



DANGEROUS GOODS PANEL (DGP)

TWENTY-SEVENTH MEETING

Montréal, 16 to 20 September 2019

Agenda Item 10: Other business

**REPORT OF THE DANGEROUS GOODS PANEL (DGP)
WORKING GROUP MEETING (DGP-WG/19)**

Montréal, 1 to 5 April 2019

(Presented by the Secretary)

1. INTRODUCTION

1.1 The Dangerous Goods Panel Working Group Meeting (DGP-WG/19) was convened from 1 to 5 April 2019 under the chairmanship of Ms. M. Paquette and the vice-chairmanship of Mr. T. Muller.

1.1.1 Mr. Nabil Naoumi, First Vice-President of the Air Navigation Commission (ANC) opened the meeting. He welcomed participants and expressed his appreciation for the work of the panel. He emphasized the importance of members being independent experts bringing forth their own professional views, which may not necessarily be those of their administration or organization, and the need for the panel to work towards consensus. He highlighted the role of the panel, the Secretariat, the ANC and the Council and emphasized the need for collaboration. He also highlighted the increasing need for collaboration among dangerous goods, operations and airworthiness experts. In this regard, the ANC established a new specific working group of the Flight Operations Panel (FLTOSP) to enable a coordinated and comprehensive approach towards ensuring the safe carriage of goods by air. Further details on the new group, including the terms of reference, were provided in an information paper to the DGP working group (see paragraph 3.8.1.2 of this report). The composition of the working group was still to be discussed by the ANC. He extended an invitation to the chair and vice-chair of the working group to meet with ANC members later in the week for an informal discussion on the ANC's plans and expectations and any issues that the DGP wanted to raise. He wished the working group success in their work.

2. ATTENDANCE

2.1 The meeting was attended by the following panel members, advisers and observers:

Members	Advisers/Observers	State/International Organization
L. Cascardo	R. Lopes Grossi	Brazil
M. Paquette	D. Bolton D. Evans B. Ligonde N. McCulloch A. Sultan	Canada
S. Aidong	Tai Feng Wu Wei Qiu Zhenhua	China
P. Tatin	M. Cosset	France
H. Brockhaus	B. Guenther	Germany
P. Privitera	C. Carboni M. Tortorici	Italy
	Y. Matsushita K. Nakano H. Oda K. Takeda S. Tazawa	Japan
	K.-H. Jang S.-M. Yoo	Republic of Korea
T. Muller	E. Boon R. Dardenne K. Vermeersch	Netherlands
	M. de Castro	Spain
H. Al Muhairi	K. Al Blooshi T. Howard A. Wagih	United Arab Emirates (UAE)
E. Gillett	D. Warden	United Kingdom
D. Pfund	M. Givens K. Leary E. Petrie	United States
S. Schwartz		International Federation of Air Line Pilots' Associations (IFALPA)

Members	Advisers/Observers	State/International Organization
D. Brennan	A. Jimenez P. Oppenheimer M. Pak	International Air Transport Association (IATA)
D. Ferguson		International Coordinating Council of Aerospace Industries Associations (ICCAIA)
	M. Boehm	Austria
	J.W. Bengtsson	Denmark
	N. Hagmann	Switzerland
	B. Carrara	The Regional Oversight Safety System (SRVSOP)
	A. McCulloch T. Rogers	Global Express Association (GEA)
	E. Remy	North Atlantic Treaty Organization (NATO)
	A. Altemos V. Arthur G. Leach	Dangerous Goods Advisory Council (DGAC)

3. REVIEW OF THE REPORT

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

3.1.1 Agenda Item 1.1: Develop proposals, if necessary, for amendments to Annex 18 — *The Safe Transport of Dangerous Goods by Air*

3.1.1.1 There were no amendments to Annex 18 proposed under this agenda item.

3.1.2 Agenda Item 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

Amendments agreed under this agenda item are presented in Appendix C to this report.

3.1.2.1 **Revision to Permitted Packagings in Packing Instruction 957** (DGP-WG/19-WP/3 (Revised))

3.1.2.1.1 Packing Instruction 957, which applied to UN 2211 — **Polymeric beads, expandable** and UN 3314 — **Plastics moulding compound**, provided for the use of single packagings but not combination packagings. This was inconsistent with the UN Model Regulations and also with the Technical Instructions, where combination packagings were always permitted when single packagings were. An additional inconsistency was identified between the Technical Instructions and the Model Regulations with respect to the types of single packagings permitted. The addition of combination packagings into Packing Instruction 957 and alignment of the types of single packagings listed with the Model Regulations were therefore proposed.

3.1.2.1.2 There were no objections to the proposal, as allowing combination packaging instead of only single packaging did not introduce any new risks. However, a number of issues were raised with regard to Packing Instruction 957, i.e.:

- a) There were concerns with the potential for these items to evolve flammable vapour (pentane), but it was reported this was only a risk when transporting large quantities in bulk.
- b) Part 7;2.12 limited the total net mass of expandable polymeric beads (or granules) or plastic moulding materials permitted in any inaccessible cargo compartment on any aircraft to 100 kg. A disconnect was noted in that the total quantity permitted in the packing instruction when offered for transport on a cargo aircraft was 200 kg.
- c) A potential lack of harmonization with the UN Model Regulations was noted with respect to permitted packagings.

3.1.2.1.3 As these issues existed independent of the amendment proposed, it was suggested that they be raised separately if members thought it necessary. The amendment was agreed.

3.1.2.2 **Revisions to Permitted Packagings in Packing Instructions** (DGP-WG/19-WP/4)

3.1.2.2.1 Amendments to the lists of permitted single packagings in certain packing instructions assigned to substances of Classes 4 and 5 for the sake of alignment with the UN Model Regulations and other Packing Instructions in the Instructions were proposed. The amendments were agreed, subject to the addition of “fibre” to the list of single packaging types for which a suitable liner was required in Packing Instructions 470 – 471 and 487 – 491 (under “additional packing requirements for single packagings”).

3.1.2.3 **Draft Amendments to the Technical Instructions to Align** **with the UN Recommendations — Part 1** (DGP-WG/19-WP/11)

3.1.2.3.1 Draft amendments to Part 1 were proposed to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods. A working group on UN harmonization (DGP-WG/UN harmonization) was tasked with reviewing the amendments. The following issues were identified:

- a) The reference number for the United Nations Recommendations on the Transport of Dangerous Goods, *Manual of Tests and Criteria* needed to be updated to “Rev. 7”.

- b) DGP-WG/UN harmonization recommended including provisions excepting dangerous goods in equipment in use or intended for use during transport, such as data loggers and cargo tracking devices with installed lithium batteries, from the Instructions. A new item i) under 1;1.1.5.1 was proposed to align with section 1.1.1.2 of the UN Model Regulations. It was acknowledged that even if not subject to dangerous goods requirements, there may be a need for these devices to be subject to operations or airworthiness requirements. The provisions would therefore be provided to the newly-established multidisciplinary Safe Carriage of Goods Specific Working Group of the Flight Operations Panel (FLTOPSP-SCG-SWG) for review (see paragraph 3.8.1.2 of this report).
- c) The working group agreed to the addition of references to an IBC and a portable tank in the definition for self-accelerating decomposition temperature (SADT) for the sake of alignment with the UN Model Regulations. A note was also added specifying that these were not permitted for transport by air. This was in line with a decision made at DGP/24 to include references to terms in definitions even if the item being defined was not permitted for transport by air (see paragraph 2.1.1.2 of the DGP/24 Report).
- d) The definition for transport index was modified in section 1.2.1 of the UN Model Regulations by adding “SCO-III” to the list of items it is assigned to (i.e. a package, overpack or freight container or unpackaged LSA-I, SCO-I or SCO-III). Unpackaged LSA-I and SCO-I were not included in the definition in Part 1;3 of the Instructions, as these were not permitted for transport by air. However, the definition for “transport index” was repeated in the classification provisions for radioactive material (Part 2;7), and in that version references to unpackaged LSA-I and SCO-I were included. It was agreed to align the definition with the UN Model Regulations and to add a note specifying that unpackaged LSA-I, SCO-I or SCO-III were not permitted for transport by air. This was in line with a decision made at DGP/24 to include references to terms in definitions even if the item being defined was not permitted for transport by air (see paragraph 2.1.1.2 of the DGP/24 Report).
- e) The list of references to provisions for which transport of excepted packages of radioactive material would apply was updated to align with revisions to the list in the UN Model Regulations. It was noted that some of the additions did not make sense. Two referred to transport document requirements in Part 5;4, which were not required for radioactive material, excepted packages. One referred to special provisions applicable to the carriage of fissile material in accordance with the responsibilities of the operator in Part 7, which would be impossible for the operator to verify without an acceptance check. It was suggested that consideration be given to only allowing fissile material to be shipped fully regulated by air. The references were placed in square brackets pending further consideration. A separate comment in relation to the list was that listing them, rather than referring to the exact provision, made reading the text and understanding the intent complicated. Restructuring the list into a table and including a general description of each provision referenced would simplify matters. The Secretary was requested to raise these issues to the UN Sub-Committee of Experts on the Transport of Dangerous Goods (referred to hereafter, for the sake of brevity, as the “UN Sub-Committee”).
- f) An editorial amendment replacing “does rate” with “dose rate” in 1;6.6 would be made.

3.1.2.3.2 A list of revisions proposed by DGP-WG/UN harmonization is provided in Appendix A and consolidated amendments are provided in Appendix C to this report. It was agreed that Part 1 would be further reviewed by panel members, and any additional discrepancies would be incorporated in the DGP/27 working paper on UN harmonization.

3.1.2.4 Draft Amendments to the Technical Instructions to Align with the UN Recommendations — Part 2 (DGP-WG/19-WP/12)

3.1.2.4.1 Draft amendments to Part 2 were proposed to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods. DGP-WG/UN harmonization was tasked with reviewing the amendments. The following issues were identified:

- a) An editorial amendment to a revised note under 2;2.2.1 would be made.
- b) A note indicating that unpackaged LSA-I, SCO-I or SCO-III was not permitted for transport by air would be added under the definition for “transport index” in 2;7.1.3. This would align with the same definition provided in 1;3 (see paragraph 3.1.2.3.1 d) above).
- c) An editorial amendment to address an incorrect reference in 2;7.2.1.1 would be made (“... in accordance with 7.2.4 to 7.2.4.5).
- d) The classification criteria added to the UN Model Regulations for SCO-III (2;7.2.3.2.1) would not be included in the Instructions other than to describe the material. A note indicating that this material was not permitted for transport by air would be modified to align with similar notes elsewhere in the Instructions.
- e) It was questioned whether it was appropriate to include references to the provisions of fissile excepted for what is to be classified as UN 2908 — **Radioactive material, excepted package — empty packaging** (2;7.2.4.1.1.7, new subparagraph e)). It was suggested that by definition an empty packaging could not meet most of the conditions, as they applied to fissile excepted nuclides in a packaging, and therefore the packaging is not empty. The Secretary was requested to raise the concern to the UN Sub-Committee.
- f) A general reference to the definitions contained in 2;7.1.3 was modified in new subparagraph 2;7.2.4.1.1.7 e) to refer specifically to the definition for fissile nuclides for the sake of alignment with the UN Model Regulations. The Secretary was requested to advise the UN Sub-Committee of the modification and to propose that it be made in the UN Model Regulations.
- g) Minor editorial amendments were made to 2;8.3.2 for the sake of clarity.
- h) Revisions to section 2.9.2 of the UN Model Regulations did not apply to the Instructions. However, it was noted that the Model Regulations contained a list of substances and articles of Class 9 subdivided into categories that was not included in the Instructions. It was agreed that Part 2;9 should be more closely aligned with 2.9.2 of the Model Regulations.

3.1.2.4.2 A list of revisions proposed by DGP-WG/UN harmonization is provided in Appendix A and consolidated amendments are provided in Appendix C to this report. It was agreed that Part 2 would be further reviewed by panel members, and any additional discrepancies would be incorporated in the DGP/27 working paper on UN harmonization.

3.1.2.5 **Draft Amendments to the Technical Instructions to Align with the UN Recommendations — Part 3 (DGP-WG/19-WP/13)**

3.1.2.5.1 Draft amendments to Part 3 were proposed to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods. DGP-WG/UN harmonization was tasked with reviewing the amendments. The following issues were identified:

- a) 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. The need to transport large quantities of medical waste occurred during the Ebola crisis in 2015. The need to transport these substances by air was not expected. The working group agreed that this waste should only be permitted for transport on cargo aircraft with the approval of the State of Origin and the State of the Operator under Special Provision A2. There was a suggestion to include the State of Destination in the approval process, but there was no other voice of support for this. However, States could require that they be involved in the approval process through a State variation. A packing instruction based on the UN provisions would be included in the Supplement as guidance to States when considering the issuance of approvals for transport.
- b) A new entry for dangerous goods in articles was introduced for the sake of harmonization with the UN Model Regulations (UN 3363 — **Dangerous goods in articles**). It was affirmed that the requirements for this entry were identical to the requirements for UN 3363 — **Dangerous goods in apparatus** and **Dangerous goods in machinery**. A note would be added under Special Provision A107, which was assigned to the three entries, to clarify this. The entry was not meant to replace the existing entries; it was added to coincide with the entries introduced into the 19th revised edition of the UN Model Regulations for articles containing dangerous goods. There was a desire to maintain the existing entries for the sake of facilitating legacy practices, but it was envisioned that these would eventually be phased out.
- c) SP 356 was assigned to UN 3529 in the UN Model Regulations. Since the special provision applied to metal hydride storage systems, it would be unnecessary to assign corresponding Special Provision A176 in the Instructions to UN 3529 — **Engine, internal combustion, flammable gas powered** or **Machinery, internal combustion, flammable gas powered**. Special Provision A176 had already been assigned to UN 3529 — **Machinery, fuel cell, flammable gas powered** and **Engine, fuel cell, flammable gas powered**.
- d) New provisions for waste gas cartridges were added to SP 327 of the UN Model Regulations. These were added to corresponding Special Provision A145 which applied to waste aerosols. A reference to waste receptacles, small, containing gas would also be added to Special Provision A145 and Special Provision A145 would be assigned to UN 2037 in Table 3-1. All were forbidden for transport by air. A new provision in SP 327 making waste gas cartridges filled with gases of Division 2.2 that

had been pierced not subject to the Regulations would also be added to Special Provision A145.

- e) Special Provision A154, which prohibited the transport of lithium batteries by air that had been identified as being damaged or defective, was revised for the sake of alignment with the UN Model Regulations. The provision included criteria for assessing whether a cell or battery was damaged or defective. There was concern that the structure of this criteria focused on assessing whether the cells or batteries were damaged or defective rather than emphasizing the need to ensure they were not damaged or defective. Work would be undertaken to shift the focus to the latter. An editorial amendment to include reference to UN SP 376 in column 2 would be made.
- f) Text specifying that the requirements in new SP 390 of the UN Model Regulations were for the purpose of package marking and documentation would not be included in corresponding Special Provision A181 of the Instructions since the latter also contained packing requirements. There would therefore be no changes to the special provision in the Instructions.
- g) The full name assigned to UN 3536 (**Lithium batteries installed in cargo transport unit** lithium ion batteries or lithium metal batteries), was referenced in Special Provision A214. The text not part of the proper shipping name was considered redundant and would therefore be removed. The Secretary was requested to advise the UN Sub-Committee.
- h) The rationale for allowing a proper shipping name from Table 3-1 as the technical name for UN 3077 — **Environmentally hazardous substance, solid, n.o.s.** and UN 3082 — **Environmentally hazardous substance, liquid, n.o.s.** in new Special Provision A215 was questioned, as it deviated from the standard practice. It was explained that industry had taken steps to make products such as paint less hazardous which meant that some no longer met the criteria for Class 3. A long technical name for paint would be of no value to emergency responders when assigned to Class 9. The issue had been discussed for several years by the UN Sub-Committee, and this was seen to be the best method for meeting the needs of all concerned. Minor editorial amendments would be made to the new special provision.
- i) Provision for the miscellaneous dangerous goods hazard label depicted in Figure 5-25 to be used for lithium batteries classified as dangerous goods until 31 December 2018 instead of the lithium battery miscellaneous dangerous goods hazard label depicted in Figure 5-26 would be removed from Special Provision A206.

3.1.2.5.2 A list of revisions proposed by DGP-WG/UN harmonization is provided in Appendix A and consolidated amendments are provided in Appendix C to this report. It was agreed that Part 3 would be further reviewed by panel members, and any discrepancies would be incorporated in the DGP/27 working paper on UN harmonization.

3.1.2.6 **Draft Amendments to the Technical Instructions to Align with the UN Recommendations — Part 4 (DGP-WG/19-WP/14)**

3.1.2.6.1 Draft amendments to Part 4 were proposed to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods. The amendments were consolidated with

amendments agreed by DGP-WG/18 (Montréal, 1 to 5 October 2018). DGP-WG/UN harmonization was tasked with reviewing the amendments. The following issues were identified:

- a) The structure of 4;1.1.2 was different to the structure of corresponding 4.1.1.3.1 of the UN Model Regulations. Proposed wording of new text included in the UN document and the location of it in the Instructions was agreed.
- b) It was determined that unlettered paragraphs under subparagraph e) in Packing Instruction 218 were intended to be part of that paragraph. The new sub-paragraph related to fire extinguishing agents would be lettered accordingly.
- c) The Secretary noted that the permitted packagings in P404 of the UN Model Regulations appeared to be more restrictive than what was permitted in the associated packing instructions in the Instructions. It was determined not to be the case as the more restrictive packagings cited applied only to Packing Group I substances, which was the same in both documents.
- d) The new packing instruction for medical waste of Category A (UN 3549) would be moved to the Supplement (see paragraph 3.1.2.5.1 a) above). The total quantity per package of UN 3549 would be set to 400 kg. The packing instruction number would be aligned with the corresponding packing instruction number in the UN Model Regulations, i.e. Packing Instruction 622. As a consequence, the number for existing Packing Instruction 622, which applied to Biomedical waste, n.o.s.; Medical waste, n.o.s.; Clinical waste, unspecified, n.o.s.; and Regulated medical waste, n.o.s. (UN 3291), would also be aligned with the corresponding packing instruction number in the UN Model Regulations, i.e. Packing Instruction 621. This facilitated multimodal transport of substances which were normally shipped among a small number of entities. It was the approach taken for the other infectious substance packing instructions.
- e) Paragraph 4.1.9.2.4 of the UN Model Regulations was modified to include criteria for transporting SCO-III radioactive material. It was considered unnecessary to add “SCO-III” to the associated paragraph in the Instructions (4;9.2.4), which prohibited the transport of unpackaged LSA-I material, SCO-I and fissile material, since SCO-III was only permitted under exclusive use by road, rail, inland waterway or sea.
- f) It was considered more appropriate to refer to Special Provision A154 instead of replacing text related to damaged and defective cells or batteries with the revised text from the special provision in Packing Instructions 965-970. This would be revisited during the review of Special Provision A154 at DGP/27.
- g) There was general agreement that the inner packing provisions for lithium batteries packed with equipment (Packing Instruction 966 and 969) were unclear. The text in the Instructions differed from the text in the Model Regulations, although the objective was intended to be the same. Regardless, the text in the Model Regulations was also unclear. The Secretariat would conduct research to determine the reasoning for not aligning with the UN Model Regulations and would present the findings to DGP/27. Any efforts to clarify the text would need to be considered by the UN Sub-Committee first.

- h) 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 with a new packing instruction in order to provide clarity and improve compliance. The associated packing instructions in the Instructions (Packing Instructions 870 and 871) were more restrictive than the UN. It was determined that there was no need to incorporate any of the text from the new UN packing instruction into the Instructions.
- i) Text related to RFID tags, temperature loggers and other devices that may be active during transport was added to the packing instruction for lithium batteries in the UN Model Regulations. A similar note was already contained in Section II of Packing Instructions 967 and 970. It was noted that some devices contained cells that were larger than what was permitted in accordance with Section II. It was agreed that the provision should not apply to the fully regulated larger batteries of Section I. It was recognized that work on assessing the risk to aircraft from electromagnetic interference was being undertaken by the Airworthiness Panel (AIRP). The provisions would be given a more thorough review. Revisions to the text would be developed for consideration at DGP/27. This would include a reference to applicable airworthiness standards.

3.1.2.6.2 A list of revisions proposed by DGP-WG/UN harmonization is provided in Appendix A and consolidated amendments are provided in Appendix C to this report. It was agreed that Part 4 would be further reviewed by panel members, and any discrepancies would be incorporated in the DGP/27 working paper on UN harmonization.

3.1.2.7 **Draft Amendments to the Technical Instructions to Align with the UN Recommendations — Part 5 (DGP-WG/19-WP/15)**

3.1.2.7.1 Draft amendments to Part 5 were proposed to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods. The amendments were consolidated with amendments agreed by DGP-WG/18 (Montréal, 1 to 5 October 2018). DGP-WG/UN harmonization was tasked with reviewing the amendments. The following issues were identified:

- a) An editorial amendment made to section 5.1.5.1.2 of the UN Model Regulations needed to be made to 5;1.2.1.2 of the Instructions.
- b) Revisions to the criteria for determining the transport index for overpacks or freight containers was unclear (5.1.5.3.2 of the UN Model Regulations and 5;1.2.3.1.2 of the Instructions). New text referred specifically to a shipment from a single shipper, despite the fact that overpacks could only be offered from a single shipper. A new sentence added for non-rigid overpacks was considered unnecessary, as the requirement was the same for rigid overpacks. The Secretary was requested to seek clarification from the UN Sub-Committee.
- c) New marking requirements for radioactive material were added to 5;2.4.5.5. They incorrectly referred to the UN number and proper shipping name assigned to a *consignment*. The Secretary was requested to advise the UN Sub-Committee.

- d) The dimensions of the lithium battery mark had been modified. The figure of the lithium battery mark in the Instructions (Figure 5-3) would need to be adjusted accordingly.

3.1.2.7.2 A list of revisions proposed by DGP-WG/UN harmonization is provided in Appendix A and consolidated amendments are provided in Appendix C to this report. It was agreed that Part 5 would be further reviewed by panel members, and any discrepancies would be incorporated in the DGP/27 working paper on UN harmonization.

3.1.2.8 Draft Amendments to the Technical Instructions to Align with the UN Recommendations — Part 6 (DGP-WG/19-WP/16)

3.1.2.8.1 Draft amendments to Part 6 were proposed to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods. The amendments were consolidated with amendments agreed by DGP-WG/18 (Montréal, 1 to 5 October 2018). DGP-WG/UN harmonization was tasked with reviewing the amendments. The following issues were identified:

- a) An amendment to Table 6-1 referring to UN 3549 for the sake of alignment with the UN Model Regulations was not considered necessary as the table was more general than the provisions in 6.1.1.1 of the UN Model Regulations;
- b) Editorial revisions to new provisions for more than one mark to appear on a package when a packaging conformed to more than one tested packaging design type would be made (6;2.1.15). The Secretary was requested to advise the UN Sub-Committee.
- c) Several other revisions of an editorial nature were developed, none of which had an impact on the UN Model Regulations.

3.1.2.8.2 A list of revisions proposed by DGP-WG/UN harmonization is provided in Appendix A and consolidated amendments are provided in Appendix C to this report. It was agreed that Part 6 would be further reviewed by panel members, and any discrepancies would be incorporated in the DGP/27 working paper on UN harmonization.

3.1.2.9 Draft Amendments to the Technical Instructions to Align with the UN Recommendations — Part 7 (DGP-WG/19-WP/17)

3.1.2.9.1 Draft amendments to Part 7 were proposed to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods. The amendments were consolidated with amendments agreed by DGP-WG/18 (Montréal, 1 to 5 October 2018). DGP-WG/UN harmonization was tasked with reviewing the amendments. Only one issue was identified in relation to loading of freight containers and accumulation of packages, overpacks and freight containers during transport, i.e. a revision made to section 7.1.8.3.3 of the UN Model Regulations did not apply to the associated provision in the Instructions (Part 7;2.9.3.3 c)) as it pertained to vehicles only.

3.1.2.9.2 A list of revisions proposed by DGP-WG/UN harmonization is provided in Appendix A and consolidated amendments are provided in Appendix C to this report. It was agreed that Part 7 would be further reviewed by panel members, and any discrepancies would be incorporated in the DGP/27 working paper on UN harmonization.

3.1.2.10 **Fish Meal (DGP-WG/19-WP/20 (Revised))**

3.1.2.10.1 A proposal to allow the transport of UN 2216 — **Fish meal, stabilized** on both passenger and cargo aircraft was proposed. This substance was not included in the dangerous goods list in the Technical Instructions prior to the 2015-2016 Edition (see paragraph 2.3.5 of the DGP/24 Report). It was a long-standing entry in the Model Regulations, but was only subject to the regulations when transported by sea. The reason for their absence from the list in the Instructions was thought to be that there was no need to transport the substance by air, as it was normally transported in bulk. The entry was added to avoid the perception that it was forbidden under any circumstance, since there had been enquiries from States on their status. It was therefore added to Table 3-1 as forbidden for transport on both passenger and cargo aircraft. Special Provision A2 was assigned to the entry allowing for transport on cargo aircraft with prior approval from the relevant States.

3.1.2.10.2 Since that time there had been some demand for the timely transport of samples of fish meal by air for the purpose of customer evaluation. The risk during sea transport was the potential for self-heating during long journeys and the loss, over time, of the antioxidant that was used to stabilize the fish meal to prevent self-heating. Information from the Marine Ingredients Organisation (IFFO) demonstrated the stability of stabilized fish meal in very large quantities, up to 1,000 kg, over a duration of up to one year where there was no evidence of self-heating. It was suggested that this risk did not apply to air transport, as the quantities would be much smaller and the journeys short. It was further suggested that the temperature in aircraft cargo compartments during flight would decrease over the duration of the flight, further reducing the risk of self-heating. However, an airworthiness expert noted that the temperature did not decrease in all cargo compartments over the duration of a flight and that some could be actively heated or controlled to a lower or higher temperature.

3.1.2.10.3 There were some concerns that the methodology used to derive the proposed quantity limits was arbitrary, as the data seemed to support that much higher limits could be transported safely. There was also a question as to why more would be permitted on cargo than on passenger aircraft when the hazard was the same. An expert with experience with fish meal concurred with the data in the paper, and advised that the risk associated with package sizes of 100 or 200 kg (or much greater, for that matter) as packaged in the proposal would not self-heat.

3.1.2.10.4 A special provision included in the Model Regulations forbidding transport if the temperature at the time of loading exceeded certain levels was considered unnecessary because of this, also recognizing the impracticalities of implementing it. The amendment, without the inclusion of this special provision, was agreed.

3.1.2.11 **Amendment to Packing Instruction 964 & Packing Instruction Y964 (DGP-WG/19-WP/21)**

3.1.2.11.1 Amendments to Packing Instructions 964 and Y964 were proposed to clarify the provision excepting UN 3082 — **Environmentally hazardous substance, liquid, n.o.s.*** from the pressure differential test contained in Part 4;1.1.6 of the Technical Instructions. There had been different interpretations of the text as written which had led some to believe the exception applied to other substances. While there was support for the proposal, the need for further clarity was raised. A revised proposal was agreed.

3.1.2.12 **Special Provision A213 (DGP-WG/19-WP/22)**

3.1.2.12.1 An amendment to Special Provision A213 was proposed to address an apparent anomaly. The provision required lithium batteries containing both lithium metal and lithium ion cells to be

classified as lithium metal batteries. It also set lithium content and total capacity limits for all cells in these batteries when transported in accordance with Section II of Packing Instructions 968, 969 and 970. It did not set limits on the lithium content and total capacity for the cells when transported in accordance with Section IB of Packing Instruction 968. The amendment made it clear that the limits applied to Section IB as well. There were no objections to the proposal. The amendment was agreed.

3.1.3 Agenda Item 1.3: Develop proposals, if necessary, for amendments to the *Supplement to the Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284SU) for incorporation in the 2021-2022 Edition

3.1.3.1 Draft Amendments to the Supplement to the Technical Instructions to Align with the UN Recommendations (DGP-WG/19-WP/19)

3.1.3.1.1 Draft amendments to the Supplement were proposed to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods. DGP-WG/UN harmonization was tasked with reviewing the amendments. There were no issues identified, other than the need to include the new entries for UN 3549 — **Medical waste, Category A affecting humans** and **Medical waste, Category A affecting animals** in Table S-3-1 and to include a new packing instruction assigned to these entries (see paragraphs 3.1.2.5.1 a) and 3.1.2.6.1 d) above).

3.1.3.1.2 A list of revisions proposed by DGP-WG/UN harmonization is provided in Appendix A and consolidated amendments are provided in Appendix E to this report. It was agreed that the Supplement would be further reviewed by panel members, and any discrepancies would be incorporated in the DGP/27 working paper on UN harmonization.

3.2 Agenda Item 2: Managing air-specific safety risks and identifying anomalies

3.2.1 Agenda Item 2.1: Develop proposals, if necessary, for amendments to Annex 18 — *The Safe Transport of Dangerous Goods by Air*

3.2.1.1 There were no amendments to Annex 18 proposed under this agenda item at DGP-WG/19. Amendments were proposed at DGP-WG/18 (see paragraph 3.2.2.10 of the DGP-WG/18 Report). These are provided in Appendix B to this report.

3.2.2 Agenda Item 2.2: 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

Amendments agreed under this agenda item are presented in Appendix D to this report.

3.2.2.1 Clarification on Reporting (DGP-WG/19-WP/1)

3.2.2.1.1 An amendment was proposed which removed the requirement to report the following occurrences to the State of Origin:

- a) dangerous goods discovered to have been carried on a flight without information being provided to the pilot-in-command; and
- b) dangerous goods discovered to have been loaded on an aircraft without the applicable segregation requirements having been applied.

It was suggested that such occurrences did not often take place within the jurisdiction of the State of Origin, making reporting of them to that State of little value. The requirement for the operator to report to their State authority was considered adequate. There were no objections to the proposal, although some believed reports should be made to the State of Occurrence. Others did not believe this was necessary on the basis that the incident would be captured through the operator's safety management system, and appropriate States would be alerted if the system revealed trends that involved them. The amendment was agreed, subject to the addition of "appropriate" before "authority of the State of the Operator".

3.2.2.2 Clarification on the Application of Marks on Packages (DGP-WG/19-WP/2)

3.2.2.2.1 The Technical Instructions made it clear that hazard and handling labels must be applied on one side of the package, but there was no clear provision requiring the same for marks. Marks were often pre-printed onto packagings, but many were applied with self-adhesive labels. Ensuring these labels were clearly visible was important for effective communication of the hazards posed by the contents of the package. Amendments making it clear that marks must not be folded or wrapped around multiple sides of a package were therefore proposed to Parts 3;4, 3;5, 5;2.2 and Packing Instructions 650 and 659. There was support for the proposal in principle, although some said it could be further simplified. A revised proposal was agreed.

3.2.2.3 Allowance in Packing Instruction 910 for the Use of Large Packagings (DGP-WG/19-WP/5)

3.2.2.3.1 Provisions for pre-production prototypes and low production run lithium batteries not tested to the requirements of Part III, subsection 38.3 of the UN *Manual of Tests and Criteria* to be shipped with the approval of the State of Origin were contained in Special Provision A88 of the Instructions, and guidance on packing these batteries was provided in Packing Instruction 910 of the Supplement. Batteries larger than 35 kg were permitted with the approval of the State of Origin in accordance with Special Provision A99, and lithium ion batteries being too large for permitted packaging was a reality. Provisions allowing for the transport of pre-production prototypes and low production-run lithium batteries to be shipped in large packaging were therefore proposed. A similar amendment had been proposed at DGP-WG/18, but it was not supported (see paragraphs 3.3.6.2.8 and 3.3.6.2.9 of the DGP-WG/18 Report). Issues raised at DGP-WG/18 were taken into account in the development of a new proposal. The revised proposal included:

- a) the addition of a new special provision allowing for the transport of large batteries approved for transport in accordance with Special Provision A99 to be shipped in large packagings;

- b) an amendment to Packing Instruction 910 to incorporate large packagings, including a requirement for the cells or batteries to be shipped at a state of charge not exceeding 30 per cent of their rated capacity; and
- c) an amendment to the list of conditions under which large packagings could be considered in Part S-4;13.

3.2.2.3.2 Amendments to Special Provisions A88 and A99 were also proposed to require approval from the State of the Operator in addition to the State of Origin. These were discussed separately from the main proposal.

Provisions for large packagings

3.2.2.3.3 Support for the proposal in principle was voiced, recognizing that the amendments provided additional guidance to States on what was currently permitted under an approval. Some believed more consideration was needed with respect to the unintended hazards that may be posed by the sophisticated packaging referred to in the proposal, particularly with respect to packaging with built-in fire suppression capabilities and whether or not these could adversely affect the capabilities of the aircraft's certified fire suppression systems. There was concern that States were not aware that these interactions needed to be taken into account. There were also concerns that over time, increasingly larger batteries would be offered for transport without a method for ensuring rapidly changing technology did not introduce new risks. While recognizing that the current provisions did not prohibit transport of batteries larger than 400 kg, the size of the packaging did infer a size limit. It was hypothetically suggested that if there was confidence that these large batteries could be transported safely under State approval using the guidance provided, then they should be permitted on a regular basis; and if there was a lack of confidence, more specific guidance needed to be provided. A counter argument was that transporting under an approval provided a higher degree of safety because of the scrutiny involved.

3.2.2.3.4 There was over-all support for the proposal with some suggestions to simplify and further clarifying the provisions. A revised amendment was developed. Panel members wished for more time for review with relevant experts in their States. Comments would be provided to the proposer with the expectation of a new proposal presented to DGP/27.

States involved in the approval process

3.2.2.3.5 In considering the need for large packagings, the proposer noted that only the State of Origin was required to be involved in approving the transport of pre-production prototype cells or batteries and batteries larger than 35 kg. He proposed adding the State of the Operator to the approval process, which would be in line with other approval conditions in the Instructions. While there were no objections to the proposal from panel members, there were some who believed approval of the State of Destination should also be required, on the basis that these three States were required to transport much smaller lithium batteries that had passed the UN tests on passenger aircraft in accordance with Special Provision A201. The decision to require three States had been made in part to ensure at least two States were involved, which would not be the case if the State of Origin and the Operator were the same. Not requiring the involvement of the State of Destination did not seem justified for batteries of an unlimited size that had not been tested. A concern that different levels of safety were being applied to cargo aircraft than to passenger aircraft was also raised. It did not seem justified to allow an unlimited size on a cargo aircraft with the approval of the State of Origin and the State of the Operator, particularly when not tested, when batteries or cells smaller than 35 kg could only be transported on a passenger aircraft with the approval of the States of the Operator, Origin, and Destination. Conversely, an industry participant cautioned against adding a State to the approval process since this would result in further delays in

shipments. He argued that the operator's safety management responsibilities would make up for the State the Operator not being involved in the approval process. He suggested there may have been good reason for the panel to only require approval from the State of the Origin when Special Provision A88 was introduced into the Instructions and asked that the Secretariat provide background information in the report. In this regard, Special Provisions A88 and A99 were introduced into the 2003-2004 Edition of the Technical Instructions based on the recommendation from the eighteenth meeting of the DGP (DGP/18, 15 to 25 October 2001). Extracts from the report of the meeting are provided in Appendix F to this report.

3.2.2.3.6 The lack of criteria for determining which States needed to be involved in the issuance of approvals was cited as a contributing cause to the two polarizing views on the subject. It was suggested that documenting criteria would facilitate the panel's decision-making process and lead to more systematic and consistent provisions.

3.2.2.3.7 Most considered requiring the State of Origin and the State of the Operator to be adequate, recognizing that this was more than what was currently required. The State of the Operator would be familiar with the operator's capabilities and therefore be an important contributor to the approval process. The amendment was agreed in principle, but would be revisited when the revised proposal to incorporate large packagings in Packing Instruction 910 would be reviewed at DGP/27.

3.2.2.4 Provisions for Mobility Aids Powered by Nickel-Metal Hydride Batteries (DGP-WG/19-WP/6)

3.2.2.4.1 Prior to the 2019-2020 Edition of the Technical Instructions, specific references to mobility aids powered by dry batteries and nickel-metal hydride batteries had been contained in the passenger provisions in Part 8 of the Instructions. The specific references to dry and nickel-metal hydride batteries were lost with the simplification of Part 8 and the separation of mobility aid provisions for which the operator was responsible from the provisions for which passengers were responsible. The absence of specific references raised doubts as to whether these battery types were permitted to be carried when installed in a mobility aid. Amendments to Part 7;2.13.1 and Table 8-1 which re-introduced the reference to dry and nickel-metal hydride batteries and a requirement for them to comply with Special Provisions A123 and A199, respectively, was therefore proposed. The addition of a reference to spillable batteries in Part 8 was also proposed, recognizing that these were referred to in Part 7. It was suggested that the lack of a reference in Part 8 could lead to the perception that they were not permitted.

3.2.2.4.2 The amendment was supported, subject to editorial revisions. There were comments raised with the practice of referring to special provisions or to the UN *Manual of Tests and Criteria* in passenger provisions, recognizing that passengers were unaware of them. The same comments had been raised several times in the past, but the panel had been unable to establish an alternate approach. The requirement had generally been seen as something directed at manufacturers and to the operator. A revised proposal, taking into account suggested editorial amendments, was agreed.

3.2.2.5 Competency Based Training (DGP-WG/19-WP/23)

3.2.2.5.1 An amendment to the proposed competency-based training provisions for dangerous goods was developed in an effort to reach consensus on the one provision that had been subject to a long-standing debate over whether or not dangerous goods training could be mandated for entities not intending to process or handle dangerous goods through Annex 18 and the Technical Instructions (see paragraphs 2.1.4.5 and 2.1.4.6 of the DGP/26 Report). It was recognized that the newly-established Flight Operations Panel Safe Carriage of Goods Specific Working Group (FLTOSP-SCGSWG) would be tasked with finding a holistic solution to this issue. It was feared, however, that the group would not be established in time to resolve the issue before the convening of DGP/27. Other than the one proposed

provision related to entities not handling dangerous goods, which represented one sentence in the provisions, the competency-based training provisions were supported by DGP/26 and by the ANC (see Recommendation 2/2 of the DGP/26 Report and its Supplement). Some States and industry had already begun developing training programmes in accordance with the new provisions (e.g. see paragraph 3.2.2.6). Delaying implementation of the provisions for another biennium would be disadvantageous, particularly since they were expected to result in more competently trained employees than the current provisions. A revision to Part 1;4.1.1 and 1;4.1.2 of the proposed provisions included in Attachment 4 of the Technical Instructions was therefore proposed in an effort to reach consensus. The revision did not introduce any new requirements but instead referred to guidance material in the same way the current provisions did. It was a compromise solution to allow States who did require personnel handling general cargo to be trained to continue doing so without being too explicit for States that could not mandate training for such entities through Annex 18 and the Technical Instructions. Support for the amendment would allow for the training provisions to be incorporated in the next edition of the Technical Instructions regardless of the status of the work undertaken by FLTOPSP-SCGSWG. FLTOPSP-SCGSWG could then work towards the development of provisions that further enhanced safety without being subject to a potentially unrealistic timeline and without delaying the already-agreed amendments from being adopted. This would also allow the DGP more time to review the proposed changes to Annex 18 developed at DGP/26 which the ANC did not consider mature enough for State consultation. It was suggested that this work could be included in the work of the working group on Restructuring Annex 18.

3.2.2.5.2 There were no objections to the proposal in principle, although some editorial revisions were suggested. Appreciation was expressed for the development of a compromise solution that would allow the provisions to be implemented without having to wait another biennium. Some, while appreciating that a more performance-based provision provided flexibility, were concerned that removing a prescriptive requirement would cause States to lose sight of who needed to be trained. One member suggested the lack of a prescriptive standard would make the auditing of States' dangerous goods training programmes too subjective, especially in years to come when the memory of the intent faded. Others believed the guidance material would support those who needed it. Despite the concerns raised, there were no objections to adopting the provision. It was a compromise that could be supported by all. The amendment, subject to editorial revisions, was agreed through consensus.

3.2.2.6 French approach to Competency-Based Training for dangerous goods (DGP-WG/19-IP/4)

3.2.2.6.1 A presentation on measures taken to prepare for the implementation and oversight of competency-based dangerous goods training and assessment programmes in one State was given. The provisions in Attachment 4 to the Instructions were used as the basis for the development. A group of experts had been formed to begin work in two phases, the first to develop a complete understanding of competency-based training principles and the second to involve operators in considering how it would be implemented. Guidance to further understanding had been developed along with tools for operators to use to facilitate the development of training plans which could also be used for the approval process. The guidance included concrete examples of what was expected. The work had focused on training for operators, but could be expanded to other entities.

3.2.2.6.2 The existing guidance material contained in Attachment 4 of the Instructions was considered to be a good basis for understanding the concept, but several areas for improvement were recommended. These were: structuring of the material chronologically to better illustrate the steps that would need to be taken for implementation; developing guidance on different levels of proficiency; expanding guidance on assessment; and developing guidance on a method to communicate competencies achieved. Feedback from operators had been promising. Some questions still remained, but there was

confidence that solutions would be found. The objective was to have a programme finalized by October 2019. Panel members were invited to provide feedback and to share their lessons learned.

3.2.2.6.3 The working group expressed great appreciation for the work done. The DGP working group on training (DGP-WG/Training) would consider ways to improve the areas identified, while taking into account the need to provide a system that could be implemented globally. The need to avoid making provisions that were too prescriptive was emphasized, as this could limit innovation and make oversight and compliance difficult in some States. Competency-based training and assessment had always been intended as one approach towards achieving compliance with the Technical Instructions, but other approaches were permitted as long as the ultimate objective of ensuring employees were competent to perform their dangerous goods functions was achieved.

3.2.2.7 Revision and Refinement of Proposed Changes to Implement Competency-Based Training (DGP-WG/19-WP/8)

3.2.2.7.1 Revisions to the competency-based training provisions included in Attachment 4 of the Instructions were proposed. The delay in incorporating the provisions in Part 1;4 in the Instructions (see Recommendation 2/2 of the DGP/26 Report and its Supplement) had allowed industry time to consider how to implement the provisions, which led to the identification of a number of issues, including:

- a) The new provisions required training for personnel performing any function in the Technical Instructions. There was a concern that the need for training of personnel performing functions that were not explicitly described in the Instructions, such as freight forwarders, load planners, loadmasters, flight dispatchers and cabin crew would be lost.
- b) There was no direct link from the new Part 1;4 provisions and the guidance material. It was suggested a direct link was necessary to facilitate implementation.

3.2.2.7.2 The proposed revisions included a list of specific high-level functions for which dangerous goods training was needed and a direct link to the guidance material. Amendments to the guidance material contained in Chapters 2 to 6 of Attachment 4 were also proposed, using principles outlined in the ICAO *TRAINAIR PLUS Training Development Guide, Competency-based Training Methodology* (Doc 9941) and the *Procedures for Air Navigation Services — Training* (PANS-TRG, Doc 9868). The amendments were intended to:

- a) address on-going concerns raised by those who believed that a standard approach to validating training programmes had been lost with the removal of the tables describing the subjects for which various categories of personnel should be familiar (Tables 1-4 and 1-5 in Part 1;4); and
- b) introduce levels of proficiencies required for each well-defined function outlined in the material.

3.2.2.7.3 The working group expressed great appreciation for the work done. Some saw the revised material as more practical than what was contained in the Instructions and provided a better picture of how the provisions could be implemented. Others, while supporting anything that provided better clarity, cautioned against being too prescriptive. The level of specificity in the revised material would make it difficult to implement in their States. The material had been included as an attachment to the Instructions so as to give States time to consider how best to implement, and some had already begun the process. It was important not to stray from the existing concepts so as not to compromise the work that these States

had already done. A training and licensing standards technical specialist from the ICAO Flight Operations Section noted the importance of ensuring the material aligned with the *Procedures For Air Navigation Services — Training* (Doc 9868), including the most recent amendments to the document (Amendments 5 and 6).

3.2.2.7.4 All supported efforts to improve the clarity and flow of the existing material. DGP-WG/Training would take a closer look at the material and consider what could be incorporated in the Instructions. In doing so, a balance between providing helpful guidance and being too prescriptive would need to be maintained. The results would be presented in a working paper to DGP/27.

3.2.2.8 Transport of Alcoholic Beverages by Passengers (DGP-WG/19-WP/26)

3.2.2.8.1 Occurrences were reported of passengers carrying bottles of alcohol that had been opened that were discovered at airport security. It was noted that the passenger provisions contained in Table 8-1 included a restriction requiring alcohol to be in retail packaging, but there was nothing that explicitly required bottles to remain unopened. The working group was invited to consider whether there was a need to expand on these restrictions.

3.2.2.8.2 Panel members did not consider the issue to be a safety risk. The safety risk would be the same regardless of whether a bottle had been opened or not. It might be a security or facilitation risk, but that would be beyond the purview of the DGP.

3.2.2.9 Maximum Capacity of Metal Receptacles (Aerosols), Non- Refillable (IP.7 & IP.7A) (DGP-WG/19-WP/27)

3.2.2.9.1 An apparent anomaly between the maximum capacity of non-refillable metal receptacles (aerosols) shown in packing instructions and the maximum design capacity for such inner packaging stated within Part 6;3.2.7 had been discussed at DGP-WG/18 (see paragraph 3.2.2.2 of the DGP-WG/18 Report). More specifically, it was noted that the maximum capacity for non-refillable metal aerosols and non-refillable receptacles containing gas (gas cartridges) established in Packing Instruction 203 was 1 000 ml while the inner packaging construction requirements for non-refillable metal receptacles (aerosols) (IP.7 and IP.7A) in Part 6;3.2.7.1 established a lower maximum capacity of 820 mL. An amendment to Packing Instruction 203 was proposed at DGP-WG/18 to correct this misalignment. There was support at that time for aligning the quantities, although it was thought that a better approach might be to align the quantity limitations in Part 6 with the 1 000 ml limit established in the packing instructions. Accordingly, an amendment to Part 6;3.2.7.1.1 was proposed to DGP-WG/19 which increased the maximum capacity of receptacles (aerosols) for IP.7 and IP.7A to 1 L.

3.2.2.9.2 The value of maintaining inner packaging codes for these receptacles was questioned during the discussions at DGP-WG/18, on the basis that they did not appear in the UN Model Regulations. The proposer did not see justification for removing the codes. He noted that the codes identified that additional design and test standards for air transport had been done, and that they provided a consistent approach to the use of inner packaging codes for all aerosols. Some members thought the issue should be given further consideration. Regardless, they supported the amendment increasing the maximum capacity for IP.7 and IP.7A in Part 6;3.2.7.1.1. The amendment was agreed.

3.2.2.10 Revision to Packing Instruction 650 (DGP-WG/19-WP/29)

3.2.2.10.1 Packing Instruction 650, assigned to Biological substance, Category B, allowed for certain quantities of other dangerous goods to be packed in the same packaging as the Division 6.2 substance under certain conditions. Only dangerous goods of Classes 3, 8 or 9 were permitted, provided the substances met the requirements of the excepted quantity provisions in Part 3;5. It was suggested that referring to all of Part 3;5 was an error, as the intent was to permit only those dangerous goods included in Class 3, 8 or 9 that had E1, E2 or E3 codes assigned to them in Column 9 of Table 3-1 and not to subject them to the other requirements of Part 3;5, some of which were more stringent than the requirements included in Packing Instruction 650. It was agreed that this was an incorrect reference that was inadvertently introduced when the excepted quantity provisions were moved into a standalone chapter. An amendment to Packing Instruction 650 to correct the error was agreed.

3.2.3 Agenda Item 2.3: Develop proposals, if necessary, for amendments to the *Supplement to the Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284SU) for incorporation in the 2021-2022 Edition

3.2.3.1 Revisions to Recommendations on Issuance of Approvals and Exemptions (DGP-WG/19-WP/10)

3.2.3.1.1 The need for further guidance on the issuance of approvals and exemptions was raised, particularly with respect to which entities the approval or exemption should be issued and the relationship between the shipper, the operator and the State authorities processing them. The Supplement to the Technical Instructions stated that the responsibility for obtaining an exemption may rest with the operator or with the shipper depending on the nature of the request and the State procedures. It was suggested more specific guidance was necessary, specifically the need to highlight the importance of involving the operator in the process. It was suggested that an indication of a substance being forbidden in Table 3-1 of the Instructions was directed at both the shipper and the operator in that the shipper could not offer the substance and an operator could not accept it for transport unless an approval or exemption was granted to both parties. However, there had been cases of authorities granting approvals or exemptions to shippers, only to find out that there were no available operators prepared to transport the dangerous goods. Challenges with approvals and exemptions referencing packing instructions contained only in the Supplement were also raised, since this document was not normally used by anyone other than State authorities. The shipper would need to indicate the applicable packing instruction number on the dangerous goods transport document, but this had little value to the operator if the contents of the packing instruction were not available to them. It was suggested that in such cases the State should provide a copy of the relevant packing instruction with the exemption or approval.

3.2.3.1.2 There was much support for developing additional guidance on the issuance of approvals and exemptions, although some cautioned against being too prescriptive with regard to procedures. A performance-based approach, including the need for qualified technical personnel at the State level, would be more effective. The fact that some States would grant approvals without providing all relevant information in the approval document was a concern. Not doing so suggested weaknesses in competencies necessary for dangerous goods State employees to adequately meet their safety responsibilities. One member maintained that this supported the need to require the involvement of more States in the approval process, as was suggested under a proposal to allow large packagings for the transport of pre-production prototypes and low production-run lithium batteries (see paragraph 3.2.2.3.3 of this report). In any event, it was evident that the level of technical expertise and competence needed for granting approvals needed to be documented. The chairman of DGP-WG/Training reported that work had

begun on aligning the existing competency-based framework for State employees contained in the Supplement with the revised competency-based training provisions contained in the PANS-TRG, and that draft guidance material related to competencies necessary for the granting of approvals and exemptions had been developed in coordination with the Secretariat. DGP-WG/Training would review and fine tune this material prior to presenting it to DGP/27. The Secretariat suggested that provisions could be further strengthened through the work on clarifying State oversight responsibilities in Annex 18 that was being undertaken by the DGP working group on Annex 18 (DGP-WG/Annex 18).

3.2.3.1.3 There was unanimous support for the development of guidance. The need to ensure a balance between providing helpful guidance without being too prescriptive was again emphasized. States needed flexibility to develop their own procedures that were effective in achieving the common objectives within their legal framework according to the size and complexity of their aviation systems.

3.2.3.2 Availability of Information in Approval and Exemption Documents (DGP-WG/19-WP/25)

3.2.3.2.1 An amendment to the guidance in the Supplement (Attachment I to Chapter 1) for processing exemptions and approvals was proposed to encourage States to replicate information from packing instructions in documents of approval and exemption when the packing instructions were used to develop criteria for safe transport. The amendment was intended to alleviate challenges for operators conducting acceptance checks who did not have access to the Supplement.

3.2.3.2.2 There was support for the intent of the proposal, but the wording was considered too specific. There were concerns that the language implied the packing instructions in the Supplement needed to be used or that they alone provided an acceptable level of safety, which was not necessarily the case. Not all authorities replicated provisions from packing instructions in their approvals; they were free to develop their own requirements provided they achieved an acceptable level of safety. The proposal referred specifically to packing instructions, but there was other information that may need to be provided with an approval. There was general agreement with an amendment that clarified the intent of making sure States provided all relevant information in the approval document and that it be passed on to all relevant entities, including the shipper and the operator. The proposal was somewhat related to the proposal on the need for additional guidance for States on the issuance of approvals and exemptions (see paragraph 3.2.3.1 of this report). A coordinated attempt to address the issues raise would be made.

3.2.4 Agenda Item 2.4: Development of proposals, if necessary, for amendments to the *Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods* (Doc 9481) for incorporation in the 2021-2022 Edition

3.2.4.1 Emergency Response Information (DGP-WG/19-WP/24)

3.2.4.1.1 An amendment to the *Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods* (Doc 9481) was proposed to incorporate references to new drill number 12. This drill number had been added to Table 4-1 in the 2019-2020 Edition of the document, but references to “drill numbers 1 through 11” had not been updated accordingly. The need for the amendment was agreed, but in looking at the provisions the need for an additional editorial amendment was discovered (i.e. reference was made to a single letter after the drill code when in fact there could be two letters). The proposer agreed to conduct a thorough review of the references to drill codes in Doc 9481 and to provide a new proposal to DGP/27.

3.3 Agenda Item 3: Managing safety risks posed by the carriage of lithium batteries by air

3.3.1 Agenda Item 3.1: Consider how lithium battery package standard under development by SAE G27 Committee (AS6413) can be incorporated into ICAO provisions (Job card DGP.003.02)

3.3.1.1 See paragraph 3.3.2.1.

3.3.2 Agenda Item 3.2: Consider marking, labelling and documentation requirements for lithium battery packages meeting the SAE G27 Committee draft standard AS6413 (Job card DGP.003.02)

3.3.2.1 Presentation of Status of SAE G-27 Lithium Battery packaging performance standard (DGP-WG/19-IP/5)

3.3.2.1.1 The co-chairman of the SAE G-27 Lithium Battery Packaging Performance Committee presented an update on the status of the standard. The committee had continued monthly WebX meetings and had met at two face-to-face meetings since the last update to DGP-WGP/18 (see paragraph 3.3.1.1 of the DGP-WG/18 Report). The standard was intended as a test method to demonstrate and document the control of the potential hazards from lithium batteries when transported as cargo on aircraft. Its goal was to control the hazards which might arise from a failure of an individual cell by containing the hazards within the package. A baseline test and a range of supplemental tests were being developed to cover different battery sizes and cell configurations, packagings that could be used for a variety of cells or batteries and benign cells or batteries that could be transported in any type of packaging. These tests addressed the hazard posed by a single cell within a packaging going into thermal runaway, but did not address the effects from an external fire. Separate tests were therefore developed to address the effects from an external flame and heat on lithium cells or batteries. These tests provided flexibility in that they could be conducted on the package containing the batteries or cells or on packaging materials only.

3.3.2.1.2 Coordinating with different stakeholders within a large group was a complex and time-consuming process. Although the standard was not yet mature enough to be subjected to the SAE formal approval process (“balloting”), the various tests in the standard would be subjected to an informal commenting process later in the year. It was emphasized that the internal baseline standard, all of the supplemental tests, and the external fire tests would be subjected to the formal balloting process at the same time. The goal was to be ready for the formal approval process at the end of 2019, but there was a strong possibility that this would be extended into 2020.

3.3.2.1.3 The SAE committee had discussed methods to provide confidence to the aviation industry that a battery/package combination had successfully passed the standard test. The committee recognized that this was mainly an implementation issue and therefore beyond its purview, but it also recognized it to be critical for the standard to be viable. While a system for packaging testing and marking was already in place within the UN Model Regulations, the lithium battery/package combination and the aviation-specific risks that prompted the need for the standard did not entirely fit within it. The SAE committee was looking for the type of information regulators would need to be able to practically implement the standard. Some cautioned against providing any input to the committee, recognizing the potential conflict of interest among stakeholders and the desire for some to focus on cost. However, there was recognition of a distinction between providing input on how the standard might be implemented and how compliance could be communicated. Input on the former would be inappropriate and potentially

futile since whether or not it was implemented would only be considered once the standard was complete. However, the DGP had the necessary expertise to consider how compliance could be communicated. Members therefore volunteered to develop a concept that could work within the existing system. A working paper would be presented to DGP/27.

3.3.3 Agenda Item 3.3: Consider the need for amendments to address impact from proposed amendment to Annex 6, Volume I on cargo compartment safety (Job cards DGP.003.02 and FLTOPSP.043)

3.3.3.1 There were no discussions under this this agenda item.

3.3.4 Agenda Item 3.4: Consider measures to mitigate safety risks posed by lithium batteries carried and/or used by passengers, crew and the operator (Job card DGP.005.01)

3.3.4.1 There were no working papers presented under this agenda item.

3.3.5 Agenda Item 3.5: Consider the need for specific measures to mitigate safety risks posed by lithium batteries packed with or contained in equipment

3.3.5.1 There were no working papers presented under this agenda item.

3.3.6 Agenda Item 3.6: Develop provisions aimed at improving compliance throughout the transport supply chain, including simplification of provisions, guidance on State oversight and outreach, and responsibilities of entities outside the aviation stream (Job card DGP.003.02)

3.3.6.1 Air Waybill Statement for Section II Consignments (DGPWG/19-WP/7)

3.3.6.1.1 The introduction of a note into Section II of the lithium battery packing instructions (Packing Instructions 965 to 970) was proposed allowing for the grouping of different battery types and packing instruction numbers in the compliance statement required on an air waybill when an air waybill was used was proposed. This benefitted the transmittal of electronic air waybill information, where the number of characters permitted in given fields was limited. It was proposed that doing so would not have an impact on safety. While there was no opposition to the intent of the proposal, the proposed text was considered too specific. It included reference to Section II of the packing instructions for UN 3090 — **Lithium metal batteries** and UN 3480 — **Lithium ion batteries**, which limited the shipper to one package in any single consignment. There was concern that the text would result in a misinterpretation of the provisions, leading to shippers offering multiple packages. It was the proposer's view that the limit established in each packing instruction were independent of the other, so a shipper could offer one package of lithium metal batteries and another package of lithium ion batteries in the same consignment. Regardless, the amendment was not agreed.

3.3.6.2 Lithium Battery Mark — Telephone Number for Further Information (DGP-WG/19-WP/28)

3.3.6.2.1 A “telephone number for additional information” was required on the mark for lithium batteries prepared in accordance with Section II of Packings Instructions 965 to 970 and Section IB of Packing Instructions 965 and 968. DGP-WG/18 had discussed the purpose of the requirement, as it was considered vague in that it did not specify the entity for which the number was needed, the circumstances under which additional information would be required, or what additional information might be required. Most considered the telephone number to be one that could be used to contact the shipper for further information regarding a lithium battery consignment during regular working hours. How to handle a damaged shipment was suggested as the type of information the shipper could provide.

3.3.6.2.2 DGP-WG/19 was presented with a suggested revision to the text under the figure containing the mark in the Technical Instructions for discussion in an effort to clarify the intent. The working group was invited to consider whether the revised text should be brought to the UN Sub-Committee of Experts on the Transport of Dangerous Goods for consideration. While there was support in principle for removing any ambiguity and improving intent, not everyone agreed the revision achieved this intent. New text referring to a “shipper” remained ambiguous, since many entities could be considered the shipper including the cell manufacturer, the battery manufacturer, the device manufacturer, the retailer or the consumer. Not all of these entities would necessarily know how to handle a damaged battery. The text also included reference to a number that could be called during “working hours”. This was also considered ambiguous because of different time zones. It was noted that the requirement for a phone number was introduced at a time when there were a number of safety recalls, and the process for handling them was relatively new. Now that there was greater awareness, it was suggested consideration could be given to achieving the original objective in a less ambiguous manner. Some thought requiring a phone number was unnecessary, noting that a number was not required for fully regulated shipments of lithium batteries.

3.3.6.2.3 Some did not see any urgent need to make any changes, as the ambiguity did not introduce any safety risks. They valued stable regulations. The proposer, while understanding the need for stability, noted that the lack of clarity had prompted numerous queries from shippers and accredited training organizations on what was expected, with many believing the requirement to be unnecessary. He questioned the value of a requirement without a clear intent.

3.3.6.2.4 Recognizing that any changes to the mark would need to be agreed by the UN Sub-Committee, it was suggested the issue be raised there. Accordingly, the Secretary was requested to bring an information paper containing a summary of the DGP’s discussion to the next Sub-Committee meeting in July 2019. Depending on feedback, a new proposal could be developed for consideration at DGP/27 and for onward submittal to the December meeting of the UN Sub-Committee.

3.3.7 Agenda Item 3.7: Monitor UN Committee’s work on hazard-based system for classification of lithium batteries and consider impact on ICAO provisions (Job card DGP.003.02)

3.3.7.1 There were no working papers presented under this agenda item.

3.4 Agenda Item 4: Clarifying State oversight responsibilities in Annex 18 (Job card DGP.005.01)

3.4.1 The chairman of the DGP Working Group on clarifying States’ responsibilities in Annex 18 (DGP-WG/Annex 18) provided an update on work that had been done since DGP-WG/18 (see

paragraph 3.4.1 of the DGP-WG/18 Report). DGP-WG/Annex 18 had met virtually since DGP-WG/18 and briefly face-to-face at DGP-WG/19. A working document had been developed linking State safety management responsibilities in Annex 19 to State safety responsibilities for dangerous goods in Annex 18. It was based on the second edition of Annex 19, which integrated the eight critical elements of a State's oversight system with its safety programme framework (SSP). These two concepts were referred to collectively in Annex 19 as the State's safety management responsibilities. The next objective would be to develop draft SARPs through a detailed review of this document for inclusion in a proposed new chapter in Annex 18. It was anticipated that this chapter would provide a strong base on which the current dangerous goods-specific Standards in Annex 18 could be structured. A face-to-face meeting was expected to be held over the summer months. A detailed report would be provided for review at DGP/27.

3.5 Agenda Item 5: Dangerous good accident and incident reporting system (Job card DGP.005.01)

3.5.1 A report on the DGP Working Group on Reporting was provided at DGP-WG/18 (see paragraph 3.5.1 of the DGP-WG/18 Report). There were no new activities since that time. A face-to-face meeting was expected to be held over the summer months in conjunction with DGP-WG/Annex 18 (see paragraph 3.4 of this report). A detailed report would be provided for review at DGP/27.

3.6 Agenda Item 6: Dangerous goods training for entities handling general cargo (Secretariat job card)

3.6.1 There were no working papers presented under this agenda item.

3.7 Agenda Item 7: Aviation Security/Dangerous Goods Coordination (Job Card DGP.001.02)

3.7.1 Agenda Item 7.1: Aviation Security/Dangerous Goods Coordination (Job Card DGP.001.02)

3.7.1.1 There were no working papers presented under this agenda item.

3.7.2 Agenda Item 7.2: Consider control measures for the cargo supply chain that addresses both safety and security concerns

3.7.2.1 There were no working papers presented under this agenda item.

3.7.3 Agenda Item 7.3: Review guidance material on chemical, biological or radiological attack

3.7.3.1 There were no working papers presented under this agenda item.

3.8 Agenda Item 8: Coordination with other panels

3.8.1 Agenda Item 8.1: Flight Operations Panels (FLTOSP)

3.8.1.1 Consideration of Persons Carried on a Cargo Aircraft (DGP-WG/19-WP/9)

3.8.1.1.1 The meeting was invited to consider the impact the definitions for passenger aircraft and cargo aircraft had on all-cargo operations and whether there was a need for modifications in order to provide flexibility to operators with respect to who was permitted on-board freighter aircraft, particularly when carrying dangerous goods not permitted on passenger aircraft. It was reported that the definition in Annex 18 and the Technical Instructions was leading some States to restrict the types of persons permitted on such aircraft beyond what was permitted in accordance with other national regulations, particularly those in the United States Federal Aviation Regulations (FARs) which were adopted by many States. The State regulations allowed for a much broader array of persons on board freighter aircraft than what would be permitted if the definitions from Annex 18 and Technical Instructions were strictly applied. The State regulations also provided significant detail with respect to the actions an operator must take to be able to carry them, such as a requirement for a full pre-flight emergency briefing. Some operators had gone beyond State requirements by including procedures such as emergency training based on aircraft types and conduct of full safety risk assessment to address the carriage of specific categories of persons. Operators argued that the strict application of the Annex 18/Technical Instructions definitions resulted in a very significant financial and operational impact which, based on their operational experience and safety risk assessments, was not justified.

3.8.1.1.2 Cargo airline representatives present at DGP-WG/19 noted the need for flexibility to reposition crew members, sometimes to remote areas that were difficult to get to. They did not see any safety risk allowing this, noting cases of off-duty crew members being helpful during emergency situations. However, untrained persons on board an all-cargo flight could be a detrimental distraction in such cases.

3.8.1.1.3 The panel member nominated by the International Federation of Air Line Pilots' Associations (IFALPA) suggested that restricting the types of people permitted on a cargo aircraft carrying dangerous goods not permitted on passenger aircraft raised the question as to whether a lower level of safety was permitted on cargo aircraft than on a passenger aircraft. When originally developing the Technical Instructions (in the late 1970s), the justification for allowing dangerous goods on a cargo aircraft that were not permitted on a passenger aircraft was the ability of the flight crew to access the dangerous goods and the ability to consider a greater range of actions in an emergency. While this was outlined in the foreword to the Technical Instructions, there was nothing that implied a lower level of safety was acceptable on a cargo aircraft. It was suggested the assumptions justifying larger quantities and different types of dangerous goods on a cargo aircraft no longer applied. An airworthiness expert noted that cargo compartments were not designed to ensure a person would be capable of entering it to fight a fire. Even if dangerous goods were accessible, training for flight crews to access them during an in-flight emergency were normally neither required nor provided. In fact, many procedures prohibited flight crew from leaving the flight deck during an emergency. Aircraft would be provided the same level of protection from dangerous goods loaded in a Class C compartment regardless of whether they were on a passenger or a cargo-only aircraft, so allowing larger quantities and types in a Class C compartment on a cargo aircraft seemed nonsensical. It was suggested that consideration be given to eliminating the distinction between passenger and cargo aircraft. Doing so would also simplify the issues raised in the working paper. This, however, was seen as something that would need to be raised in a separate working paper.

3.8.1.1.4 While there was support for further discussion, it was recognized that determining who could be on board an aircraft was an operational decision. Any discussion would therefore need to involve operations experts. The FLTOPSP Secretary, who was present for the discussion, considered the definitions for passenger and cargo aircraft in Annex 18 to be applicable to that Annex only. He noted that Annex 6 did not distinguish between passenger or cargo aircraft but instead referred to passenger-carrying operations. While defining the terms in Annex 6 would not be appropriate, he did not oppose the development of guidance material in a yet-to-be-determined location. He would be available to support the work.

3.8.1.2 Creation of a Specific Working Group of the Flight Operations Panel on the Safe Carriage of Goods (DGP-WG/19-IP/1)

3.8.1.2.1 The meeting was provided with background information on the creation by the ANC of a specific working group of the FLTOPSP on the Safe Carriage of Goods (SCG-SWG). While recognizing the value of a multidisciplinary group, concerns with how membership would be determined and whether the new group would be able to make decisions involving dangerous goods without coordinating with the DGP were raised. The DGP Secretary reported that the composition of the group was still to be decided by the ANC. The FLTOPSP secretary assured the meeting that any new work proposed by the SCG-SWG would need to be approved by the ANC, who would ensure assignment to the appropriate groups. This could result in the DGP or any of the other panels taking the lead on certain tasks, with input from the specific working group, or vice versa. Members requested that the process for establishing the group remain transparent and suggested their views be heard. These views were raised during the informal discussion the chair and vice-chair of the working group had with ANC members later in the week (see paragraph 1.1.1 of this report).

3.8.2 Agenda Item 8.2: Airworthiness Panel (AIRP)

3.8.2.1 There were no working papers presented under this agenda item.

3.8.3 Agenda Item 8.3: Safety Management Panel (SMP)

3.8.3.1 There were no working papers presented under this agenda item.

3.8.4 Agenda Item 8.4 Remotely Piloted Aircraft Systems Panel (RPASP)

3.8.4.1 There were no working papers presented under this agenda item.

3.8.5 Agenda Item 8.5: Any other panels

3.8.5.1 There were no working papers presented under this agenda item.

3.8.6 Agenda Item 9: Harmonization of *Guidance Material for the Dangerous Goods Panel (DGP) to Aid in the Preparation of the Technical Instructions and Supporting Documents with revised dangerous goods provisions*

3.8.6.1 There were no working papers presented under this agenda item.

3.8.7 **Agenda Item 10: Other business**

3.8.7.1 **DGP Collaboration (DGP-WG/19-IP/2)**

3.8.7.1.1 An information paper was presented with extracted text from an ANC working paper that referred to the DGP's concept of safety as being different from the ANC's, its lack of focus on the overarching subject of cargo safety management, divisions within the panel, and the panel's culture of voting. The meeting was invited to discuss this feedback and consider how the panel could more effectively work towards positive change in the areas of cooperation and consensus. Some suggestions were:

- a) Acknowledging that consensus could be achieved through compromise. A solution might not always be the preferred one for all, but it was a good one if no one objected to it. This had been demonstrated earlier in the week when the working group agreed to a proposed amendment to the competency-based training provisions after years of debate (see paragraph 3.2.2.5 of this report).
- b) Focusing on what panel members could agree on and how all panel members' concerns could be addressed.
- c) Making sure all relevant information was provided to panel members ahead of the meeting so that members had time to coordinate with relevant experts and among each other so that informed decisions could be made.
- d) Encouraging more direct communication between the panel and ANC members instead of relying solely on the Secretary — the invitation extended to the chair and vice-chair to meet with ANC members during DGP-WG/19 was appreciated.

3.8.7.1.2 Some panel members expressed opinions which differed from those expressed in the ANC working paper. It was suggested that consensus on some very specific dangerous goods issues, often of a multimodal nature, was not always achievable and that a show of hands was the only way to reach a decision. Regardless, the panel did reach consensus on most issues. The safe transport of lithium batteries was the most divisive issue, but was a complex and ever-changing issue that challenged ANC and Council members as well. Some opposed the notion that there were divisions on the panel. Differences of opinion challenged panel members to think more deeply, resulting in better solutions. Some panel members expressed particular concern with the suggestion that the panel was not reaching for the highest level of safety. They thought this to be an inaccurate statement, citing the panel's hard work to ensure safety over the course of almost forty years and the high regard the ANC held for it in the past. Regardless, the fact that this was the current perception of ANC members needed to be addressed.

3.8.7.1.3 A distinction between reaching consensus on safety and non-safety issues was highlighted. While reaching a decision through a show of hands where a choice between two options had no impact on safety could be considered acceptable, a decision on a safety issue through a show of hands might not be. It was suggested that a contributing factor in not achieving consensus on certain issues was the lack of criteria for determining what was considered an acceptable level of safety. Establishing a target level of safety would ensure all were working towards the same objective. It was suggested that guidance be sought from the ANC in this regard.

3.8.7.1.4 Appreciation for bringing forth the issues to the panel was expressed. Panel members were committed to rebuilding trust and implementing measures to ensure the panel worked collaboratively toward shared goals.

3.8.7.2 Participation of Observers in a Consultative Capacity (DGP-WG/19-IP/3)

3.8.7.2.1 The meeting was invited to discuss participation of non-governmental organizations at individual meetings of the DGP. It was suggested that the evolving hazards posed by new technology and the increasingly complex global supply chain involving many entities apart from shippers and operators presented new challenges to the air transportation system. Stakeholders impacted by the panel's recommendations could provide the DGP with specific data and an expectation of potential safety impacts on the global supply chain. Accordingly, the meeting was invited to consider developing a process for allowing participation of non-governmental organizations at relevant DGP meetings that could be recommended to the ANC. While acknowledging that the *Directives for Panels of the Air Navigation Commission* (Doc 7984) outlined a process where the ANC approved participation on a case-by-case and meeting-by-meeting basis, based on the expectation that it would contribute to the panel's work, there was no documented mechanism for the panel to review or advise the ANC on participation. The United Nations Economic and Social Council (ECOSOC) had criteria for participation of non-governmental organizations in international conferences convened by the United Nations which was provided to DGP-WG/19 as a basis for discussion.

3.8.7.2.2 Panel members voiced support for allowing relevant experts from non-governmental organizations to participate. Caution was emphasized when considering who could participate. There would need to be clear criteria in place to prevent lobbyists or anyone with a personal agenda from attending meetings. Participants would need to be technical experts whose purpose was to support the panel by answering questions and providing data. While focusing on the DGP, it was suggested other panels could benefit from the same type of approach.

3.8.7.2.3 The Secretary reminded the meeting of frustrations voiced from panel members in the past when industry involvement disrupted the meeting's agenda. Measures would need to be in place to prevent this from recurring. Recognizing that the DGP was a panel of the ANC and as such was subject to its directives, she offered to provide the report of this discussion to ANC members and to informally discuss the issue with them. Their feedback would be provided to the panel in time for DGP/27.

APPENDIX A

REVISIONS TO DRAFT AMENDMENTS TO THE TECHNICAL INSTRUCTIONS TO ALIGN WITH THE UN RECOMMENDATIONS PRESENTED IN DGP-WG/19-WPS/11, 12, 13, 14, 15, 16, 17 AND 19 PROPOSED BY DGP-WG/UN HARMONIZATION

Note.— The proposed revisions shown in the following table have been incorporated in Appendix C to this report.

Working Paper number	Page number from working paper	TI reference	Amendment
DGP-WG/19-WP/11 (see paragraph 3.1.2.3.1 a) of this report)	2	Note under chapter title	<p><i>Amend</i> reference as follows:</p> <p><i>Note.— Recommendations on Tests and Criteria, which are incorporated by reference into certain provisions of these Instructions, are published as a separate Manual (United Nations Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria) (ST/SG/AC.10/11/Rev.6 and Amend.4), the contents of which are:</i></p>
DGP-WG/19-WP/11(see paragraph 3.1.2.3.1 b) of this report)	3	Part 1;1.1.5.1	<p>Replace the Secretariat note with the following:</p> <p><u>i) equipment such as data loggers and cargo tracking devices with installed lithium batteries, attached to or placed in packages, overpacks or unit load devices are not subject to any provisions of these Instructions provided the following conditions are met:</u></p> <ol style="list-style-type: none"> <u>1) the equipment must be in use or intended for use during transport;</u> <u>2) each cell or battery must meet the provisions of Part 2;9.3 a), e), f) (if applicable) and g);</u> <u>3) for a lithium ion cell, the Watt-hour rating must not be more than 20 Wh;</u> <u>4) for a lithium ion battery, the Watt-hour rating must not be more than 100 Wh;</u> <u>5) for a lithium metal cell, the lithium content must not be more than 1 g;</u> <u>6) for a lithium metal battery, the aggregate lithium content must not be more than 2 g;</u> <u>7) the equipment must be capable of withstanding the shocks and loadings normally encountered during transport.</u> <p><u><i>Note.— This exception does not apply where the data loggers or cargo tracking devices are offered for transport as a consignment in accordance with Packing Instruction 967 or 970.</i></u></p>

Working Paper number	Page number from working paper	TI reference	Amendment
DGP-WG/19-WP/11 (see paragraph 3.1.2.3.1 d) of this report)	5	Part 1;3	<p>Add the following note under the definition for “transport index”:</p> <p style="text-align: center;"><i>Note.— Unpackaged LSA-I, SCO-I or SCO-III material are not permitted for transport by air.</i></p>
DGP-WG/19-WP/11 (see paragraph 3.1.2.3.1 e) of this report)	7	Part 1;6.1.5.1 a)	<p>Add square brackets around references which need further review, as follows:</p> <p style="text-align: center;">6.1.5 Specific provisions for the transport of excepted packages</p> <p>6.1.5.1 Excepted packages which may contain radioactive material as specified in 2;7.2.4.1.1 are subject only to the following provisions of Parts 5 to 7:</p> <p>a) the applicable provisions specified in 5;1.1 (as applicable), 5;1.2.2.2, 5;1.2.2.3, 5;1.2.4, 5;1.4, 5;1.6.3, 5;2.2, 5;2.4.10, <u>5;3.2.12 b)</u>, 5;3.2.12 e), 5;3.3, <u>5;4.1.5.7.1 f) 1)</u>, <u>5;4.1.5.7.1 f) 2)</u>, <u>5;4.1.5.7.1 i)</u>, 5;4.4, 7;1.6, 7;2.5, 7;2.9.3.1, <u>7;2.9.4.3</u>, 7;3.2.1, 7;3.2.4, 7;4.4 and 7;4.5; and</p>
DGP-WG/19-WP/11 (see paragraph 3.1.2.3.1 f) of this report)	6	Part 1;6.6	<p>Replace “does rate” with “dose rate”, i.e.:</p> <p style="text-align: center;">6.6 NON-COMPLIANCE</p> <p>In the event of non-compliance with any limit in these Instructions applicable to radiation level <u>dose rate</u> or contamination:</p>
DGP-WG/19-WP/12 (see paragraph 3.1.2.4.1 a) of this report)	4	2;2.2.1, Note	<p>Move new text to end of note and <i>delete</i> “also”, i.e. it should read:</p> <p style="text-align: center;"><i>Note.— UN 1950 — Aerosols, UN 2037 — Receptacles, small, containing gas and UN 2037 — Gas cartridges must be regarded as being in Division 2.1 when the criteria in 2.5.1 a) are met. For chemicals under pressure of UN Nos. 3500 to 3505, see Special Provision A187.</i></p>
DGP-WG/19-WP/12 (see paragraph 3.1.2.4.1 b) of this report)	10	2;7.1.3	<p>Add the following note under the definition for “transport index”:</p> <p style="text-align: center;"><i>Note.— Unpackaged LSA-I, SCO-I or SCO-III material are not permitted for transport by air.</i></p>
DGP-WG/19-WP/12 (see paragraph 3.1.2.4.1 c) of this report)	10	2;7.2.1.1	<p>Replace reference to “7.2.4.5” with “7.2.5”</p>

Working Paper number	Page number from working paper	TI reference	Amendment
DGP-WG/19-WP/12 (see paragraph 3.1.2.4.1 d) of this report)	15	2;7.2.3.2.1 c)	<p><i>Amend</i> criteria for SCO-III to read as follows:</p> <p><u>c) SCO-III: A large solid object which, because of its size, cannot be transported in a type of package described in these Instructions.</u></p> <p><u>Note.— SCO-III material is forbidden for transport by air.</u></p>
DGP-WG/19-WP/12 (see paragraph 3.1.2.4.1 e) and f) of this report)	19	2;7.2.4.1.1.7	<p>Place square brackets around references to 7.2.3.5.1 a) to f) pending further discussion/feedback from the UN Sub-Committee and amend reference to 7.1.3 as follows:</p> <p><u>e) if the packaging has contained fissile material, one of the provisions of [7.2.3.5.1 a) to f)] or one of the provisions for exclusion for fissile nuclides as described in 7.1.3 must apply.</u></p>
DGP-WG/19-WP/12 (see paragraph 3.1.2.4.1 g))	20	2;8.3.2	<p><i>Delete</i> superfluous “the” before “classification: and divide 8.3.2 into two paragraphs as follows:</p> <p>8.3.2 In assigning the packing group in accordance with 8.2.3, account must be taken of human experience in instances of accidental exposure. In the absence of human experience, the grouping classification must be based on data obtained from experiments in accordance with OECD Guideline for the Testing of Chemicals No. 404, <i>Acute Dermal Irritation/Corrosion</i>, 2015 or No. 435, <i>In Vitro Membrane Barrier Test Method for Skin Corrosion</i>, 2015, <u>No. 431, <i>In Vitro Skin Corrosion: Reconstructed Human Epidermis (RHE) Test Method</i>, 2016 or No. 430, <i>In Vitro Skin Corrosion: Transcutaneous Electrical Resistance (TER) Test Method</i>, 2015.</u></p> <p><u>8.3.2.1 A substance or mixture which is determined not to be corrosive in accordance with OECD Guideline for the Testing of Chemicals No. 404, No. 435, No. 431 or No. 430, <i>In Vitro Skin Corrosion: Transcutaneous Electrical Resistance Test (TER)</i>, 2015 or No. 431, <i>In Vitro Skin Corrosion: Human Skin Model Test</i>, 2015 may be considered not to be corrosive to skin for the purposes of these Instructions without further testing. If the in vitro test results indicate that the substance or mixture is corrosive and not assigned to Packing Group I, but the test method does not allow discrimination between Packing Groups II and III, it must be considered to be Packing Group II.</u></p>
DGP-WG/19-WP/12 (see paragraph 3.1.2.4.1 h))	21	2;9	<p><i>Incorporate</i> relevant provisions from 2.9.2 of the Model Regulation into Part 2;9 of the Instructions as shown in Appendix B to this report.</p>

Working Paper number	Page number from working paper	TI reference	Amendment
DGP-WG/19-WP/13 (see paragraph 3.1.2.5.1 a))	3	Table 3-1	<p>For UN 3549 Medical waste, Category A affecting humans and Medical waste, Category A affecting animals:</p> <p>— Add “A2” to column 7 — Replace the text in columns 10 and 11 with “FORBIDDEN” — Replace the text in columns 12 and 13 with “FORBIDDEN”</p>
DGP-WG/19-WP/13 (see paragraph 3.1.2.5.1 b))	3	Table 3-1	<p>Add the following note under Special Provision A107:</p> <p><i>Note.— This special provision is assigned to UN 3363 — <u>Dangerous goods in articles, Dangerous goods in machinery and Dangerous goods in apparatus. The same requirements of these Instructions apply to each of these articles.</u></i></p> <p>Add UN 3363 — Dangerous goods in articles to Packing Instruction 963.</p>
DGP-WG/19-WP/13 (see paragraph 3.1.2.5.1 c))	7	Table 3-1	<p>Remove A176 from column 7 for UN 3529 — Engine, internal combustion, flammable gas powered and UN 3529 — Machinery, internal combustion, flammable gas powered.</p>
DGP-WG/19-WP/13 (see paragraph 3.1.2.5.1 d))	9	Table 3-1	<p>Add A145 to column 7 for UN 2037 for gas cartridges that are permitted for transport.</p>
DGP-WG/19-WP/13 (see paragraph 3.1.2.5.1 d))	9	Table 3-2, Special Provision A145	<p>Add reference to waste receptacles, small containing gas.</p> <p>Add the following:</p> <p><i><u>Waste gas cartridges and waste receptacles, small, containing gas that were filled with gases of Division 2.2 and have been pierced are not subject to these Instructions</u></i></p>
DGP-WG/19-WP/13 (see paragraph 3.1.2.5.1 e))	11	Table 3-2, Special Provision A154	<p>— Add square brackets around special provision — Add “376” to column 2.</p> <p><i>Note.— More work to be done on Special Provision A154.</i></p>
DGP-WG/19-WP/13 (see paragraph 3.1.2.5.1 f))	12	Table 3-2, Special Provision A181	<p>Delete new text.</p>

Working Paper number	Page number from working paper	TI reference	Amendment
DGP-WG/19-WP/13 (see paragraph 3.1.2.5.1 g))	13	Table 3-2, Special Provision A214	Delete additional text after proper shipping name for UN 3536.
DGP-WG/19-WP/13 (see paragraph 3.1.2.5.1 h))	13	Table 3-2, Special Provision A215	— Delete “only” after UN 3082 — Delete “*” after the example for the proper shipping name for UN 3082
DGP-WG/19-WP/30 (this report) (see paragraph 3.1.2.5.1 i))	n/a	Table 3-2, Special Provision A206	Amend as follows: The hazard label must conform to the model shown in Figure 5-26. Figure 5-25 may continue to be used until 31 December 2018.
DGP-WG/19-WP/14 (see paragraph 3.1.2.6.1 b))	5	Packing Instruction 218	— Delete letters f) and g) so that the paragraphs are included as part of e) — Renumber new paragraph g) to f)
DGP-WG/19-WP/14 (see paragraph 3.1.2.6.1 d))	9	Packing Instruction 622	— Replace “Packing Instruction 682” with “Packing Instruction 622” — Amend heading to read “Cargo aircraft only for UN 3549 only” — Replace “[?]” under “total quantity per package” in combination packagings table with “400 kg” — Move packing instruction to the Supplement
DGP-WG/19-WP/14 (see paragraph 3.1.2.6.1 f))	14 and 15	Packing Instruction 965	Replace proposed new text in paragraph 2 with the following in square brackets: <u>[Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.]</u> <i>Note.— This will need to be given further consideration at DGP/27 in conjunction with the work to be done on Special Provision A154.</i>
DGP-WG/19-WP/14 (see paragraph 3.1.2.6.1 f))	15 and 16	Packing Instruction 966	Replace proposed new text in paragraph 2 with the following in square brackets: <u>[Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.]</u> <i>Note.— This will need to be given further consideration at DGP/27 in conjunction with the work to be done on Special Provision A154.</i>

Working Paper number	Page number from working paper	TI reference	Amendment
DGP-WG/19-WP/14 (see paragraph 3.1.2.6.1 f))	18 and 19	Packing Instruction 967	<p>— <i>Replace</i> proposed new text in paragraph 2 with the following in square brackets:</p> <p><u>[Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.]</u></p> <p><i>Note.— This will need to be given further consideration at DGP/27 in conjunction with the work to be done on Special Provision A154.</i></p> <p>— <i>Delete</i> proposed new text related to RFIDs from paragraph I.1.</p>
DGP-WG/19-WP/14 (see paragraph 3.1.2.6.1 f))	20	Packing Instruction 968	<p><i>Replace</i> proposed new text in paragraph 2 with the following in square brackets:</p> <p><u>[Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.]</u></p> <p><i>Note.— This will need to be given further consideration at DGP/27 in conjunction with the work to be done on Special Provision A154.</i></p>
DGP-WG/19-WP/14 (see paragraph 3.1.2.6.1 f))	21	Packing Instruction 969	<p><i>Replace</i> proposed new text in paragraph 2 with the following in square brackets:</p> <p><u>[Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.]</u></p> <p><i>Note.— This will need to be given further consideration at DGP/27 in conjunction with the work to be done on Special Provision A154.</i></p>
DGP-WG/19-WP/14 (see paragraph 3.1.2.6.1 f))	25 and 26	Packing Instruction 970	<p>— <i>Replace</i> proposed new text in paragraph 2 with the following in square brackets:</p> <p><u>[Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.]</u></p> <p><i>Note.— This will need to be given further consideration at DGP/27 in conjunction with the work to be done on Special Provision A154.</i></p> <p>— <i>Delete</i> proposed new text related to RFIDs from paragraph I.1.</p>
DGP-WG/19-WP/14 (see paragraph 3.1.2.6.1 i))		Packing Instructions 967 and 970	Further review of text related to RFID tags, temperature loggers and other devices that may be active during transport necessary would be developed for consideration at DGP/27.
DGP-WG/19-WP/15 (see paragraph 3.1.2.7.1 a))	2	5;1.2.1.2	<i>Move</i> “; and” from the end of subparagraph c) to the end of subparagraph b)
DGP-WG/19-WP/15 (see paragraph 3.1.2.7.1 b))	3	5;1.2.3.1.2	<i>Place</i> square brackets around the paragraph awaiting feedback from the UN Sub-Committee.

Working Paper number	Page number from working paper	TI reference	Amendment
DGP-WG/19-WP/15 (see paragraph 3.1.2.7.1 c))	3	5;2.4.5.5	<i>Place</i> square brackets around the proposed new text awaiting feedback from the UN Sub-Committee.
DGP-WG/19-WP/15 (see paragraph 3.1.2.7.1 d))	5	Figure 5-3	<i>Amend</i> dimensions of label to 100 mm x 100 mm.
DGP-WG/19-WP/16 (see paragraph 3.1.2.8.1 a))	2	Table 6-1	<i>Delete</i> proposed new text.
DGP-WG/19-WP/16 (see paragraph 3.1.2.8.1 b))	3	6;2.1.15	<i>Amend</i> proposed new text as follows: <u>2.1.15 Where a packaging conforms to more than one tested packaging design type, the packaging may bear more than one mark to indicate the relevant performance test requirements that have been met. The marks must appear in close proximity to one another and each mark must appear in its entirety.</u>
DGP-WG/19-WP/16 (see paragraph 3.1.2.8.1 c))	5	6;5.2.1.1	<i>Insert</i> “not” after “The standard must” in the two notes as follows: <u>Note.— This standard must not be used for linerless cylinders manufactured from two parts joined together.</u>
DGP-WG/19-WP/16 (see paragraph 3.1.2.8.1 c))	6	6;5.2.1.3	<i>Replace</i> “shall” with “must” in new note next to ISO 7866:2012 + Cor 1:2014.
DGP-WG/19-WP/16 (see paragraph 3.1.2.8.1 c))	8	6;5.2.7.2	<i>Replace</i> “country” with “State” in Note 2.
DGP-WG/19-WP/16 (see paragraph 3.1.2.8.1 c))	9	6;5.2.9	<i>Replace</i> “country” with “State” and “competent” with “appropriate national” in Note 2.
DGP-WG/19-WP/17 (see paragraph 3.1.2.9.1)	2	7;2.9.3.3 c)	<i>Delete</i> “ <u>or freight container and 0.1 mSv/h at 2 m from the external surface of the aircraft or freight container</u> ”
DGP-WG/19-WP/19 (see paragraph 3.1.3.1)	3	S-3;2 Supplementary dangerous goods list and S-4;8	<i>For Medical waste, Category A</i> , affecting humans, solid and Medical waste, Category A , affecting animals only: — <i>Add</i> records from DGP-WG/19-WP/13, as amended. — <i>Add</i> Packing Instruction from DGP-WG/19-WP/14, as amended

APPENDIX B

AMENDMENTS TO ANNEX 18 AGREED BY DGP-WG/18 FOR THE SAKE OF
HARMONIZATION WITH UN RECOMMENDATIONS ON THE TRANSPORT OF
DANGEROUS GOODS

INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES

CHAPTER 1. DEFINITIONS

...

DGP-WG/18-WP/27 (see paragraph 3.2.2.10 of the DGP-WG/18 report):

Packaging. One or more ~~R~~receptacles and any other components or materials necessary for the receptacle to perform ~~its~~ their containment and other safety functions.

Note.— For radioactive material, see Part 2, paragraph ~~7.2~~ 7.1.3 of the Technical Instructions.

...

APPENDIX C

CONSOLIDATION OF AMENDMENTS TO THE TECHNICAL INSTRUCTIONS DEVELOPED AT DGP-WG/18 AND DGP-WG/19 FOR THE SAKE OF HARMONIZATION WITH UN RECOMMENDATIONS ON THE TRANSPORT OF DANGEROUS GOODS

...

Part 1

GENERAL

...

Chapter 1

SCOPE AND APPLICABILITY

...

Paragraph 3.1.2.3.1 a) of the DGP-WG/19 report:

Note.— Recommendations on Tests and Criteria, which are incorporated by reference into certain provisions of these Instructions, are published as a separate Manual (United Nations Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria) (ST/SG/AC.10/11/Rev.6 and Amend.17), the contents of which are:

Part I. Classification procedures, test methods and criteria relating to explosives of Class 1;

Part II. Classification procedures, test methods and criteria relating to self-reactive and polymerizing substances of Division 4.1 and organic peroxides of Division 5.2;

Part III. Classification procedures, test methods and criteria relating to substances or articles of Class 2, Class 3, Class 4, Division 5.1, Class 8 and Class 9;

For languages other than English: There may be a need for amendment to the following for the sake of alignment with 1.1 of the UN Model Regulations, (see ST/SG/AC.10/46/Add.1), e.g. French version should read:

1.1 Sous le Nota 1 des dispositions générales, à la quatrième partie, remplacer « au matériel de transport » par « aux équipements de transport ».

Part IV. Test methods concerning transport equipment; and

Part V. Classification procedures, test methods and criteria relating to sectors other than transport.

Appendices. Information common to a number of different types of tests and national contacts for test details.

...

1.1.5 General exceptions

1.1.5.1 Except for 7;4.2, these Instructions do not apply to dangerous goods carried by an aircraft where the dangerous goods are:

a) to provide, during flight, medical aid to a patient when those dangerous goods:

1) have been placed on board with the approval of the operator; or

2) form part of the permanent equipment of the aircraft when it has been adapted for specialized use;

providing that:

- 1) gas cylinders have been manufactured specifically for the purpose of containing and transporting that particular gas;
- 2) equipment containing wet cell batteries is kept and, when necessary, secured in an upright position to prevent spillage of the electrolyte;

Note.— *For dangerous goods that passengers are permitted to carry as medical aid, see 8;1.1.2.*

- b) to provide, during flight, veterinary aid or a humane killer for an animal;
- c) for dropping in connection with agricultural, horticultural, forestry, ice jam control and landslide clearance or pollution control activities;
- d) for dropping or triggering in connection with avalanche control activities;
- e) to provide, during flight, or related to the flight, aid in connection with search and rescue operations;
- f) vehicles carried in aircraft designed or modified for vehicle ferry operations and all of the following requirements are met:
 - 1) authorization has been given by the appropriate authorities of the States concerned, and such authorities have prescribed specific terms and conditions for the particular operator's operation;
 - 2) vehicles are secured in an upright position;
 - 3) fuel tanks are so filled as to prevent spillage of fuel during loading, unloading and transit; and
 - 4) adequate ventilation rates are maintained in the aircraft compartment in which the vehicle is carried;

For French version: There may be a need for amendment to the following for the sake of alignment with 1.1.1.2 (a) of the UN Model Regulations, (see ST/SG/AC.10/46/Add.1), e.g.

1.1.1.2 a) Remplacer « engins de transport » par « matériels de transport ». Dans le nota 3, remplacer « moyen de transport » par « matériel de transport »

- g) required for the propulsion of the means of transport or the operation of its specialized equipment during transport (e.g. refrigeration units) or that are required in accordance with the operating regulations (e.g. fire extinguishers) (see 2.2).

Note.— *This exception is only applicable to the means of transport performing the transport operation.*

h) contained within items of excess baggage being sent as cargo provided that:

- 1) the excess baggage has been consigned as cargo by or on behalf of a passenger;
- 2) the dangerous goods may only be those that are permitted by and in accordance with 8;1.1.2 to be carried in checked baggage;
- 3) the excess baggage is marked with the words "Excess baggage consigned as cargo".

UN Model Regulations, 1.1.1.2 (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.3.1 b) of the DGP-WG/19 report:

(i) equipment such as data loggers and cargo tracking devices with installed lithium batteries, attached to or placed in packages, overpacks or unit load devices are not subject to any provisions of these Instructions provided the following conditions are met:

1) the equipment must be in use or intended for use during transport;

2) each cell or battery must meet the provisions of Part 2:9.3 a), e), f) (if applicable) and g);

3) for a lithium ion cell, the Watt-hour rating must not be more than 20 Wh;

- 4) for a lithium ion battery, the Watt-hour rating must not be more than 100 Wh;
- 5) for a lithium metal cell, the lithium content must not be more than 1 g;
- 6) for a lithium metal battery, the aggregate lithium content must not be more than 2 g;
- 7) the equipment must be capable of withstanding the shocks and loadings normally encountered during transport.

Note.— This exception does not apply where the data loggers or cargo tracking devices are offered for transport as a consignment in accordance with Packing Instruction 967 or 970.]

...

Chapter 3

GENERAL INFORMATION

Parts of this Chapter are affected by State Variation BE 1; see Table A-1

3.1 DEFINITIONS

...

Designated postal operator. Any governmental or non-governmental entity officially designated by a Universal Postal Union (UPU) member country to operate postal services and to fulfil the related obligations arising from the acts of the UPU Convention on its territory.

UN Model Regulations, 1.2.1 (see ST/SG/AC.10/46/Add.1)

Dose rate. The ambient dose equivalent or the directional dose equivalent, as appropriate, per unit time, measured at the point of interest.

...

UN Model Regulations, 1.2.1 (see ST/SG/AC.10/46/Add.1)

Radiation level. ~~For the transport of radioactive material, the corresponding dose rate expressed in millisieverts per hour or microsieverts per hour.~~

UN Model Regulations, 1.2.1 (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.3.1 c) of the DGP-WG/19 report:

Self-accelerating decomposition temperature (SADT). The lowest temperature at which self-accelerating decomposition may occur ~~with~~ in a substance in the packaging, IBC or portable tank as used in offered for transport. The SADT must be determined in accordance with the test procedures given in Part II, Section 28 of the Manual of Tests and Criteria.

Note.— IBC and portable tanks are not permitted for transport by air unless otherwise provided for in these Instructions.

UN Model Regulations, 1.2.1 (see ST/SG/AC.10/46/Add.1)

Self-accelerating polymerization temperature (SAPT). The lowest temperature at which self-accelerating polymerization may occur with a substance in the packaging as offered for transport. The SAPT must be determined in accordance with the test procedures established for the self-accelerating decomposition temperature for self-reactive substances in accordance with Part II, Section 28 of the UN *Manual of Tests and Criteria*.

...

UN Model Regulations, 1.2.1 (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.3.1 d) of the DGP-WG/19 report

Transport index (TI) assigned to a package, overpack or freight container, or to unpackaged LSA-I, SCO-I or SCO-III.
For the transport of radioactive material, a number which is used to provide control over radiation exposure.

Note.— Unpackaged LSA-I, SCO-I or SCO-III material are not permitted for transport by air.

...

DGP-WG/18-WP/27 (see paragraph 3.2.2.10 of the DGP-WG/18 report):

UN number. The four-digit number assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals to identify an article or substance or a particular group of articles or substances.

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Chapter 5

DANGEROUS GOODS SECURITY

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5.3 PROVISIONS FOR HIGH CONSEQUENCE DANGEROUS GOODS

5.3.1 Definition of high consequence dangerous goods

5.3.1.1 High consequence dangerous goods are those which have the potential for misuse in a terrorist event and which may, as a result, produce serious consequences such as mass casualties, mass destruction or, particularly for Class 7, mass socio-economic disruption.

5.3.1.2 An indicative list of high consequence dangerous goods in classes and divisions other than Class 7 is given in Table 1-7.

UN Model Regulations, Table 1.4.1 (see ST/SG/AC.10/46/Add.1)

Table 1-7. Indicative list of high consequence dangerous goods

Class 1 Division 1.1 explosives
Class 1 Division 1.2 explosives
Class 1 Division 1.3 compatibility group C explosives
Class 1 Division 1.4 UN Nos. 0104, 0237, 0255, 0267, 0289, 0361, 0365, 0366, 0440, 0441, 0455, 0456 and 0500, <u>0512 and 0513</u>
Class 1 Division 1.5 explosives
<u>Class 1 Division 1.6 explosives</u>
Division 2.3 toxic gases (excluding aerosols)
Class 3 desensitized explosives
Division 4.1 desensitized explosives
Division 6.1 substances of Packing Group I; except when transported under the excepted quantity provisions in 3;5
Division 6.2 infectious substances of Category A (UN Nos. 2814 and 2900) <u>and medical waste of Category A (UN 3549)</u>

...

UN Model Regulations, 1.4.3.2.3 (see ST/SG/AC.10/46/Add.1)

5.5 RADIOACTIVE MATERIAL

For radioactive material, the provisions of this Chapter are deemed to be complied with when the provisions of the Convention on Physical Protection of Nuclear Material¹ and the IAEA circular on ~~“The Physical Protection of Nuclear Material and Nuclear Facilities”~~ Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities² are applied.

...

Chapter 6

GENERAL PROVISIONS CONCERNING RADIOACTIVE MATERIAL

Parts of this Chapter are affected by State Variations BR 8, JP 3, JP 23, VC 7; see Table A-1

6.1 SCOPE AND APPLICATION

UN Model Regulations, 1.5.1.1 (see ST/SG/AC.10/46/Add.1)

6.1.1 These Instructions establish standards of safety which provide an acceptable level of control of the radiation, criticality and thermal hazards to ~~persons~~ people, property and the environment that are associated with the transport of radioactive material. These Instructions are based on the IAEA *Regulations for the Safe Transport of Radioactive Material*, (2012-2018 Edition), IAEA Safety Standards Series No. SSR-6 (Rev.1), IAEA, Vienna (2012-2018). Explanatory material can be found in *Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material (2012-2018 Edition)*, Safety Standard Series No. SSG-26 (Rev.1), IAEA, Vienna (2014-2019). The prime responsibility for safety must rest with the person or organization responsible for facilities and activities that give rise to radiation risk.

UN Model Regulations, 1.5.1.2 (see ST/SG/AC.10/46/Add.1)

6.1.2 The objective of these Instructions is to establish requirements that must be satisfied to ensure safety and to protect ~~persons~~ people, property and the environment from the harmful effects of ionizing radiation ~~in~~ during the transport of radioactive material. This protection is achieved by requiring:

- a) containment of the radioactive contents;
- b) control of external ~~radiation levels~~ dose rate;
- c) prevention of criticality; and
- d) prevention of damage caused by heat.

These requirements are satisfied firstly by applying a graded approach to the limits of the contents for packages and aircraft and to the performance standards, which are applied to package designs depending upon the hazard of the radioactive contents. Secondly, they are satisfied by imposing conditions on the design and operation of packages and on the maintenance of the packagings, including consideration of the nature of the radioactive contents. ~~Finally~~ Thirdly, they are satisfied by requiring administrative controls including, where appropriate, approval by competent authorities. Finally, further protection is provided by making arrangements for planning and preparing emergency response to protect people, property and the environment.

...

1. INFCIRC/274/Rev.1, IAEA, Vienna (1980).

2. ~~INFCIRC/225/Rev.4 (Corrected)~~, IAEA, Vienna (1999) INFCIRC/225/Rev.5, IAEA, Vienna (2011).

6.1.5 Specific provisions for the transport of excepted packages

6.1.5.1 Excepted packages which may contain radioactive material as specified in 2;7.2.4.1.1 are subject only to the following provisions of Parts 5 to 7:

UN Model Regulations, 1.5.1.5.1 a) (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.3.1 e) of the DGP-WG/19 Report:

Secretariat Note.— Reference to 5;3.2.12 b) is added in addition to the changes introduced into the 20th revised edition of the UN Model Regulations since it appears to have been missing (corresponding 5.2.1.7 is referenced in the UN Model Regulations).

- a) the applicable provisions specified in 5;1.1 (as applicable), 5;1.2.2.2, 5;1.2.2.3, 5;1.2.4, 5;1.4, 5;1.6.3, 5;2.2, 5;2.4.10, 5;3.2.12 b), 5;3.2.12 e), 5;3.3, 5;4.1.5.7.1 f) 1), 5;4.1.5.7.1 f) 2), 5;4.1.5.7.1 i), 5;4.4, 7;1.6, 7;2.5, 7;2.9.3.1, 7;2.9.4.3, 7;3.2.1, 7;3.2.4, 7;4.4 and 7;4.5; and
- b) the requirements for excepted packages specified in 6;7.3;

except when the radioactive material possesses other hazardous properties and has to be classified in a class other than Class 7 in accordance with Special Provision A130 or A194, where the provisions listed in a) and b) above apply only as relevant and in addition to those relating to the main class or division.

UN Model Regulations, 1.5.1.5.2 (see ST/SG/AC.10/46/Add.1)

6.1.5.2 Excepted packages are subject to the relevant provisions of all other parts of these Instructions. ~~If the excepted package contains fissile material, one of the fissile exceptions provided in 2;7.2.3.5 must apply and the requirements of 7;2.9.4.3 must be met.~~

6.2 RADIATION PROTECTION PROGRAMME

6.2.1 The transport of radioactive material must be subject to a radiation protection programme, which must consist of systematic arrangements aimed at providing adequate consideration of radiation protection measures.

6.2.2 Doses to persons must be below the relevant dose limits. Protection and safety must be optimized in order that the magnitude of individual doses, the number of persons exposed and the likelihood of incurring exposure must be kept as low as reasonably achievable, economic and social factors being taken into account, within the restriction that the doses to individuals are subject to dose constraints. A structured and systematic approach must be adopted and must include consideration of the interfaces between transport and other activities.

6.2.3 The nature and extent of the measures to be employed in the programme must be related to the magnitude and likelihood of radiation exposure. The programme must incorporate the requirements in 6.2.2 and 6.2.4 to 6.2.7, 7;2.9.1.1 and 7;2.9.1.2. Programme documents must be available, on request, for inspection by the relevant competent authority.

6.2.4 For occupational exposure arising from transport activities, where it is assessed that the effective dose either:

- a) is likely to be between 1 and 6 mSv in a year, a dose assessment programme via workplace monitoring or individual monitoring must be conducted; or
- b) is likely to exceed 6 mSv in a year, individual monitoring must be conducted.

UN Model Regulations, 1.5.2.4 (see ST/SG/AC.10/46/Add.1)

When ~~individual monitoring or workplace monitoring~~ or individual monitoring is conducted, appropriate records must be kept.

Note.— For occupational exposure arising from transport activities, where it is assessed that the effective dose is most unlikely to exceed 1 mSv in a year, no special work patterns, detailed monitoring, dose assessment programmes or individual record-keeping need be required.

UN Model Regulations, 1.5.2.5 (see ST/SG/AC.10/46/Add.1)

6.2.5 In the event of ~~accidents or incidents~~ a nuclear or radiological emergency during the transport of radioactive material, emergency provisions, as established by relevant national and/or international organizations, must be observed to protect persons, property and the environment. ~~Appropriate guidelines for such provisions are contained in "Planning and Preparing for Emergency Response to Transport Accidents Involving Radioactive Material", IAEA Safety Standard Series No. TS-G-1.2 (ST-3), IAEA, Vienna (2002).~~ This includes arrangements for preparedness and response established

in accordance with the national and/or international requirements and in a consistent and coordinated manner with the national and/or international emergency arrangements.

UN Model Regulations, 1.5.2.6 (see ST/SG/AC.10/46/Add.1)

6.2.6 ~~Emergency procedures must take into account~~ The arrangements for preparedness and response must be based on the graded approach and take into consideration the identified hazards and their potential consequences, including the formation of other dangerous substances that may result from the reaction between the contents of a consignment and the environment in the event of an accident, a nuclear or radiological emergency. Guidance for the establishment of such arrangements is contained in Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSR Part 7, IAEA, Vienna (2015); Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSG-2, IAEA, Vienna (2011); Arrangements for Preparedness for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GS-G-2.1, IAEA, Vienna (2007), and Arrangements for the Termination of a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSG-11, IAEA, Vienna (2018).

...

6.4 SPECIAL ARRANGEMENT

6.4.1 Special arrangement means those provisions, approved by the competent authority, under which consignments which do not satisfy all the requirements of these Instructions applicable to radioactive material may be transported.

UN Model Regulations, 1.5.4.2 (see ST/SG/AC.10/46/Add.1)

6.4.2 Consignments for which conformity with any provision applicable to radioactive material is impracticable must not be transported except under special arrangement. Provided the competent authority is satisfied that conformity with the radioactive material provisions of these Instructions is impracticable and that the requisite standards of safety established by these Instructions have been demonstrated ~~through alternative means~~ through means alternative to the other provisions of these Instructions, the competent authority may approve special arrangement transport operations for a single consignment or a planned series of multiple consignments. The overall level of safety in transport must be at least equivalent to that which would be provided if all the applicable requirements in these Instructions had been met. For international consignments of this type, multilateral approval must be required.

...

6.6 NON-COMPLIANCE

UN Model Regulations, 1.5.6.1 (see ST/SG/AC.10/46/Add.1)

In the event of non-compliance with any limit in these Instructions applicable to radiation level, dose rate or contamination:

- a) the shipper, consignee, operator and any organization involved during transport, who may be affected, as appropriate, must be informed of the non-compliance:
 - i) by the operator if the non-compliance is identified during transport; or
 - ii) by the consignee if the non-compliance is identified at receipt;
- b) ~~the operator~~, shipper, operator or consignee, as appropriate, must:
 - i) take immediate steps to mitigate the consequences of the non-compliance;
 - ii) investigate the non-compliance and its causes, circumstances and consequences;
 - iii) take appropriate action to remedy the causes and circumstances that led to the non-compliance and to prevent a recurrence of ~~similar~~ the causes and circumstances similar to those that led to the non-compliance; and
 - iv) communicate to the relevant competent authority(ies) the causes of the non-compliance and the corrective or preventative actions taken or to be taken;
- c) the communication of the non-compliance to the shipper and relevant competent authority(ies), respectively, must be made as soon as practicable and it must be immediate whenever an emergency exposure situation has developed or is developing.

...

Part 2

CLASSIFICATION OF DANGEROUS GOODS

INTRODUCTORY CHAPTER

...

6. CLASSIFICATION OF ARTICLES AS ARTICLES CONTAINING DANGEROUS GOODS N.O.S.

...

6.3 This section does not apply to articles for which a more specific proper shipping name already exists in Table 3-1.

UN Model Regulations, 2.0.5.4 (see ST/SG/AC.10/46/Add.1)

6.4 This section does not apply to dangerous goods of Class 1, Division 6.2, Class 7 or radioactive material contained in articles. However, this section applies to articles containing explosives which are excluded from Class 1 in accordance with 2:1.5.2.4.

6.5 Articles containing dangerous goods must be assigned to the appropriate class or division determined by the hazards present using, where applicable, Table 2-1 for each of the dangerous goods contained in the article. If dangerous goods classified as Class 9 are contained within the article, all other dangerous goods present in the article must be considered to present a higher hazard.

6.6 Subsidiary hazards must be representative of the primary hazard posed by the other dangerous goods contained within the article. When only one item of dangerous goods is present in the article, the subsidiary hazard(s), if any, is the subsidiary hazard(s) identified in column 4 of Table 3-1. If the article contains more than one item of dangerous goods and these could react dangerously with one another during transport, each of the dangerous goods must be enclosed separately (see 4;1.1.8).

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Chapter 1

CLASS 1 — EXPLOSIVES

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1.5.2 Exclusion from Class 1

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1.5.2.4 An article may be excluded from Class 1 when three unpackaged articles, each individually activated by its own means of initiation or ignition or external means to function in the designed mode, meet the following test criteria:

- a) no external surface has a temperature of more than 65°C. A momentary spike in temperature up to 200°C is acceptable;
- b) no rupture or fragmentation of the external casing or movement of the article or detached parts thereof of more than one metre in any direction;

UN Model Regulations, 2.1.3.6.4 (b) (see ST/SG/AC.10/46/Add.1)

Note.— Where the integrity of the article may be affected in the event of an external fire, these criteria must be examined by a fire test, ~~such as described in ISO 12097-3.~~ One such method is described in ISO 14451-2 using a heating rate of 80 K/min.

...

Chapter 2

CLASS 2 — GASES

2.1 DEFINITIONS AND GENERAL PROVISIONS

2.1.1 A gas is a substance which:

- a) at 50°C has a vapour pressure greater than 300 kPa; or
- b) is completely gaseous at 20°C at a standard pressure of 101.3 kPa.

2.1.2 The transport condition of a gas is described according to its physical state as:

- a) compressed gas — a gas which when packaged under pressure for transport is entirely gaseous at –50°C; this category includes all gases with a critical temperature less than or equal to –50°C;
- b) liquefied gas — a gas which when packaged under pressure for transport is partially liquid at temperatures above –50°C. A distinction is made between:

High pressure liquefied gas: a gas with a critical temperature between –50°C and +65°C, and

Low pressure liquefied gas: a gas with a critical temperature above +65°C;

- c) refrigerated liquefied gas — a gas which when packaged for transport is made partially liquid because of its low temperature;
- d) dissolved gas — a gas which when packaged under pressure for transport is dissolved in a liquid phase solvent; or
- e) adsorbed gas — a gas which when packaged for transport is adsorbed onto a solid porous material resulting in an internal receptacle pressure of less than 101.3 kPa at 20°C and less than 300 kPa at 50°C.

UN Model Regulations, 2.2.1.3 (see ST/SG/AC.10/46/Add.1)

2.1.3 This class comprises compressed gases; liquefied gases; dissolved gases; refrigerated liquefied gases; mixtures of one or more gases with one or more vapours of substances of other classes; articles charged with a gas; ~~and~~ aerosols and chemicals under pressure. (For aerosols, see 1;3.1.)

Note.—“Cryogenic liquid” means the same as “refrigerated liquefied gas”.

2.1.4 Pressures of all kinds relating to receptacles (such as test pressure, internal pressure, safety-valve opening pressure) are always indicated in gauge pressure (pressure in excess of atmospheric pressure); however, the vapour pressure of substances is always expressed in absolute pressure.

2.2 DIVISIONS

2.2.1 Substances of Class 2 are assigned to one of three divisions based on the primary hazard of the gas during transport.

Note.— UN 1950 — **Aerosols**, UN 2037 — **Receptacles, small, containing gas** and UN 2037 — **Gas cartridges** must be regarded as being in Division 2.1 when the criteria in 2.5.1 a) are met. For chemicals under pressure of UN Nos. 3500 to 3505, see Special Provision A187.

- a) Division 2.1 — Flammable gases.

Gases which at 20°C and a standard pressure of 101.3 kPa:

- i) are ignitable when in a mixture of 13 per cent or less by volume with air; or

UN Model Regulations, 2.2.2.1 a) ii) (see ST/SG/AC.10/46/Add.1)

ii) have a flammable range with air of at least 12 percentage points regardless of the lower flammable limit. Flammability must be determined by tests or by calculation in accordance with methods adopted by ISO (see ISO 10156:2010~~2010~~[2017](#)). Where insufficient data are available to use these methods, tests by a comparable method recognized by the appropriate national authority must be used.

>

b) Division 2.2 — Non-flammable, non-toxic gases.

Gases which:

- i) are asphyxiant — gases which dilute or replace the oxygen normally in the atmosphere; or
- ii) are oxidizing — gases which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does; or
- iii) do not come under the other divisions.

UN Model Regulations, 2.2.2.1 b) iii) (see ST/SG/AC.10/46/Add.1)

Note.— In 2.2.1 b) ii), “gases which cause or contribute to the combustion of other material more than air does” means pure gases or gas mixtures with an oxidizing power greater than 23.5 per cent as determined by a method specified in ISO 10156:2010~~2010~~[2017](#).

c) Division 2.3 — Toxic gases.

Gases which:

- i) are known to be so toxic or corrosive to humans as to pose a hazard to health; or
- ii) are presumed to be toxic or corrosive to humans because they have an LC₅₀ value equal to or less than 5 000 mL/m³ (ppm) when tested in accordance with 6.2.1.3.

≠

Note.— Gases meeting the above criteria owing to their corrosivity are to be classified as toxic with a subsidiary corrosive hazard.

...

2.4 MIXTURES OF GASES

For the classification of gas mixtures into one of the three divisions (including vapours of substance from other classes), the following principles must be used:

UN Model Regulations, 2.2.3 a) (see ST/SG/AC.10/46/Add.1)

- a) Flammability must be determined by tests or by calculation in accordance with methods adopted by ISO (see ISO 10156:2010~~2010~~[2017](#)). Where insufficient data are available to use these methods, tests by a comparable method recognized by the appropriate national authority may be used.
- b) The level of toxicity is determined by either tests in accordance with 6.2.1.3 or a calculation method using the following formula:

$$LC_{50} \text{ Toxic (mixture)} = \frac{1}{\sum_{i=1}^n \frac{f_i}{T_i}}$$

where f_i = mole fraction of the i^{th} component substance of the mixture, and

where T_i = toxicity index of the i^{th} component substance of the mixture (the T_i equals the LC₅₀ value when available).

When LC₅₀ values are unknown, the toxicity index is determined by using the lowest LC₅₀ value of substances of similar physiological and chemical effects, or through testing if this is the only practical possibility.

- ≠ c) A gas mixture has a subsidiary hazard of corrosivity when the mixture is known by human experience to be destructive to the skin, eyes or mucous membranes or when the LC₅₀ value of the mixture's corrosive components is equal to or less than 5 000 mL/m³ (ppm) when the LC₅₀ value is calculated by the formula:

$$LC_{50} \text{ Corrosive (mixture)} = \frac{1}{\sum_{i=1}^n \frac{f_{ci}}{T_{ci}}}$$

where f_{ci} = mole fraction of the i^{th} corrosive component substance of the mixture, and

where T_{ci} = Toxicity index of the i^{th} corrosive component substance of the mixture (the T_{ci} equals the LC₅₀ value when available).

UN Model Regulations, 2.2.3 d) (see ST/SG/AC.10/46/Add.1)

- d) Oxidizing ability is determined either by tests or by calculation methods adopted by the International Standards Organization (see the Note in 2.2.1 b) and ISO 10156:2010 ~~2010~~ **2017**).

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Chapter 4

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

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4.3 SUBSTANCES LIABLE TO SPONTANEOUS COMBUSTION (DIVISION 4.2)

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4.3.2.3 Self-heating substances

4.3.2.3.1 A substance must be classified as a self-heating substance of Division 4.2 if, in tests performed in accordance with the test method given in the current edition of the UN *Manual of Tests and Criteria*, Part III, subsection 33.3.1.6:

- a) a positive result is obtained using a 25 mm sample cube at 140°C;
- b) a positive result is obtained in a test using a 100 mm sample cube at 140°C and a negative result is obtained in a test using a 100 mm sample cube at 120°C and the substance is to be transported in packages with a volume of more than 3 m³;
- c) a positive result is obtained in a test using a 100 mm sample cube at 140°C and a negative result is obtained in a test using a 100 mm sample cube at 100°C and the substance is to be transported in packages with a volume of more than 450 L;
- d) a positive result is obtained in a test using a 100 mm sample cube at 140°C and a positive result is obtained using a 100 mm sample cube at 100°C.

UN Model Regulations, 2.4.3.2.3.1 (see ST/SG/AC.10/46/Add.1)

Self-reactive substances, ~~except for type G~~, which also give a positive result according to this test method must not be classified in Division 4.2 but in Division 4.1 (see 4.2.3.1.1).

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Chapter 5

CLASS 5 — OXIDIZING SUBSTANCES; ORGANIC PEROXIDES

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Table 2-7. List of currently assigned organic peroxides in packagings

Note.— Peroxides to be transported must fulfil the classification and the control and emergency temperatures (derived from the self-accelerating decomposition temperature (SADT)) as listed.

Organic peroxide	Concentration (per cent)	Diluent type A (per cent)	Diluent type B (per cent) (Note 1)	Inert solid (per cent)	Water (per cent)	Control tempera- ture (°C)	Emergency tempera- ture (°C)	UN generic entry	Sub- sidiary hazards and notes
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UN Model Regulations, 2.5.3.2.4 (see ST/SG/AC.10/46/Add.1)

Dibenzoyl peroxide	≤35			≥65				Exempt	29
Di-(4-tert-butylcyclohexyl) peroxydicarbonate	≤100					+30	+35	3114	
+ Di-(4-tert-butylcyclohexyl) peroxydicarbonate	≤42 as a paste					+35	+40	3116 3118	
Di-(4-tert-butylcyclohexyl) peroxydicarbonate	≤42 as a stable dispersion in water					+30	+35	3119	

...

...

Chapter 6

CLASS 6 — TOXIC AND INFECTIOUS SUBSTANCES

Parts of this Chapter are affected by State Variation CA 8

INTRODUCTORY NOTE

Note.— Toxins from plant, animal or bacterial sources which do not contain any infectious substances or toxins that are not contained in substances which are infectious substances should be considered for classification in Division 6.1 and assignment to UN 3172.

6.1 DEFINITIONS

Class 6 is divided into two divisions as follows:

- a) Division 6.1 — Toxic substances.

Substances liable either to cause death or injury or to harm human health if swallowed, if inhaled or by skin contact.

Note.— In these Instructions “poisonous” has the same meaning as “toxic”.

b) Division 6.2 — Infectious substances.

UN Model Regulations, 2.6.1 b) (see ST/SG/AC.10/46/Add.1)

Substances known to contain, or reasonably expected to contain, pathogens. Pathogens are defined as micro-organisms (including bacteria, viruses, ~~rickettsiae~~, parasites, fungi) and other agents such as prions, which can cause disease in humans or animals.

...

6.3 DIVISION 6.2 — INFECTIOUS SUBSTANCES**6.3.1 Definitions**

For the purposes of these Instructions:

UN Model Regulations, 2.6.3.1.1 (see ST/SG/AC.10/46/Add.1)

6.3.1.1 *Infectious substances* are substances which are known to contain, or are reasonably expected to contain, pathogens. Pathogens are defined as micro-organisms (including bacteria, viruses, ~~rickettsiae~~, parasites, fungi) and other agents such as prions, which can cause disease in humans or animals.

6.3.1.2 *Biological products* are those products derived from living organisms which are manufactured and distributed in accordance with the requirements of appropriate national authorities, which may have special licensing requirements, and are used either for prevention, treatment or diagnosis of disease in humans or animals, or for development, experimental or investigational purposes related thereto. They include, but are not limited to, finished or unfinished products such as vaccines.

6.3.1.3 *Cultures* are the result of a process by which pathogens are intentionally propagated. This definition does not include patient specimens as defined in 6.3.1.4.

6.3.1.4 *Patient specimens* are those collected directly from humans or animals, including, but not limited to, excreta, secretions, blood and its components, tissue and tissue fluid swabs, and body parts being transported for purposes such as research, diagnosis, investigational activities, and disease treatment and prevention.

UN Model Regulations, 2.6.3.1.6 (see ST/SG/AC.10/46/Add.1)

6.3.1.5 *Medical or clinical wastes* are wastes derived from the veterinary treatment of animals, the medical treatment ~~of animals or~~ humans or from bio-research.

6.3.2 Classification of infectious substances

UN Model Regulations, 2.6.3.2.1 (see ST/SG/AC.10/46/Add.1)

6.3.2.1 Infectious substances must be classified in Division 6.2 and assigned to UN 2814, UN 2900, UN 3291 ~~or~~, UN 3373 or UN 3549 as appropriate.

6.3.2.2 Infectious substances are divided into the following categories:

6.3.2.2.1 *Category A*: An infectious substance which is transported in a form that, when exposure to it occurs, is capable of causing permanent disability, life-threatening or fatal disease in otherwise healthy humans or animals. Indicative examples of substances that meet these criteria are given in Table 2-10.

Note. — An exposure occurs when an infectious substance is released outside of the protective packaging resulting in physical contact with humans or animals.

- a) Infectious substances meeting these criteria which cause disease in humans or in both humans and animals must be assigned to UN 2814. Infectious substances which cause disease only in animals must be assigned to UN 2900.
- b) Assignments to UN 2814 or UN 2900 must be based on the known medical history and symptoms of the source human or animal, endemic local conditions, or professional judgement concerning individual circumstances of the source human or animal.

Note 1.— The proper shipping name for UN 2814 is **Infectious substance, affecting humans**. The proper shipping name for UN 2900 is **Infectious substance, affecting animals** only.

Note 2.— Table 2-10 is not exhaustive. Infectious substances, including new or emerging pathogens, which do not appear in Table 2-10 but which meet the same criteria must be assigned to Category A. In addition, if there is doubt as to whether or not a substance meets the criteria it must be included in Category A.

UN Model Regulations, 2.6.3.2.2.1 (see ST/SG/AC.10/46/Add.1)

Note 3.— In Table 2-10, the micro-organisms written in italics are bacteria, ~~mycoplasma, rickettsiae~~ or fungi.

6.3.2.2.2 *Category B*: An infectious substance which does not meet the criteria for inclusion in Category A. Infectious substances in Category B must be assigned to UN 3373.

Note.— The proper shipping name of UN 3373 is **Biological substances, Category B**.

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6.3.2.3 *Exceptions*

...

6.3.2.3.9 Except for:

UN Model Regulations, 2.6.3.2.3.9 (see ST/SG/AC.10/46/Add.1)

- a) medical waste (UN 3291 and UN 3549);
- b) medical devices or equipment contaminated with or containing infectious substances in Category A (UN 2814 or UN 2900); and
- c) medical devices or equipment contaminated with or containing other dangerous goods that meet the definition of another hazard class,

medical devices or equipment potentially contaminated with or containing infectious substances which are being transported for disinfection, cleaning, sterilization, repair, or equipment evaluation are not subject to the provisions of these Instructions if packed in packagings designed and constructed in such a way that, under normal conditions of transport, they cannot break, be punctured or leak their contents. Packagings must be designed to meet the construction requirements listed in 6;3.

...

6.3.5 Medical or clinical wastes

UN Model Regulations, 2.6.3.5.1 (see ST/SG/AC.10/46/Add.1)

6.3.5.1 Medical or clinical wastes containing:

- a) ~~Category A infectious substances must be assigned to UN 2814 or UN 2900~~ or UN 3549 as appropriate. Solid medical waste containing Category A infectious substances generated from the medical treatment of humans or veterinary treatment of animals may be assigned to UN 3549. The UN 3549 entry must not be used for waste from bio-research or liquid waste
- b) ~~Medical or clinical wastes containing infectious substances in Category B~~ infectious substances must be assigned to UN 3291.

6.3.5.2 Medical or clinical wastes that are reasonably believed to have a low probability of containing infectious substances must be assigned to UN 3291. For the assignment, international, regional or national waste catalogues may be taken into account.

Note.— The proper shipping name for UN 3291 is **Clinical waste, unspecified, n.o.s.** or **Biomedical waste, n.o.s.** or **Medical waste, n.o.s.** or **Regulated medical waste, n.o.s.**

6.3.5.3 Decontaminated medical or clinical wastes that previously contained infectious substances are not subject to these Instructions unless they meet the criteria for inclusion in another class.

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Chapter 7

CLASS 7 — RADIOACTIVE MATERIAL

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7.1.3 Definitions of specific terms

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UN Model Regulations, 1.1.1.2 (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.4.1 b) of the DGP-WG/19 report:

Transport index (TI) assigned to a package, overpack or freight container, or to unpackaged LSA-I or SCO-I or SCO-III. A number which is used to provide control over radiation exposure.

Note.— Unpackaged LSA-I, SCO-I or SCO-III material are not permitted for transport by air.

...

7.2 CLASSIFICATION

7.2.1 General provisions

UN Model Regulations, 2.7.2.1.1 (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.4.1 c) of the DGP-WG/19 report:

7.2.1.1 Radioactive material must be assigned to one of the UN numbers specified in Table 2-11 in accordance with 7.2.4.2 7.2.4 to 7.2.4.5, taking into account the material characteristics determined in 7.2.3.

Table 2-11. Assignment of UN numbers

UN number	Proper shipping name and description ^a
...	
	Surface contaminated objects (7.2.3.2)
	UN Model Regulations, Table 2.7.2.1.1 (see ST/SG/AC.10/46/Add.1)
UN 2913	Radioactive material, surface contaminated objects (SCO-I or SCO-II or SCO-III), non-fissile or fissile excepted ^b
UN 3326	Radioactive material, surface contaminated objects (SCO-I or SCO-II), fissile
...	

7.2.2 Determination of basic radionuclide values

7.2.2.1 The following basic values for individual radionuclides are given in Table 2-12:

- a) A_1 and A_2 in TBq;
- b) activity concentration limits for exempt material in Bq/g; and

c) activity limits for exempt consignments in Bq.

7.2.2.2 For individual radionuclides:

UN Model Regulations, 2.7.2.2.2 a) and b) (see ST/SG/AC.10/46/Add.1)

- a) which are not listed in Table 2-12, determination of the basic radionuclide values referred to in 7.2.2.1 requires multilateral approval. For these radionuclides, activity concentration limits for exempt material and activity limits for exempt consignments must be calculated in accordance with the principles established in the [Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, IAEA Safety Standards Series No.415 GSR Part 3](#), IAEA, Vienna (1996/2014). It is permissible to use the A_2 value calculated using a dose coefficient for the appropriate lung absorption type as recommended by the International Commission on Radiological Protection, if the chemical forms of each radionuclide under both normal and accident conditions of transport are taken into consideration. Alternatively, the radionuclide values in Table 2-13 may be used without obtaining competent authority approval.
- b) in instruments or articles in which the radioactive material is enclosed or is included as a component part of the instrument or other manufactured article and which meet 7.2.4.1.1.3 c), alternative basic radionuclide values to those in Table 2-12 for the activity limit for an exempt consignment are permitted and require multilateral approval. Such alternative activity limits for an exempt consignment must be calculated in accordance with the principles set out in the [International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, Safety Series No.115, IAEA, Vienna \(1996\) GSR Part 3](#).

UN Model Regulations, 2.7.2.2.3 (see ST/SG/AC.10/46/Add.1)

7.2.2.3 In the calculations of A_1 and A_2 for a radionuclide not in Table 2-12, a single radioactive decay chain in which the radionuclides are present in their naturally occurring proportions, and in which no daughter progeny nuclide has a half-life either longer than 10 days or longer than that of the parent nuclide, must be considered as a single radionuclide; and the activity to be taken into account and the A_1 or A_2 value to be applied must be that corresponding to the parent nuclide of that chain. In the case of radioactive decay chains in which any daughter progeny nuclide has a half-life either longer than 10 days or greater than that of the parent nuclide, the parent and such daughter progeny nuclides must be considered as mixtures of different nuclides.

...

Table 2-12. Basic radionuclides values for individual radionuclides

UN Model Regulations, Table 2.7.2.2.1 (see ST/SG/AC.10/46/Add.1)

Radionuclide (atomic number)	Special form A_1 (TBq)	Other form A_2 (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
...				
Barium (56)				
Ba-131 (a)	2×10^0	2×10^0	1×10^2	1×10^6
Ba-133	3×10^0	3×10^0	1×10^2	1×10^6
Ba-133m	2×10^1	6×10^{-1}	1×10^2	1×10^6
<u>Ba-135m</u>	<u>2×10^1</u>	<u>6×10^{-1}</u>	<u>1×10^2</u>	<u>1×10^6</u>
Ba-140 (a)	5×10^{-1}	3×10^{-1}	1×10^1 (b)	1×10^5 (b)
...				
Germanium (32)				
Ge-68 (a)	5×10^{-1}	5×10^{-1}	1×10^1	1×10^5
<u>Ge-69</u>	<u>1×10^0</u>	<u>1×10^0</u>	<u>1×10^1</u>	<u>1×10^6</u>
...				
Iridium (77)				

Radionuclide (atomic number)	Special form A_1 (TBq)	Other form A_2 (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Ir-189 (a)	1×10^1	1×10^1	1×10^2	1×10^7
Ir-190	7×10^{-1}	7×10^{-1}	1×10^1	1×10^6
Ir-192	1×10^0 (c)	6×10^{-1}	1×10^1	1×10^4
<u>Ir-193m</u>	<u>4×10^1</u>	<u>4×10^0</u>	<u>1×10^4</u>	<u>1×10^7</u>
Ir-194	3×10^{-1}	3×10^{-1}	1×10^2	1×10^5
...				
Nickel (28)				
<u>Ni-57</u>	<u>6×10^{-1}</u>	<u>6×10^{-1}</u>	<u>1×10^1</u>	<u>1×10^6</u>
Ni-59	Unlimited	Unlimited	1×10^4	1×10^8
Ni-63	4×10^1	3×10^1	1×10^5	1×10^8
Ni-65	4×10^{-1}	4×10^{-1}	1×10^1	1×10^6
...				
Strontium (38)				
Sr-82 (a)	2×10^{-1}	2×10^{-1}	1×10^1	1×10^5
<u>Sr-83</u>	<u>1×10^0</u>	<u>1×10^0</u>	<u>1×10^1</u>	<u>1×10^6</u>
Sr-85	2×10^0	2×10^0	1×10^2	1×10^6
Sr-85m	5×10^0	5×10^0	1×10^2	1×10^7
Sr-87m	3×10^0	3×10^0	1×10^2	1×10^6
Sr-89	6×10^{-1}	6×10^{-1}	1×10^3	1×10^6
Sr-90 (a)	3×10^{-1}	3×10^{-1}	1×10^2 (b)	1×10^4 (b)
Sr-91 (a)	3×10^{-1}	3×10^{-1}	1×10^1	1×10^5
Sr-92 (a)	1×10^0	3×10^{-1}	1×10^1	1×10^6
...				
Terbium (65)				
<u>Tb-149</u>	<u>8×10^{-1}</u>	<u>8×10^{-1}</u>	<u>1×10^1</u>	<u>1×10^6</u>
Tb-157	4×10^1	4×10^1	1×10^4	1×10^7
Tb-158	1×10^0	1×10^0	1×10^1	1×10^6
Tb-160	1×10^0	6×10^{-1}	1×10^1	1×10^6
<u>Tb-161</u>	<u>3×10^1</u>	<u>7×10^1</u>	<u>1×10^3</u>	<u>1×10^6</u>
...				

UN Model Regulations, Table 2.7.2.2.1, note (b) (see ST/SG/AC.10/46/Add.1)

(b) Parent nuclides and their progeny included in secular equilibrium are listed in the following (the activity to be taken into account is that of the parent nuclide only):

Sr-90	Y-90
Zr-93	Nb-93m
Zr-97	Nb-97
Ru-106	Rh-106
Ag-108m	Ag-108
Cs-137	Ba-137m

Radionuclide (atomic number)		Special form A_1 (TBq)	Other form A_2 (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Ce-144	Pr-144				
Ba-140	La-140				
Bi-212	Tl-208 (0.36), Po-212 (0.64)				
Pb-210	Bi-210, Po-210				
Pb-212	Bi-212, Tl-208 (0.36), Po-212 (0.64)				
Rn-222	Po-218, Pb-214, Bi-214, Po-214				
Ra-223	Rn-219, Po-215, Pb-211, Bi-211, Tl-207				
Ra-224	Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)				
Ra-226	Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210				
Ra-228	Ac-228				
Th-228	Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)				
Th-229	Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213, Pb-209				
UN Model Regulations, Table 2.7.2.2.1, note (b) (see ST/SG/AC.10/46/Add.1)					
Th-nat ¹	Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)				
Th-234	Pa-234m				
U-230	Th-226, Ra-222, Rn-218, Po-214				
U-232	Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)				
U-235	Th-231				
U-238	Th-234, Pa-234m				
UN Model Regulations, Table 2.7.2.2.1, note (b) (see ST/SG/AC.10/46/Add.1)					
U-nat ¹	Th-234, Pa-234m, U-234, Th-230, Ra-226, Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210				
Np-237	Pa-233				
Am-242m	Am-242				
Am-243	Np-239				
(c) The quantity may be determined from a measurement of the rate of decay or a measurement of the radiation level at a prescribed distance from the source.					
(d) These values apply only to compounds of uranium that take the chemical form of UF ₆ , UO ₂ F ₂ and UO ₂ (NO ₃) ₂ in both normal and accident conditions of transport.					
(e) These values apply only to compounds of uranium that take the chemical form of UO ₃ , UF ₄ , UCl ₄ and hexavalent compounds in both normal and accident conditions of transport.					
(f) These values apply to all compounds of uranium other than those specified in (d) and (e) above.					
(g) These values apply to unirradiated uranium only.					

UN Model Regulations, Table 2.7.2.2.1, note (b) (see ST/SG/AC.10/46/Add.1)

In the case of Th-natural, the parent nuclide is Th-232, in the case of U-natural the parent nuclide is U-238.

...

7.2.3 Determination of other material characteristics

7.2.3.1 Low specific activity (LSA) material

7.2.3.1.1 (Reserved)

7.2.3.1.2 LSA material must be in one of three groups:

a) LSA-I

- i) uranium and thorium ores and concentrates of such ores, and other ores containing naturally occurring radionuclides;
- ii) natural uranium, depleted uranium, natural thorium, or their compounds or mixtures, that are unirradiated and in solid or liquid form;
- iii) radioactive material for which the A_2 value is unlimited. Fissile material may be included only if excepted under 7.2.3.5; or

- iv) other radioactive material in which the activity is distributed throughout and the estimated average specific activity does not exceed 30 times the values for activity concentration specified in 7.2.2.1 to 7.2.2.6. Fissile material may be included only if excepted under 7.2.3.5.
- b) LSA-II
- i) water with tritium concentration up to 0.8 TBq/L;
 - ii) other material in which the activity is distributed throughout and the estimated average specific activity does not exceed 10^{-4} A₂/g for solids and gases, and 10^{-5} A₂/g for liquids.

UN Model Regulations, 2.7.2.3.1.2 c) (see ST/SG/AC.10/46/Add.1)

- c) LSA-III — solids (e.g. consolidated wastes, activated materials), excluding powders ~~that meet the requirements of 7.2.3.1.3~~, in which:
- i) the radioactive material is distributed throughout a solid or a collection of solid objects, or is essentially uniformly distributed in a solid compact binding agent (such as concrete, bitumen and ceramic); and
 - ii) ~~the radioactive material is relatively insoluble, or it is intrinsically contained in a relatively insoluble matrix, so that even under loss of packaging, the loss of radioactive material per package by leaching when placed in water for seven days would not exceed 0.1 A₂; and~~
 - iii) ~~the estimated average specific activity of the solid, excluding any shielding material, does not exceed 2×10^{-3} A₂/g.~~

UN Model Regulations, 2.7.2.3.1.3 (see ST/SG/AC.10/46/Add.1)

7.2.3.1.3 ~~LSA-III material must be a solid of such a nature that if the entire contents of a package were subjected to the test specified in 7.2.3.1.4, the activity in the water would not exceed 0.1 A₂.~~ Deleted

...

7.2.3.2 Surface contaminated object (SCO)

UN Model Regulations, 2.7.2.3.2 (see ST/SG/AC.10/46/Add.1)

7.2.3.2.1 SCO is classified in one of ~~two~~ three groups:

- a) SCO-I: A solid object on which:
- i) the non-fixed contamination on the accessible surface averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 0.4 Bq/cm² for all other alpha emitters;
 - ii) the fixed contamination on the accessible surface averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 4×10^4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 4×10^3 Bq/cm² for all other alpha emitters; or
 - iii) the non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 4×10^4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 4×10^3 Bq/cm² for all other alpha emitters;
- b) SCO-II: A solid object on which either the fixed or non-fixed contamination on the surface exceeds the applicable limits specified for SCO-I in a) above and on which:
- i) the non-fixed contamination on the accessible surface averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 400 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 40 Bq/cm² for all other alpha emitters;
 - ii) the fixed contamination on the accessible surface, averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 8×10^5 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 8×10^4 Bq/cm² for all other alpha emitters; or
 - iii) the non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 8×10^5 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 8×10^4 Bq/cm² for all other alpha emitters.

UN Model Regulations, 2.7.2.3.2 (c) (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.4.1 d) of the DGP-WG/19 report:

c) SCO-III: A large solid object which, because of its size, cannot be transported in a type of package described in these Instructions.

Note.— SCO-III material is forbidden for transport by air.

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7.2.3.3 *Special form radioactive material*

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7.2.3.3.5 The relevant test methods are:

a) Impact test: The specimen must drop onto the target from a height of 9 m. The target must be as defined in 6;7.13;

UN Model Regulations, 2.7.2.3.3.5 (b) (see ST/SG/AC.10/46/Add.1)

b) Percussion test: The specimen must be placed on a sheet of lead which is supported by a smooth, solid surface and struck by the flat face of a mild steel bar so as to cause an impact equivalent to that resulting from a free drop of 1.4 kg ~~through~~ from a height of 1 m. The lower part of the bar must be 25 mm in diameter with the edges rounded off to a radius of (3.0 ± 0.3) mm. The lead, of hardness number 3.5 to 4.5 on the Vickers scale and not more than 25 mm thick, must cover an area greater than that covered by the specimen. A fresh surface of lead must be used for each impact. The bar must strike the specimen so as to cause maximum damage.

UN Model Regulations, 2.7.2.3.3.5 (c) (see ST/SG/AC.10/46/Add.1)

c) Bending test: The test must apply only to long, slender sources with both a minimum length of 10 cm and a length to minimum width ratio of not less than 10. The specimen must be rigidly clamped in a horizontal position so that one-half of its length protrudes from the face of the clamp. The orientation of the specimen must be such that the specimen will suffer maximum damage when its free end is struck by the flat face of a steel bar. The bar must strike the specimen so as to cause an impact equivalent to that resulting from a free vertical drop of 1.4 kg ~~through~~ from a height of 1 m. The lower part of the bar must be 25 mm in diameter with the edges rounded off to a radius of (3.0 ± 0.3) mm.

d) Heat test: The specimen must be heated in air to a temperature of 800°C and held at that temperature for a period of 10 minutes and must then be allowed to cool.

...

7.2.3.3.7 For specimens which comprise or simulate indispersible solid material, a leaching assessment must be performed as follows:

a) The specimen must be immersed for 7 days in water at ambient temperature. The volume of water to be used in the test must be sufficient to ensure that at the end of the 7-day test period, the free volume of the unabsorbed and unreacted water remaining must be at least 10 per cent of the volume of the solid test sample itself. The water must have an initial pH of 6-8 and a maximum conductivity of 1 mS/m at 20°C;

UN Model Regulations, 2.7.2.3.3.7 (b) (see ST/SG/AC.10/46/Add.1)

b) The water ~~with~~ and the specimen must then be heated to a temperature of $(50 \pm 5)^\circ\text{C}$ and maintained at this temperature for 4 hours;

c) The activity of the water must then be determined;

d) The specimen must then be kept for at least 7 days in still air at not less than 30°C and relative humidity not less than 90 per cent;

UN Model Regulations, 2.7.2.3.3.7 (e) (see ST/SG/AC.10/46/Add.1)

e) The specimen must then be immersed in water of the same specification as in a) above and the water ~~with~~ and the specimen heated to $(50 \pm 5)^\circ\text{C}$ and maintained at this temperature for 4 hours;

- f) The activity of the water must then be determined.

7.2.3.3.8 For specimens which comprise or simulate radioactive material enclosed in a sealed capsule, either a leaching assessment or a volumetric leakage assessment must be performed as follows:

- a) The leaching assessment must consist of the following steps:
- i) the specimen must be immersed in water at ambient temperature. The water must have an initial pH of 6-8 with a maximum conductivity of 1 mS/m at 20°C;

UN Model Regulations, 2.7.2.3.3.8 (a)(ii) (see ST/SG/AC.10/46/Add.1)

- ii) the water and specimen must then be heated to a temperature of $(50 \pm 5)^\circ\text{C}$ and maintained at this temperature for 4 hours;
 - iii) the activity of the water must then be determined;
 - iv) the specimen must then be kept for at least 7 days in still air at not less than 30°C and relative humidity of not less than 90 per cent;
 - v) the process in i), ii) and iii) must be repeated;
- b) The alternative volumetric leakage assessment must comprise any of the tests prescribed in ISO 9978:1992 "Radiation protection — Sealed radioactive sources — Leakage test methods", provided that they are acceptable to the competent authority.

7.2.3.4 *Low dispersible radioactive material*

7.2.3.4.1 The design for low dispersible radioactive material requires multilateral approval. Low dispersible radioactive material must be such that the total amount of this radioactive material in a package, taking into account the provisions of 6;7.7.14, must meet the following requirements:

UN Model Regulations, 2.7.2.3.4.1 (a) (see ST/SG/AC.10/46/Add.1)

- a) The ~~radiation level~~ dose rate at 3 m from the unshielded radioactive material does not exceed 10 mSv/h;
- b) If subjected to the tests specified in 6;7.19.3 and 6;7.19.4, the airborne release in gaseous and particulate forms of up to 100 μm aerodynamic equivalent diameter would not exceed 100 A_2 . A separate specimen may be used for each test; and
- c) If subjected to the test specified in 7.2.3.1.4, the activity in the water would not exceed 100 A_2 . In the application of this test, the damaging effects of the tests specified in b) above must be taken into account.

7.2.3.4.2 Low dispersible material must be tested as follows:

A specimen that comprises or simulates low dispersible radioactive material must be subjected to the enhanced thermal test specified in 6;7.19.3 and the impact test specified in 6;7.19.4. A different specimen may be used for each of the tests. Following each test, the specimen must be subjected to the leach test specified in 7.2.3.1.4. After each test, it must be determined if the applicable requirements of 7.2.3.4.1 have been met.

7.2.3.4.3 Demonstration of compliance with the performance standards in 7.2.3.4.1 and 7.2.3.4.2 must be in accordance with 6;7.11.1 and 6;7.11.2.

7.2.3.5 *Fissile material*

7.2.3.5.1 Fissile material and packages containing fissile material must be classified under the relevant entry as fissile in accordance with Table 2-11 unless excepted by one of the provisions of sub-paragraphs a) to f) below and transported subject to the requirements of 7;2.9.4.3. All provisions apply only to material in packages that meets the requirements of 6;7.6.2.

- a) Uranium enriched in uranium-235 to a maximum of 1 per cent by mass, and with a total plutonium and uranium-233 content not exceeding 1 per cent of the mass of uranium-235, provided that the fissile nuclides are distributed essentially homogeneously throughout the material. In addition, if uranium-235 is present in metallic, oxide or carbide forms, it must not form a lattice arrangement;

- b) Liquid solutions of uranyl nitrate enriched in uranium-235 to a maximum of 2 per cent by mass, with a total plutonium and uranium-233 content not exceeding 0.002 per cent of the mass of uranium, and with a minimum nitrogen to uranium atomic ratio (N/U) of 2;
- c) Uranium with a maximum uranium enrichment of 5 per cent by mass uranium-235 provided:
 - i) there is no more than 3.5 g of uranium-235 per package;
 - ii) the total plutonium and uranium-233 content does not exceed 1 per cent of the mass of uranium-235 per package;
 - iii) transport of the package is subject to the consignment limit provided in 7;2.9.4.3 c);
- d) Fissile nuclides with a total mass not greater than 2 g per package provided the package is transported subject to the consignment limit provided in 7;2.9.4.3 d);

UN Model Regulations, 2.7.2.3.5 (e) (see ST/SG/AC.10/46/Add.1)

- e) Fissile nuclides with a total mass not greater than 45 g subject to ~~limits provided in~~ [the requirements of 7;2.9.4.3 e\)](#);
- f) A fissile material that meets the requirements of 7;2.9.4.3 b), 7.2.3.6 and 5;1.2.2.1.

UN Model Regulations, 2.7.2.3.6 (see ST/SG/AC.10/46/Add.1)

7.2.3.6 ~~A~~ Fissile material excepted from classification as fissile under 7.2.3.5.1 f) must be subcritical without the need for accumulation control under the following conditions:

- a) the conditions of 6;7.10.1 a);
- b) the conditions consistent with the assessment provisions stated in 6;7.10.12 b) and 6;7.10.13 b) for packages; and
- c) the conditions specified in 6;7.10.11 a).

7.2.4 Classification of packages

7.2.4.1 The quantity of radioactive material in a package must not exceed the relevant limits for the package type as specified below.

7.2.4.1.1 Classification as excepted packages

7.2.4.1.1.1 A package may be classified as excepted packages if it meets one of the following conditions:

- a) it is an empty packaging having contained radioactive material;
- b) it contains instruments or articles not exceeding the activity limits specified in columns 2 and 3 of Table 2-14;
- c) it contains articles manufactured of natural uranium, depleted uranium or natural thorium; or
- d) it contains radioactive material not exceeding the activity limits specified in column 4 of Table 2-14; or
- e) it contains less than 0.1 kg of uranium hexafluoride not exceeding the activity limits specified in column 4 of Table 2-14.

7.2.4.1.1.2 A package containing radioactive material may be classified as an excepted package provided that the radiation level at any point on its external surface does not exceed 5 μ Sv/h.

7.2.4.1.1.3 Radioactive material which is enclosed in or is included as a component part of an instrument or other manufactured article may be classified under UN 2911 — **Radioactive material, excepted package — instruments or articles** provided that:

- a) the radiation level at 10 cm from any point on the external surface of any unpackaged instrument or article is not greater than 0.1 mSv/h; and
- b) each instrument or article bears the mark "RADIOACTIVE" on its external surface except for the following:
 - i) radioluminescent time-pieces or devices;

- ii) consumer products that either have received regulatory approval in accordance with 1.6.1.4 c) or do not individually exceed the activity limit for an exempt consignment in Table 2-12 (column 5), provided such products are transported in a package that bears the mark "RADIOACTIVE" on an internal surface in such a manner that a warning of the presence of radioactive material is visible on opening the package; and
- iii) other instruments or articles too small to bear the mark "RADIOACTIVE", provided that they are transported in a package that bears the mark "RADIOACTIVE" on its internal surface in such a manner that a warning of the presence of radioactive material is visible on opening the package;

UN Model Regulations, 2.7.2.4.1.3 (c), (d), (e) and (f) (see ST/SG/AC.10/46/Add.1)

- c) the active material is completely enclosed by non-active components (a device performing the sole function of containing radioactive material must not be considered to be an instrument or manufactured article); ~~and~~
- d) the limits specified in columns 2 and 3 of Table 2-14 are met for each individual item and each package, respectively;

e) reserved, and

f) if the package contains fissile material, one of the provisions of 7.2.3.5.1 a) to f) must apply.

7.2.4.1.1.4 Radioactive material in forms other than as specified in 7.2.4.1.1.3 and with an activity not exceeding the limits specified in column 4 of Table 2-14 may be classified under UN 2910 — **Radioactive material, excepted package — limited quantity of material**, provided that:

UN Model Regulations, 2.7.2.4.1.4 (a), (b) (ii), (c) (see ST/SG/AC.10/46/Add.1)

- a) the package retains its radioactive contents under routine conditions of transport; ~~and~~
- b) the package bears the mark "RADIOACTIVE" on either:
 - i) an internal surface in such a manner that a warning of the presence of radioactive material is visible on opening the package; or
 - ii) the outside of the package, where it is impractical to mark an internal surface; and

c) if the package contains fissile material, one of the provisions of 7.2.3.5.1 a) to f) must apply.

7.2.4.1.1.5 Uranium hexafluoride not exceeding the limits specified in column 4 of Table 2-14 may be classified under UN 3507 — **Uranium hexafluoride, radioactive material, excepted package**, less than 0.1 kg per package, non-fissile or fissile-excepted provided that:

- a) the mass of uranium hexafluoride in the package is less than 0.1 kg; and
- b) the conditions of 7.2.4.5.2 and 7.2.4.1.1.4 a) and b) are met.

7.2.4.1.1.6 Articles manufactured of natural uranium, depleted uranium or natural thorium and articles in which the sole radioactive material is unirradiated natural uranium, unirradiated depleted uranium or unirradiated natural thorium may be classified under UN 2909, **Radioactive material, excepted package — articles manufactured from natural uranium or depleted uranium or natural thorium** provided that the outer surface of the uranium or thorium is enclosed in an inactive sheath made of metal or some other substantial material.

7.2.4.1.1.7 An empty packaging which had previously contained radioactive material may be classified under UN 2908 — **Radioactive material, excepted package — empty packaging** provided that:

- a) it is in a well-maintained condition and securely closed;
- b) the outer surface of any uranium or thorium in its structure is covered with an inactive sheath made of metal or some other substantial material;

UN Model Regulations, 2.7.2.4.1.7 (c) (ii), (d) and (e) (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.4.1 e) and f) of the DGP-WG/19 report:

- c) the level of internal non-fixed contamination, when averaged over any 300 cm², does not exceed:
 - i) 400 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters; and
 - ii) 40 Bq/cm² for all other alpha emitters; ~~and~~

- d) any labels which may have been displayed on it in conformity with 5;3.2.6 are no longer visible; and
e) if the packaging has contained fissile material, one of the provisions of [7.2.3.5.1 a) to f)] or one of the provisions for exclusion for fissile nuclides as described in 7.1.3 must apply.

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Chapter 8

CLASS 8 — CORROSIVE SUBSTANCES

8.1 DEFINITION AND GENERAL PROVISIONS

For French version: There may be a need for amendment to the following for the sake of alignment with 2.8.1.1 of the UN Model Regulations, (see ST/SG/AC.10/46/Add.1), i.e.:

2.8.1.1 Remplacer « engins de transport » par « matériels de transport ».

8.1.1 Corrosive substances are substances which, by chemical action, will cause irreversible damage to the skin or, in the case of leakage, will materially damage, or even destroy, other goods or the means of transport.

...

8.3 PACKING GROUP ASSIGNMENT FOR SUBSTANCES AND MIXTURES

8.3.1 Existing human and animal data, including information from single or repeated exposure, must be the first line of evaluation, as they give information directly relevant to effects on the skin.

UN Model Regulations, 2.8.3.2 (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.4.1 g) of the DGP-WG/19 report:

8.3.2 In assigning the packing group in accordance with 8.2.3, account must be taken of human experience in instances of accidental exposure. In the absence of human experience, the grouping classification must be based on data obtained from experiments in accordance with OECD Guideline for the Testing of Chemicals No. 404, *Acute Dermal Irritation/Corrosion*, 2015 or No. 435, *In Vitro Membrane Barrier Test Method for Skin Corrosion*, 2015, No. 431, *In Vitro Skin Corrosion: Reconstructed Human Epidermis (RHE) Test Method*, 2016 or No. 430, *In Vitro Skin Corrosion: Transcutaneous Electrical Resistance (TER) Test Method*, 2015.

8.3.2.1 A substance or mixture which is determined not to be corrosive in accordance with OECD Guideline for the Testing of Chemicals No. 404, No. 435, No. 431 or No. 430, *In Vitro Skin Corrosion: Transcutaneous Electrical Resistance Test (TER)*, 2015 or No. 431, *In Vitro Skin Corrosion: Human Skin Model Test*, 2015 may be considered not to be corrosive to skin for the purposes of these Instructions without further testing. If the in vitro test results indicate that the substance or mixture is corrosive and not assigned to Packing Group I, but the test method does not allow discrimination between Packing Groups II and III, it must be considered to be Packing Group II.

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Chapter 9

CLASS 9 — MISCELLANEOUS DANGEROUS SUBSTANCES AND ARTICLES, INCLUDING ENVIRONMENTALLY HAZARDOUS SUBSTANCES

DGP-WG/19 (see paragraph 3.1.2.4.1 h) of the DGP-WG/19 report:

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9.2 ASSIGNMENT TO CLASS 9

Class 9 includes, inter alia: [The substances and articles of Class 9 are subdivided as shown in Table 2-16.](#)

Insert the following new table (the text in existing 9.2 has been incorporated in the “notes” column of the table):

Table 2-16. Substances and articles of Class 9

<i>UN number</i>	<i>Name</i>	<i>Notes</i>
<i>Substances which, on inhalation as fine dust, may endanger health</i>		
2212	Asbestos, amphibole (amosite, tremolite, actinolite, anthophyllite, crocidolite)	
2590	Asbestos, chrysotile	
<i>Substances evolving flammable vapour</i>		
2211	Polymeric beads, expandable , evolving flammable vapour	
3314	Plastics moulding compound in dough, sheet or extruded rope form evolving flammable vapour	
<i>Lithium batteries</i>		
3090	Lithium metal batteries (including lithium alloy batteries)	See 2;9.3
3091	Lithium metal batteries contained in equipment (including lithium alloy batteries)	
3091	Lithium metal batteries packed with equipment (including lithium alloy batteries)	
3480	Lithium ion batteries (including lithium ion polymer batteries)	
3481	Lithium ion batteries contained in equipment (including lithium ion polymer batteries)	
3481	Lithium ion batteries packed with equipment (including lithium ion polymer batteries)	
3536	Lithium batteries installed in cargo transport unit	
<i>Capacitors</i>		
3499	Capacitor, electric double layer (with an energy storage capacity greater than 0.3 Wh)	
3508	Capacitor, asymmetric (with an energy storage capacity greater than 0.3 Wh)	

<i>UN number</i>	<i>Name</i>	<i>Notes</i>
<i>Live-saving appliances</i>		
2990	Life-saving appliances, self-inflating	
3072	Life-saving appliances, not self-inflating containing dangerous goods as equipment	
3268	Safety devices , electrically initiated	
<i>Substances and articles which, in the event of fire, may form dioxins</i>		
2315	Polychlorinated biphenyls, liquid	Examples of articles are transformers, condensers and apparatus containing those substances.
3432	Polychlorinated biphenyls, solid	
3151	Polyhalogenated biphenyls, liquid	
3151	Halogenated monomethyldiphenylmethanes, liquid	
3151	Polyhalogenated terphenyls, liquid	
3152	Polyhalogenated biphenyls, solid	
3152	Halogenated monomethyldiphenylmethanes, solid	
3152	Polyhalogenated terphenyls, solid	
<i>Substances transported or offered for transport at elevated temperatures</i>		
3257	Elevated temperature liquid, n.o.s. , at or above 100°C and below its flash point (including molten metals, molten salts, etc.)	Elevated temperature substances (i.e. substances that are transported or offered for transport at temperatures equal to or exceeding 100°C in a liquid state or at temperatures equal to or exceeding 240°C in a solid state (these substances may only be carried under 1;1.1)).
3258	Elevated temperature solid, n.o.s. , at or above 240°C	
<i>Environmentally hazardous substances</i>		
3077	Environmentally hazardous substance, solid, n.o.s.	Environmentally hazardous substances (aquatic environment) are those that meet the criteria in 2.9.3 of the UN Model Regulations or that meet criteria in international regulations or national regulations established by the appropriate national authority in the State of Origin, transit or destination of the consignment. Substances or mixtures dangerous to the aquatic environment not otherwise classified under these Instructions must be assigned to Packing Group III and assigned to UN 3077 or UN 3082.
3082	Environmentally hazardous substance, liquid, n.o.s.	
<i>Genetically modified micro-organisms (GMMOs) and genetically modified organisms (GMOs)</i>		
3245	Genetically modified micro-organisms	GMMOs or GMOs which do not meet the definition of toxic substances (see 6.2) or infectious substances (see 6.3) must be assigned to UN 3245. GMMOs or GMOs are not subject to these Instructions when authorized for use by the appropriate national authorities of the States of Origin, transit and destination. Genetically modified live animals must be transported under terms and conditions of the appropriate national authorities of the States of Origin and destination.
3245	Genetically modified organisms	
<i>Ammonium nitrate based fertilizers</i>		
2071	Ammonium nitrate based fertilizer	Solid ammonium nitrate based fertilizers must be classified in accordance with the procedure as set out in the <i>Manual of Tests and Criteria</i> , Part III, Section 39.

UN number	Name	Notes
<i>Other substances or articles presenting a danger during transport, but not meeting the definitions of another class</i>		
1841	Acetaldehyde ammonia	
1845	Dry ice	
1845	Carbon dioxide, solid	
1931	Zinc dithionite	
1931	Zinc hydrosulphite	
1941	Dibromodifluoromethane	
1990	Benzaldehyde	
2216	Fish meal, stabilized	
2216	Fish scrap, stabilized	
2807	Magnetized material	<p>Magnetized material is any material which, when packed for air transport, has a maximum magnetic field strength sufficient to cause a compass deflection of more than 2 degrees at a distance of 2.1 m from any point on the surface of the assembled package. The magnetic field strength at the compass producing a 2 degree deflection is taken to be 0.418 A/m (0.00525 Gauss).</p> <p>The magnetic field strength must be measured with a magnetic compass sensitive enough to read a 2 degree variation, preferably in 1 degree increments or finer, or using a Gauss meter having a sensitivity sufficient to measure magnetic fields greater than 0.0005 Gauss within a tolerance of plus or minus 5 per cent, or by an equivalent means.</p> <p>Compass measurements must be taken in an area free from magnetic interference other than the Earth's magnetic field. When using a compass, the material and the compass must be aligned in an east-west direction. Gauss meter measurements must be in accordance with the manufacturer's instructions. Measurements are taken while the packaged material is rotated through 360 degrees in its horizontal plane while maintaining a constant distance (2.1 m or 4.6 m as referred to in Packing Instruction 953) between the measuring device and any point on the outside surface of the package. Shielding may be used to reduce the package's magnetic strength.</p> <p><i>Note.— Masses of ferro-magnetic metals such as automobiles, automobile parts, metal fencing, piping and metal construction material, even if not meeting the definition of magnetized material may affect aircraft compasses, as may packages or items which individually do not meet the definition of magnetized material but cumulatively may have a magnetic field strength of a magnetized material.</i></p>
2969	Castor beans	
2969	Castor meal	
2969	Castor pomace	
2969	Castor flake	
3166	Vehicle, flammable gas powered	
3166	Vehicle, flammable liquid powered	

<i>UN number</i>	<i>Name</i>	<i>Notes</i>
3166	Vehicle, fuel cell, flammable gas powered †	
3166	Vehicle, fuel cell, flammable liquid powered †	
3171	Battery-powered vehicle	
3171	Battery-powered equipment	
3316	Chemical kit	
3316	First aid kit	
3334	Aviation regulated liquid, n.o.s.	Aviation regulated liquid is any material which has narcotic, noxious or other properties such that, in the event of spillage or leakage on an aircraft, extreme annoyance or discomfort could be caused to crew members so as to prevent the correct performance of assigned duties.
3335	Aviation regulated solid, n.o.s.	Aviation regulated solid is any material which has narcotic, noxious or other properties such that, in the event of spillage or leakage on an aircraft, extreme annoyance or discomfort could be caused to crew members so as to prevent the correct performance of assigned duties.
3359	Fumigated cargo transport unit	
3363	Dangerous goods in machinery	
3363	Dangerous goods in apparatus	
3363	Dangerous goods in articles	
3509	Packagings, discarded, empty, uncleaned	
3530	Engine, internal combustion	
3530	Machinery, internal combustion	
3548	Articles containing miscellaneous dangerous goods, n.o.s.	

Some examples of articles in Class 9 are:

- _____ Engines, internal combustion;
- _____ Life-saving appliances, self-inflating;
- _____ Battery-powered equipment or vehicle.

Some examples of substances in Class 9 are:

- _____ Asbestos, amphibole (amosite, tremolite, actinolite, anthophyllite, crocidolite)
- _____ Asbestos, chrysotile
- _____ Carbon dioxide, solid (dry ice);
- _____ Zinc dithionite.

Part 3

DANGEROUS GOODS LIST, SPECIAL PROVISIONS AND LIMITED AND EXCEPTED QUANTITIES

Chapter 2

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

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Table 3-1. Dangerous Goods List

Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4		6	7	8	9	10	11	12	13
UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/46/Add.1):												
<u>Detonators, electronic programmable for blasting†</u>	<u>0511</u>	<u>1.1B</u>		<u>Explosive</u>				<u>E0</u>	<u>FORBI</u>	<u>DDEN</u>	<u>FORBI</u>	<u>DDEN</u>
<u>Detonators, electronic programmable for blasting†</u>	<u>0512</u>	<u>1.4B</u>		<u>Explosive 1.4</u>				<u>E0</u>	<u>FORBI</u>	<u>DDEN</u>	<u>131</u>	<u>75 kg</u>
UN Model Regulations, Chapter 3.2, dangerous goods list, SP347 (see ST/SG/AC.10/46/Add.1):												
<u>Detonators, electronic programmable for blasting†</u>	<u>0513</u>	<u>1.4S</u>		<u>Explosive 1.4</u>		<u>A165</u>		<u>E0</u>	<u>131</u>	<u>25 kg</u>	<u>131</u>	<u>100 kg</u>

Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4		6	7	8	9	10	11	12	13

UN Model Regulations, Chapter 3.2, dangerous goods list, SP393 (see ST/SG/AC.10/46/Add.1):

Nitrocellulose , dry or wetted with less than 25% water (or alcohol), by mass	0340	1.1D				<u>A216</u>			FORBI	DDEN	FORBI	DDEN
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP393 (see ST/SG/AC.10/46/Add.1):

Nitrocellulose , unmodified or plasticized with less than 18% plasticizing substance, by mass	0341	1.1D				<u>A216</u>			FORBI	DDEN	FORBI	DDEN
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP393 (see ST/SG/AC.10/46/Add.1):

Nitrocellulose, plasticized with not less than 18% plasticizing substance, by mass	0343	1.3C				<u>A216</u>			FORBI	DDEN	FORBI	DDEN
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP393 (see ST/SG/AC.10/46/Add.1):

Nitrocellulose, wetted with not less than 25% alcohol, by mass	0342	1.3C				<u>A216</u>			FORBI	DDEN	FORBI	DDEN
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UN Model Regulations, Chapter 3.2, dangerous goods list, UN 2037 (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.5.1 d) of the DGP-WG/19 report.

Gas cartridges , (flammable) without a release device, non-refillable	2037	2.1		Gas flammable		<u>A145</u> <u>A167</u>		<u>E0</u>	<u>203</u> <u>Y203</u>	<u>1 kg</u> <u>1 kg</u>	<u>203</u>	<u>15 kg</u>
Gas cartridges , (non-flammable) without a release device, non-refillable	2037	2.2		Gas non-flammable		<u>A98</u> <u>A145</u> <u>A167</u>		<u>E0</u>	<u>203</u> <u>Y203</u>	<u>1 kg</u> <u>1 kg</u>	<u>203</u>	<u>15 kg</u>

Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4		6	7	8	9	10	11	12	13
Gas cartridges (oxidizing) without a release device, non-refillable	2037	2.2	5.1	Gas non-flammable & Oxidizer		<u>A145</u> A167		<u>E0</u>	<u>203</u>	<u>1 kg</u>	<u>203</u>	<u>15 kg</u>
Gas cartridges (toxic & corrosive) without a release device, non-refillable	2037	2.3	8		AU 1 CA 7 IR 3 NL 1 US 3	A2			FORBI	DDEN	FORBI	DDEN
Gas cartridges (toxic, flammable & corrosive) without a release device, non-refillable	2037	2.3	2.1 8		AU 1 CA 7 IR 3 NL 1 US 3	A2			FORBI	DDEN	FORBI	DDEN
Gas cartridges (toxic & flammable) without a release device, non-refillable	2037	2.3	2.1		AU 1 CA 7 IR 3 NL 1 US 3	A2			FORBI	DDEN	FORBI	DDEN
Gas cartridges (toxic, oxidizing & corrosive) without a release device, non-refillable	2037	2.3	5.1 8		AU 1 CA 7 IR 3 NL 1 US 3	A2 A211			FORBI	DDEN	FORBI	DDEN
Gas cartridges (toxic & oxidizing) without a release device, non-refillable	2037	2.3	5.1		AU 1 CA 7 IR 3 NL 1 US 3	A2			FORBI	DDEN	FORBI	DDEN
Gas cartridges (toxic) without a release device, non-refillable	2037	2.3			AU 1 CA 7 IR 3 NL 1 US 3	A2			FORBI	DDEN	FORBI	DDEN
Receptacles, small, containing gas (flammable) without a release device, non-refillable	2037	2.1		Gas flammable		<u>A145</u> A167		<u>E0</u>	<u>203</u> <u>Y203</u>	<u>1 kg</u> <u>1 kg</u>	<u>203</u>	<u>15 kg</u>
Receptacles, small, containing gas (non-flammable) without a release device, non-refillable	2037	2.2		Gas non-flammable		A98 <u>A145</u> A167		<u>E0</u>	<u>203</u> <u>Y203</u>	<u>1 kg</u> <u>1 kg</u>	<u>203</u>	<u>15 kg</u>
Receptacles, small, containing gas (oxidizing) without a release device, non-refillable	2037	2.2	5.1	Gas non-flammable & Oxidizer		<u>A145</u> A167		<u>E0</u>	<u>203</u>	<u>1 kg</u>	<u>203</u>	<u>15 kg</u>

Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4		6	7	8	9	10	11	12	13
Receptacles, small, containing gas (toxic & corrosive) without a release device, non-refillable	2037	2.3	8		AU 1 CA 7 IR 3 NL 1 US 3	A2			FORBI	DDEN	FORBI	DDEN
Receptacles, small, containing gas (toxic, flammable & corrosive) without a release device, non-refillable	2037	2.3	2.1 8		AU 1 CA 7 IR 3 NL 1 US 3	A2			FORBI	DDEN	FORBI	DDEN
Receptacles, small, containing gas (toxic & flammable) without a release device, non-refillable	2037	2.3	2.1		AU 1 CA 7 IR 3 NL 1 US 3	A2			FORBI	DDEN	FORBI	DDEN
Receptacles, small, containing gas (toxic, oxidizing & corrosive) without a release device, non-refillable	2037	2.3	5.1 8		AU 1 CA 7 IR 3 NL 1 US 3	A2 A211			FORBI	DDEN	FORBI	DDEN
Receptacles, small, containing gas (toxic & oxidizing) without a release device, non-refillable	2037	2.3	5.1		AU 1 CA 7 IR 3 NL 1 US 3	A2			FORBI	DDEN	FORBI	DDEN
Receptacles, small, containing gas (toxic) without a release device, non-refillable	2037	2.3			AU 1 CA 7 IR 3 NL 1 US 3	A2			FORBI	DDEN	FORBI	DDEN

DGP-WG/19-WP/20 (Revised) (see paragraph 3.1.2.10 of the DGP-WG/19 report):

Fish meal, stabilized	2216	9		Miscellaneous	AU 1 IR 3 NL 3 US 3	A2 A219	III	E1	FORBI 956	DDEN 100 kg	FORBID 956	DEN 200 kg
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP386 (see ST/SG/AC.10/46/Add.1):

Dipropylamine	2383	3	8	Liquid flammable & Corrosive		A209	II	E2	352 Y340	1 L 0.5 L	363	5 L
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Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4		6	7	8	9	10	11	12	13

UN Model Regulations, Chapter 3.2, dangerous goods list, SP386 (see ST/SG/AC.10/46/Add.1):

2-Dimethylaminoethyl methacrylate, stabilized	2522	6.1		Toxic		A209	II	E4	654 Y641	5 L 1 L	662	60 L
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP394 (see ST/SG/AC.10/46/Add.1):

Nitrocellulose with water , not less than 25% water by mass	2555	4.1		Solid flammable	BE 3	A57 A217	II	E0	452	15 kg	453	50 kg
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP394 (see ST/SG/AC.10/46/Add.1):

Nitrocellulose with alcohol , not less than 25% alcohol, by mass, and not more than 12.6% nitrogen, by dry mass	2556	4.1		Solid flammable	BE 3	A57 A217	II	E0	452	1 kg	453	15 kg
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP394 (see ST/SG/AC.10/46/Add.1):

Nitrocellulose , with not more than 12.6% nitrogen, by dry mass, mixture without plasticizer, without pigment	2557	4.1		Solid flammable	BE 3	A57 A86 A217	II	E0	452	1 kg	453	15 kg
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP394 (see ST/SG/AC.10/46/Add.1):

Nitrocellulose , with not more than 12.6% nitrogen, by dry mass, mixture without plasticizer, with pigment	2557	4.1		Solid flammable	BE 3	A57 A86 A217	II	E0	452	1 kg	453	15 kg
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Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4		6	7	8	9	10	11	12	13

UN Model Regulations, Chapter 3.2, dangerous goods list, SP394 (see ST/SG/AC.10/46/Add.1):

Nitrocellulose , with not more than 12.6% nitrogen, by dry mass, mixture with plasticizer, without pigment	2557	4.1		Solid flammable	BE 3	A57 A86 <u>A217</u>	II	E0	452	1 kg	453	15 kg
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP394 (see ST/SG/AC.10/46/Add.1):

Nitrocellulose , with not more than 12.6% nitrogen, by dry mass, mixture with plasticizer, with pigment	2557	4.1		Solid flammable	BE 3	A57 A86 <u>A217</u>	II	E0	452	1 kg	453	15 kg
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP274 (see ST/SG/AC.10/46/Add.1):

Environmentally hazardous substance, solid, n.o.s.*	3077	9		Miscellaneous	DE 5 US 4	A97 A158 A179 A197 <u>A215</u>	III	E1	956 Y956	400 kg 30 kg G	956	400 kg
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP274 (see ST/SG/AC.10/46/Add.1):

Environmentally hazardous substance, liquid, n.o.s.*	3082	9		Miscellaneous	DE 5 US 4	A97 A158 A197 <u>A215</u>	III	E1	964 Y964	450 L 30 kg G	964	450 L
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UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/46/Add.1):

Biomedical waste, n.o.s.	3291	6.2		Infectious		A117	II	E0	<u>622621</u>	No limit	<u>622621</u>	No limit
Clinical waste, unspecified, n.o.s.	3291	6.2		Infectious		A117	II	E0	<u>622621</u>	No limit	<u>622621</u>	No limit

Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4		6	7	8	9	10	11	12	13

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

Medical waste, n.o.s.	3291	6.2		Infectious		A117	II	E0	622621	No limit	622621	No limit
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UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/46/Add.1):

Regulated medical waste, n.o.s.	3291	6.2		Infectious		A117	II	E0	622621	No limit	622621	No limit
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UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/46/Add.1):

<u>Dangerous goods in articles</u>	<u>3363</u>	<u>9</u>		<u>Miscellaneous</u>		<u>A48</u> <u>A107</u>		<u>E0</u>	<u>see 962</u>		<u>see 962</u>	
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP394 (see ST/SG/AC.10/46/Add.1):

Desensitized explosive, solid, n.o.s.*	3380	4.1			BE 3	A133 <u>A217</u>	I		FORBI	DDEN	FORBI	DDEN
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP356 (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.5.1 c) of the DGP-WG/19 report:

Engine, internal combustion, flammable gas powered	3529	2.1		Gas flammable		A70 A87 A208		E0	FORBI	DDEN	220	No limit
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Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4		6	7	8	9	10	11	12	13

UN Model Regulations, Chapter 3.2, dangerous goods list, SP356 (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.5.1 c) of the DGP-WG/19 report:

Machinery, internal combustion, flammable gas powered	3529	2.1		Gas flammable		A70 A87 A208		E0	FORBI	DDEN	220	No limit
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UN Model Regulations, Chapter 3.2, dangerous goods list, SP395 (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.5.1 a) of the DGP-WG/19 report:

<u>Medical waste, Category A, affecting humans, solid</u>	<u>3549</u>	<u>6.2</u>		<u>Infectious</u>		<u>A2</u> <u>A218</u>		<u>E0</u>	<u>FORBI</u>	<u>DDEN</u>	<u>FORBI</u>	<u>DDEN</u>
<u>Medical waste, Category A, affecting animals only, solid</u>	<u>3549</u>	<u>6.2</u>		<u>Infectious</u>		<u>A2</u> <u>A218</u>		<u>E0</u>	<u>FORBI</u>	<u>DDEN</u>	<u>FORBI</u>	<u>DDEN</u>

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Chapter 3

SPECIAL PROVISIONS

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Table 3-2. Special provisions

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A78 (≈172) Where a radioactive material has a subsidiary hazard(s):

- a) The substance must be allocated to Packing Group I, II or III, if appropriate, by application of the packing group criteria provided in Part 2 corresponding to the nature of the predominant subsidiary hazard.
- b) Packages must be labelled with subsidiary hazard labels corresponding to each subsidiary hazard exhibited by the material in accordance with the relevant provisions of 5;3.2; corresponding placards must be affixed to cargo transport units in accordance with the relevant provisions of 5;3.6.
- c) For the purposes of documentation and package marking, the proper shipping name must be supplemented with the name of the constituents which most predominantly contribute to this subsidiary hazard(s) and which must be enclosed in parenthesis. However, where the constituent is listed by name in Table 3-1 and:
 - i) “forbidden” is shown in columns 10 and 11, the dangerous goods transport document must indicate Cargo Aircraft Only and the package must bear cargo aircraft only labels, except that the substance may be shipped on a passenger aircraft with the prior approval of the appropriate authority of the State of Origin and the State of the Operator under the conditions established by those authorities. A copy of the document of approval, showing the quantity limitations and the packaging requirements, must accompany the consignment; and
 - ii) “forbidden” is shown in columns 12 and 13, the substance is forbidden for transport by air except that the substance may be shipped on a cargo aircraft with the prior approval of the appropriate authority of the State of Origin and the State of the Operator under the conditions established by those authorities. A copy of the document of approval, showing the quantity limitations and the packaging requirements, must accompany the consignment.

Radioactive material with a subsidiary hazard of Division 4.2 in Packing Group I must be transported in Type B packages. These may be transported on passenger or cargo aircraft.

UN Model Regulations, Chapter 3.3, SP 172 (d) (see ST/SG/AC.10/46/Add.1)

- d) The dangerous goods transport document must indicate the ~~subsidiary~~ class or division of the subsidiary hazard and, where assigned, the packing group as required by 5;4.1.4.1 d) and e).

For packing, see also 4;9.1.5.

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UN Model Regulations, Chapter 3.3, SP 301 (see ST/SG/AC.10/46/Add.1)

A107 (≈301) This entry only applies to articles such as machinery, ~~or apparatus or devices~~ containing dangerous goods as a residue or as an integral element of the ~~machinery or apparatus~~ articles. It must not be used for ~~machinery or apparatus~~ articles for which a proper shipping name already exists in Table 3-1.

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Where the quantity of dangerous goods contained as an integral element in ~~machinery or apparatus articles~~ exceeds the limits permitted by Packing Instruction 962, and the dangerous goods meet the provisions of Special Provision 301 of the UN Model Regulations, the ~~machinery or apparatus articles~~ may be transported only with the prior approval of the appropriate authority of the State of Origin and the State of the Operator under the written conditions established by those authorities.

*Note.— This special provision is assigned to UN 3363 — **Dangerous goods in articles, Dangerous goods in machinery and Dangerous goods in apparatus.** The same requirements of these Instructions apply to each of these articles.*

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UN Model Regulations, Chapter 3.3, SP 327 (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.5.1 d) of the DGP-WG/19 report.

A145 Waste aerosols, waste gas cartridges and waste receptacles, small, containing gas are forbidden from air transport. Waste gas cartridges and waste receptacles, small, containing gas that were filled with gases of Division 2.2 and have been pierced are not subject to these Instructions.

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UN Model Regulations, Chapter 3.3, SP 376 (see ST/SG/AC.10/46/Add.1), DGP-WG/18 (see paragraph 3.3.6.3 of the DGP-WG/18 report) and DGP-WG/19 (see paragraph 3.1.2.5 e) of the DGP-WG/19 report)

≠ **A154 376** ~~Lithium 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 or cells or batteries that cannot be diagnosed as damaged or defective prior to transport).~~

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 special provision, 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.

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TIs UN

UN Model Regulations, Chapter 3.3, SP 356 (d) (see ST/SG/AC.10/46/Add.1)

- A176 (356) Metal hydride storage systems installed in vehicles, vessels, machinery, engines or aircraft or in completed components or intended to be installed in vehicles, vessels, machinery, engines or aircraft must be approved by the appropriate national authority before acceptance for transport. The dangerous goods transport document must include an indication that the package was approved by the appropriate national authority or a copy of the appropriate national authority approval must accompany each consignment.

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UN Model Regulations, Chapter 3.3, SP 360 (see ST/SG/AC.10/46/Add.1)

- A185 (360) Vehicles only powered by lithium metal batteries or lithium ion batteries must be ~~consigned under~~ assigned to the entry UN 3171 **Battery-powered vehicle**.

Lithium batteries installed in cargo transport units, designed only to provide power external to the transport unit must be assigned to entry UN 3536 Lithium batteries installed in cargo transport unit.

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DGP-WG/19 (see paragraph 3.1.2.5.1 i) of the DGP-WG/19 report):

- A206 (384) The hazard label must conform to the model shown in Figure 5-26. ~~Figure 5-25 may continue to be used until 31 December 2018.~~

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DGP-WG/19-WP/22 (see paragraph 3.1.2.12 of the DGP-WG/19 report):

- A213 (387) Lithium batteries in conformity with 2.9.3 f) containing both primary lithium metal cells and rechargeable lithium ion cells must be assigned to UN Nos. 3090 or 3091 as appropriate. When such batteries are transported in accordance with Section IB or II of Packing Instruction 968, or in accordance with Section II of Packing Instruction 969 or 970, the total lithium content of all lithium metal cells contained in the battery must not exceed 1.5 g, and the total capacity of all lithium ion cells contained in the battery must not exceed 10 Wh.

- A214 (388) UN No. 3166 entries apply to vehicles powered by flammable liquid or flammable gas internal combustion engines or fuel cells.

Vehicles powered by a fuel cell engine must be assigned to UN 3166 **Vehicle, fuel cell, flammable gas powered** or UN 3166 **Vehicle, fuel cell, flammable liquid powered**, as appropriate. These entries include hybrid electric vehicles powered by both a fuel cell and an internal combustion engine with wet batteries, sodium batteries, lithium metal batteries or lithium ion batteries, transported with the battery(ies) installed.

Other vehicles which contain an internal combustion engine must be assigned to UN 3166 **Vehicle, flammable gas powered** or UN 3166 **Vehicle, flammable liquid powered**, as appropriate. These entries include hybrid electric vehicles powered by both an internal combustion engine and wet batteries, sodium batteries, lithium metal batteries or lithium ion batteries, transported with the battery(ies) installed.

If a vehicle is powered by a flammable liquid and a flammable gas internal combustion engine, it must be assigned to UN 3166 **Vehicle, flammable gas powered**.

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Entry UN 3171 only applies to vehicles powered by wet batteries, sodium batteries, lithium metal batteries or lithium ion batteries and equipment powered by wet batteries or sodium batteries transported with these batteries installed.

For the purpose of this special provision, vehicles are self-propelled apparatus designed to carry one or more persons or goods. Examples of such vehicles are cars, motorcycles, scooters, three- and four-wheeled vehicles or motorcycles, trucks, locomotives, bicycles (pedal cycles with a motor) and other vehicles of this type (e.g. self-balancing vehicles or vehicles not equipped with at least one seating position), wheelchairs, lawn tractors, self-propelled farming and construction equipment, boats and aircraft. This includes vehicles transported in a packaging. In this case some parts of the vehicle may be detached from its frame to fit into the packaging.

UN Model Regulations, Chapter 3.3, SP 388 (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.5.1 g) of the DGP-WG/19 report:

Examples of equipment are lawnmowers, cleaning machines or model boats and model aircraft. Equipment powered by lithium metal batteries or lithium ion batteries must be assigned to UN 3091 **Lithium metal batteries contained in equipment** or UN 3091 **Lithium metal batteries packed with equipment** or UN 3481 **Lithium ion batteries contained in equipment** or UN 3481 **Lithium ion batteries packed with equipment**, as appropriate. Lithium ion batteries or lithium metal batteries installed in a cargo transport unit and designed only to provide power external to the cargo transport unit must be assigned to the entry UN 3536 Lithium batteries installed in cargo transport unit.

UN Model Regulations, Chapter 3.3, SP 274 (see ST/SG/AC.10/46/Add.1)

- + A215 (≈274) For UN 3077 and UN 3082, the technical name may be a name shown in bold characters in column 1 of Table 3-1, provided that this name does not include "n.o.s." or an "**". The name which most appropriately describes the substance or mixture must be used, e.g.:

UN 3082, **Environmentally hazardous substance, liquid, n.o.s. (Paint)**
UN 3082, **Environmentally hazardous substance, liquid, n.o.s. (Perfumery products)**

UN Model Regulations, Chapter 3.3, SP 393 (see ST/SG/AC.10/46/Add.1)

- + A216 (393) The nitrocellulose must meet the criteria of the Bergmann-Junk test or methyl violet paper test in the *Manual of Tests and Criteria* Appendix 10. Tests of type 3 (c) need not be applied.

UN Model Regulations, Chapter 3.3, SP 394 (see ST/SG/AC.10/46/Add.1)

- + A217 (394) The nitrocellulose must meet the criteria of the Bergmann-Junk test or methyl violet paper test in the *Manual of Tests and Criteria* Appendix 10.

UN Model Regulations, Chapter 3.3, SP 395 (see ST/SG/AC.10/46/Add.1)

- + A218 (395) This entry must only be used for solid medical waste of Category A transported for disposal.

DGP-WG/19-WP/20 (Revised) (see paragraph 3.1.2.10 of the DGP-WG/19 report):

- + A219 308 Stabilization of fish meal must be achieved to prevent spontaneous combustion by effective application of ethoxyquin, BHT (butylated hydroxytoluene) or tocopherols (also used in a blend with rosemary extract) at the time of production. The said application must occur within twelve months prior to shipment. Fish meal must contain at least 50 ppm (mg/kg) of ethoxyquin, 100 ppm (mg/kg) of BHT or 250 ppm (mg/kg) of tocopherol-based antioxidant at the time of consignment.

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Part 4**PACKING INSTRUCTIONS**

...

Chapter 1**GENERAL PACKING REQUIREMENTS**

...

**1.1 GENERAL REQUIREMENTS APPLICABLE TO ALL CLASSES
EXCEPT CLASS 7**

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

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.

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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.

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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:

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- 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 — <u>Seamless, welded and composite</u> Cylinders for compressed and liquefied gases (excluding acetylene) — Inspection at time of filling |

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Packing Instruction 218

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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.

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 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 PP97 of the Model Regulations is not included since tubes are not permitted for transport of dangerous goods by air.

f) 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

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Chapter 5

CLASS 3 — FLAMMABLE LIQUIDS

...

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.

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Chapter 6

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

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DGP-WG/19-WP/4 (see paragraph 3.1.2.2 of the DGP-WG/19 report):

Packing Instruction 457

Passenger and cargo aircraft for UN 3241 only

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ADDITIONAL PACKING REQUIREMENTS FOR SINGLE PACKAGINGS

— Packagings must meet the Packing Group II performance requirements.

SINGLE PACKAGINGS

<i>Composites</i>	<i>Drums</i>	<i>Jerricans</i>
Plastic receptacle with outer wooden box (6HC)	Plastics (1H1, 1H2)	Plastics (3H1, 3H2)
Plastic receptacle with outer plywood drum (6HD1)		
Plastic receptacle with outer plywood box (6HD2)		
Plastic receptacle with outer fibre drum (6HG1)		
Plastic receptacle with outer fibreboard box (6HG2)		
Plastic receptacle with outer plastic drum (6HH1)		
<u>Plastic receptacle with outer solid plastic box (6HH2)</u>		

...

DGP-WG/19-WP/4 (see paragraph 3.1.2.2 the DGP-WG/19 report):

Packing Instructions 462 – 463

Passenger aircraft

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ADDITIONAL PACKING REQUIREMENTS FOR SINGLE PACKAGINGS

Packing Group III

— Packagings must meet the Packing Group II performance requirements.

SINGLE PACKAGINGS FOR PACKING GROUP III ONLY (PI 463)

<i>Composites</i>	<i>Cylinders</i>	<i>Drums</i>	<i>Jerricans</i>
All (see 6;3.1.18)	See 4;2.7	Aluminium (1B1, <u>1B2</u>) Other metal (1N1, <u>1N2</u>) Plastics (1H1, <u>1H2</u>) Steel (1A1, <u>1A2</u>)	Aluminium (3B1, <u>3B2</u>) Plastics (3H1, <u>3H2</u>) Steel (3A1, <u>3A2</u>)

...

DGP-WG/19-WP/4 (see paragraph 3.1.2.2 the DGP-WG/19 report):

Packing Instructions 464 – 465

Cargo aircraft only

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ADDITIONAL PACKING REQUIREMENTS FOR SINGLE PACKAGINGS

Packing Group III

— Packagings must meet the Packing Group II performance requirements.

SINGLE PACKAGINGS FOR PACKING GROUP III ONLY (PI 465)

<i>Composites</i>	<i>Cylinders</i>	<i>Drums</i>	<i>Jerricans</i>
All (see 6;3.1.18)	See 4;2.7	Aluminium (1B1, <u>1B2</u>) Other metal (1N1, <u>1N2</u>) Plastics (1H1, <u>1H2</u>) Steel (1A1, <u>1A2</u>)	Aluminium (3B1, <u>3B2</u>) Plastics (3H1, <u>3H2</u>) Steel (3A1, <u>3A2</u>)

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DGP-WG/19-WP/4 (see paragraph 3.1.2.2 the DGP-WG/19 report):

Packing Instructions 470 – 471

Cargo aircraft only

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ADDITIONAL PACKING REQUIREMENTS FOR SINGLE PACKAGINGS

Packing Group III

- Packagings must meet the Packing Group II performance requirements.
- Fibreboard fibre, wood and plywood single packagings must be fitted with a suitable liner.

SINGLE PACKAGINGS

<i>Boxes</i>	<i>Composites</i>	<i>Cylinders</i>	<i>Drums</i>	<i>Jerricans</i>
Aluminium (4B) Fibreboard (4G) Natural wood (4C2) Other metal (4N) Plastics (4H2) Plywood (4D) Reconstituted wood (4F) Steel (4A)	All (see 6;3.1.18)	See 4;2.7	Aluminium (1B1, 1B2) Other metal (1N1, 1N2) <u>Fibre (1G)</u> Plastics (1H1, 1H2) <u>Plywood (1D)</u> Steel (1A1, 1A2)	Aluminium (3B1, 3B2) Plastics (3H1, 3H2) Steel (3A1, 3A2)

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DGP-WG/19-WP/4 (see paragraph 3.1.2.2 the DGP-WG/19 report):

Packing Instructions 478 – 479

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ADDITIONAL PACKING REQUIREMENTS FOR SINGLE PACKAGINGS

Packing Group III

- Packagings must meet the Packing Group II performance requirements.

SINGLE PACKAGINGS FOR PACKING GROUP III (PI 479 only)

<i>Composites</i>	<i>Cylinders</i>	<i>Drums</i>	<i>Jerricans</i>
All (see 6;3.1.18)	See 4;2.7	Aluminium (1B1, <u>1B2</u>) Other metal (1N1, <u>1N2</u>) Plastics (1H1, <u>1H2</u>) Steel (1A1, <u>1A2</u>)	Aluminium (3B1, <u>3B2</u>) Plastics (3H1, <u>3H2</u>) Steel (3A1, <u>3A2</u>)

DGP-WG/19-WP/4 (see paragraph 3.1.2.2 the DGP-WG/19 report):

Packing Instructions 480 – 482			
Cargo aircraft only			
...			
SINGLE PACKAGINGS FOR PACKING GROUP III ONLY (PI 482)			
<i>Composites</i>	<i>Cylinders</i>	<i>Drums</i>	<i>Jerricans</i>
All (see 6;3.1.18)	See 4;2.7	Aluminium (1B1, <u>1B2</u>) Other metal (1N1, <u>1N2</u>) Plastics (1H1, <u>1H2</u>) Steel (1A1, <u>1A2</u>)	Aluminium (3B1, <u>3B2</u>) Plastics (3H1, <u>3H2</u>) Steel (3A1, <u>3A2</u>)

...

DGP-WG/19-WP/4 (see paragraph 3.1.2.2 the DGP-WG/19 report):

Packing Instructions 487 – 491				
...				
ADDITIONAL PACKING REQUIREMENTS FOR SINGLE PACKAGINGS				
— Fibreboard <u>fibre</u> , wood and plywood single packagings must be fitted with a suitable liner.				
<i>Packing Group III</i>				
— Packagings must meet the Packing Group II performance requirements				
...				
SINGLE PACKAGINGS FOR PACKING GROUPS II AND III ONLY				
<i>Boxes</i>	<i>Composites</i>	<i>Cylinders</i>	<i>Drums</i>	<i>Jerricans</i>
Aluminium (4B) Fibreboard (4G) Natural wood (4C2) Other metal (4N) Plastics (4H2) Plywood (4D) Reconstituted wood (4F) Steel (4A)	All (see 6;3.1.18)	See 4;2.7	Aluminium (1B1, 1B2) <u>Fibre (1G)</u> Other metal (1N1, 1N2) Plastics (1H1, 1H2) <u>Plywood (1D)</u> Steel (1A1, 1A2)	Aluminium (3B1, 3B2) Plastics (3H1, 3H2) Steel (3A1, 3A2)

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Chapter 7**CLASS 5 — OXIDIZING SUBSTANCES;
ORGANIC PEROXIDES**

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Packing Instructions 553 – 555

Cargo aircraft only

...

ADDITIONAL PACKING REQUIREMENTS FOR SINGLE PACKAGINGS*Packing Group III*

— Packagings must meet the Packing Group II performance requirements.

SINGLE PACKAGINGS FOR PACKING GROUP III (PI 555)

<i>Composites</i>	<i>Drums</i>	<i>Jerricans</i>
All (see 6;3.1.18)	Aluminium (1B1, <u>1B2</u>) Other metal (1N1, <u>1N2</u>) Plastics (1H1, <u>1H2</u>) Steel (1A1, <u>1A2</u>)	Aluminium (3B1, <u>3B2</u>) Plastics (3H1, <u>3H2</u>) Steel (3A1, <u>3A2</u>)

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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.

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Special packing provisions

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- 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

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

Drums

Aluminium (1B1, 1B2)
Fibre (1G)
Other metal (1N1, 1N2)
Plastics (1H1, 1H2)
Plywood (1D)
Steel (1A1, 1A2)

Jerricans

Aluminium (3B1, 3B2)
Plastics (3H1, 3H2)
Steel (3A1, 3A2)

...

DGP-WG/19-WP/14 (see paragraph 3.1.2.6.1 d) of the DGP-WG/19 report):

Packing Instruction ~~622~~621

4.

The general packing requirements of 4;1 except 1.1.20 must be met.

Consignments must be prepared in such a manner that they arrive at their destination in good condition and present no hazard to persons or animals during transport.

Consignments must be packed in steel drums (1A2), aluminium drums (1B2), other metal drums (1N2), plywood drums (1D), fibre drums (1G), plastic drums (1H2), steel jerricans (3A2), aluminium jerricans (3B2), plastic jerricans (3H2), steel boxes (4A), aluminium boxes (4B), wooden boxes (4C1, 4C2), plywood boxes (4D), reconstituted wood boxes (4F) or fibreboard boxes (4G), plastic boxes (4H1, 4H2), other metal boxes (4N). Packagings must meet Packing Group II requirements.

The packaging tests may be those appropriate for solids when there is sufficient absorbent material to absorb the entire amount of liquid present and the packaging is capable of retaining liquids.

In all other circumstances, the packaging tests must be those appropriate for liquids.

Packagings intended to contain sharp objects such as broken glass and needles must be resistant to puncture and retain liquids under the performance test conditions for the packaging.

Chapter 9**CLASS 7 — RADIOACTIVE MATERIAL**

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9.1 GENERAL

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 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.

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**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.

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.

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Chapter 11

CLASS 9 — MISCELLANEOUS DANGEROUS GOODS

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DGP-WG/19-WP/20 (Revised) (see paragraph 3.1.2.10 of the DGP-WG/19 report):

Packing Instruction 956

Passenger and cargo aircraft for UN 1841, UN 1931, UN 2216, UN 3432, UN 2969, UN 3077, UN 3152 and UN 3335 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.

<i>UN number and proper shipping name</i>	COMBINATION PACKAGINGS			SINGLE PACKAGINGS		
	<i>Inner packaging (see 6;3.2)</i>	<i>Inner packaging quantity (per receptacle)</i>	<i>Total quantity per package — passenger</i>	<i>Total quantity per package — cargo</i>	<i>Quantity — passenger</i>	<i>Quantity — cargo</i>
UN 1841 Acetaldehyde ammonia	Glass	10.0 kg	200 kg	200 kg	200 kg	200 kg
	Fibre	50.0 kg				
	Metal	50.0 kg				
	Paper bag	50.0 kg				
	Plastics	50.0 kg				
	Plastic bag	50.0 kg				
UN 1931 Zinc dithionite or Zinc hydrosulphite	Glass	10.0 kg	100 kg	200 kg	100 kg	200 kg
	Fibre	50.0 kg				
	Metal	50.0 kg				
	Paper bag	50.0 kg				
	Plastics	50.0 kg				
	Plastic bag	50.0 kg				
<u>UN 2216 Fish meal, stabilized</u>	<u>Glass</u>	<u>10.0 kg</u>	<u>100 kg</u>	<u>200 kg</u>	<u>100 kg</u>	<u>200 kg</u>
	<u>Fibre</u>	<u>50.0 kg</u>				
	<u>Metal</u>	<u>50.0 kg</u>				
	<u>Paper bag</u>	<u>50.0 kg</u>				
	<u>Plastics</u>	<u>50.0 kg</u>				
	<u>Plastic bag</u>	<u>50.0 kg</u>				

...

DGP-WG/19-WP/3 (Revised) (see paragraph 3.1.2.1 of the DGP-WG/19 report):

Packing Instruction 957

Passenger and cargo aircraft for UN 2211 and UN 3314 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.

COMBINATION PACKAGINGS					
<i>UN number and proper shipping name</i>	<i>Inner packaging (see 6:3.2)</i>	<i>Inner packaging quantity (per receptacle)</i>	<i>Quantity — passenger</i>	<i>Quantity — cargo</i>	SINGLE PACKAGINGS
UN 2211 Polymeric beads, expandable , evolving flammable vapour	<u>Glass</u>	<u>10 kg</u>	100 kg	200 kg	Yes
UN 3314 Plastics moulding compound in dough, sheet or extruded rope form evolving flammable vapour	<u>Fibre</u>	<u>50 kg</u>			
	<u>Metal</u>	<u>50 kg</u>			
	<u>Paper bag</u>	<u>50 kg</u>			
	<u>Plastics</u>	<u>50 kg</u>			
	<u>Plastic bag</u>	<u>50 kg</u>			

OUTER PACKAGINGS OF COMBINATION PACKAGINGS (see 6:3.1)

Boxes

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

Drums

Aluminium (1B1, 1B2)
Fibre (1G)
Other metal (1N1, 1N2)
Plastics (1H1, 1H2)
Plywood (1D)
Steel (1A1, 1A2)

Jerricans

Aluminium (3B1, 3B2)
Plastics (3H1, 3H2)
Steel (3A1, 3A2)

ADDITIONAL PACKING REQUIREMENTS FOR SINGLE PACKAGINGS

For other than metal and plastics packagings, a sealed plastic liner must be used.

SINGLE PACKAGINGS

Boxes

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

Drums

Aluminium (1B1, 1B2)
 Fibre (1G)
Other metal (1N1, 1N2)
Plastics (1H1, 1H2)
 Plywood (1D)
 Steel (1A1, 1A2)

Jerricans

Aluminium (3B1, 3B2)
Plastics (3H1, 3H2)
Steel (3A1, 3A2)

...

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)

<i>UN number and proper shipping name</i>	<i>State</i>	<i>Total net quantity of dangerous goods in one package (excluding magnetic material)</i>
UN 3363 Dangerous goods in apparatus or Dangerous goods in machinery or <u>Dangerous goods in articles</u>	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.

...

DGP-WG/19-WP/21 (see paragraph 3.1.2.11 of the DGP-WG/19 report):

Packing Instruction 964

Passenger and cargo aircraft for UN 1941, UN 1990, UN 2315, UN 3151, UN 3082 and UN 3334 only

General requirements

~~Except for UN 3082 when the requirements of 4.1.1.6 do not apply, Part 4, Chapter 1 requirements must be met, including~~ (with the exception that for UN 3082 the requirements of 4.1.1.6 do not apply). These requirements include:

...

DGP-WG/19-WP/21 (see paragraph 3.1.2.11 of the DGP-WG/19 report):

Packing Instruction Y964

Limited quantities

Passenger and cargo aircraft for UN 1941, UN 1990, UN 3082 and UN 3334 only

General requirements

~~Except for UN 3082 when the requirements of 4.1.1.6 do not apply, Part 4, Chapter 1 requirements must be met~~ (with the exception that the requirements of 4.1.1.2, 1.1.9 c), 1.1.9 e), 1.1.16, 1.1.18, and 1.1.20 and in addition for UN 3082 the requirements of 4.1.1.6 do not apply), including These requirements include:

...

...

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:

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) and DGP-WG/19-WP/14 (see paragraph 3.1.2.6.1 f) of the DGP-WG/19 report:

~~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).~~ **Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.**

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:

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) and DGP-WG/19-WP/14 (see paragraph 3.1.2.6.1 f) of the DGP-WG/19 report:

~~[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). Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.]~~

...

...

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:

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) and DGP-WG/19-WP/14 (see paragraph 3.1.2.6.1 f) of the DGP-WG/19 report:

- [~~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).~~ Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for 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:

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) and DGP-WG/19-WP/14 (see paragraph 3.1.2.6.1 f) of the DGP-WG/19 report:

~~[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). Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.]~~

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:

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) and DGP-WG/19-WP/14 (see paragraph 3.1.2.6.1 f) of the DGP-WG/19 report:

~~[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):~~
Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.]

...

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:

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) and DGP-WG/19-WP/14 (see paragraph 3.1.2.6.1 f) of the DGP-WG/19 report:

~~[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).~~ **Cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport.**

...

Part 5

SHIPPER'S RESPONSIBILITIES

...

Chapter 1

GENERAL

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1.2 GENERAL PROVISIONS FOR CLASS 7

1.2.1 Approval of shipments and notification

1.2.1.1 General

In addition to the approval of package designs described in Part 6, Chapter 4, multilateral shipment approval is also required in certain circumstances (1.2.1.2 and 1.2.1.3). In some circumstances it is also necessary to notify competent authorities of a shipment (1.2.1.4).

UN Model Regulations, 5.1.5.1.2 (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.7.1 a) of the DGP-WG/19 report:

1.2.1.2 Shipment approvals

Multilateral approval must be required for:

- a) The shipment of Type B(M) packages not conforming with the requirements of 6;7.6.5;
- b) The shipment of Type B(M) packages containing radioactive material with an activity greater than 3000 A₁ or 3000 A₂, as appropriate, or 1000 TBq, whichever is the lower; **and**
- c) The shipment of packages containing fissile materials if the sum of the criticality safety indexes of the packages in a single freight container or in an aircraft exceeds 50; ~~and~~

except that a competent authority may authorize transport into or through its country without shipment approval, by a specific provision in its design approval (see 1.2.2.1).

...

1.2.1.4 Notifications

Notification to competent authorities is required as follows:

- a) Before the first shipment of any package requiring competent authority approval, the shipper must ensure that copies of each applicable competent authority certificate applying to that package design have been submitted to the competent authority of the country of origin of the shipment and to the competent authority of each country through or into which the consignment is to be transported. The shipper is not required to await an acknowledgement from the competent authority, nor is the competent authority required to make such acknowledgement of receipt of the certificate;
- b) For each of the following types of shipments:
 - i) Type C packages containing radioactive material with an activity greater than 3000 A₁ or 3000 A₂, as appropriate, or 1000 TBq, whichever is the lower;
 - ii) Type B(U) packages containing radioactive material with an activity greater than 3000 A₁ or 3000 A₂, as appropriate, or 1000 TBq, whichever is the lower;
 - iii) Type B(M) packages;
 - iv) Shipment under special arrangement;

 UN Model Regulations, 5.1.5.1.4 (b) (see ST/SG/AC.10/46/Add.1)

the shipper must notify the competent authority of the country of origin of the shipment and the competent authority of each country through or into which the consignment is to be transported. This notification must be ~~in the hands in~~ the possession of each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance;

...

1.2.3 Determination of transport index (TI) and criticality safety index (CSI)

1.2.3.1 Determination of transport index

1.2.3.1.1 The transport index (TI) for a package, overpack or freight container, must be the number derived in accordance with the following procedure:

 UN Model Regulations, 5.1.5.3.1 (see ST/SG/AC.10/46/Add.1)

- a) Determine the maximum ~~radiation level~~ dose rate in units of millisieverts per hour (mSv/h) at a distance of 1 m from the external surfaces of the package, overpack, or freight container. The value determined must be multiplied by 100 and the resulting number is the transport index. For uranium and thorium ores and their concentrates, the maximum ~~radiation level~~ dose rate at any point 1 m from the external surface of the load may be taken as:
- 0.4 mSv/h for ores and physical concentrates of uranium and thorium;
 - 0.3 mSv/h for chemical concentrates of thorium;
 - 0.02 mSv/h for chemical concentrates of uranium, other than uranium hexafluoride;
- b) For freight containers, the value determined in step a) above must be multiplied by the appropriate factor from Table 5-1;

 UN Model Regulations, 5.1.5.3.1 (see ST/SG/AC.10/46/Add.1)

- c) The value obtained in steps a) and b) above must be rounded up to the first decimal place (e.g. 1.13 becomes 1.2), except that a value of 0.05 or less may be considered as zero and the resulting number is the transport index value.

Note.— If the measured dose rate comprises more than one type of radiation, then the transport index should be based on the sum of all the dose rates from each type of radiation (see paragraph 523.1 of the IAEA Specific Safety Guide No. SSG-26 (2012 Edition)).

 UN Model Regulations, 5.1.5.3.2 (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.7.1 b) of the DGP-WG/19 report:

~~1.2.3.1.2 The transport index for each rigid overpack or freight container must be determined as either the sum of the transport indices of all the packages contained therein, or by direct measurement of radiation level, except in the case of non-rigid overpacks for which the transport index must be determined only as the sum of the transport indices of all the packages. For a shipment from a single shipper, the shipper may determine the transport index by direct measurement of dose rate. The transport index for a non-rigid overpack must be determined only as the sum of the transport indices of all the packages within the overpack.~~

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Chapter 2

MARKING

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2.4 MARKING SPECIFICATIONS AND REQUIREMENTS

2.4.1 Marking with proper shipping name and UN or ID number

DGP-WG/18-WP/11 (see paragraph 3.1.2.2 of the DGP-WG/18 Report) and UN Model Regulations, 5.2.1.1 (see ST/SG/AC.10/46/Add.1):

2.4.1.1 Unless otherwise provided in these Instructions, the proper shipping name of the dangerous goods (supplemented with the technical name(s) if appropriate, see Part 3, Chapter 1) and, when assigned, the corresponding UN or ID number preceded by the letters "UN" or "ID", as appropriate, must be displayed on each package. The UN or ID number and the letters "UN" or "ID" must be at least 12 mm high, except for packagings of 30-litre L capacity or less or of 30 kg maximum net mass and for cylinders of 60-litre L water capacity or less, when they must be at least 6 mm in height and except for packagings of 5-litre L capacity or less or of 5 kg maximum net mass or less when they must be of an appropriate size. In the case of unpackaged articles, the mark must be displayed on the article, on its cradle or on its handling, storage or launching device. A typical package mark would be:

"Corrosive liquid, acidic, organic, n.o.s. (caprylyl chloride) UN 3265".

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2.4.5 Special marking requirements for radioactive material

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UN Model Regulations, 5.2.1.5.6 (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.7.1 c) of the DGP-WG/19 report:

2.4.5.5 Each package which conforms to a Type B(U), Type B(M) or Type C package design must have the outside of the outermost receptacle which is resistant to the effects of fire and water plainly marked by embossing, stamping or other means resistant to the effects of fire and water with the trefoil symbol, as shown in Figure 5-1 below. Any mark on the package made in accordance with the requirements of 2.4.5.3 a) and b) and 2.4.5.4 c) relating to the package type that does not relate to the UN number and proper shipping name assigned to the consignment must be removed or covered.

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2.4.16 Special marking requirements for lithium batteries

2.4.16.1 Packages containing lithium cells or batteries prepared in accordance with Section II of Packing Instructions 965 to 970 and Section IB of Packing Instructions 965 and 968 must be marked as shown in Figure 5-3.

2.4.16.2 The mark must indicate:

- a) the appropriate UN number preceded by the letters "UN" as follows:
 - 1) "UN 3090" for lithium metal cells or batteries;
 - 2) "UN 3480" for lithium ion cells or batteries;
 - 3) "UN 3091" for lithium metal cells or batteries contained in, or packed with, equipment; or
 - 4) "UN 3481" for lithium ion cells or batteries contained in, or packed with, equipment.

Where a package contains lithium cells or batteries assigned to different UN numbers, all applicable UN numbers must be indicated on one or more marks.

- b) a telephone number for additional information.

UN Model Regulations, 5.2.1.9.2(see ST/SG/AC.10/46/Add.1):

2.4.16.3 The mark must be in the form of a rectangle or a square with hatched edging. The symbol (group of batteries, one damaged and emitting flame, above the UN number for lithium ion or lithium metal batteries or cells) must be black on white or suitable contrasting background. The hatching must be red. The mark must be a minimum dimension of ~~420~~ 100 mm wide x ~~110~~ 100 mm high and the minimum width of the hatching must be 5 mm. If the size of the package so requires, the dimensions ~~line thickness~~ may be reduced to not less than ~~405~~ 100 mm wide x ~~74~~ 70 mm high. Where dimensions are not specified, all features must be in approximate proportion to those shown on the full-size mark (Figure 5-3).

2.4.16.4 Packages containing lithium batteries that meet the requirements of Section IB of Packing Instructions 965 or 968 must bear both the lithium battery mark (Figure 5-3) and the lithium battery Class 9 hazard label (Figure 5-26).

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UN Model Regulations, Figure 5.2.5 (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.7.1 d) of the DGP-WG/19 report:

Replace Figure 5-3 with the following:

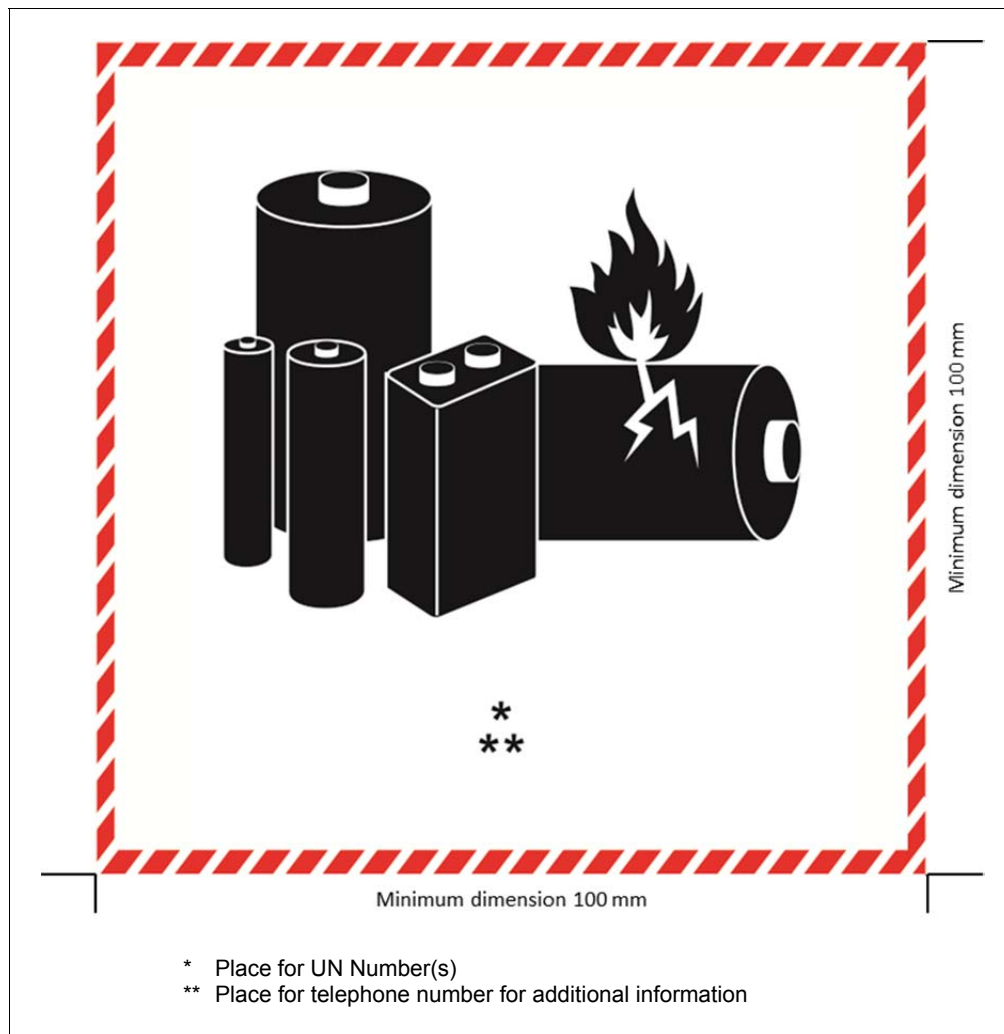


Figure 5-3. Lithium battery mark

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Chapter 3

LABELLING

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3.5 LABEL SPECIFICATIONS

3.5.1 Class hazard label specifications

3.5 LABEL SPECIFICATIONS

3.5.1 Class hazard label specifications

3.5.1.1 Labels must satisfy the provisions of this section and conform, in terms of colour, symbols and general format, to the specimen labels shown in Figures 5-4 to 5-26.

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Labelling of radioactive material

- h) Each label conforming to the applicable Figure 5-20, 5-21 or 5-22 must be completed with the following information:
 - 1) Contents:
 - A) except for LSA-I material, the name(s) of the radionuclide(s) as taken from Table 2-12, using the symbols prescribed therein. For mixtures of radionuclides, the most restrictive nuclides must be listed to the extent the space on the line permits. The group of LSA or SCO must be shown following the name(s) of the radionuclide(s). The terms "LSA-II", "LSA-III", "SCO-I" and "SCO-II" must be used for this purpose;
 - B) for LSA-I material, the term "LSA-I" is all that is necessary; the name of the radionuclide is not necessary;
 - 2) Activity: The maximum activity of the radioactive contents during transport expressed in units of becquerels (Bq) with the appropriate SI prefix symbol. For fissile material, the total mass of fissile nuclides in units of grams (g), or multiples thereof, may be used in place of activity;
 - 3) For overpacks and freight containers the "contents" and "activity" entries on the label must bear the information required in 3.5.1.1 h) 1) A) and B), respectively, totalled together for the entire contents of the overpack or freight container except that on labels for overpacks or freight containers containing mixed loads of packages containing different radionuclides, such entries may read "See Transport Documents";

UN Model Regulations, 5.2.2.1.12.2 d) (see ST/SG/AC.10/46/Add.1):

- 4) Transport index: The number determined in accordance with 1.2.3.1.1 and 1.2.3.1.2. (~~No transport index entry is required~~ **except** for category I-WHITE.)
- i) Each label conforming to Figure 5-23 must be completed with the criticality safety index (CSI) as stated in the certificate of approval applicable in the States through or into which the consignment is transported and issued by the competent authority.
- j) For overpacks and freight containers, the label conforming to Figure 5-23 must bear the sum of the criticality safety indexes of all the packages contained therein.
- k) In all cases of international transport of packages requiring competent authority approval of design or shipment, for which different approval types apply in the different countries concerned by the shipment, the labelling must be in accordance with the certificate of the country of origin of design.

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Chapter 4

DOCUMENTATION

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For French language version: please check alignment with the English of the Technical Instructions. The need for an amendment to the UN Model Regulations was identified, but this likely does not affect the French edition of the Technical Instructions because the text in the Technical Instructions is slightly different. Please verify alignment with English Technical Instructions. The amendment to the UN Model Regulations is:

5.4.1.5.1 Modifier la première phrase pour lire comme suit :
« Sauf pour les emballages vides non nettoyés, la quantité totale de marchandises dangereuses à laquelle s'applique la description (volume ou masse, selon le cas) doit être indiquée pour chaque marchandise dangereuse ayant une désignation officielle de transport, un numéro ONU, ou un groupe d'emballage différent. »

UN Model Regulations, 5.4.1.5.1 (see ST/SG/AC.10/46/Add.1):

4.1.5 Information required in addition to the dangerous goods description

In addition to the dangerous goods description the following information must be included after the dangerous goods description on the dangerous goods transport document.

4.1.5.1 Quantity of dangerous goods, number and type of packagings

The number of packages, type of packaging (e.g. steel drum, fibreboard box, etc.) and net quantity of dangerous goods in each package (by volume or mass, as appropriate) must be indicated for each item of dangerous goods bearing a different proper shipping name, UN number or packing group. Abbreviations may be used to specify the unit of measurement for the quantity.

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UN Model Regulations, 5.4.1.5.7.1 (see ST/SG/AC.10/46/Add.1):

4.1.5.7 Radioactive material

4.1.5.7.1 The following information must be included for each consignment of Class 7 material, as applicable, in the order given:

- a) The name or symbol of each radionuclide or, for mixtures of radionuclides, an appropriate general description or a list of the most restrictive nuclides;
- b) A description of the physical and chemical form of the material, or a notation that the material is special form radioactive material or low dispersible radioactive material. A generic chemical description is acceptable for chemical form;

Note.— For empty Type B(U) or Type B(M) packages as specified in the Note to 2;7.2.4.1.1.7, the name or symbol of the radionuclide of the shielding material followed by the physical and chemical form must be included (e.g. U-dep., solid, metal oxide) in which case the indicated radionuclide may differ from the radionuclide(s) authorized in the package design certificate.

- c) The maximum activity of the radioactive contents during transport expressed in units of becquerels (Bq) with an appropriate SI prefix symbol (see 1;3.2). For fissile material, the mass of fissile material (or mass of each fissile nuclide for mixtures when appropriate) in units of grams (g), or appropriate multiples thereof, may be used in place of activity;
- d) The category of the package, overpack or freight container, as assigned per 1.2.3.1.4, i.e. I-WHITE, II-YELLOW, III-YELLOW;

- e) The transport index as determined per 1.2.3.1.1 and 1.2.3.1.2 (~~categories II-YELLOW and III-YELLOW only~~ except for category I-WHITE);

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Part 6

PACKAGING NOMENCLATURE, MARKING, REQUIREMENTS AND TESTS

Chapter 2

MARKING OF PACKAGINGS OTHER THAN INNER PACKAGINGS

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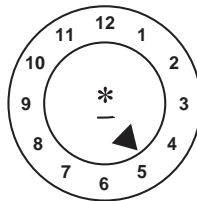
2.1 MARKING REQUIREMENTS FOR PACKAGINGS OTHER THAN INNER PACKAGINGS

DGP-WG/18-WP/11 (see paragraph 3.1.2.2 of the DGP-WG/18 report) and UN Model Regulations, 6.1.3.1 (see ST/SG/AC.10/46/Add.1):

2.1.1 Each packaging intended for use according to these Instructions must bear marks which are durable, legible and placed in a location and of such a size relative to the packaging as to be readily visible. For packages with a gross mass of more than 30 kg the marks, or a duplicate thereof, must appear on the top or on a side of the packaging. Letters, numerals and symbols must be at least 12 mm high, except for packagings of 30 L capacity or less or of 30 kg ~~capacity or less~~ maximum net mass, when they must be at least 6 mm in height and except for packagings of 5 L capacity or less or of 5 kg maximum net mass ~~or less~~ when they must be of an appropriate size. The marks must show:

...

- e) the last two digits of the year during which the packaging was manufactured. Packagings of types 1H1, 1H2, 3H1 and 3H2 must also be appropriately marked with the month of manufacture; this may be marked on the packaging in a different place from the remainder of the mark. An appropriate method is:



UN Model Regulations, 6.1.3.1 e) (see ST/SG/AC.10/46/Add.1):

- * The last two digits of the year of manufacture may be displayed at that place. In such a case and when the clock is placed adjacent to the UN design type mark, the two digits indication of the year in the type approval mark and in the inner circle of the clock mark may be waived. However, when the clock is not placed adjacent to the UN design type mark, the two digits of the year in the mark and in the clock must be identical.

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Note.— Other methods that provide the minimum required information in a durable, visible and legible form are also acceptable.

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UN Model Regulations, 6.1.3.13 (see ST/SG/AC.10/46/Add.1):

2.1.15 Where a packaging conforms to more than one tested packaging design type, the packaging may bear more than one mark to indicate the relevant performance test requirements that have been met. The marks must appear in close proximity to one another and each mark must appear in its entirety.

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Chapter 3

REQUIREMENTS FOR PACKAGINGS

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3.1.2 Aluminium drums

1B1 non-removable head
1B2 removable head

3.1.2.1 Body and heads must be constructed of aluminium at least 99 per cent pure or of an aluminium base alloy. Materials must be of a suitable type and of adequate thickness in relation to the capacity of the drum and to its intended use.

3.1.2.2 All seams must be welded. Chime seams, if any, must be reinforced by the application of separate reinforcing rings.

3.1.2.3 The body of a drum of a capacity greater than 60 L must, in general, have at least two expanded rolling hoops or, alternatively, at least two separate rolling hoops. If there are separate rolling hoops they must be fitted tightly on the body and so secured that they cannot shift. Rolling hoops must not be spot welded.

3.1.2.4 Openings for filling, emptying and venting in the bodies or heads on non-removable head (1B1) drums must not exceed 7 cm in diameter. Drums with larger openings are considered to be of the removable head type (1B2). Closures for openings in the bodies and heads of drums must be so designed and applied that they will remain secure and leakproof under normal conditions of transport. Closure flanges must be welded in place so that the weld provides a leakproof seam. Gaskets or other sealing elements must be used with closures, unless the closure is inherently leakproof.

3.1.2.5 Closure devices for removable head drums must be so designed and applied that they will remain secure and drums will remain leakproof under normal conditions of transport. Gaskets or other sealing elements must be used with all removable heads.

UN Model Regulations, 6.1.4.2.6 (see ST/SG/AC.10/46/Add.1):

3.1.2.6 If materials used for body, heads, closures and fittings are not in themselves compatible with the contents to be transported, suitable internal protective coatings or treatments must be applied. These coatings or treatments must retain their protective properties under normal conditions of transport.

~~3.1.2.6~~ 3.1.2.7 Maximum capacity of drum: 450 L.

~~3.1.2.7~~ 3.1.2.9 Maximum net mass: 400 kg.

3.1.3 Drums of metal other than aluminium or steel

1N1 non-removable head
1N2 removable head

3.1.3.1 The body and heads must be constructed of a metal or of a metal alloy other than steel or aluminium. Material must be of a suitable type and of adequate thickness in relation to the capacity of the drum and to its intended use.

3.1.3.2 Chime seams, if any, must be reinforced by the application of separate reinforcing rings. All seams, if any, must be joined (welded, soldered, etc.) in accordance with the technical state-of-the-art for the metal or metal alloy used.

3.1.3.3 The body of a drum of a capacity greater than 60 L must, in general, have at least two expanded rolling hoops or, alternatively, at least two separate rolling hoops. If there are separate rolling hoops, they must be fitted tightly on the body and so secured that they cannot shift. Rolling hoops must not be spot welded.

3.1.3.4 Openings for filling, emptying and venting in the bodies or heads or non-removable head (1N1) drums must not exceed 7 cm in diameter. Drums with larger openings are considered to be of the removable head type (1N2). Closures for openings in the bodies and heads of drums must be so designed and applied that they will remain secure and leakproof under normal conditions of transport. Closure flanges must be joined in place (welded, soldered, etc.) in accordance with the

technical state of the art for the metal or metal alloy used so that the seam join is leakproof. Gaskets or other sealing elements must be used with closures, unless the closure is inherently leakproof.

3.1.3.5 Closure devices for removable head drums must be so designed and applied that they will remain secure and drums will remain leakproof under normal conditions of transport. Gaskets or other sealing elements must be used with all removable heads.

UN Model Regulations, 6.1.4.3.6 (see ST/SG/AC.10/46/Add.1):

3.1.3.6 If materials used for body, heads, closures and fittings are not in themselves compatible with the contents to be transported, suitable internal protective coatings or treatments must be applied. These coatings or treatments must retain their protective properties under normal conditions of transport.

~~3.1.3.6~~ 3.1.3.7 Maximum capacity of drum: 450 L.

~~3.1.3.7~~ 3.1.3.8 Maximum net mass: 400 kg.

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Chapter 5

REQUIREMENTS FOR THE CONSTRUCTION AND TESTING OF CYLINDERS AND CLOSED CRYOGENIC RECEPTACLES, AEROSOL DISPENSERS AND SMALL RECEPTACLES CONTAINING GAS (GAS CARTRIDGES) AND FUEL CELL CARTRIDGES CONTAINING LIQUEFIED FLAMMABLE GAS

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5.2.1 Design, construction and initial inspection and testing

5.2.1.1 The following standards apply for the design, construction and initial inspection and test of UN cylinders, except that inspection requirements related to the conformity assessment system and approval must be in accordance with 5.2.5:

<i>Reference</i>	<i>Title</i>	<i>Applicable for manufacture</i>
ISO 11119-2:2012 + Amd 1:2014	Gas cylinders — Refillable composite gas cylinders and tubes — Design, construction and testing — Part 2: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 L with load-sharing metal liners	Until further notice
UN Model Regulations, 6.2.2.1.1 (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.8.1 c) of the DGP-WG/19 report:		
ISO 11119-3:2002	Gas cylinders of composite construction — Specification and test methods — Part 3: Fully wrapped fibre reinforced composite gas cylinders with non-load-sharing metallic or non-metallic liners. <u>Note.— This standard must not be used for linerless cylinders manufactured from two parts joined together.</u>	Until 31 December 2020
ISO 11119-3:2013	Gas cylinders — Refillable composite gas cylinders and tubes — Design, construction and testing — Part 3: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 L with non-load-sharing metallic or non-metallic liners <u>Note.— This standard must not be used for linerless cylinders manufactured from two parts joined together.</u>	Until further notice
<u>ISO 11119-4: 2016</u>	<u>Gas cylinders — Refillable composite gas cylinders — Design, construction and testing — Part 4: Fully wrapped fibre reinforced composite gas cylinders up to 150 l with load-sharing welded metallic liners.</u>	<u>Until further notice</u>

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5.2.1.3 The following standards apply for the design, construction and initial inspection and test of UN acetylene cylinders except that inspection requirements related to the conformity assessment system and approval must be in accordance with 5.2.5.

Note.— The maximum of 1 000 L volume as mentioned in the ISO standard ISO 21029-1:2004 Cryogenic vessels, does not apply for refrigerated liquefied gases in closed cryogenic receptacles installed in apparatus (e.g. MRI or cooling machines).

For the cylinder shell:

<i>Reference</i>	<i>Title</i>	<i>Applicable for manufacture</i>
ISO 9809-1:1999	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 1: Quenched and tempered steel cylinders with tensile strength less than 1 100 MPa. <i>Note.— The note concerning the F factor in section 7.3 of this standard must not be applied for UN cylinders.</i>	Until 31 December 2018
ISO 9809-1:2010	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 1: Quenched and tempered steel cylinders with tensile strength less than 1 100 MPa.	Until further notice
ISO 9809-3:2000	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 3: Normalized steel cylinders.	Until 31 December 2018
ISO 9809-3:2010	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 3: Normalized steel cylinders.	Until further notice
UN Model Regulations, 6.2.2.1.3 (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.8.1 c) of the DGP-WG/19 report:		
ISO 4706:2008	Gas cylinders — Refillable welded steel cylinders — Test pressure 60 bar and below	Until further notice
ISO 7866:2012 + Cor 1:2014	Gas cylinders — Refillable seamless aluminum alloy gas cylinders — Design, construction and testing <i>Note.— Aluminum alloy 6351A or equivalent must not be used</i>	Until further notice

For the [acetylene cylinder including the](#) porous mass in the cylinder:

<i>Reference</i>	<i>Title</i>	<i>Applicable for manufacture</i>
ISO 3807-1:2000	Cylinders for acetylene — Basic requirements — Part 1: Cylinders without fusible plugs.	Until 31 December 2020
ISO 3807-2:2000	Cylinders for acetylene — Basic requirements — Part 2: Cylinders with fusible plugs.	Until 31 December 2020
ISO 3807:2013	Gas cylinders — Acetylene cylinders — Basic requirements and type testing	Until further notice

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5.2.2 Materials

In addition to the material requirements specified in the cylinder and closed cryogenic receptacle design and construction standards, and any restrictions specified in the applicable Packing Instruction for the gas(es) to be transported (e.g. Packing Instruction 200, Packing Instruction 202 or Packing Instruction 214), the following standards apply to material compatibility:

Reference	Title	Applicable for manufacture
UN Model Regulations, 6.2.2.2 (see ST/SG/AC.10/46/Add.1):		
ISO 11114-1:2012 <u>ISO 11114-1:2012 + A1:2017</u>	Gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 1: Metallic materials.	Until further notice
ISO 11114-2:2013	Gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 2: Non-metallic materials.	Until further notice

5.2.3 Service equipment

The following standards apply to closures and their protection:

Reference	Title	Applicable for manufacture
ISO 11117:1998	Gas cylinders — Valve protection caps and valve guards for industrial and medical gas cylinders — Design, construction and tests.	Until 31 December 2014
ISO 11117:2008+ Cor 1:2009	Gas cylinders — Valve protection caps and valve guards — Design, construction and tests.	Until further notice
ISO 10297:1999	Gas cylinders — Refillable gas cylinder valves — Specification and type testing.	Until 31 December 2008
ISO 10297:2006	Gas cylinders — Refillable gas cylinder valves — Specification and type testing.	Until 31 December 2020
ISO 10297:2014	Gas cylinders — Cylinder valves — Specification and type testing	Until further notice <u>Until 31 December 2022</u>
<u>ISO 10297:2014 + A1:2017</u>	<u>Gas cylinders — Cylinder valves — Specification and type testing.</u>	<u>Until further notice</u>
UN Model Regulations, 6.2.2.3 (see ST/SG/AC.10/46/Add.1):		
≠ ISO 13340:2001	Transportable gas cylinders — Cylinder valves for non-refillable cylinders — Specification and prototype testing.	Until 31 December 2020
+ ISO 14246:2014	Gas cylinders — Cylinder valves — Manufacturing tests and examination	Until further notice <u>Until 31 December 2024</u>
<u>ISO 14246:2014 + A1:2017</u>	<u>Gas cylinders — Cylinder valves — Manufacturing tests and examinations</u>	<u>Until further notice</u>
+ ISO 17871:2015	Gas cylinders — Quick-release cylinders valves — Specification and type testing	Until further notice
<u>ISO 17879:2017</u>	<u>Gas cylinders — Self-closing cylinder valves — Specification and type testing</u> <u>Note.— This standard must not be applied to self-closing valves in acetylene cylinders.</u>	<u>Until further notice</u>

For UN metal hydride storage systems, the requirements specified in the following standard apply to closures and their protection:

Reference	Title	Applicable for manufacture
ISO 16111:2008	Transportable gas storage devices — Hydrogen absorbed in reversible metal hydride	Until further notice

5.2.4 Periodic inspection and test

≠ 5.2.4.1 The following standards apply to the periodic inspection and testing of UN cylinders and their closures:

Reference	Title	Applicable for manufacture
ISO 6406:2005	Seamless steel gas cylinders — Periodic inspection and testing.	Until further notice
ISO 10460:2005	Gas cylinders – Welded carbon-steel gas cylinders – Periodic inspection and testing. <i>Note.— The repair of welds described in clause 12.1 of this standard must not be permitted. Repairs described in clause 12.2 require the approval of the appropriate national authority which approved the periodic inspection and test body in accordance with 5.2.6.</i>	Until further notice
ISO 10461:2005/A1:2006	Seamless aluminium-alloy gas cylinders — Periodic inspection and testing.	Until further notice
UN Model Regulations, 6.2.2.4 (see ST/SG/AC.10/46/Add.1):		
ISO 10462:2005	Transportable cylinders for dissolved acetylene — Periodic inspection and maintenance.	Until 31 December 2018
ISO 10462:2013	Gas cylinders — Acetylene cylinders — Periodic inspection and maintenance.	Until further notice
ISO 11513:2011	Gas cylinders — Refillable welded steel cylinders containing materials for sub-atmospheric gas packaging (excluding acetylene) — Design, construction, testing, use and periodic inspection.	Until further notice
≠ ISO 11623:2002	Transportable gas cylinders — Periodic inspection and testing of composite gas cylinders.	Until 31 December 2020
+ ISO 11623:2015	Gas cylinders — Composite construction — Periodic inspection and testing	Until further notice
+ ISO 22434:2006	Transportable gas cylinders — Inspection and maintenance of cylinder valves <i>Note.— These requirements may be met at times other than at the periodic inspection and test of UN cylinders.</i>	Until further notice
UN Model Regulations, 6.2.2.4 (see ST/SG/AC.10/46/Add.1):		
ISO 20475:2018	Gas cylinders — Cylinder bundles — Periodic inspection and testing	Until further notice


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5.2.7 Marking of UN refillable cylinders and closed cryogenic receptacles

Note.— Marking requirements for UN metal hydride storage systems are given in 5.2.9.

5.2.7.1 Refillable UN cylinders and closed cryogenic receptacles must be marked clearly and legibly with certification, operational and manufacturing marks. These marks must be permanently affixed (e.g. stamped, engraved or etched) on the cylinder. The marks must be on the shoulder, top end or neck of the cylinder and closed cryogenic receptacle or on a permanently affixed component of the cylinder and closed cryogenic receptacle (e.g. welded collar or corrosion-resistant plate welded to the outer jacket of a closed cryogenic receptacle). Except for the UN packaging symbol, the minimum size of the marks must be 5 mm for cylinders and closed cryogenic receptacles with a diameter greater than or equal to 140 mm and 2.5 mm for cylinders and closed cryogenic receptacles with a diameter less than 140 mm. The minimum size of the UN packaging symbol must be 10 mm for cylinders and closed cryogenic receptacles with a diameter greater than or equal to 140 mm and 5 mm for cylinders and closed cryogenic receptacles with a diameter less than 140 mm.

5.2.7.2 The following certification marks must be applied:

- a) The UN packaging symbol 

This symbol must not be used for any purpose other than certifying that a packaging complies with the relevant requirements in Chapters 1 to 6;

- b) The technical standard (e.g. ISO 9809-1) used for the design, construction and testing;
- c) The character(s) identifying the country of approval, as indicated by the distinguishing signs used on vehicles in international road traffic;

Note 1.— 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.

UN Model Regulations, 6.2.2.7.2 c) (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.8.1 c) of the DGP-WG/19 report:

Note 2.— For the purpose of this mark the State of approval means the country of the competent authority that authorized the initial inspection and test of the individual receptacle at the time of manufacture.


- d) The identity mark or stamp of the inspection body that is registered with the appropriate national authority of the country authorizing the marking;
- e) The date of the initial inspection, the year (four digits) followed by the month (two digits) separated by a slash (i.e. “/”).

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5.2.9 Marking of UN metal hydride storage systems

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5.2.9.2 The following marks must be applied:

- a) The UN packaging symbol 

This symbol must not be used for any purpose other than for certifying that a packaging complies with the relevant requirements in Chapters 1 to 6;

- b) “ISO 16111” (the technical standard used for design, manufacture and testing);
- c) The character(s) identifying the country of approval, as indicated by the distinguishing signs used on vehicles in international road traffic;

UN Model Regulations, 6.2.2.9.2 c) (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.8.1 c) of the DGP-WG/19 report:

Note 1.— 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.

Note 2.— For the purpose of this mark the State of approval means the country of the appropriate national authority that authorized the initial inspection and test of the individual system at the time of manufacture.

...

Chapter 6

 UN Model Regulations, 6.3 (see ST/SG/AC.10/46/Add.1):

PACKAGINGS FOR INFECTIOUS SUBSTANCES OF CATEGORY A (UN 2814 AND UN 2900)

6.1 GENERAL

 UN Model Regulations, 6.3.1.1 (see ST/SG/AC.10/46/Add.1):

The requirements of this chapter apply to packagings intended for the transport of infectious substances of Category A, UN 2814 and UN 2900.

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 DGP-WG/18-WP/11 (see paragraph 3.1.2.2 of the DGP-WG/18 Report) and UN 6.3.4.1:

6.4.1 Each packaging intended for use according to these Instructions must bear marks which are durable, legible and placed in a location and of such a size relative to the packaging as to be readily visible. For packages with a gross mass of more than 30 kg the marks, or a duplicate thereof, must appear on the top or on a side of the packaging. Letters, numerals and symbols must be at least 12 mm high, except for packagings of 30 L capacity or less or of 30 kg capacity or less maximum net mass, when they must be at least 6 mm in height and except for packagings of 5 L capacity or less or of 5 kg or less maximum net mass, when they must be of an appropriate size.

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Table 6-4. Tests required for packaging types

 UN Model Regulations, 6.3.5.2.2:

Type of packaging ^a	Tests required							
	Primary receptacle		Water spray 6.5.3-6.5.1	Cold conditioning 6.5.3-6.5.2	Drop 6.5.3	Additional drop 6.5.3-6.5.3	Puncture 6.5.4	Stacking 6;4.6
	Rigid outer packaging	Plastics	Other	No. of samples	No. of samples	No. of samples	No. of samples	No. of samples
Fibreboard box	X		5	5	10		2	
			X	5	0	5	2	
Fibreboard drum	X		3	3	6		2	
			X	3	0	3	2	Required on three samples when testing a "U"-marked packaging, as defined in 6.5.1.6 for specific provisions.
Plastics box	X		0	5	5	Required on one sample when the packaging is intended to contain dry ice.	2	
			X	0	5		2	
Plastics drum/jerrican	X		0	3	3		2	
			X	0	3	2		
Boxes of other material	X		0	5	5		2	
			X	0	0	5	2	
Drums/jerricans of other material	X		0	3	3		2	
			X	0	0	3	2	

a. *Type of packaging* categorizes packagings for test purposes according to the kind of packaging and its material characteristics.

Note 1.— In instances where a primary receptacle is made of two or more materials, the material most liable to damage determines the appropriate test.

Note 2.— The material of the secondary packagings are not taken into consideration when selecting the test or conditioning for the test.

6.5.2.2.1 Explanation for use of Table 6-4

UN Model Regulations, 6.3.5.2.2 (see ST/SG/AC.10/46/Add.1):

6.5.2.2.1.1 If the packaging to be tested consists of a fibreboard outer box with a plastics primary receptacle, five samples must undergo the water spray test (see 6.5.3-6.5.1) prior to dropping and another five must be conditioned to –18°C (see 6.5.3-6.5.2) prior to dropping. If the packaging is to contain dry ice, then one further single sample must be dropped five times after conditioning in accordance with 6.5.3-6.5.3.

6.5.2.2.1.2 Packagings prepared as for transport must be subjected to the tests in 6.5.3 and 6.5.4. For outer packagings, the headings in Table 6-4 relate to fibreboard or similar materials whose performance may be rapidly affected by moisture, plastics which may embrittle at low temperature, and other materials such as metal whose performance is not affected by moisture or temperature.

6.5.3 Drop test

UN Model Regulations, 6.3.5.3.1 (see ST/SG/AC.10/46/Add.1):

6.5.3.1 Drop height and target

6.5.3.1.1 Samples must be subjected to free-fall drops from a height of 9 metres onto a non-resilient, horizontal, flat, massive and rigid surface in conformity with 6.4.3.3.

UN Model Regulations, 6.3.5.3.2 (see ST/SG/AC.10/46/Add.1):

6.5.3.2 Number of test samples and drop orientation

6.5.3.2.1 Where the samples are in the shape of a box, five must be dropped, one in each of the following orientations:

- a) flat on the base;
- b) flat on the top;
- c) flat on the longest side;
- d) flat on the shortest side;
- e) on a corner.

6.5.3.2.2 Where the samples are in the shape of a drum, three must be dropped, one in each of the following orientations:

- a) diagonally on the top chime, with the centre of gravity directly above the point of impact;
- b) diagonally on the base chime;
- c) flat on the side.

6.5.3.4.3 While the sample must be released in the required orientation, it is accepted that for aerodynamic reasons the impact may not take place in that orientation.

6.5.3.5.4 Following the appropriate drop sequence, there must be no leakage from the primary receptacle(s), which must remain protected by cushioning/absorbent material in the secondary packaging.

6.5.3.6.5 *Special preparation of test sample for the drop test*

6.5.3.6.5.1 *Fibreboard — water spray test*

Fibreboard outer packagings: The sample must be subjected to a water spray that simulates exposure to rainfall of approximately 5 cm per hour for at least one hour. It must then be subjected to the test described in 6.5.3.1.

6.5.3.6.5.2 *Plastics material — cold conditioning*

Plastics primary receptacles or outer packagings: The temperature of the test sample and its contents must be reduced to -18°C or lower for a period of at least 24 hours and within 15 minutes of removal from that atmosphere the test sample must be subjected to the test described in 6.5.3.1. Where the sample contains dry ice, the conditioning period may be reduced to four hours.

6.5.3.6.5.3 *Packagings intended to contain dry ice — additional drop test*

Where the packaging is intended to contain dry ice, a test additional to that specified in 6.5.3.1 and, when appropriate, in 6.5.3.6.5.1 or 6.5.3.6.5.2 must be carried out. One sample must be stored so that all the dry ice dissipates and then that sample must be dropped in one of the orientations described in 6.5.3.2.1 or in 6.5.3.2.2, as appropriate which must be that most likely to result in failure of the packaging.

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Chapter 7

REQUIREMENTS FOR THE CONSTRUCTION, TESTING AND APPROVAL OF PACKAGES FOR RADIOACTIVE MATERIAL AND FOR THE APPROVAL OF SUCH MATERIAL

...

7.1 GENERAL REQUIREMENTS

7.1.1 The package must be so designed in relation to its mass, volume and shape that it can be easily and safely transported. In addition, the package must be so designed that it can be properly secured in the aircraft during transport.

7.1.2 The design must be such that any lifting attachments on the package will not fail when used in the intended manner and that, if failure of the attachments should occur, the ability of the package to meet other requirements of these Instructions would not be impaired. The design must take account of appropriate safety factors to cover snatch lifting.

7.1.3 Attachments and any other features on the outer surface of the package which could be used to lift it must be designed either to support its mass in accordance with the requirements of 7.1.2 or must be removable or otherwise rendered incapable of being used during transport.

UN Model Regulations, 6.4.2.4 (see ST/SG/AC.10/46/Add.1):

7.1.4 As far as practicable, the packaging must be designed ~~and finished~~ so that the external surfaces are free from protruding features and can be easily decontaminated.

7.1.5 As far as practicable, the outer layer of the package must be designed so as to prevent the collection and the retention of water.

7.1.6 Any features added to the package at the time of transport which are not part of the package must not reduce its safety.

7.1.7 The package must be capable of withstanding the effects of any acceleration, vibration or vibration resonance, which may arise under routine conditions of transport without any deterioration in the effectiveness of the closing devices on the various receptacles or in the integrity of the package as a whole. In particular, nuts, bolts and other securing devices must be designed so as to prevent them from becoming loose or being released unintentionally, even after repeated use.

UN Model Regulations, 6.4.2.8 (see ST/SG/AC.10/46/Add.1):

7.1.8 The design of the package must take into account ageing mechanisms.

~~7.1.8~~ 7.1.9 The materials of the packaging and any components or structures must be physically and chemically compatible with each other and with the radioactive contents. Account must be taken of their behaviour under irradiation.

~~7.1.9~~ 7.1.10 All valves through which the radioactive contents could escape must be protected against unauthorized operation.

~~7.1.10~~ 7.1.11 The design of the package must take into account ambient temperatures and pressures that are likely to be encountered in routine conditions of transport.

~~7.1.11~~**7.1.12** A package must be so designed that it provides sufficient shielding to ensure that, under routine conditions of transport and with the maximum radioactive contents that the package is designed to contain, the radiation level at any point on the external surface of the package would not exceed the values specified in 2;7.2.4.1.1.2, 4;9.1.10 and 4;9.1.11, as applicable, with account taken of 7;2.10.3.3 c).

~~7.1.12~~**7.1.13** For radioactive material having other dangerous properties, the package design must take into account those properties (see Part 2, Introductory Chapter, 3.1, 3.2 and 4;9.1.5).

...

7.3 REQUIREMENTS FOR EXCEPTED PACKAGES

UN Model Regulations, 6.4.4 (see ST/SG/AC.10/46/Add.1):

An excepted package must be designed to meet the requirements specified in 7.1 and 7.2 to 7.12 and, in addition, the requirements of 7.6.2 if it contains fissile material allowed by one of the provisions of 2;7.2.3.5.1 a) to f), and the requirements of 7.2 if carried by air.

...

UN Model Regulations, 6.4.6.2 (see ST/SG/AC.10/46/Add.1):

7.5 REQUIREMENTS FOR PACKAGES CONTAINING URANIUM HEXAFLUORIDE

...

7.5.2 Each package designed to contain 0.1 kg or more of uranium hexafluoride must be designed so that ~~it would meet~~ **the package would meet** the following requirements:

- a) withstand, without leakage and without unacceptable stress, as specified in ISO 7195:2005, the structural test as specified in 7.20 except as allowed in 7.5.4;
- b) withstand, without loss or dispersal of the uranium hexafluoride, the free drop test specified in 7.14.4; and
- c) withstand, without rupture of the containment system, the thermal test specified in 7.16.3 except as allowed in 7.5.4.

...

7.6 REQUIREMENTS FOR TYPE A PACKAGES

...

7.6.8 Special form radioactive material may be considered as a component of the containment system.

UN Model Regulations, 6.4.7.9 (see ST/SG/AC.10/46/Add.1):

7.6.9 If the containment system forms a separate unit of the package, ~~it~~ **the containment system** must be capable of being securely closed by a positive fastening device which is independent of any other part of the packaging.

...

UN Model Regulations, 6.4.7.17 (see ST/SG/AC.10/46/Add.1):

7.6.17 Type A packages to contain gas

A **Type A** package designed for gases must prevent loss or dispersal of the radioactive contents if the package were subjected to the tests specified in 7.15. ~~A, except for a~~ **except for a** Type A package designed for tritium gas or for noble gases ~~must be excepted from this requirement.~~

7.7 REQUIREMENTS FOR TYPE B(U) PACKAGES

7.7.1 Type B(U) packages must be designed to meet the requirements specified in 7.1, 7.2 and 7.6.2 to 7.6.15, except 7.6.14 a), and, in addition, to the requirements specified in 7.7.2 to 7.7.15.

UN Model Regulations, 6.4.8.2 (see ST/SG/AC.10/46/Add.1):

7.7.2 A package must be designed so that, under the ambient conditions specified in 7.7.5 and 7.7.6, heat generated within the package by the radioactive contents does not, under normal conditions of transport, as demonstrated by the tests in 7.14, adversely affect the package in such a way that it would fail to meet the applicable requirements for containment and shielding if left unattended for a period of one week. Particular attention must be paid to the effects of heat, which may cause one or more of the following:

- a) alter the arrangement, the geometrical form or the physical state of the radioactive contents or, if the radioactive material is enclosed in a can or receptacle (for example, clad fuel elements), cause the can, receptacle or radioactive material to deform or melt;
- b) lessening of the efficiency of the packaging through differential thermal expansion or cracking or melting of the radiation shielding material;
- c) in combination with moisture, accelerate corrosion.

...

7.7.8 A package must be so designed that, if it were subjected to:

- a) the tests specified in 7.14, it would restrict the loss of radioactive contents to not more than 10^{-6} A₂ per hour; and
- b) the tests specified in 7.16.1, 7.16.2 b), 7.16.3 and 7.16.4 and either the tests in:
 - i) 7.16.2 c), when the package has a mass not greater than 500 kg, an overall density not greater than 1 000 kg/m³ based on the external dimensions, and radioactive contents greater than 1 000 A₂ not as special form radioactive material; or
 - ii) 7.16.2 a), for all other packages,

it would meet the following requirements:

UN Model Regulations, 6.4.8.8 (see ST/SG/AC.10/46/Add.1):

- retain sufficient shielding to ensure that the radiation level dose rate at 1 m from the surface of the package would not exceed 10 mSv/h with the maximum radioactive contents which the package is designed to contain; and
- restrict the accumulated loss of radioactive contents in a period of one week to not more than 10 A₂ for krypton-85 and not more than A₂ for all other radionuclides.

Where mixtures of different radionuclides are present, the provisions of 2;7.2.2.4 to 2;7.2.2.6 must apply except that for krypton-85, an effective A₂(i) value equal to 10 A₂ may be used. For case a) above, the assessment must take into account the external non-fixed contamination limits of 4;9.1.2.

...

7.8 REQUIREMENTS FOR TYPE B(M) PACKAGES

UN Model Regulations, 6.4.9.1 (see ST/SG/AC.10/46/Add.1):

Type B(M) packages must meet the requirements for Type B(U) packages specified in 7.7.1, except that for packages to be transported solely within a specified country or solely between specified countries, conditions other than those given in 7.6.5, 7.7.4 to 7.7.6 and 7.7.9 to 7.7.15 may be assumed with the approval of the competent authorities of these countries. Notwithstanding, the requirements for Type B(U) packages specified in 7.7.4 and 7.7.9 to 7.7.15 must be met as far as practicable.

...

**7.10 REQUIREMENTS FOR PACKAGES
CONTAINING FISSILE MATERIAL**

...

7.10.2 Packages containing fissile material that meet the provisions of subparagraph d) and one of the provisions of a) to c) below are excepted from the requirements of 7.10.4 to 7.10.14.

...

- c) packages containing fissile material in any form provided that:
- i) the smallest external dimension of the package is not less than 10 cm;
 - ii) the package, after being subjected to the tests specified in 7.14.1 to 7.14.6:
 - retains its fissile material contents;
 - preserves the minimum overall outside dimensions of the package to at least 10 cm;
 - prevents the entry of a 10 cm cube;
 - iii) the criticality safety index of the package is calculated using the following formula:

$$CSI=50 \times 2 \times \left(\frac{\text{Mass of U-235 in package (g)}}{450} \right) + \left(\frac{\text{Mass of other fissile nuclides* in package (g)}}{280} \right)$$

* Plutonium may be of any isotopic composition provided that the amount of Pu-241 is less than that of Pu-240 in the package

UN Model Regulations, 6.4.11.2 (see ST/SG/AC.10/46/Add.1):

- iv) the ~~maximum~~ **total** mass of fissile nuclides in any package does not exceed 15 g;
- d) the total mass of beryllium, hydrogenous material enriched in deuterium, graphite and other allotropic forms of carbon in an individual package must not be greater than the mass of fissile nuclides in the package except where ~~their~~ **the** total concentration **of these materials** does not exceed 1 g in any 1 000 g of material. Beryllium incorporated in copper alloys up to 4 per cent in weight of the alloy does not need to be considered.

...

7.10.8 For a package in isolation, it must be assumed that water can leak into or out of all void spaces of the package, including those within the containment system. However, if the design incorporates special features to prevent such leakage of water into or out of certain void spaces, even as a result of error, absence of leakage may be assumed in respect of those void spaces. Special features must include either of the following:

- a) multiple high standard water barriers not less than two of which would remain watertight if the package were subject to the tests prescribed in 7.10.13 b), a high degree of quality control in the manufacture, maintenance and repair of packagings and tests to demonstrate the closure of each package before each shipment; or
- b) for packages containing uranium hexafluoride only, with maximum enrichment of 5 mass per cent uranium-235:

UN Model Regulations, 6.4.11.8 (see ST/SG/AC.10/46/Add.1):

- i) packages where, following the tests prescribed in 7.10.13 b), there is no physical contact between the valve **or the plug** and any other component of the packaging other than at its original point of attachment and where, in addition, following the test prescribed in 7.16.3, the valves **and the plug** remain leaktight; and
- ii) a high degree of quality control in the manufacture, maintenance and repair of packagings coupled with tests to demonstrate closure of each package before each shipment.

...

7.10.11:

- a) The package must be subcritical under conditions consistent with the Type C package tests specified in 7.19.1 assuming reflection by at least 20 cm of water but no water-in leakage.

UN Model Regulations, 6.4.11.11 b) (see ST/SG/AC.10/46/Add.1):

- b) In the assessment of 7.10.10, ~~allowance must not be made for use of special features of as specified in 7.10.8 unless, following the Type C package tests specified in 7.19.1 and, subsequently, the water in leakage test of 7.18.3, leakage of water into or out of the void spaces is prevented~~ provided that leakage of water into or out of the void spaces is prevented when the package is submitted to the Type C package tests specified in 7.19.1 followed by the water leakage test specified in 7.18.3.

...

7.11 TEST PROCEDURES AND DEMONSTRATION OF COMPLIANCE

7.11.1 Demonstration of compliance with the performance standards required in 2;7.2.3.1.3, 2;7.2.3.1.4, 2;7.2.3.3.1, 2;7.2.3.3.2, 2;7.2.3.4.1, 2;7.2.3.4.2 and 6;7.1 to 6;7.10 must be accomplished by any of the methods listed below or by a combination thereof:

UN Model Regulations, 6.4.12 a) (see ST/SG/AC.10/46/Add.1):

- a) Performance of tests with specimens representing ~~LSA III material, or~~ special form radioactive material, or low dispersible radioactive material or with prototypes or samples of the packaging, where the contents of the specimen or the packaging for the tests must simulate, as closely as practicable, the expected range of radioactive contents and the specimen or packaging to be tested must be prepared as presented for transport;
- b) Reference to previous satisfactory demonstrations of a sufficiently similar nature;
- c) Performance of tests with models of appropriate scale incorporating those features which are significant with respect to the item under investigation when engineering experience has shown results of such tests to be suitable for design purposes. When a scale model is used, the need for adjusting certain test parameters, such as penetrator diameter or compressive load, must be taken into account;
- d) Calculation, or reasoned argument, when the calculation procedures and parameters are generally agreed to be reliable or conservative.

...

7.12 TESTING THE INTEGRITY OF THE CONTAINMENT SYSTEM AND SHIELDING AND EVALUATING CRITICALITY SAFETY

UN Model Regulations, 6.4.13 (see ST/SG/AC.10/46/Add.1):

After each of the applicable tests test or group of tests or sequence of the applicable tests, as appropriate, specified in 7.14 to 7.20:

- a) faults and damages must be identified and recorded;
- b) it must be determined whether the integrity of the containment system and shielding has been retained to the extent required in 7.1 to 7.10 for the package under test; and
- c) it must be determined, for packages containing fissile material, whether the assumptions and conditions used in the assessments required by 7.10.1 to 7.10.14 for one or more packages are valid.

...

7.14 TESTS FOR DEMONSTRATING ABILITY TO WITHSTAND NORMAL CONDITIONS OF TRANSPORT

...

7.14.4 Free drop test: the specimen must drop onto the target so as to suffer maximum damage in respect of the safety features to be tested.

UN Model Regulations, 6.4.15.4 a) (see ST/SG/AC.10/46/Add.1):

- a) The height of the drop, measured from the lowest point of the specimen to the upper surface of the target, must be not less than the distance specified in Table 6-6 for the applicable mass. The target must be as defined in 7.13;

- b) For rectangular fibreboard or wood packages not exceeding a mass of 50 kg, a separate specimen must be subjected to a free drop onto each corner from a height of 0.3 m;
- c) For cylindrical fibreboard packages not exceeding a mass of 100 kg, a separate specimen must be subjected to a free drop onto each of the quarters of each rim from a height of 0.3 m.

...

7.14.6 Penetration test: the specimen must be placed on a rigid, flat, horizontal surface which will not move significantly while the test is being carried out.

- a) A bar of 3.2 cm in diameter with a hemispherical end and a mass of 6 kg must be dropped and directed to fall, with its longitudinal axis vertical, onto the centre of the weakest part of the specimen so that, if it penetrates sufficiently far, it will hit the containment system. The bar must not be significantly deformed by the test performance;

UN Model Regulations, 6.4.15.6 b) (see ST/SG/AC.10/46/Add.1):

- b) The height of the drop of the bar, measured from its lower end to the intended point of impact on the upper surface of the specimen, must be 1 m.

...

7.16 TESTS FOR DEMONSTRATING THE ABILITY TO WITHSTAND ACCIDENT CONDITIONS IN TRANSPORT

7.16.1 The specimen must be subjected to the cumulative effects of the tests specified in 7.16.2 and 7.16.3, in that order. Following these tests, either this specimen or a separate specimen must be subjected to the effect(s) of the water immersion test(s) as specified in 7.16.4 and, if applicable, 7.17.

7.16.2 Mechanical test: the mechanical test consists of three different drop tests. Each specimen must be subjected to the applicable drops as specified in 7.7.8 or 7.10.13. The order in which the specimen is subjected to the drops must be such that, on completion of the mechanical test, the specimen must have suffered such damage as will lead to the maximum damage in the thermal test which follows:

- a) For drop I, the specimen must drop onto the target so as to suffer the maximum damage, and the height of the drop measured from the lowest point of the specimen to the upper surface of the target must be 9 m. The target must be as defined in 7.13;

UN Model Regulations, 6.4.17.2 b) (see ST/SG/AC.10/46/Add.1):

- b) For drop II, the specimen must drop onto a bar rigidly mounted perpendicularly on the target so as to suffer the maximum damage. The height of the drop measured from the intended point of impact of the specimen to the upper surface of the bar must be 1 m. The bar must be of solid mild steel of circular cross-section, (15.0 ± 0.5 cm) in diameter and 20 cm long unless a longer bar would cause greater damage, in which case a bar of sufficient length to cause maximum damage must be used. The upper end of the bar must be flat and horizontal with its edge rounded off to a radius of not more than 6 mm. The target on which the bar is mounted must be as described in 7.13;
- c) For drop III, the specimen must be subjected to a dynamic crush test by positioning the specimen on the target so as to suffer maximum damage by the drop of a 500 kg mass from 9 m onto the specimen. The mass must consist of a solid mild steel plate 1 m by 1 m and must fall in a horizontal attitude. The lower face of the steel plate must have its edges and corners rounded off to a radius of not more than 6 mm. The height of the drop must be measured from the underside of the plate to the highest point of the specimen. The target on which the specimen rests must be as defined in 7.13.

7.16.3 Thermal test: the specimen must be in thermal equilibrium under conditions of an ambient temperature of 38°C, subject to the solar insolation conditions specified in Table 6-5 and subject to the design maximum rate of internal heat generation within the package from the radioactive contents. Alternatively, any of these parameters are allowed to have different values prior to and during the test, provided due account is taken of them in the subsequent assessment of package response. The thermal test must then consist of:

- a) exposure of a specimen for a period of 30 minutes to a thermal environment which provides a heat flux at least equivalent to that of a hydrocarbon fuel/air fire in sufficiently quiescent ambient conditions to give a minimum average flame emissivity coefficient of 0.9 and an average temperature of at least 800°C, fully engulfing the specimen, with a surface absorptivity coefficient of 0.8 or that value which the package may be demonstrated to possess if exposed to the fire specified, followed by;

UN Model Regulations, 6.4.17.3 b) (see ST/SG/AC.10/46/Add.1):

- b) exposure of the specimen to an ambient temperature of 38°C, subject to the solar insolation conditions specified in Table 6-5 and subject to the design maximum rate of internal heat generation within the package by the radioactive contents for a sufficient period to ensure that temperatures in the specimen are ~~everywhere~~ decreasing in all parts of the specimen and/or are approaching initial steady-state conditions. Alternatively, any of these parameters are allowed to have different values following cessation of heating, provided due account is taken of them in the subsequent assessment of package response.

...

7.22 APPLICATIONS AND APPROVALS FOR RADIOACTIVE MATERIAL TRANSPORT

See 6.4.23 of the UN Model Regulations.

7.23 REGISTRATION OF SERIAL NUMBERS AND VALIDATION

7.23.1 The competent authority must be informed of the serial number of each packaging manufactured to a design approved by them. The competent authority must maintain a register of such numbers.

7.23.2 Multilateral approval may be by validation of the original certificate issued by the competent authority of the State of Origin of the design or shipment.

7.24 TRANSITIONAL MEASURES FOR CLASS 7

UN Model Regulations, 6.4.24 (see ST/SG/AC.10/46/Add.1):

7.24.1 Packages not requiring competent authority approval of design under the 1985, ~~and 1985~~

(As Amended 1990), 1996 edition, 1996 edition (revised), 1996 (as amended 2003), 2005, 2009 editions of IAEA Safety Series No. 6 and 2012 edition of IAEA Safety Standards Series No. SSR-6 ~~editions of IAEA Safety Series No. 6~~

7.24.1.1 Packages not requiring competent authority approval of design (excepted packages, Type IP-1, Type IP-2, Type IP-3 and Type A packages) must meet these Instructions in full, except that:

~~a) packages that meet the requirements of the 1985 or 1985 (As Amended 1990) Editions of IAEA Regulations for the Safe Transport of Radioactive Material (IAEA Safety Series No.6);~~

~~a) i) may continue in transport provided that they were prepared for transport prior to 31 December 2003, and are subject to the requirements of 6.4.24.4 of the UN Model Regulations, if applicable;~~

~~b) ii) may continue to be used, provided that all the following conditions are met:~~

~~i) they were not designed to contain uranium hexafluoride;~~

~~ii) the applicable requirements of 1;6.3 of these Instructions are applied;~~

~~iii) the activity limits and classification in Part 2;7 of these Instructions are applied;~~

~~iv) the requirements and controls for transport in Parts 1, 3, 4, 5 and 7 of these Instructions are applied;~~

~~v) the packaging was not manufactured or modified after 31 December 2003.~~

~~b) packages that meet the requirements of the 1996, 1996 (revised), 1996 (as amended 2003), 2005 or 2009 Editions of IAEA Safety Series No. 6, or 2012 Edition of IAEA Safety Standards Series No. SSR-6;~~

~~(i) may continue in transport provided that they were prepared for transport prior to 31 December 2025 and are subject to the requirements of 6.4.24.4 of the UN Model Regulations, if applicable; or~~

~~(ii) may continue to be used, provided that all the following conditions are met:~~

~~1) the applicable requirements of 1;6.3 of these Instructions are applied;~~

~~2) the activity limits and classification in Chapter 2.7 of these Instructions are applied;~~

3) the requirements and controls for transport in Parts 1, 3, 4, 5 and 7 of these Instructions are applied; and

4) the packaging was not manufactured or modified after 31 December 2025.

~~7.24.1.2 Any packaging modified, unless to improve safety, or manufactured after 31 December 2003, must meet the requirements of these Instructions in full. Packages prepared for transport not later than 31 December 2003 under the 1985 or 1985 (As Amended 1990) editions of IAEA Safety Series No. 6 may continue in transport. Packages prepared for transport after this date must meet the requirements of these Instructions in full.~~

UN Model Regulations, 6.4.24.2 (see ST/SG/AC.10/46/Add.1):

7.24.2 Packages approved under the 1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) editions of IAEA Safety Series No. 6
Package designs approved under the 1985, 1985 (as amended 1990), 1996, 1996 (revised), 1996 (as amended 2003), 2005 and 2009 Editions of IAEA Safety Series No. 6 and 2012 Edition of IAEA Safety Standards Series No. SSR-6

7.24.2.1 Packages requiring competent authority approval of the design must meet these Instructions in full ~~unless the following conditions are met~~ except:

a) ~~the packagings were manufactured to a package design approved by the competent authority under the provisions of the 1973 or 1973 (As Amended) or the 1985 or 1985 (As Amended 1990) Editions of IAEA Safety Series No. 6)~~ may continue to be used provided that all of the following conditions are met;

b) the package design is subject to multilateral approval;

c) the applicable requirements of 1;6.3 of these Instructions are applied;

d) the activity limits and classification in Part 2;7 of these Instructions are applied;

e) the requirements and controls for transport in in Parts 1, 3, 4, 5 and 7 of these Instructions are applied;

f) for a package containing fissile material and transported by air, the requirement of 7.10.11 is met;

~~g) for packages that meet the requirements of the 1973 or 1973 (As Amended) Editions of IAEA Safety Series No. 6:~~

~~i) the packages retain sufficient shielding to ensure that the radiation level at 1 m from the surface of the package would not exceed 10 mSv/h in the accident conditions of transport defined in the 1973 Revised or 1973 Revised (As Amended) Editions of IAEA Safety Series No. 6 with the maximum radioactive contents which the package is authorized to contain;~~

~~ii) the packages do not utilize continuous venting;~~

~~iii) a serial number in accordance with the provision of 5;2.4.5.1 c) is assigned to and marked on the outside of each packaging.~~

b) packagings that were manufactured to a package design approved by the competent authority under the provisions of the 1996, 1996 (revised), 1996 (as amended 2003), 2005 or 2009 Editions of IAEA Safety Series No. 6, or 2012 Edition of IAEA Safety Standards Series No. SSR-6 may continue to be used provided that all of the following conditions are met:

i) the package design is subject to multilateral approval after 31 December 2025;

ii) the applicable requirements of 1;6.3 of these Instructions are applied;

iii) the activity limits and material restrictions of Chapter 2.7 of these Instructions are applied;

iv) the requirements and controls for transport in Parts 1, 3, 4, 5 and 7 of these Instructions are applied.

7.24.2.2 No new manufacture of packagings to a package design meeting the provisions of the 1973, 1973 (As Amended), 1985, and 1985 (As Amended 1990) Editions of IAEA Safety Series No. 6 must be permitted to commence.

7.24.2.3 No new manufacture of packagings of a package design meeting the provisions of the 1996, 1996 (revised), 1996 (as amended 2003), 2005 or 2009 Editions of IAEA Safety Series No. 6, or 2012 Edition of IAEA Safety Standards Series No. SSR-6 must be permitted to commence after 31 December 2028.

7.24.3 Special form radioactive material approved under the ~~1973, 1973 (As Amended), 1985 and 1985 (As Amended 1990) editions of IAEA Safety Series No. 6~~ the 1985, 1985 (as amended 1990), 1996, 1996 (revised), 1996 (as amended 2003), 2005 or 2009 Editions of IAEA Safety Series No. 6 or 2012 Edition of IAEA Safety Standards Series No. SSR-6

Special form radioactive material manufactured to a design ~~which~~^{that} had received unilateral approval by the competent authority under the ~~1973, 1973 (As Amended), 1985 or, 1985 (as amended 1990), 1996, 1996 (revised), 1996 (as amended 2003), 2005 and 2009~~ Editions of IAEA Safety Series No. 6 and 2012 Edition of IAEA Safety Standards Series No. SSR-6 may continue to be used when in compliance with the mandatory management system in accordance with the applicable requirements of 1:6.5.3.1. There shall be no new manufacture of such special form radioactive material ~~must~~ to a design that had received unilateral approval by the competent authority under the 1985 or 1985 (as amended 1990) Editions of IAEA Safety Series No. 6. No new manufacture of special form radioactive material to a design that had received unilateral approval by the competent authority under the 1996, 1996 (revised), 1996 (as amended 2003), 2005 and 2009 Editions of IAEA Safety Series No. 6, and 2012 Edition of IAEA Safety Standards Series No. SSR-6 shall be permitted to commence after 31 December 2025.

Part 7

OPERATOR'S RESPONSIBILITIES

Chapter 2

STORAGE AND LOADING

2.9.3 Stowage during transport and storage in transit

2.9.3.1 Consignments must be securely stowed.

2.9.3.2 Provided that its average surface heat flux does not exceed 15 W/m^2 and that the immediately surrounding cargo is not in sacks or bags, a package or overpack may be carried or stored among packaged general cargo without any special stowage provisions except as may be specifically required by the competent authority in an applicable certificate of approval.

2.9.3.3 Loading of freight containers and accumulation of packages, overpacks and freight containers must be controlled as follows:

- a) Except under the condition of exclusive use, the total number of packages, overpacks and freight containers aboard a single aircraft must be so limited that the total sum of the transport indexes aboard the aircraft does not exceed the values shown in Table 7-6. For consignments of LSA-I material, there is no limit on the sum of the transport indexes;
- b) Where a consignment is transported under exclusive use, there is no limit on the sum of the transport indexes aboard a single aircraft, but the requirement on minimum separation distances established in 2.9.6 applies;

UN Model Regulations, 7.1.8.3.3 (see ST/SG/AC.10/46/Add.1)

- ~~c) The radiation level, dose rate under routine conditions of transport must not exceed 2 mSv/h at any point on, and 0.1 mSv/h at 2 m from, the external surface of the aircraft;~~
- d) The total sum of the criticality safety indexes in a freight container and aboard an aircraft must not exceed the values shown in Table 7-7.

APPENDIX D

AMENDMENTS TO THE TECHNICAL INSTRUCTIONS AGREED AT DGP-WG/18 AND
DGP-WG/19 TO ADDRESS AIR-SPECIFIC SAFETY RISKS AND IDENTIFIED ANOMALIES

Part 3

DANGEROUS GOODS LIST,
SPECIAL PROVISIONS AND
LIMITED AND EXCEPTED QUANTITIES

...

Chapter 2

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

...

Table 3-1. Dangerous Goods List

Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger aircraft		Cargo aircraft	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4	5	6	7	8	9	10	11	12	13
DGP-WG/18-WP/21 (see paragraph 3.2.2.7 of the DGP-WG/18 report) (incorporated in the 2019-2020 Edition by way of a corrigendum):												
Engine, internal combustion	3530	9		Miscellaneous		A87 A208		E0	972	No limit	972	No limit
Machinery, internal combustion	3530	9		Miscellaneous		A87 A208		E0	972	No limit	972	No limit
DGP-WG/18-WP/5 (see paragraph 3.2.2.1 of the DGP-WG/18 report) (incorporated in the 2019-2020 Edition by way of a corrigendum):												
Toxic solid, flammable, inorganic, n.o.s.*	3535	6.1	4.1	Toxic & Solid flammable		A5	I II	E5 E4	665 668 Y644	1 kg 15 kg 1 kg	672 675	15 kg 50 kg
...												

...

Chapter 4

DANGEROUS GOODS IN LIMITED QUANTITIES

...

4.5 PACKAGE MARKING

4.5.1 Packages containing limited quantities of dangerous goods must be marked as required by the applicable paragraphs of 5;2, except that 5;2.4.4.1 does not apply.

4.5.2 Packages containing limited quantities of dangerous goods and prepared in accordance with this chapter must bear the mark shown in Figure 3-1 below. The mark must be readily visible, legible and able to withstand open weather exposure without a substantial reduction in effectiveness. The mark must be in the form of a square set at an angle of 45°(diamond shaped). The top and bottom portions and the surrounding line must be black. The centre area must be white or a suitable contrasting background. The minimum dimension must be 100 mm × 100 mm and the minimum width of the line forming the diamond must be 2 mm. The symbol "Y" must be placed in the centre of the mark and must be clearly visible. Where dimensions are not specified, all features must be in approximate proportion to those shown.

4.5.2.1 If the size of the package so requires, the minimum outer dimensions shown in Figure 3-1 may be reduced to be not less than 50 mm × 50 mm provided the mark remains clearly visible. The minimum width of the line forming the diamond may be reduced to a minimum of 1 mm. The symbol "Y" must remain in approximate proportion to that shown in Figure 3-1.

DGP-WG/19-WP/2 (see paragraph 3.2.2.2 of the DGP-WG/19 report):

4.5.2.2 The entire mark must appear on one side of the package.

...

Chapter 5

DANGEROUS GOODS PACKED IN EXCEPTED QUANTITIES

...

5.4 MARKING OF PACKAGES

5.4.1 Packages containing excepted quantities of dangerous goods prepared in accordance with this chapter must be durably and legibly marked with the mark shown in Figure 3-2. The primary hazard class or, when assigned, the division of each of the dangerous goods contained in the package must be shown in the mark. Where the name of the shipper or consignee is not shown elsewhere on the package, this information must be included within the mark.

5.4.2 The mark must be in the form of a square. The hatching and symbol must be of the same colour, black or red, on white or suitable contrasting background. The dimensions of the mark must be a minimum of 100 mm × 100 mm. Where dimensions are not specified, all features must be in approximate proportion to those shown.

DGP-WG/19-WP/2 (see paragraph 3.2.2.2 of the DGP-WG/19 report):

5.4.3 The entire mark must appear on one side of the package.

...

Part 4

PACKING INSTRUCTIONS

...

Chapter 5

CLASS 3 — FLAMMABLE LIQUIDS

...

DGP-WG/18-WP/20 (see paragraph 3.2.2.6 of the DGP-WG/18 report):

Packing Instruction 378

Passenger and cargo aircraft for UN 3528 only
(See Packing Instruction 220 for flammable gas-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)

...

ADDITIONAL PACKING REQUIREMENTS

...

Flammable liquid fuel tanks

Except as otherwise provided for in this packing instruction, fuel tanks must be drained of fuel and tank caps fitted securely. Special precautions are necessary to ensure complete drainage of the fuel system of machines or equipment incorporating internal combustion engines, such as lawn mowers and outboard motors, where such machines or equipment could possibly be handled in other than an upright position. When it is not possible to handle in other than an upright position, machinery must be drained of fuel as far as practicable, and if any fuel remains, it must not exceed one-quarter of the tank capacity.

...

...

Chapter 8

CLASS 6 — TOXIC AND INFECTIOUS SUBSTANCES

...

Packing Instruction 650

This packing instruction applies to UN 3373.

...

DGP-WG/19-WP/2 (see paragraph 3.2.2.2 of the DGP-WG/19 report):

- 4) For transport, the mark illustrated below must be displayed on the external surface of the outer packaging on a background of a contrasting colour and must be clearly visible and legible. The mark must be in the form of a square set at an angle of 45° (diamond-shaped) with each side having a length of at least 50 mm, the width of the line must be at least 2 mm, and the letters and numbers must be at least 6 mm high. The entire mark must appear on one side of the package. The proper shipping name "Biological substance, Category B" in letters at least 6 mm high must be marked on the outer packaging adjacent to the diamond-shaped mark.

...

DGP-WG/18-WP/22 (see paragraph 3.3.6.4 of the DGP-WG/18 report):

- 11) Infectious substances assigned to UN 3373 which are packed and marked in accordance with this packing instruction are not subject to any other requirement in these Instructions except for the following:
- a) the name and address of the shipper and of the consignee must be provided on each package;
 - b) the name and telephone number of a person responsible must be provided on a written document (such as an air waybill) or on the package;
 - c) classification must be in accordance with 2;6.3.2;
 - d) the incident reporting requirements in 7;4.4 and 7;4.5 must be met;

...

DGP-WG/19-WP/29 (see paragraph 3.2.2.10 of the DGP-WG/18 report):

- 13) Other dangerous goods must not be packed in the same packaging as Division 6.2 infectious substances unless they are necessary for maintaining the viability, stabilizing or preventing degradation or neutralizing the hazards of the infectious substances. A quantity of 30 ml or less of dangerous goods included in Class 3, 8 or 9 permitted as excepted quantities under 3;5 may be packed in each primary receptacle containing infectious substances ~~provided these substances meet the requirements of 3;5~~. When these small quantities of dangerous goods are packed with infectious substances in accordance with this packing instruction no other requirements in these Instructions need be met.

...

Chapter 11

CLASS 9 — MISCELLANEOUS DANGEROUS GOODS

...

Packing Instruction 959

Passenger and cargo aircraft for UN 3245 only

...

DGP-WG/19-WP/2 (see paragraph 3.2.2.2 of the DGP-WG/19 report):

For transport, the mark illustrated below must be displayed on the external surface of the outer packaging on a background of a contrasting colour and must be clearly visible and legible. The mark must be in the form of a square set at an angle of 45° (diamond-shaped) with each side having a length of at least 50 mm; the width of the line must be at least 2 mm and the letters and numbers must be at least 6 mm high. The entire mark must appear on one side of the package.

...

DGP-WG/18-WP/22 (see paragraph 3.3.6.4 the DGP-WG/18 report):

GMOs or GMMOs assigned to UN 3245 which are packed and marked in accordance with this packing instruction are not subject to any other requirement in these Instructions except for the following:

- 1) the name and address of the shipper and of the consignee must be provided on each package;
- 2) classification must be in accordance with 2;9.2.1 c);
- 3) the incident reporting requirements in 7;4.4 and 7;4.5 must be met;
- 4) the inspection for damage or leakage requirements in 7;3.1.3 and 7;3.1.4;
- 5) passengers and crew members are prohibited from transporting UN 3245 either as, or in, carry-on baggage or checked baggage or on their person.

...

DGP-WG/18-WP/22 (see paragraph 3.3.6.4 the DGP-WG/18 report):

Packing Instruction 965

Cargo aircraft only for UN 3480

...

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);
- 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 7;4.5 (Operator's responsibilities — Reporting of undeclared and misdeclared dangerous goods);
- 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.

...

...

DGP-WG/18-WP/22 (see paragraph 3.3.6.4 the DGP-WG/18 report):

Packing Instruction 966

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

...

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 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);
- ~~Part 7;4.5 (Operator's responsibilities — Reporting of undeclared and misdeclared dangerous goods);~~
- 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.

...

...

DGP-WG/18-WP/22 (see paragraph 3.3.6.4 of the DGP-WG/18 report):

Packing Instruction 967

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

...

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 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);
- ~~Part 7;4.5 (Operator's responsibilities — Reporting of undeclared and misdeclared dangerous goods);~~
- 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.

...

...

DGP-WG/18-WP/22 (see paragraph 3.3.6.4 of the DGP-WG/18 report):

Packing Instruction 968

Cargo aircraft only for UN 3090

...

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);
- 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 7;4.5 (Operator's responsibilities — Reporting of undeclared and misdeclared dangerous goods);
- 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.

...

...

DGP-WG/18-WP/22 (see paragraph 3.3.6.4 of the DGP-WG/18 report):

Packing Instruction 969

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

...

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 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);
- Part 7;4.5 (Operator's responsibilities — Reporting of undeclared and misdeclared dangerous goods);
- 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.

...

...

DGP-WG/18-WP/22 (see paragraph 3.3.6.4 of the DGP-WG/18 report):

Packing Instruction 970

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

...

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 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);
- Part 7;4.5 (Operator's responsibilities — Reporting of undeclared and misdeclared dangerous goods);
- 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.

...

...

DGP-WG/18-WP/20 (see paragraph 3.2.2.6 of the DGP-WG/18 report):

Packing Instruction 972

Passenger or cargo aircraft for UN 3530 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 952 for battery-powered equipment and vehicles)

...

ADDITIONAL PACKING REQUIREMENTS

...

Liquid fuel tanks

Except as otherwise provided for in this packing instruction, fuel tanks must be drained of fuel and tank caps fitted securely. Special precautions are necessary to ensure complete drainage of the fuel system of machines or equipment incorporating internal combustion engines, such as lawn mowers and outboard motors, where such machines or equipment could possibly be handled in other than an upright position. When it is not possible to handle in other than an upright position, machinery must be drained of fuel as far as practicable, and if any fuel remains, it must not exceed one-quarter of the tank capacity.

...

...

Part 5

SHIPPER'S RESPONSIBILITIES

...

Chapter 2

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MARKING

...

2.2 APPLICATION OF MARKS

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2.2.2 All package marks required by 2.1:

- a) must be durable and printed or otherwise marked on, or affixed to, the external surface of the package;
- b) must be readily visible and legible;
- c) must be able to withstand open weather exposure without a substantial reduction in effectiveness;
- d) must be displayed on a background of contrasting colour; and
- e) must not be located with other package marks that could substantially reduce their effectiveness.

DGP-WG/19-WP/2 (see paragraph 3.2.2.2 of the DGP-WG/19 report):

2.2.3 The marks required by 2.4.9 (Figure 5-2) and 2.4.16 (Figure 5-3) must be applied on one side of the package.

Part 6

PACKAGING NOMENCLATURE, MARKING, REQUIREMENTS AND TESTS

...

Chapter 3

REQUIREMENTS FOR PACKAGINGS

...

3.2.7 Metal receptacles (aerosols), non-refillable (IP.7, IP.7A, IP.7B)

3.2.7.1 Receptacles (aerosols) IP.7 and IP.7A

3.2.7.1.1 *Materials and construction.* Uniform quality steel plate or non-ferrous metal of uniform drawing quality must be used:

- IP.7 receptacles must have a minimum wall thickness of 0.18 mm;
- IP.7A receptacles must have a minimum wall thickness of 0.20 mm.

DGP-WG/19-WP/27 (see paragraph 3.2.2.9 of the DGP-WG/19 report):

The receptacles may be seamless or with seams welded, soldered, brazed, double-seamed or swaged. The ends must be of pressure design. Maximum capacity must not exceed ~~820 mL~~ 1 L and the maximum inner diameter must not exceed 76 mm.

...

Part 7**OPERATOR'S RESPONSIBILITIES**

...

Chapter 2**STORAGE AND LOADING**

...

**2.13 LOADING OF BATTERY-POWERED MOBILITY AIDS
CARRIED UNDER THE PROVISIONS OF PART 8**

DGP-WG/19-WP/6 (see paragraph 3.2.2.4 of the DGP-WG/19 report):

2.13.1 Loading of ~~non-spillable wet~~ battery-powered mobility aids powered by non-spillable wet batteries or batteries which comply with Special Provision A123 or A199

2.13.1.1 An operator must secure, by use of straps, tie-downs or other restraint devices, a battery-powered mobility aid with installed batteries. The mobility aid, the batteries, electrical cabling and controls must be protected from damage including by the movement of baggage, mail or cargo.

2.13.1.2 An operator must verify that:

a) the passenger has confirmed that the battery is:

- 1) a non-spillable wet battery that complies with Special Provision A67;
- 2) a dry battery that complies with Special Provision A123; or
- 3) a nickel-metal hydride battery that complies with Special Provision A199.

b) the battery terminals are protected from short circuits (e.g. by being enclosed within a battery container);

c) the battery is either:

- 1) securely attached to the mobility aid and the electrical circuits are isolated following the manufacturer's instructions; or
- 2) removed by the user, if the mobility aid is specifically designed to allow it to be, following the manufacturer's instructions.

d) a maximum of one spare battery is carried per passenger.

2.13.1.3 An operator must ensure that any battery(ies) removed from the mobility aid and any spare battery are carried in strong, rigid packagings, protected from short circuit and stowed in the cargo compartment.

2.13.1.4 The operator must inform the pilot-in-command of the location of any mobility aids with installed batteries, removed batteries and spare batteries.

...

2.13.2 Loading of mobility aids powered by spillable batteries ~~iesy-powered mobility aids~~

...

2.13.3 Loading of mobility aids powered by lithium ion batteries ~~iesy-powered mobility aids~~

...

Chapter 4

PROVISION OF INFORMATION

...

DGP-WG/19-WP/1 (see paragraph 3.2.2.1 of the DGP-WG/19 report):

4.6 REPORTING OF DANGEROUS GOODS OCCURRENCES

An operator must report to the appropriate authority of the State of the Operator ~~and the State of Origin~~ any occasion when:

- a) dangerous goods are discovered to have been carried when not loaded, segregated, separated or secured in accordance with Part 7;2; or
- b) dangerous goods are discovered to have been carried without information having been provided to the pilot-in-command in accordance with Part 7;4.1.

...

Part 8

PROVISIONS CONCERNING
PASSENGERS AND CREW

Chapter 1

PROVISIONS FOR DANGEROUS GOODS
CARRIED BY PASSENGERS OR CREW

...

Table 8-1. Provisions for dangerous goods carried by passengers or crew

DGP-WG/19-WP/6 (see paragraph 3.2.2.4 of the DGP-WG/19 report):

<i>Dangerous Goods</i>	<i>Location</i>		<i>Approval of the operator(s) is required</i>	<i>Restrictions</i>
	<i>Checked baggage</i>	<i>Carry-on baggage</i>		
Batteries				
...				
4) Battery-powered Mobility aids (e.g. wheelchairs) <u>powered by:</u> <ul style="list-style-type: none"> – spillable batteries; – non-spillable wet batteries; – dry batteries; – nickel-metal hydride batteries; or – lithium ion batteries 	Yes	(see d) <u>e</u>)	Yes	<p>a) for use by passengers whose mobility is restricted by either a disability, their health or age, or a temporary mobility problem (e.g. broken leg);</p> <p>b) the passenger should make advance arrangements with each operator and provide information on the type of battery installed and on the handling of the mobility aid (including instructions on how to isolate the battery);</p> <p><u>c) in the case of a dry battery or nickel-metal hydride battery, each battery must comply with Special Provision A123 or A199, respectively;</u></p> <p>e) in the case of a non-spillable wet battery:</p> <ul style="list-style-type: none"> i) each battery must comply with Special Provision A67; and ii) a maximum of one spare battery may be carried per passenger; <p>e) in the case of a lithium ion battery:</p> <ul style="list-style-type: none"> i) each battery must be of a type which meets the requirements of each test in the <i>UN Manual of Tests and Criteria</i>, Part III, subsection 38.3; ii) when the mobility aid does not provide adequate protection to the battery: <ul style="list-style-type: none"> – the battery must be removed in accordance with the manufacturer's instructions; – the battery must not exceed 300 Wh;

<i>Dangerous Goods</i>	<i>Location</i>		<i>Approval of the operator(s) is required</i>	<i>Restrictions</i>
	<i>Checked baggage</i>	<i>Carry-on baggage</i>		
				<ul style="list-style-type: none"> — the battery terminals must be protected from short circuit (by insulating the terminals, e.g. by taping over exposed terminals); — the battery must be protected from damage (e.g. by placing each battery in a protective pouch); and — the battery must be carried in the cabin; iii) a maximum of one spare battery not exceeding 300 Wh or two spare batteries not exceeding 160 Wh each may be carried. Spare batteries must be carried in the cabin.
...				

...

Attachment 4

PROPOSED NEW TRAINING PROVISIONS

...

Chapter 1

PROPOSED NEW PART 1, CHAPTER 4 — DANGEROUS GOODS TRAINING

Chapter 4

DANGEROUS GOODS TRAINING

*Parts of this Chapter are affected by State Variations AE 2, BR 7, CA 11, HK 1;
see Table A-1*

4.1 ESTABLISHMENT OF DANGEROUS GOODS TRAINING PROGRAMMES

Note.— A training programme includes elements such as design methodology, assessment, initial and recurrent training, instructor qualifications and competencies, training records and evaluation of the effectiveness of training.

DGP-WG/19-WP/23 (see paragraph 3.2.2.5 of the DGP-WG/19 report):

Original proposed sentence has been restructured (Original text: "The employer must establish and maintain a dangerous goods training programme for personnel that perform functions aimed at ensuring that dangerous goods are transported in accordance with these Instructions")

~~4.1.1 The employer must establish and maintain a dangerous goods training programme for personnel performing any function described in these Instructions. The employer of personnel that perform functions aimed at ensuring that dangerous goods are transported in accordance with these Instructions must establish and maintain a dangerous goods training programme.~~

The following provision will be further reviewed in conjunction with a review of the training provisions in Annex 18

~~[— 4.1.2 The employer [should/must] establish and maintain a dangerous goods training programme for personnel who may not perform any function described in these Instructions but do perform functions related to the movement of cargo, baggage, passengers or mail. The aim of the programme is to ensure personnel are competent to perform functions aimed at preventing undeclared dangerous goods or dangerous goods not permitted from being carried on an aircraft.]~~

Moved from under 1;4.2.1

~~*Note. 1— Chapter 6 provides guidance on tasks that personnel responsible for certain well-defined functions would typically perform. An approach to ensuring personnel are competent to perform any function for which they are responsible is provided in Guidance on a Competency-based Approach to Dangerous Goods Training and Assessment (see Chapter 2 of this attachment).*~~

Note 2.— Security personnel who are involved with the screening of passengers and crew and their baggage and cargo or mail are required to be trained irrespective of whether the operator on which the passenger or cargo is to be transported carries dangerous goods as cargo.

4.1.3 All operators must establish a dangerous goods training programme regardless of whether or not they are approved to transport dangerous goods as cargo.

4.1.4 Training courses may be developed and delivered by or for the employer.

4.2 OBJECTIVE OF DANGEROUS GOODS TRAINING

4.2.1 The employer must ensure that personnel are competent to perform any function for which they are responsible prior to performing any of these functions. This must be achieved through training and assessment commensurate with the functions for which they are responsible. Such training must include:

- a) general awareness/familiarization training — Personnel must be trained to be familiar with the general provisions;
- b) function-specific training — Personnel must be trained to perform competently any function for which they are responsible; and
- c) safety training — Personnel must be trained on how to recognize the hazards presented by dangerous goods, on the safe handling of dangerous goods, and on emergency response procedures.

Moved to under 1;4.1.1:

~~Note 1. — An approach to ensuring personnel are competent to perform any function for which they are responsible is provided in Guidance on a Competency-based Approach to Dangerous Goods Training and Assessment (see Chapter 2 of this attachment).~~

Note 2. — General information on the provisions for dangerous goods carried by passengers and crew (see Part 8) should be included in training courses, as appropriate.

4.2.2 Personnel who have received training but who are assigned to new functions must be assessed to determine their competence in respect of their new function. If competency is not demonstrated, appropriate additional training must be provided.

...

APPENDIX E

AMENDMENTS TO THE SUPPLEMENT TO THE TECHNICAL
INSTRUCTIONS DEVELOPED AT DGP-WG/19 FOR THE SAKE OF HARMONIZATION
WITH UN RECOMMENDATIONS ON THE TRANSPORT OF DANGEROUS GOODS

Part S-3

DANGEROUS GOODS LIST,
SPECIAL PROVISIONS AND QUANTITY LIMITATIONS

...

Chapter 2

SUPPLEMENTARY DANGEROUS GOODS LIST

Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4		6	7	8	9	10	11	12	13
UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/46/Add.1)												
<u>Detonators, electronic programmable for blasting†</u>	<u>0511</u>	<u>1.1B</u>		<u>Explosive</u>				<u>E0</u>	<u>FORBIDDEN (131)</u>		<u>FORBIDDEN (131)</u>	
<u>Detonators, electronic programmable for blasting†</u>	<u>0512</u>	<u>1.4B</u>		<u>Explosive 1.4</u>				<u>E0</u>	<u>FORBIDDEN (131)</u>		<u>131I</u>	<u>75 kg</u>
Desensitized explosive, solid, n.o.s.*	3380	4.1		Solid flammable	BE 3	A133 <u>A217</u>	I		FORBI	DDEN	FORBI	DDEN
Nitrocellulose, dry or wetted with less than 25% water (or alcohol), by mass	0340	1.1D		Explosive		<u>A216</u>			FORBIDDEN (112 b) or c)		FORBIDDEN (112 b) or c)	

Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4		6	7	8	9	10	11	12	13
Nitrocellulose , unmodified or plasticized with less than 18% plasticizing substance, by mass	0341	1.1D		Explosive		A216			FORBIDDEN (112 b))		FORBIDDEN (112 b))	
Nitrocellulose, plasticized with not less than 18% plasticizing substance, by mass	0343	1.3C		Explosive		A216 A313			FORBIDDEN (111)		FORBIDDEN (111)	
Nitrocellulose, wetted with not less than 25% alcohol, by mass	0342	1.3C		Explosive		A216 A313			FORBIDDEN (114 a))		FORBIDDEN (114 a))	
Dipropylamine	2383	3	8	Liquid flammable & Corrosive		A209 A330	II	E2	352 Y340	1 L 0.5 L	363	5 L
Dangerous goods in articles	3363	9		Miscellaneous		A48 A107 A332		E0	see 962		see 962	
2-Dimethylaminoethyl methacrylate, stabilized	2522	6.1		Toxic		A209 A330	II	E4	654 Y641	5 L 1 L	662	60 L
Engine, internal combustion, flammable gas powered	3529	2.1		Gas flammable		A70 A87 A176 A208		E0	FORBI	DDEN	220	No limit
Machinery, internal combustion, flammable gas powered	3529	2.1		Gas flammable		A70 A87 A176 A208		E0	FORBI	DDEN	220	No limit
UN Model Regulations, Chapter 3.2, dangerous goods list, SP395 (see ST/SG/AC.10/46/Add.1) and paragraphs 3.1.2.5.1 a), 3.1.2.6.1 d) and 3.1.3.1.1 of the DGP-WG/19 Report:												
Medical waste, Category A, affecting humans, solid	3549	6.2		Infectious		A2 A218		E0	FORBI	DDEN	622	400 kg

Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4		6	7	8	9	10	11	12	13
<u>Medical waste, Category A, affecting animals only, solid</u>	<u>3549</u>	<u>6.2</u>		<u>Infectious</u>		<u>A2</u> <u>A218</u>		<u>E0</u>	<u>FORBI</u>	<u>DDEN</u>	<u>622</u>	<u>400 kg</u>

...

Chapter 6

SPECIAL PROVISIONS

Against the entries in the Supplementary Dangerous Goods List (Table S-3-1), column 7 shows any special provisions that are applicable. Where these special provisions have not been listed in Table 3-2 of the Technical Instructions, they are listed in Table S-3-4 below.

Table S-3-4. Special Provisions

Supplementary special provisions

...

UN Model Regulations, Chapter 3.3, SP 370 (see ST/SG/AC.10/46/Add.1)

A326 (370) This entry only applies to ammonium nitrate that meets one of the following criteria:

- ammonium nitrate with more than 0.2% combustible substances, including any organic substance calculated as carbon, to the exclusion of any added substance; ~~and~~ or
- ammonium nitrate with not more than 0.2% combustible substances, including any organic substance calculated as carbon, to the exclusion of any added substance, that gives a positive result when tested in accordance with Test Series 2 (see UN *Manual of Tests and Criteria*, Part I). See also UN 1942.

This entry must not be used for ammonium nitrate for which a proper shipping name already exists in the Table 3-1 of the Technical Instructions including ammonium nitrate mixed with fuel oil (ANFO) or any of the commercial grades of ammonium nitrate.

...

UN Model Regulations, Chapter 3.3, SP 379 (see ST/SG/AC.10/46/Add.1)

A329 (379) Anhydrous ammonia adsorbed or absorbed on a solid contained in ammonia dispensing systems or cylinders intended to form part of such systems may be transported on cargo aircraft only with the prior approval of the appropriate authority of the State of Origin and the State of the Operator under the written conditions established by those authorities in addition to the following:

- a) the adsorption or absorption presents the following properties:
 - 1) the pressure at a temperature of 20°C in the cylinder is less than 0.6 bar;
 - 2) the pressure at a temperature of 35°C in the cylinder is less than 1 bar;
 - 3) the pressure at a temperature of 85°C in the cylinder is less than 12 bar;
- b) the adsorbent or absorbent material must not have dangerous properties listed in Classes 1 to 8;
- c) the maximum contents of a cylinder must be 10 kg of ammonia; and
- d) cylinders containing adsorbed or absorbed ammonia must meet the following conditions:
 - 1) cylinders must be made of a material compatible with ammonia as specified in ~~ISO 11114-1:2012~~ ISO 11114-1:2012 + A1:2017;
 - 2) cylinders and their means of closure must be hermetically sealed and able to contain the generated ammonia;

- 3) each cylinder must be able to withstand the pressure generated at 85°C with a volumetric expansion no greater than 0.1%;
- 4) each cylinder must be fitted with a device that allows for gas evacuation once pressure exceeds 15 bar without violent rupture, explosion or projection; and
- 5) each cylinder must be able to withstand a pressure of 20 bar without leakage when the pressure relief device is deactivated.

When offered for transport in an ammonia dispenser, the cylinders must be connected to the dispenser in such a way that the assembly is guaranteed to have the same strength as a single cylinder.

The properties of mechanical strength mentioned in this special provision must be tested using a prototype of a cylinder and/or dispenser filled to nominal capacity, by increasing the temperature until the specified pressures are reached.

The test results must be documented, must be traceable and must be communicated to the relevant authorities upon request.

...

UN Model Regulations, 4.1.4.1, P622 (see ST/SG/AC.10/46/Add.1) and paragraphs 3.1.2.5.1 a), 3.1.2.6.1 d) and 3.1.3.1.1 of the DGP-WG/19 Report:

Packing Instruction 622

Cargo aircraft only for UN 3468 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.

<u>COMBINATION PACKAGINGS</u>				<u>SINGLE PACKAGINGS</u>
<u>UN number and proper shipping name</u>	<u>Inner packaging (see 6;3.2)</u>	<u>Intermediate packaging</u>	<u>Total quantity per package</u>	
UN 3549 <u>Medical waste, Category A, affecting humans, solid</u>	<u>Metal</u>	<u>Metal</u>	<u>400 kg</u>	<u>No</u>
	<u>Plastics</u>	<u>Plastics</u>		
UN 3549 <u>Medical waste, Category A, affecting animals only, solid</u>	<u>Metal</u>	<u>Metal</u>	<u>400 kg</u>	<u>No</u>
	<u>Plastics</u>	<u>Plastics</u>		

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

Fibreboard (4G)
Aluminium (4B)
Plastics (4H2)
Plywood (4D)
Other metal (4N)
Steel (4A)

Drums

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

Jerricans

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

...

APPENDIX F

EXTRACT FROM THE REPORT OF THE EIGHTEENTH MEETING OF THE DANGEROUS GOODS PANEL RELATED TO THE INTRODUCTION OF SPECIAL PROVISIONS A88 AND A99 INTO THE TECHNICAL INSTRUCTIONS

2.7.3 Large Lithium Batteries: Packing and Transport by Cargo-only Aircraft (DGP/18-WP/48)

2.7.3.1 The requirements for the transport of lithium batteries in the UN Recommendations and the Technical Instructions no longer include limitations on the lithium content in individual cells or on the aggregate lithium content of batteries. Under these requirements, any battery that successfully passes the relevant tests in the UN Test Manual may be classified in Class 9 and transported under the provisions applicable to Lithium batteries (UN 3090), without regard to the lithium content of the cell or battery. One of the main reasons that the UNSCOE removed the cell and battery lithium content limitations was to provide for the transport of large, advanced technology lithium batteries, such as are increasingly being employed to power electric and hybrid vehicles.

2.7.3.2 Lithium batteries intended for use in vehicle propulsion may be transported as individual batteries or as assemblies that consist of two or more batteries. A survey of international lithium battery manufacturers had indicated that the smallest individual battery used as a battery assembly component has a mass of 12 kg. Alternatively, several batteries may be transported as a complete battery assembly, as would be installed in a vehicle. The survey of manufacturers also indicated that the largest battery assembly envisioned would have a mass of 500 kg. Individual batteries employ a strong, impact-resistant outer casing, and battery assemblies may be enclosed in an additional impact-resistant casing.

2.7.3.3 The gross mass of a large lithium battery or a battery assembly can thus exceed the current 35 kg G per package quantity limitation that is indicated in Table 3-1 of the TI. This precluded the transport of a package containing the batteries necessary to power a single electric vehicle by cargo aircraft. In order to ensure that such batteries may be transported by cargo aircraft in a single package (either as individual batteries or a complete battery assembly), it was proposed to amend the Technical Instructions to authorize the transport of large lithium batteries in a quantity per package exceeding the 35 kg G limit if approved by the appropriate authority of the State of origin. For purposes of application of this provision, a "large" lithium battery would be a battery with a gross mass of 12 kg or greater and employing a strong, impact-resistant outer casing (corresponding to the smallest battery to be used for vehicle propulsion), with smaller batteries remaining subject to the current 35 kg G per package quantity limit.

2.7.3.4 In order to be classified in Class 9, "large" lithium batteries would have to meet the tests prescribed in the UN Test Manual. In most cases, advanced technology large lithium batteries are equipped with thermal and energy management systems which ensure that they do not impose unwarranted risks either during use or in transport. The strong, impact-resistant outer casing renders them safe for use in vehicles even in the event of accidents. Paragraph e) of Packing Instruction 903 requires lithium batteries to be packed in inner packagings to prevent short circuits and movement. Paragraph f) requires use of UN packagings conforming to the requirements applicable to Packing Group II. Neither of these requirements are considered appropriate for large lithium batteries. Owing to the size of batteries, and the strong outer casings employed in their construction, packing more along the lines of that authorized for sodium batteries (UN 3292, see Packing Instruction 433) was considered appropriate. The transport of a single large battery assembly, or several individual large batteries secured within a strong outer packaging (such as a wooden crate), was considered to afford less opportunity for short circuit than would many small batteries packed in a single package (as was currently permitted under the packing and quantity limits in the Instructions). From the practical point of view, the risk of short circuit, and not merely the gross mass of batteries in a package, was the more serious potential

risk associated with the transport of lithium batteries. On this basis, it was proposed that the appropriate authority of the State of Origin also be authorized to approve the use of alternate packagings, including, when appropriate, strong outer packagings or protective enclosures (such as fully enclosed or wooden slatted crates) that would not be subject to the UN performance packaging requirements of Part 6 of the Instructions.

2.7.3.5 Requiring approval by the competent authority would ensure that the necessary level of safety was maintained in transport by taking appropriate account of the size and construction of the batteries, and the packaging necessary to properly protect the batteries in transport.

2.7.3.6 It was consequently proposed to add a new special provision against the entry "Lithium batteries, UN 3090" in Table 3-1 of the Instructions.

2.7.3.7 There was general agreement with this proposal, although a number of detailed points were raised:

- a) it was suggested that the approval of the State of the Operator and the State of Destination should also be obtained. However, it was pointed out that this was not normally the case if the approval were to be granted by the State of Origin against a specific set of criteria (as specified in this case);
- b) it was noted that the provision would apply to all large lithium batteries, not only those to be used in vehicles;
- c) the need for a better understanding of strong outer packaging was suggested. It was pointed out that this text is used in other parts of the Technical Instructions and UN Recommendations and is commonly understood.

2.7.3.8 In light of the discussions, a new special provision for application to Lithium batteries (UN 3090), for cargo aircraft only, was agreed, together with additional text in P 903.

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2.13.3 **Special Provision A45 and Transitional Period (DGP/18-WP/36 and WP/52)**

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2.13.3.4 A new special provision A88 had already been discussed, consistent with special provision SP 310 in the 12th revised edition of the UN Recommendations. This special provision would allow the transport on passenger and cargo aircraft of prototype lithium batteries when transported for testing and lithium batteries manufactured in small production runs of less than 100 that are not tested in accordance with the UN tests. While use of this special provision for the transport of batteries by road is not of concern, it was believed that it would not be in the best interest of safety to authorize the use of this special provision, for transport by aircraft. It was decided that the proposed special provision A88 should be included in the Instructions. However, it was agreed that this would be based on the approval of the appropriate national authority of the State of Origin and that it would only apply to prototype batteries to except them from the UN testing under specified conditions.

...

2.13.3.9 It was agreed not to pursue the proposal (A88) which would have disallowed prototype batteries being shipped for testing. It was agreed that these could be allowed, without having been tested according to the UN Test Requirements, but only with the approval of the State of Origin.

2.13.3.10 In light of the discussions, the meeting approved amendments to A 45, A 88 and 8;1.1.2.

— END —