must contain only one inner packaging.
— Inner packagings containing a small amount of free liquid may be included in intermediate packaging provided that there is sufficient absorbent or solidifying material in the inner or intermediate packaging to absorb or solidify all the liquid content present. Suitable absorbent material which withstands the temperatures and vibrations liable to occur under normal conditions of transport must be used.
— Intermediate packagings must be secured in outer packagings with suitable cushioning and/or absorbent material.

OUTER PACKAGINGS OF COMBINATION PACKAGINGS

Boxes	*Drums*	*Jerricans*
Fibreboard (4G)	Fibre (1G)	Aluminium (3B2)
Aluminium (4B)	Plastics (1H2)	Plastics (3H2)
Plastics (4H2)	Plywood (1D)	Steel (3A2)
Plywood (4D)	Steel (1A2)	
Other metal (4N)	Other metal (1N2)	
Steel (4A)	Aluminium (1B2)	

. . .

Chapter 9

CLASS 7 — RADIOACTIVE MATERIAL

. . .

9.1 GENERAL

. . .

UN Model Regulations, 4.1.9.1.4 (see ST/SG/AC.10/46/Add.1)

9.1.4 Except as provided in 7;3.2.5, the level of non-fixed contamination on the external and internal surfaces of overpacks and freight containers, must not exceed the limits specified in 9.1.2. This requirement does not apply to the internal surfaces of freight containers being used as packagings, either loaded or empty.

. . .

9.1.8 Before each shipment of any package, it must be ensured that all the requirements specified in the relevant provisions of these Instructions and in the applicable certificates of approval have been fulfilled. The following requirements must also be fulfilled, if applicable:

a) It must be ensured that lifting attachments which do not meet the requirements of 6;7.1.2 have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with 6;7.1.3;

b) Each Type B(U), Type B(M) and Type C package must be held until equilibrium conditions have been approached closely enough to demonstrate compliance with the requirements for temperature and pressure unless an exemption from these requirements has received unilateral approval;

c) For each Type B(U), Type B(M) and Type C package, it must be ensured by inspection and/or appropriate tests that all closures, valves, and other openings of the containment system through which the radioactive contents might escape are properly closed and, where appropriate, sealed in the manner for which the demonstrations of compliance with the requirements of 6;7.7.8 and 6;7.9.3 were made;

d) For packages containing fissile material, the measurement specified in 6;7.10.5 b) and the tests to demonstrate closure of each package as specified in 6;7.10.8 must be performed.

UN Model Regulations, 4.1.9.1.8 (see ST/SG/AC.10/46/Add.1)

e) For packages intended to be used for shipment after storage, it must be ensured that all packaging components and radioactive contents have been maintained during storage in a manner such that all the requirements specified in the relevant provisions of these Instructions and in the applicable certificates of approval have been fulfilled.

. . .

9.2 REQUIREMENTS AND CONTROLS FOR TRANSPORT OF LSA MATERIAL AND SCO

9.2.1 The quantity of LSA material or SCO in a single Industrial package Type 1 (Type IP-1), Industrial package Type 2 (Type IP-2), or Industrial package Type 3 (Type IP-3), must be so restricted that the external radiation level at 3 m from the unshielded material does not exceed 10 mSv/h.

9.2.2 LSA material and SCO which are or contain fissile material, which is not excepted under 2;7.2.3.5, must meet the applicable requirements in 7;2.9.4.1 and 7;2.9.4.2.

9.2.3 LSA material and SCO which are or contain fissile material must meet the applicable requirements of 6;7.10.1.

Secretariat Note.— The UN Model Regulations introduced new classification criteria for SCO-III to allow for the transport of a large solid object to be transported unpackaged under exclusive use by road, rail, inland waterway or sea. Paragraph 4.1.9.2.4 of the UN Model Regulations has been modified accordingly. There is no alignment needed in the Technical Instructions since SCO-III will not be permitted for transport by air. However, in looking at the provision in the Technical Instructions, i.e. 4;9.2.4 below, it is questioned whether the provision is too specific and whether it should be made more general. Could signalling out LSA-1, SCO-I and fissile material be interpreted to mean that other material could be transported unpackaged?

9.2.4 LSA-I material, SCO-I and fissile material must not be transported unpackaged.

9.2.5 LSA material and SCO must be packaged in accordance with Table 4-2.

. . .

Chapter 10

CLASS 8 — CORROSIVE SUBSTANCES

. . .

Secretariat Note.— The packing instruction assigned to UN 2794 — Batteries, wet, filled with acid, UN 2795 — Batteries, wet, filled with alkali and UN 3028 — Batteries, dry, containing potassium hydroxide solid in the UN Model Regulations was replaced in order to provide clarity and improve compliance. The associated packing instructions in the Technical Instructions (Packing Instruction 870 for UN 2794 and UN 2795 and Packing Instruction 871 for UN 3028) are not aligned with the UN Model Regulations. They are more restrictive than the UN in that packagings are subject to the Part 6 testing requirements. The DGP is invited to consider whether any of the provisions of P801 should be incorporated in the Packing

Instruction 870 and/or Packing Instruction 871 of the Technical Instructions. The provisions in the Model Regulations are as follows:

The following packagings are authorized, provided that the provisions of 4.1.1.1, 4.1.1.2, 4.1.1.6, and 4.1.3 are met:

(1) Rigid outer packagings, wooden slatted crates or pallets.

Additionally, the following conditions shall be met:

(a) Batteries stacks shall be in tiers separated by a layer of electrically non-conductive material;
(b) Battery terminals shall not support the weight of other superimposed elements;
(c) Batteries shall be packaged or secured to prevent inadvertent movement;
(d) Batteries shall not leak under normal conditions of transport or appropriate measures shall be taken to prevent the release of electrolyte from the package (e.g. individually packaging batteries or other equally effective methods); and
(e) Batteries shall be protected against short circuits.

(2) Stainless steel or plastics bins may also be used to transport used batteries.

Additionally, the following conditions shall be met:
(a) The bins shall be resistant to the electrolyte that was contained in the batteries;
(b) The bins shall not be filled to a height greater than the height of their sides;
(c) The outside of the bins shall be free of residues of electrolyte contained in the batteries;
(d) Under normal conditions of transport, no electrolyte shall leak from the bins;
(e) Measures shall be taken to ensure that filled bins cannot lose their content; and
(f) Measures shall be taken to prevent short circuits (e.g. batteries are discharged, individual protection of the battery terminals, etc.).

. . .

Chapter 11

CLASS 9 — MISCELLANEOUS DANGEROUS GOODS

. . .

Packing Instruction 962

Passenger and cargo aircraft for UN 3363 only

General requirements

Part 4, Chapter 1 requirements must be met (except that the requirements of 4;1.1.2, 1.1.9, 1.1.13 and 1.1.16 do not apply), 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.

UN Model Regulations, 4.1.4.1, P907 (see ST/SG/AC.10/46/Add.1)

This entry only applies to articles, such as machinery, apparatus or ~~machinery~~ devices containing dangerous goods as a residue or as an integral element of the ~~machinery or apparatus~~ article. It must not be used for ~~apparatus or machinery~~ an article for which a proper shipping name exists in Table 3-1. For other than fuel system components, ~~apparatus or machinery~~ articles may only contain one or more of the following: dangerous goods permitted under 3;4.1.2 or UN 2807 or gases of Division 2.2 without subsidiary hazard but excluding refrigerated liquefied gases.

UN Model Regulations, 4.1.4.1, P907 and 3.2, dangerous goods list (see ST/SG/AC.10/46/Add.1)

UN number and proper shipping name		*State*	*Total net quantity of dangerous goods in one package (excluding magnetic material)*
UN 3363	**Dangerous goods in apparatus** or **Dangerous goods in machinery** or **Dangerous goods in articles**	Liquid	0.5 L
		Solid	1 kg
		Gas (Division 2.2 only)	0.5 kg

ADDITIONAL PACKING REQUIREMENTS

— If the ~~machinery or apparatus~~ article 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~~ article 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~~ articles 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~~ articles 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~~ articles.

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 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:

Secretariat Note.— The DGP is invited to consider whether the following amendments, proposed for the sake of alignment with the revisions made to Special Provision A154 (UN SP 376) (see DGP-WG/19-WP/13) are appropriate. On the one had they are redundant, as the text replicates what is in the special provision. On the other hand, the DGP has endeavoured to make the lithium battery packing instructions (965-970) standalone.

UN Model Regulations, Chapter 3.3, SP 376 and Instructions, Special Provision A154 (see DGP-WG/19-WP/13), (see ST/SG/AC.10/46/Add.1)

~~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).~~Lithium ion cells or batteries and lithium metal cells or batteries identified as being damaged or defective such that they do not conform to the type tested according to the applicable provisions of the *Manual of Tests and Criteria* are forbidden for transport. For the purposes of this packing instruction, these may include, but are not limited to:

a) cells or batteries identified as being defective for safety reasons;

b) cells or batteries that have leaked or vented;

c) cells or batteries that cannot be diagnosed prior to transport; or

Packing Instruction 965

Cargo aircraft only for UN 3480

d) cells or batteries that have sustained physical or mechanical damage.

In assessing a cell or battery as damaged or defective, an assessment or evaluation must be performed based on safety criteria from the cell, battery or product manufacturer or by a technical expert with knowledge of the cell's or battery's safety features. An assessment or evaluation may include, but is not limited to, the following criteria:

a) acute hazard, such as gas, fire, or electrolyte leaking;

b) the use or misuse of the cell or battery;

c) signs of physical damage, such as deformation to cell or battery casing, or colours on the casing;

d) external and internal short circuit protection, such as voltage or isolation measures;

e) the condition of the cell or battery safety features; or

f) damage to any internal safety components, such as the battery management system.

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.

. . .

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:

Secretariat Note.— The DGP is invited to consider whether the following amendments, proposed for the sake of alignment with the revisions made to Special Provision A154 (see DGP-WG/19-WP/13) are appropriate. On the one had they are redundant, as the text replicates what is in the special provision. On the other hand, the DGP has endeavoured to make the lithium battery packing instructions (965-970) standalone.

UN Model Regulations, Chapter 3.3, SP 376 and Instructions, Special Provision A154 (see DGP-WG/19-WP/13), (see ST/SG/AC.10/46/Add.1)

Packing Instruction 966

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

~~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).~~Lithium ion cells or batteries and lithium metal cells or batteries identified as being damaged or defective such that they do not conform to the type tested according to the applicable provisions of the *Manual of Tests and Criteria* are forbidden for transport. For the purposes of this packing instruction, these may include, but are not limited to:

a) cells or batteries identified as being defective for safety reasons;

b) cells or batteries that have leaked or vented;

c) cells or batteries that cannot be diagnosed prior to transport; or

d) cells or batteries that have sustained physical or mechanical damage.

In assessing a cell or battery as damaged or defective, an assessment or evaluation must be performed based on safety criteria from the cell, battery or product manufacturer or by a technical expert with knowledge of the cell's or battery's safety features. An assessment or evaluation may include, but is not limited to, the following criteria:

a) acute hazard, such as gas, fire, or electrolyte leaking;

b) the use or misuse of the cell or battery;

c) signs of physical damage, such as deformation to cell or battery casing, or colours on the casing;

d) external and internal short circuit protection, such as voltage or isolation measures;

e) the condition of the cell or battery safety features; or

f) damage to any internal safety components, such as the battery management system.

I. **SECTION I**

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

. . .

I.2 **Additional requirements**

— Lithium ion cells and batteries must be protected against short circuits.

Secretariat Note.— It is suggested that the intent of the provisions for packaging in the Technical Instructions is unclear. It does not align with the UN Model Regulations The DGP is invited to consider if there is a need for clarification. The text in the UN Model Regulations is as follows:

UN Model Regulations:

For cells or batteries packed with equipment:
Packagings conforming to the requirements in paragraph (1) of this packing instruction, then placed with the equipment in an outer packaging; or
Packagings that completely enclose the cells or batteries, then placed with equipment in a packaging conforming to the requirements in paragraph (1) of this packing instruction. The equipment shall be secured against movement within the outer packaging.

— 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

Packing Instruction 966

Passenger and cargo aircraft for UN 3481 (packed with equipment) only
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 number required for the equipment's operation, plus two spare sets. A "set" of cells or batteries is the number of individual cells or batteries that are required to power each piece of equipment.
- Batteries manufactured after 31 December 2011 must be marked with the Watt-hour rating on the outside case.

≠

Secretariat Note.— It is suggested that the following new provisions added to the UN Model Regulations in P903 for packagings containing both cells or batteries packed with and contained in equipment is unnecessary in the Technical Instructions since Special Provision 181 requires the applicable parts of both packing instructions apply. This is the next text from P903 of the Model Regulations:

"(5) For packagings containing both cells or batteries packed with equipment and contained in equipment:

(a) For cells and batteries, packagings that completely enclose the cells or batteries, then placed with equipment in a packaging conforming to the requirements in paragraph (1) of this packing instruction; or

(b) Packagings conforming to the requirements in paragraph (1) of this packing instruction, then placed with the equipment in a strong outer packaging constructed of suitable material, and of adequate strength and design in relation to the packaging capacity and its intended use. The outer packaging shall be constructed in such a manner as to prevent accidental operation during transport and need not meet the requirements of 4.1.1.3.

The equipment shall be secured against movement within the outer packaging.

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 in strong outer packagings. When active, these devices shall meet defined standards for electromagnetic radiation to ensure that the operation of the devices does not interfere with aircraft systems.

Secretariat Note.— The text added to the UN Model Regulations P903, shown in previous Secretariat note, includes text related to RFID tags, temperature loggers etc. is already contained in Section II of Packing Instructions 967 and 970. It is proposed to also include this text in Section I of those packing instructions for the sake of alignment with the UN Model Regulations (see Packing instructions 967 and 970 below). The DGP is also invited to consider whether the text should be included in Packing Instructions 966 and 969. The text is as follows:

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 in strong outer packagings. When active, these devices shall meet defined standards for electromagnetic radiation to ensure that the operation of the devices does not interfere with aircraft systems.

• • •

Packing Instruction 966

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

II.2 **Additional requirements**

Secretariat Note.— It is suggested that the intent of the provisions for packaging in the Technical Instructions is unclear. It does not align with the UN Model Regulations The DGP is invited to consider if there is a need for clarification. The text in the UN Model Regulations is as follows:

UN Model Regulations:

For cells or batteries packed with equipment:
Packagings conforming to the requirements in paragraph (1) of this packing instruction, then placed with the equipment in an outer packaging; or
Packagings that completely enclose the cells or batteries, then placed with equipment in a packaging conforming to the requirements in paragraph (1) of this packing instruction.
The equipment shall be secured against movement within the outer packaging.

— 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.

. . .

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:

Secretariat Note.— The DGP is invited to consider whether the following amendments, proposed for the sake of alignment with the revisions made to Special Provision A154 (UN SP 376) (see DGP-WG/19-WP/13) are appropriate. On the one had they are redundant, as the text replicates what is in the special provision. On the other hand, the DGP has endeavoured to make the lithium battery packing instructions (965-970) standalone.

~~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).~~Lithium ion cells or batteries and

Packing Instruction 967

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

lithium metal cells or batteries identified as being damaged or defective such that they do not conform to the type tested according to the applicable provisions of the *Manual of Tests and Criteria* are forbidden for transport. For the purposes of this packing instruction, these may include, but are not limited to:

a) cells or batteries identified as being defective for safety reasons;

b) cells or batteries that have leaked or vented;

c) cells or batteries that cannot be diagnosed prior to transport; or

d) cells or batteries that have sustained physical or mechanical damage.

In assessing a cell or battery as damaged or defective, an assessment or evaluation must be performed based on safety criteria from the cell, battery or product manufacturer or by a technical expert with knowledge of the cell's or battery's safety features. An assessment or evaluation may include, but is not limited to, the following criteria:

a) acute hazard, such as gas, fire, or electrolyte leaking;

b) the use or misuse of the cell or battery;

c) signs of physical damage, such as deformation to cell or battery casing, or colours on the casing;

d) external and internal short circuit protection, such as voltage or isolation measures;

e) the condition of the cell or battery safety features; or

f) damage to any internal safety components, such as the battery management system.

I. **SECTION I**

Each cell or battery must meet 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

Secretariat Note.— The following text is currently contained in Section II in the Instructions. It has been added here for the sake of alignment with changes to the UN Model Regulations, which introduces the text into P903. It will be brought to the attention of the new specific working group of the Flight Operations Panel (FLTOPSP)

UN Model Regulations, 4.1.4.1, P903 (5) (see ST/SG/AC.10/46/Add.1)

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 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:

Secretariat Note.— The DGP is invited to consider whether the following amendments, proposed for the sake of alignment with the revisions made to Special Provision A154 (UN SP 376) (see DGP-WG/19-WP/13) are appropriate. On the one had they are redundant, as the text replicates what is in the special provision. On the other hand, the DGP has endeavoured to make the lithium battery packing instructions (965-970) standalone.

~~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).~~ Lithium ion cells or batteries and lithium metal cells or batteries identified as being damaged or defective such that they do not conform to the type tested according to the applicable provisions of the *Manual of Tests and Criteria* are forbidden for transport. For the purposes of this packing instruction, these may include, but are not limited to:

a) cells or batteries identified as being defective for safety reasons;

b) cells or batteries that have leaked or vented;

c) cells or batteries that cannot be diagnosed prior to transport; or

d) cells or batteries that have sustained physical or mechanical damage.

In assessing a cell or battery as damaged or defective, an assessment or evaluation must be performed based on safety criteria from the cell, battery or product manufacturer or by a technical expert with knowledge of the cell's or battery's safety features. An assessment or evaluation may include, but is not limited to, the following criteria:

a) acute hazard, such as gas, fire, or electrolyte leaking;

b) the use or misuse of the cell or battery;

c) signs of physical damage, such as deformation to cell or battery casing, or colours on the casing;

d) external and internal short circuit protection, such as voltage or isolation measures;

e) the condition of the cell or battery safety features; or

f) damage to any internal safety components, such as the battery management system.

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.

. . .

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:

Secretariat Note.— The DGP is invited to consider whether the following amendments, proposed for the sake of alignment with the revisions made to Special Provision A154 (UN SP 376) (see DGP-WG/19-WP/13) are appropriate. On the one had they are redundant, as the text replicates what is in the special provision. On the other hand, the DGP has endeavoured to make the lithium battery packing instructions (965-970) standalone.

~~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).~~Lithium ion cells or batteries and lithium metal cells or batteries identified as being damaged or defective such that they do not conform to the type tested according to the applicable provisions of the *Manual of Tests and Criteria* are forbidden for transport. For the purposes of this packing instruction, these may include, but are not limited to:

a) cells or batteries identified as being defective for safety reasons;

b) cells or batteries that have leaked or vented;

c) cells or batteries that cannot be diagnosed prior to transport; or

d) cells or batteries that have sustained physical or mechanical damage.

In assessing a cell or battery as damaged or defective, an assessment or evaluation must be performed based on safety criteria from the cell, battery or product manufacturer or by a technical expert with knowledge of the cell's or battery's safety features. An assessment or evaluation may include, but is not limited to, the following criteria:

a) acute hazard, such as gas, fire, or electrolyte leaking;

b) the use or misuse of the cell or battery;

c) signs of physical damage, such as deformation to cell or battery casing, or colours on the casing;

d) external and internal short circuit protection, such as voltage or isolation measures;

e) the condition of the cell or battery safety features; or

f) damage to any internal safety components, such as the battery management system.

Packing Instruction 969

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

I. **SECTION I**

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

I.1 **General requirements**

Part 4;1 requirements must be met.

. . .

I.2 **Additional requirements**

— Lithium metal cells and batteries must be protected against short circuits.

Secretariat Note.— It is suggested that the intent of the provisions for packaging in the Technical Instructions is unclear. It does not align with the UN Model Regulations The DGP is invited to consider if there is a need for clarification. The text in the UN Model Regulations is as follows:

UN Model Regulations:

For cells or batteries packed with equipment:
Packagings conforming to the requirements in paragraph (1) of this packing instruction, then placed with the equipment in an outer packaging; or
Packagings that completely enclose the cells or batteries, then placed with equipment in a packaging conforming to the requirements in paragraph (1) of this packing instruction.
The equipment shall be secured against movement within the outer packaging.

— 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 number required for the equipment's operation, plus two spare sets. A "set" of cells or batteries is the number of individual cells or batteries that are required to power each piece of equipment.
— 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.

Secretariat Note.— It is suggested that the following new provisions added to the UN Model Regulations in P903 for packagings containing both cells or batteries packed with equipment is unnecessary in the Technical Instructions since Special Provision 181 requires the applicable parts of both packing instructions apply. This is the next text from P903 of the Model Regulations:

"(5) For packagings containing both cells or batteries packed with equipment and contained in equipment:

(a) For cells and batteries, packagings that completely enclose the cells or batteries, then placed with equipment in a packaging conforming to the requirements in paragraph (1) of this packing instruction; or

(b) Packagings conforming to the requirements in paragraph (1) of this packing instruction, then placed

Packing Instruction 969

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

with the equipment in a strong outer packaging constructed of suitable material, and of adequate strength and design in relation to the packaging capacity and its intended use. The outer packaging shall be constructed in such a manner as to prevent accidental operation during transport and need not meet the requirements of 4.1.1.3.

The equipment shall be secured against movement within the outer packaging.

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 in strong outer packagings. When active, these devices shall meet defined standards for electromagnetic radiation to ensure that the operation of the devices does not interfere with aircraft systems..

Secretariat Note.— The text added to the UN Model Regulations P903, shown in previous Secretariat note, includes text related to RFID tags, temperature loggers etc. is already contained in Section II of Packing Instructions 967 and 970. It is proposed to also include this text in Section I of those packing instructions for the sake of alignment with the UN Model Regulations (see Packing instructions 967 above and 970 below). The DGP is also invited to consider whether the text should be included in Packing Instructions 966 and 969. The text is as follows:

> 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 in strong outer packagings. When active, these devices shall meet defined standards for electromagnetic radiation to ensure that the operation of the devices does not interfere with aircraft systems.

. . .

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

Packing Instruction 969

II.2 **Additional requirements**

— Lithium metal cells and batteries must:

Secretariat Note.— It is suggested that the intent of the provisions for packaging in the Technical Instructions is unclear. It does not align with the UN Model Regulations The DGP is invited to consider if there is a need for clarification. The text in the UN Model Regulations is as follows:

UN Model Regulations:

For cells or batteries packed with equipment:

Packagings conforming to the requirements in paragraph (1) of this packing instruction, then placed with the equipment in an outer packaging; or

Packagings that completely enclose the cells or batteries, then placed with equipment in a packaging conforming to the requirements in paragraph (1) of this packing instruction. The equipment shall be secured against movement within the outer packaging.

— 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.

. . .

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:

Secretariat Note.—	The DGP is invited to consider whether the following amendments, proposed for the sake of alignment with the revisions made to Special Provision A154 (UN SP 376) (see DGP-WG/19-WP/13) are appropriate. On the one had they are redundant, as the text replicates what is in the special provision. On the other hand, the DGP has endeavoured to make the lithium battery packing instructions (965-970) standalone.

~~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).~~Lithium ion cells or batteries and lithium metal cells or batteries identified as being damaged or defective such that they do not conform to the type tested according to the applicable provisions of the *Manual of Tests and Criteria* are forbidden for transport. For the purposes of this packing instruction, these may include, but are not limited to:

a) cells or batteries identified as being defective for safety reasons;

b) cells or batteries that have leaked or vented;

c) cells or batteries that cannot be diagnosed prior to transport; or

d) cells or batteries that have sustained physical or mechanical damage.

In assessing a cell or battery as damaged or defective, an assessment or evaluation must be performed based on safety criteria from the cell, battery or product manufacturer or by a technical expert with knowledge of the cell's or battery's safety features. An assessment or evaluation may include, but is not limited to, the following criteria:

a) acute hazard, such as gas, fire, or electrolyte leaking;

b) the use or misuse of the cell or battery;

c) signs of physical damage, such as deformation to cell or battery casing, or colours on the casing;

d) external and internal short circuit protection, such as voltage or isolation measures;

e) the condition of the cell or battery safety features; or

f) damage to any internal safety components, such as the battery management system.

I. **SECTION I**

Each cell or battery must meet 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 3091 **Lithium metal batteries contained in equipment**	5 kg of lithium metal cells or batteries	35 kg of lithium metal cells or batteries

Secretariat Note.— The following text is currently contained in Section II in the Instructions. It has been added here for the sake of alignment with changes to the UN Model Regulations, which introduces the text into P903. It will be brought to the attention of the new specific working group of the Flight Operations Panel (FLTOPSP)

UN Model Regulations, 4.1.4.1, P903 (5) (see ST/SG/AC.10/46/Add.1)

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.

. . .

— END —