



WORKING PAPER

**DANGEROUS GOODS PANEL (DGP)
WORKING GROUP MEETING (DGP-WG/21)**

Virtual Meeting, 24 to 28 May 2021

REPORT OF THE MEETING

(Presented by the Secretary)

1. INTRODUCTION

1.1 The Dangerous Goods Panel Working Group Meeting (DGP-WG/21) was convened virtually from 24 to 28 May 2021. The working group met virtually on account of the COVID-19 pandemic. The schedule was limited to three hours of discussion each day, recognizing it would be difficult for those in different time zones to adhere to normal meeting hours.

1.2 The meeting was chaired by Mr. T. Muller. Mr. Muller, who previously served as vice-chair, took over the role of chair from Ms. M. Paquette. Ms. Paquette left the panel following the previous working group meeting (DGP-WG/20, 19 to 23 October 2020). Mr. L. Cascardo was elected vice-chair.

2. FAREWELL TO MICHELINE PAQUETTE

2.1 Mr. Muller expressed appreciation for the success of Ms. Paquette in chairing the DGP for many years. Her tenure began in 2014 during a particularly tumultuous time when the panel was faced with strong and conflicting views regarding lithium batteries. Despite the challenges, she was able to lead the panel to acceptable outcomes through strong leadership, skills and dedication. Panel members expressed similar sentiment. Mr. Muller also expressed appreciation to the Canadian delegation for actively supporting the DGP over the course of Ms. Paquette's tenure. She was respected by all, and she would be missed.

2. ATTENDANCE

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

Members	Advisers	State/International Organization
S. Bitossi		Australia

Members	Advisers	State/International Organization
L. Cascardo	P.F. Macário	Brazil
S. Cumberbirch	D. Bolton D. Evans G. Sansoucy	Canada
P. Guo	S. Au (Hong Kong) A. Lee (Hong Kong) F.K. Lam (Hong Kong) F. Tai Q. Yang J. Wan (Hong Kong)	China
P. Tatin		France
S. Weizenhöfer		Germany
P. Privitera	A. Pellas	Italy
M. Araya	Y. Fujii Y. Funai N. Iki K. Nakano T. Tanaka K. Yanagawa	Japan
T. Muller	E. Boon R. Dardenne H. Strijbosch K. Vermeersch	Netherlands
M. De Castro	D. Kurdchenko Á. de Marcos F. Rodríguez Guzmán S. García Wolfrum	Russian Federation Spain
H. Al Muhairi	H. Abdel-Monem K. Alblooshi T. Howard A. Wagih	United Arab Emirates
J. Hanafin	C. Ruzicka	United Kingdom
D. Pfund	M. Givens K. Leary K. Miller E. Petrie K. Ranck	United States

Members	Advisers	State/International Organization
D. Brennan	C. Chan	International Air Transport Association (IATA)
D. Ferguson		International Coordinating Council of Aerospace Industries Associations (ICCAIA)
S. Schwartz	T. Lempiainen M. Phaneuf	International Federation of Air Line Pilots' Associations (IFALPA)
Advisers		
E. Sigrist S. Schultes		European Chemical Industry Council (CEFIC)
E. Altemos V. Arthur G. Leach		Dangerous Goods Advisory Council (DGAC)
Observers		
R. Machuca		Chile
H. Senja		Finland
F. Hamilton Carroll		Rwanda
R. Cataldo N. Hagmann		Switzerland
L. Calleja Barcena		European Aviation Safety Agency (EASA)
A. McCulloch T. Rogers		Global Express Association (GEA)
E. Remy		North Atlantic Treaty Organization (NATO)
P. Balasubramanian		Strategic Aviation Solutions International (SASI)

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 2023-2024 Edition

3.1.2.1 Amendments to the Technical Instructions proposed for the sake of alignment with the UN Recommendations on the Transport of Dangerous goods were developed by the DGP Working Group on UN Harmonization (DGP-WG/UN Harmonization). This working group was established at the DGP Working Group Meeting in 2020 (DGP-WG/20, 19 to 23 October 2020) as a permanent body of the DGP tasked with:

- a) harmonizing ICAO dangerous goods provisions with the UN Recommendations on the Transport of Dangerous Goods with the goal of facilitating intermodal transport while maintaining an acceptable level of safety for air transport; and
- b) identifying areas for which harmonization with the UN Recommendations on the Transport of Dangerous Goods may introduce unacceptable risk to aviation.

3.1.2.2 The chair expressed his appreciation to the working group, which had met several times prior to DGP-WG/21. The Secretariat noted that DGP-WG/UN Harmonization provided significant support to ICAO, which was gratefully appreciated.

3.1.2.3 The chair encouraged input from panel members, observers and advisers during the review of the working papers, especially those who did not take part in the DGP-WG/UN Harmonization work. The report of the discussions is provided in paragraphs 3.1.2.4 through 3.1.2.10 and 3.1.3.1.

3.1.2.4 Draft Amendments to Part 1 of the Technical Instructions to Align with the UN Recommendations (DGP-WG/21-WP/11)

3.1.2.4.1 Draft amendments to Part 1 were developed by DGP-WG/UN Harmonization to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods. DGP-WG/UN Harmonization alerted the meeting to the following:

- a) A definition for Manual of Tests and Criteria, which included its latest revision number, was introduced into Part 1;3 for the sake of alignment with the UN Model Regulations. This would make it unnecessary in the future for the number to be modified each time the document was referenced everywhere else in the Technical

Instructions. DGP-WG/UN Harmonization recommended introducing a definition for Model Regulations in Part 1;3 for the same reason. References to revision numbers for the UN Manual of Tests and Criteria and the UN Model Regulations would be removed throughout the Technical Instructions, except for the definitions in 1;3, and the consistent use of “UN Manual of Tests and Criteria” and “UN Model Regulations” would be ensured throughout the document.

- b) Replacement of the term “Liquids” with “Liquid” was proposed, on the basis that the singular form was used in the UN Model Regulations. The definition itself was modified to align with the singular term.
- c) A revision to the title of the ADR which removed a reference to “European” had not been incorporated in the UN Model Regulations. DGP-WG/UN Harmonization recommended it be made in the Technical Instructions. The chair of the UN Sub-Committee of Experts on the Transport of Dangerous Goods advised that this had been informally raised at the UN, and he expected the UN Model Regulations would be amended accordingly.

3.1.2.4.2 The need for “Rev.21” to be replaced with “Rev.22” in the new definition for UN Model Regulations was identified during discussions.

3.1.2.4.3 There were no objections to the amendments proposed. A list of revisions made in addition to those in DGP-WG/21-WP/11 is provided in Appendix A, and consolidated amendments to the Technical Instructions developed at DGP-WG/20 and DGP-WG/21 for the sake of harmonization with UN Model Regulations are provided in Appendix B to this report. Panel members were invited to further review the amendments and advise DGP-WG/Harmonization of any discrepancies. DGP-WG/UN Harmonization would submit final amendments in a working paper to DGP/28 for approval.

3.1.2.5 **Draft Amendments to Part 2 of the Technical Instructions to Align with the UN Recommendations (DGP-WG/21-WP/12)**

3.1.2.5.1 Draft amendments to Part 2 were proposed by DGP-WG/UN Harmonization to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods. DGP-WG/UN Harmonization alerted the meeting to the following:

- a) Inconsistencies between the elements in Table 2-6 (List of currently assigned self-reactive substances in packagings) and Table 2-7 (List of currently assigned organic peroxides in packagings) in the Technical Instructions and the associated tables in the UN Model Regulations were identified. While some of the discrepancies were small, they could cause challenges during acceptance checks. A thorough review of the two tables would therefore be carried out and proposed amendments would be developed for consideration at DGP/28. This might result in the need for rationale to be added to the *Guidance for the Panel to Aid in Preparation of the Technical Instructions and Supporting Documents*.
- b) Inconsistencies in Table 3-1 for certain self-reactive substances were also identified with regard to whether or not a UN number was included for those that were forbidden for transport. DGP-WG/UN Harmonization concluded that the UN number

should be provided for substances even when they were forbidden. Amendments to address the inconsistencies would be developed for consideration at DGP/28.

3.1.2.5.2 The need to remove unnecessary text from 2;9.3 g) was identified during the presentation of the working paper. The text specified that the test summary from manufacturers and subsequent distributors of cells or batteries would only be required from 1 January 2020. The UN would be advised of this deletion.

3.1.2.5.3 There were no objections to the amendments proposed. A list of revisions made in addition to those in DGP-WG/21-WP/12 is provided in Appendix A, and consolidated amendments to the Technical Instructions developed at DGP-WG/20 and DGP-WG/21 for the sake of harmonization with UN Model Regulations are provided in Appendix B to this report. Panel members were invited to further review the amendments and advise DGP-WG/Harmonization of any discrepancies. DGP-WG/UN Harmonization would submit final amendments in a working paper to DGP/28 for approval.

3.1.2.6 **Draft Amendments to Part 3 of the Technical Instructions to Align with the UN Recommendations (DGP-WG/21-WP/13)**

3.1.2.6.1 Draft amendments to Part 3 were proposed by DGP-WG/UN Harmonization to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods. DGP-WG/UN Harmonization alerted the meeting to the following:

- a) The “no limit” maximum net quantity per package set for UN 2794 — **Batteries, wet, filled with acid**, electric storage, UN 2795 — **Batteries, wet, filled with alkali**, electric storage and UN 3292 — **Cells, containing sodium** in Table 3-1 for cargo aircraft would be replaced with 400 kg. This was proposed with the recognition that these articles must be packed in UN specification packagings, and 400 kg is the maximum quantity permitted in such packagings. The need for the amendment was identified during discussions on a new note introduced by the UN Sub-Committee under certain packaging instructions where exceptions from design type testing were provided (see paragraph 3.1.2.7.1 a) of this report).
- b) A minor editorial revision to a new note under sub-paragraph a) of Special Provision A19 would be made and the UN would be advised.

3.1.2.6.2 There were no objections to the amendments proposed. Consolidated amendments to the Technical Instructions developed at DGP-WG/20 and DGP-WG/21 for the sake of harmonization with UN Model Regulations are provided in Appendix B to this report. Panel members were invited to further review the amendments and advise DGP-WG/Harmonization of any discrepancies. DGP-WG/UN Harmonization would submit final amendments in a working paper to DGP/28 for approval.

3.1.2.7 **Draft Amendments to Part 4 of the Technical Instructions to Align with the UN Recommendations (DGP-WG/21-WP/14)**

3.1.2.7.1 Draft amendments to Part 4 were proposed by DGP-WG/UN Harmonization to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods. DGP-WG/UN Harmonization alerted the meeting to the following:

- a) A provision that appeared in 4;1.1.2 related to packagings manufactured and tested under a quality assurance programme did not appear in the corresponding paragraph in Part 4 of the UN Model Regulations, but did appear in 6.1.1.4 of that document. DGP-WG/UN Harmonization concluded it should remain in Part 4;1.1.2 of the Technical Instructions and added it as a new 6;1.1.3 for the sake of harmonization with the UN Model Regulations. A note that referred to an ISO packaging standard was also moved to Part 6;1.1.3 and revised for the sake of alignment with the UN Model Regulations.
- b) Notes were added to the UN Model Regulations to certain packing instructions where exceptions from design type testing were provided to clarify that the packaging used could be larger than the 400 kg maximum net mass limit specified in 6.1.4 of that document (Table 6-2 and Part 6;3 of the Technical Instructions). The provision was added to the UN document to address the incorrect belief that such packaging was subject to the design test requirements of Part 6 if the package exceeded the mass or volume limits generally applicable. DGP-WG/UN Harmonization added the note only to the associated packing instructions in the Technical Instructions where there was no limit to the quantities of dangerous goods permitted for transport by air. It was not added to Packing Instructions 215, 216, 217, or 965-970.
- c) There was a suggestion to replace a cross reference from Packing Instruction 214 to an ISO standard in Part 6 with the specific standard that applied. However, there was more than one ISO standard listed in the specific paragraph of Part 6 referenced that could apply, so keeping the cross reference was considered necessary.
- d) DGP-WG/UN Harmonization identified a need to add additional packing requirements for engines and machinery in Packing Instructions 220 and 378 that were contained in the associated packing instruction in the UN Model Regulations (P005) and in Packing Instruction 972.
- e) The “no limit” total quantity per package for cargo aircraft established in Packing Instruction 492, which applied to UN 3292 — **Cells, containing sodium**; and Packing Instruction 870, which applied UN 2794 — **Batteries, wet, filled with acid**, electric storage and UN 2795 — **Batteries, wet, filled with alkali**, electric storage was replaced with 400 kg to align with the revisions to Table 3-1 proposed for Part 3 (see paragraph 3.1.2.6.1 a) of this report).
- f) Packing Instruction 621 was restructured to align with standard packing instructions and packagings with non-removeable heads for drums and jerricans were added to the outer packagings table for the sake of alignment with the UN Model Regulations.

3.1.2.7.2 It was noted during discussions that the structure of the Spanish version of Packing Instruction 621 did not align with the English version. The Secretariat would advise the Spanish Section of this discrepancy. Panel members were invited to advise the newly-established DGP-WG/Harmonization of discrepancies such as this one when identified in the future so that all proposed changes funnel through that group.

3.1.2.7.3 There were no objections to the amendments proposed. A list of revisions made in addition to those in DGP-WG/21-WP/14 is provided in Appendix A, and consolidated amendments to the Technical Instructions developed at DGP-WG/20 and DGP-WG/21 for the sake of harmonization with UN Model Regulations are provided in Appendix B to this report. Panel members were invited to further review the amendments and advise DGP-WG/Harmonization of any discrepancies. DGP-WG/UN Harmonization would submit final amendments in a working paper to DGP/28 for approval.

3.1.2.8 **Draft Amendments to Part 5 of the Technical Instructions to Align with the UN Recommendations (DGP-WG/21-WP/15)**

3.1.2.8.1 Draft amendments to Part 5 were proposed by DGP-WG/UN Harmonization to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods. DGP-WG/UN Harmonization alerted the meeting to the following:

- a) The requirement for a telephone number on the lithium battery mark was removed from the UN Model Regulations, and a note was added allowing the current mark with the telephone number to be used until 31 December 2026. DG-WG/UN Harmonization questioned whether specifying an end-of-use date was necessary, recognizing that there may be a large quantity of pre-printed marks with a place holder for the telephone number in circulation, and there was no apparent safety impact if it appeared on the mark indefinitely. DG-WG/UN Harmonization recommended raising the question with the UN Sub-Committee.
- b) The provisions for information related to elevated temperature substances to be included with the proper shipping name in the dangerous goods description were revised in the UN Model Regulations by separating provisions for “Molten” from provisions for “elevated temperature substances”. The requirement for “Molten” to appear had been included under a heading for elevated temperature substances in the Technical Instructions, despite the fact that the latter were forbidden for transport by air. DGP-WG/UN Harmonization recommended including the new paragraph for molten substances introduced into the UN Model Regulations and removing the paragraph for elevated temperature substances.

3.1.2.8.2 The need for further editorial revisions was identified during the presentation of the paper. These are shown in Appendix A to this report.

3.1.2.8.3 There was a question on whether the note related to the lithium battery mark applied solely to the telephone number or if it applied also to the dimension of the mark, which was modified in the 2021-2022 Edition. A note was added to that edition specifying that the mark from the 2019-2020 Edition could continue to be used. It was clarified that the new note with an end-of-use clause applied only to the telephone number. The existing note allowed the previous dimension (a minimum of 120 mm x 110 mm) to be used indefinitely, although this was considered redundant in that the dimensions on the current mark (minimum dimension 100 mm x 100 mm) did not prohibit this size. It was noted that

the note did not appear in the UN Model Regulations, but the DGP had decided to include it to avoid problems during acceptance. The chairman of the UN Sub-Committee noted there had been a robust debate with regard to the telephone number and whether or not an option to maintain the telephone number should be provided. Some, particularly industry, did not want an option as this could result in problems during acceptance. Providing the end-of-use date was introduced as a compromise, and the need for an option would be revisited by the committee as that date approached. Referring to the original question that led to the DGP discussion, it was suggested to combine the provisions in the two notes into one for the sake of simplification or that the note related to dimensions be deleted. This would be considered by DGP-WG/UN Harmonization.

3.1.2.8.4 There were no objections to the amendments proposed. A list of revisions made in addition to those in DGP-WG/21-WP/15 is provided in Appendix A, and consolidated amendments to the Technical Instructions developed at DGP-WG/20 and DGP-WG/21 for the sake of harmonization with the UN Model Regulations are provided in Appendix B to this report. Panel members were invited to further review the amendments and advise DGP-WG/Harmonization of any discrepancies. DGP-WG/UN Harmonization would submit final amendments in a working paper to DGP/28 for approval.

3.1.2.9 Draft Amendments to Part 6 of the Technical Instructions to Align with the UN Recommendations (DGP-WG/21-WP/16)

3.1.2.9.1 Draft amendments to Part 6 were proposed by DGP-WG/UN Harmonization to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods. DGP-WG/UN Harmonization alerted the meeting to the following:

- a) Further review of the use of terminology related to pressure receptacles would be carried out by DGP-WG/UN Harmonization.
- b) Replacement of new provisions referring to bundles of cylinders in Part 6;5.2.5.1.2 b) and c) with “not used” would be considered by DGP-WG/UN Harmonization with the recognition that these are prohibited for air transport.
- c) A new paragraph was introduced in the UN Model Regulations and numbered as 6.2.2.5.0. The paragraph numbering was altered in the Technical Instructions so as to avoid using “0”.
- d) A note introduced in 6.2.2.7 of the UN Model Regulations included a mandatory requirement, so it was incorporated in the general provision of the Technical Instructions (6;5.2.7.2 b)). The UN Sub-Committee would be informed.

3.1.2.9.2 The need for further editorial revisions was identified during the discussion of the paper. These are shown in Appendix A to this report.

3.1.2.9.3 A list of revisions made in addition to those in DGP-WG/21-WP/16 is provided in Appendix A, and consolidated amendments to the Technical Instructions developed at DGP-WG/20 and DGP-WG/21 for the sake of harmonization with UN Model Regulations are provided in Appendix B to this report. Panel members were invited to further review the amendments and advise DGP-WG/Harmonization of any discrepancies. Final amendments would be submitted to DGP/28.

3.1.2.10 **Draft Amendments to the Attachments to the Technical Instructions to Align with the UN Recommendations (DGP-WG/21-WP/20)**

3.1.2.10.1 Draft amendments to the Attachments to the Technical Instructions were proposed by DGP Working Group on UN Harmonization (DGP-WG/UN Harmonization) to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods.

3.1.2.10.2 The need to revise the proper shipping name for UN 2913 was identified during the presentation of the working paper. This is shown in Appendix A to this working paper. The amendments developed for the attachments to the Technical Instructions are included with the consolidated amendments to the Technical Instructions developed at DGP-WG/20 and DGP-WG/21 for the sake of harmonization with UN Model Regulations in Appendix B to this report. Panel members were invited to further review the amendments and advise DGP WG/Harmonization of any discrepancies. Final amendments would be submitted to DGP/28.

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 2023-2024 Edition**

3.1.3.1 **Draft Amendments to the Supplement to the Technical Instructions to Align with the UN Recommendations (DGP-WG/21-WP/19)**

3.1.3.1.1 Draft amendments to the Supplement were proposed by DGP-WG/UN Harmonization to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods. DGP-WG/UN Harmonization alerted the meeting to the following:

- a) It was proposed to replace the 150 kg maximum net quantity per package limit for UN 3538 — **Articles containing non-flammable, non toxic gas, n.o.s.** in Table S-3-1 with “No limit”, with the recognition that the entry in the table was an article. It was noted that there were several other articles in Table S-3-1 that had quantity limits in need of review. It was further suggested that guidance may need to be developed for States, since these articles could only be transported under an approval. DGP-WG/Supplement would be involved with this work.
- b) A new special provision added to the UN Model Regulations (SP396) that applied to UN 3538 — **Articles containing non-flammable, non toxic gas, n.o.s.** included requirements for cylinders with open valves containing a gas that presented an asphyxiation hazard when transported with articles in cargo transport units that were considered irrelevant for air transport. However, DGP-WG/UN Harmonization recommended the inclusion of revised text that alerted operators to the asphyxiation hazard. Improper use of “risk” in the new special provision in the UN Model Regulations was also identified. The UN Sub-Committee would be advised.
- c) The need for a complete review of Packing Instructions 200 and 213 against P200 of the UN Model Regulations was identified. DGP-WG/Supplement would be involved with this review.

3.1.3.1.2 The discussion highlighted the need for coordination between DGP-WG/UN Harmonization and DGP-WG/Supplement. The rapporteurs of each group would work together to develop working methods.

3.1.3.1.3 There were no objections to the amendments proposed. They are presented in Appendix D to this report. Panel members were invited to further review the amendments and advise DGP WG/Harmonization of any discrepancies. Final amendments would be submitted to DGP/28.

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.

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 2023-2024 Edition**

3.2.2.1 **Editorial Correction of Part 2 (DGP-WG/21-WP/2)**

3.2.2.1.1 The need for editorial revisions to references to Part 1;1.1.2 (approvals) and 1;1.1.3 (exemptions) from the temperature control provisions for self-reactive substances (2;4.2.3.3) and organic peroxides (2;5.3.3.1) was identified. An amendment was agreed (see Appendix C).

3.2.2.2 **Precedence of Classification Environmentally Hazardous Substance vs Aviation Regulated Substance (DGP-WG/21-WP/6)**

3.2.2.2.1 An amendment to the classification criteria for UN 3334 — **Aviation regulated liquid, n.o.s.** and UN 3335 — **Aviation regulated solid, n.o.s.** was proposed requiring the substances to be assigned to UN 3082 — **Environmentally hazardous substance, liquid, n.o.s.** or UN 3077 — **Environmentally hazardous substance, solid, n.o.s.** if they also met the criteria for environmentally hazardous substances as set out in 2.9.3 of the UN Model Regulations. It was argued that establishing a higher precedence of hazard for environmentally hazardous substances was appropriate given the well-defined criteria for their classification, which applied to all modes of transport, versus the very subjective criteria for classifying aviation regulated substances, which were only regulated by the air mode. There were reports of consignments being offered for transport as environmentally hazardous substances being rejected by operator acceptance staff who believed the consignment should be classified as aviation regulated substances. Introducing a precedence of hazard would help eliminate such conflicts. It was noted that both environmentally hazardous substances and aviation regulated substances were assigned to the same packing instructions.

3.2.2.2.2 While there was some support for the proposal, there were concerns that the aviation hazard would be ignored if not classified as UN 3334 or UN 3335. It was noted that environmentally hazardous substances were not hazardous to the safety of the aircraft, but aviation regulated substances could be. Different drill codes were assigned to each substance in the *Emergency Response Guidance for*

Aircraft Incidents Involving Dangerous Goods (Doc 9481) whereby UN 3082 and UN 3077 were assigned “9L”, with “L” an indication that additional hazards were low or none, and UN 3334 and UN 3335 were assigned “9A”, with “A” an indication that the substance could be anaesthetic. There were concerns that the flight crew would not be notified of this hazard if the classification changed. There were also concerns that the exception for environmentally hazardous substances in packagings containing a net quantity per single or inner packaging of 5 L or less for liquids and 5 kg or less for solids could make substances previously classified as aviation regulated unregulated. There was sympathy for the need to facilitate transport, but the need for an approach that would communicate the aviation hazards was voiced. Some felt a better approach would be to strengthen the classification criteria for aviation regulated to make it less subjective and to base the criteria on data. In this respect, there were requests for incident data justifying classification as aviation regulated substances.

3.2.2.2.3 The proposer did not share the concerns that a hazard would be ignored, emphasizing that the packaging required in the packing instructions for both substances was the same and there were no extra conditions that applied to aviation regulated. The hazard communication was identical (miscellaneous), and there were no additional handling or loading requirements. In fact, environmentally hazardous had an extra form of hazard communication in the form of the dead fish mark. He was not aware of any incidents involving aviation regulated substances, suggesting the requirements addressed the hazards. He noted another disconnect discovered since the submission of the working paper related to Special Provision A97 which might need further review. The special provision specified that environmentally hazardous substances must be used for substances which were hazardous to the environment but did not meet the classification criteria of any other class or other substance within Class 9, but that an equivalent special provision was not included in the Model Regulations. This created a disconnect with the other modes whereby a substance might be classified as environmentally hazardous by other modes but not the aviation mode.

3.2.2.2.4 A new proposal would be submitted to DGP/28 taking into account the issue raised related to Special Provision A97.

3.2.2.3 **Proposed Amendment to Special Provision A117 (DGP-WG/21-WP/10)**

3.2.2.3.1 Special Provision A117 required wastes containing Category A infectious substances to be assigned to UN 2814 — **Infectious substance, affecting humans** or UN 2900 — **Infectious substance, affecting animals**. It was proposed to modify this special provision by referring to UN 3549 — **Medical waste, Category A**, affecting animals only, solid and **Medical waste, Category A, affecting humans**, solid. UN 3549 had been added to the 2021-2022 Editions of the Technical Instructions and the Supplement, and it was suggested not revising Special Provision A117 to include a reference to this new UN number was an oversight.

3.2.2.3.2 The amendment was supported with one suggestion to assign A117 to UN 3549 in Table 3-1 and Table S-3-1 of the Supplement. However, this was not supported by the proposer because Special Provision A117 was assigned only to UN 3291 — **Biomedical waste, n.o.s., Clinical waste, unspecified, n.o.s., Medical waste, n.o.s. and Regulated medical waste, n.o.s.** to ensure that these substances contained only infectious substances of Category B and not Category A. If wastes contained substances of Category A, UN 3291 could not be used. He suggested that if A117 were assigned to UN 3549 it would also need to be assigned to UN 2814 or UN 2900, but that this should be subject to a separate proposal if anyone thought it necessary.

3.2.2.3.3 The proposal as presented was agreed (see Appendix C).

3.2.2.4 **Proposed Special Provision for Life-Saving Appliances (DGP-WG/21-WP/21, Revised)**

3.2.2.4.1 A proposal to move a provision in Packing Instruction 955 that made life-saving appliances containing only small cartridges of a Division 2.2 gas not subject to the Technical Instructions to a new special provision was made. It was suggested that including such an exception in a packing instruction was inconsistent with how other exceptions were handled in the Technical Instructions and was not aligned with the UN Model Regulations, which included the exception in a special provision. An amendment to replace “see 955” with “955” in the packing instruction fields of Table 3-1 for UN 3072 — **Life-saving appliances, not self-inflating** and UN 2990 — **Life-saving appliances, self-inflating** was also proposed. While “see” was used before a packing instruction number in Table 3-1 for other dangerous goods entries if a value for the maximum net quantity per package was not provided, a limit was provided for UN 3072 or UN 2990 .

3.2.2.4.2 The amendments were agreed, subject to editorial revisions (see Appendix C).

3.2.2.5 **Revisions to the Excepted Quantity Code E0 (DGP-WG/21-WP/32)**

3.2.2.5.1 Inconsistencies with respect to how excepted quantity codes were assigned to entries in Table 3-1 that were forbidden for transport were identified. In some cases, the field for the excepted quantity code was left blank and in others a value of “E0” was provided. Amendments to remove the inconsistencies were proposed.

3.2.2.5.2 The rapporteur of DGP-WG/UN Harmonization reported that this issue had been raised by that group when developing the amendments to the Technical Instructions to align with the UN Model Regulations. The group had concluded that criteria for assigning codes to forbidden dangerous goods should be developed and included in the *Guidance for the Panel to Aid in Preparation of the Technical Instructions and Supporting Documents*. DGP-WG/UN Harmonization would be conducting a comprehensive review of this document and would be submitting an updated document to DGP/28. A separate working paper would be submitted by DGP-WG/UN Harmonization to correct any anomalies between the criteria developed and the actual values in the Technical Instructions.

3.2.2.5.3 A decision on the amendments proposed in DGP-WG/21-WP/32 would be deferred until DGP/28.

3.2.2.6 **Revision to Special Provision A132 (DGP-WG/21-WP/33)**

3.2.2.6.1 Special Provision A132 contained an outdated time period for which an exception from the requirement for articles containing smoke-producing substances that are corrosive to bear a corrosive subsidiary hazard label could be applied.

3.2.2.6.2 A proposal to delete the exception was agreed (see Appendix C).

3.2.2.7 **Revision to Special Provision A35 (DGP-WG/21-WP/34)**

3.2.2.7.1 Special Provision A35 clarified that wetted metal powders assigned to:

- a) UN 1326 — **Hafnium powder, wetted** with not less than 25% water;

- b) UN 1352 — **Titanium powder, wetted** with not less than 25% water; and
- c) UN 1358 — **Zirconium powder, wetted** with not less than 25% water;

were not subject to the Technical Instructions when the particle sizes were *more than* 53 microns (mechanically produced) or *more than* 840 microns (chemically produced). However, the entries for these substances in Table 3-1 specified particle sizes of *less than* 53 microns (mechanically produced) or *less than* 840 microns (chemically produced). Specifying *more than* in the special provision and *less than* in Table 3-1 meant that particle sizes equal to 53 or 840 microns were not accounted for. They would therefore be excepted from the Technical Instructions in accordance with the name in Table 3-1 but not in accordance with Special Provision A35. Since the name in Table 3-1 was harmonized with the name in the UN Model Regulations and that document did not contain an associated special provision, an amendment to the special provision was proposed to clarify that particle sizes equal to 53 microns (mechanically produced) or 840 microns (chemically produced) were not subject to the Technical Instructions.

3.2.2.7.2 The amendment, subject to minor editorial revisions, was agreed (see Appendix C).

3.2.2.8 **Assignment of Special Provision A1 to UN 2881 (DGP-WG/21-WP/37)**

3.2.2.8.1 The working paper was submitted to invite the working group to consider assigning Special Provision A1 to UN 2881 — **Metal catalyst, dry**. UN 2881 was forbidden for transport on both passenger and cargo aircraft when meeting the criteria for Packing Group I, forbidden on passenger aircraft when meeting the criteria for Packing Group II, and permitted on both passenger and cargo aircraft when meeting the criteria for Packing Group III. Special Provision A36 was assigned to the substance, which specified that Special Provision A2 could only be applied for Packing Group I and Special Provision A1 could only be applied for Packing Group II, yet neither A1 nor A2 were assigned to the substances. UN 2881 was assigned a packing instruction number in the passenger aircraft column for Packing Group II in Table S-3-1 of the Supplement to the Technical Instructions, suggesting the substance could be transported on passenger aircraft under an approval.

3.2.2.8.2 The working group did not have time to review the proposal since it was a late submission. It would be re-submitted to DGP/28.

3.2.2.9 **Proposed Editorial Revisions to Technical Instructions (DGP-WG/21-WP 38)**

3.2.2.9.1 An editorial revision to the UN numbers provided in a cross reference to **Engine, internal combustion** from Gas turbine engines in Table 3-1 and to UN number references associated with aircraft engines, fuel cell engine, and turbine engines listed in the Glossary of Terms (Attachment 2) were proposed. The classification for engines had been modified in the 2017-2018 Edition of the Technical Instructions resulting in three UN numbers. The proposed revisions therefore incorporated these numbers.

3.2.2.9.2 The working group did not have time to review the proposal since it was a late submission. It would be re-submitted to DGP/28.

**3.2.2.10 Revisions to Special Provision A136
(DGP-WG/21-WP-40)**

3.2.2.10.1 Special Provision A136 specified that substances assigned to it must be shaded from direct sunlight and all sources of heat and placed in adequately ventilated areas. There were no requirements, however, for any statement to this effect to appear on the dangerous goods transport document or for packages to bear the keep away from heat label. Without these requirements, an operator might not know to keep these packages away from sunlight or sources of heat. An amendment to Special Provision A136 requiring a statement on the dangerous goods transport document and the application of the keep away from heat label was therefore proposed.

3.2.2.10.2 The working group did not have time to review the proposal since it was a late submission. It would be re-submitted to DGP/28.

3.2.2.11 Revision to Packing Instruction 870 (DGP-WG/21-WP/8)

3.2.2.11.1 Packing conditions for batteries installed in equipment were provided in Packing Instruction 870, which applied to UN 2794 — **Batteries, wet, filled with acid** and UN 2795 — **Batteries, wet, filled with alkali**. It was proposed to remove these packing conditions, with the recognition that wet batteries filled with acid or alkali would be classified as UN 3171 — **Battery-powered equipment** and therefore subject to Packing Instruction 952.

3.2.2.11.2 The amendment was agreed (see Appendix C).

3.2.2.12 Revision to Packing Instruction 621 (DGP-WG/21-WP/22)

3.2.2.12.1 An amendment to Packing Instruction 621 was proposed which removed text that was not contained in the corresponding packing instruction contained in the UN Model Regulations (P621). The text required consignments to be prepared in such a manner that they arrived at their destination in good condition and presented no hazard to persons or animals during transport. This text was included in 4.1.8 of the UN Model Regulations, which applied to infectious substances of Category A. The text was considered inappropriate for Packing Instruction 621, which was assigned to wastes containing only Category B infectious substances (UN 3291 — **Biomedical waste, n.o.s., Clinical waste, unspecified, n.o.s., Medical waste, n.o.s.** and **Regulated medical waste, n.o.s.**).

3.2.2.12.2 The amendment was agreed (see Appendix C).

**3.2.2.13 Revision to Packing Instruction Y960
(DGP-WG/21-WP/35)**

3.2.2.13.1 A working paper was submitted proposing to amend Packing Instruction Y960 to include aluminium and steel boxes to the list of outer packagings of combination packagings permitted and to add a column for maximum quantity of dangerous goods per package to the quantity limit table. It was suggested that not including steel and aluminium boxes was an inadvertent error, given other metal boxes were included and steel and aluminium boxes were included in the corresponding packing instruction in the UN Model Regulations. The addition of the extra column to the packing instruction was proposed to distinguish the maximum quantity permitted per package, which was shown in Table 3-1, from the maximum quantity of dangerous goods per kit permitted, which was shown in the existing packing instruction.

3.2.2.13.2 The working group did not have time to review the proposal since it was a late submission. It would be re-submitted to DGP/28.

3.2.2.14 Revision to Required Special Provision Numbers on Transport Document (DGP-WG/21-WP/3)

3.2.2.14.1 The addition of Special Provision A88 to and removal of Special Provision A208 from the list of special provisions that must appear on the transport document in accordance with Part 5;4.1.5.8.1 b) were proposed. While Special Provision A88 specified that it must be noted on the dangerous goods transport document, Special Provision A208 did not and it did not provide any specific information that acceptance staff should be aware of. An amendment to Special Provisions A1 and A2 was also proposed to specify that the special provision must be noted on the dangerous goods transport document. An additional proposal to add similar text to Special Provision A78 was made during presentation of the working paper.

3.2.2.14.2 It was suggested during the discussion that Special Provision A144 should also be added to Part 5;4.1.5.8.1 b) and that an editorial correction to delete a note under 5;4.1.5.8.1 a) should be made. The note referred to Packing Instruction 621, which had been renumbered from 622 in the 2021-2022 Edition, and allowed 622 to continue to be indicated on the transport document when applied to UN 3291 until 31 March 2021.

3.2.2.14.3 The amendment as presented was agreed as was the editorial correction (see Appendix C). The amendment to Special Provision A78 proposed during the presentation and the addition of A144 to the list of special provisions that must appear on the transport document were not agreed as members wanted more time to consider. These would be considered in a separate proposal to DGP/28.

3.2.2.15 Annotation of Special Provision Number “A99” on Transport Document (DGP-WG/21-WP/4, Revised)

3.2.2.15.1 An amendment to Special Provision A99 was proposed to specify that the special provision must be noted on the dangerous goods transport document. The addition of the special provision to the list of special provisions that must appear on the transport document in accordance with Part 5;4.1.5.8.1 b) was also proposed. The special provision allowed the transport of lithium batteries (UN 3090, UN 3480, UN 3091 or UN 3481) having a mass exceeding 35 kg on cargo aircraft with the approval of the appropriate authority of the State of Origin and the State of the Operator. It also required a copy of the document of approval to accompany the consignment. Requiring the special provision to appear on the transport document was necessary to alert the operator to the need to verify that the copy of the document has accompanied the shipment.

3.2.2.15.2 The amendment was agreed (see Appendix C).

3.2.2.16 Replacement of Marks (DGP-WG/21-WP/7 (Revised))

3.2.2.16.1 A proposal to extend the existing requirement in Part 7;2.7 for operators to replace labels that were lost, detached or illegible to marks was discussed at DGP-WG/20 (see paragraph 3.2.2.6 of the DGP-WG/20 Report). While there was support for the amendment in principle at that time, there was some concern that the scope of it was too broad in that it could be interpreted to apply to marks such as the name and address of the shipper and consignee, the UN number or the proper shipping name. There was also concern that a proposed reference to “other” documentation was too broad.

3.2.2.16.2 A new proposal was presented to DGP-WG/21 to address the concerns raised at DGP-WG/20. The text referred to the specific marks in the Technical Instructions that applied, and specified an air waybill as an example of a document other than the dangerous goods transport document in attempt to address the concern that “other documentation” was too broad. Referring to documents other than the dangerous goods transport document was considered important to address some packages containing certain dangerous goods that were required to bear labels but were not required to be accompanied by a dangerous goods transport document.

3.2.2.16.3 One member raised concerns that the requirement would cause delays in transport for dangerous goods that were not required to be accompanied by a transport document such as lithium batteries packed in accordance with Section II of the lithium battery packing instructions and dangerous goods in excepted quantities, because further information would need to be obtained from the shipper which was sometimes difficult to do. The member therefore expressed a preference for a recommendation rather than a mandatory requirement to replace the mark. While sympathetic to the challenges, others did not see it as reason to replace the proposed amendment with a recommendation. The challenges were not new in that an operator would be required to stop a shipment missing a mark under the current provisions. The mark was a form of hazard communication, so it was important to ensure it remained on the package.

3.2.2.16.4 One member suggested that marks for UN 3373 — **Biological substance, Category B** and UN 3245 — **Genetically modified organisms** or **Genetically modified micro-organisms** be included in the list for which the proposed requirement applied. However, it was decided not to as they were not included with the proposal. A proposed amendment to include UN 3373 would potentially be developed for consideration at DGP/28.

3.2.2.16.5 There were no objections to the proposal other than the preference for a recommendation. The amendment as presented was agreed, subject to a minor editorial revision (see Appendix C).

3.2.2.17 **Revision to the List of Dangerous Goods that Do Not Need to be Listed on the NOTOC (DGP-WG/21-WP/36)**

3.2.2.17.1 The addition of UN 3164 — **Articles, pressurized, hydraulic** containing non-flammable gas and UN 3164 — **Articles, pressurized, pneumatic** containing non-flammable gas to the list of dangerous goods not required to appear with the information to the pilot-in-command (NOTOC) contained in Table 7-9 when the conditions of Packing Instruction 208 a) were met was proposed. Packing Instruction 208 a) excepted the requirement for UN 3164 to appear on the NOTOC when the articles were installed in construction equipment and assembled machinery and designed and constructed with a burst pressure of not less than 5 times their charged pressure at 21°C when shipped.

3.2.2.17.2 The amendment was agreed (see Appendix C).

3.2.2.18 **Requirements for Dry Ice Loading (DGP-WG/21-WP/39)**

3.2.2.18.1 Increased quantities of dry ice were shipped during the COVID-19 pandemic to ensure the viability of COVID-19 pharmaceuticals. A working paper proposing to revise the loading of dry ice provisions to reflect these increased quantities was submitted. However, the working group did not have time to review the proposal since it was a late submission. It would be re-submitted to DGP/28.

3.2.2.19 **Risk Posed by Wooden Pallets Used in Overpack (DGP-WG/21-WP/41)**

3.2.2.19.1 The working group was advised of an incident involving a leak caused by a rivet from a wooden pallet used as an overpack. While this incident happened on the ground, there was a risk that rivets protruding from wooden plates during loading and unloading could penetrate outer packings resulting in leakage of dangerous goods during transport. Additional incidents involving wooden pallets and protruding rivets or nails were reported by other panel members, some involving overpacks prepared by shippers and some involving pallets prepared by operators and pallets handled by forklifts. While acknowledging the risk, there were some who thought it was being effectively managed by operators and did not consider the risk as high. Others were open to further discussion, although it was questioned whether the dangerous goods regulations were the appropriate place to address the issue, recognizing incidents could occur regardless of whether or not dangerous goods were involved and that the issues raised may already be addressed by other Annexes such as Annexes 6 and 19.

3.2.2.19.2 There were no amendments proposed, but the feedback from the panel was appreciated. Further research on the subject would be carried out and a proposed amendment would be developed for submission to DGP/28 if deemed necessary.

3.2.2.20 Number of Batteries Permitted for Lithium Battery-Powered Mobility Aids (DGP-WG/21-WP/5)

3.2.2.20.1 The provisions for battery-powered mobility aids were refined in the 2019-2020 Edition of the Technical Instructions resulting in those for which the operator was responsible being moved to Part 7;2.13 and those for which the passenger was responsible maintained in Table 8-1. Questions had been raised as to whether revised wording, which referred to batteries in the singular form, was intended to limit the number of batteries that could be removed from the mobility aid to one and what the Watt-hour rating limit was if the removal of more than one battery was permitted. The working paper did not seek any revisions to the provisions, it simply questioned the intent of the provisions.

3.2.2.20.2 With regard to the number of batteries, the working group agreed that there was never any intent to only allow the removal of one battery from the mobility aid. The intent was to ensure batteries that could not be protected when attached to the mobility aid were removed, if possible, and carried in the cabin in order to prevent a thermal event in the cargo compartment. This would apply to any number of batteries necessary to power the mobility aid. With regard to the Watt-hour rating, the working group considered the provisions to be clear in stating that no single battery could exceed a Watt-hour rating of 300 Wh, and two spares could not exceed 160 Wh each. While agreeing on the intent of the provisions, panel members acknowledged that they needed further clarification.

3.2.2.20.3 The queries raised prompted another discussion on whether or not the Watt-hour limits were appropriate and on the challenges faced by operators with implementing and verifying compliance with the provisions. Determining the Watt-hour limits had been based on the needs at the time the provisions were introduced rather than any scientific criteria. The operator was responsible for assessing the risk of carrying the mobility aids, but acquiring the safety information necessary to do so was not always possible. Another complicating factor was the fact that in some States the responsibility of preparing the mobility for transport was the airport operator. The operator was also faced with the challenge of balancing safety with human rights, and denying passengers the right to carry their mobility aid was not a solution. The need to consider more performance-based provisions was acknowledged, keeping in mind that these might also be challenging to implement. The need to develop guidance material to support operators was also acknowledged.

3.2.2.20.4 It was agreed that a job card would be developed. The work would need to involve a thorough analysis of the safety issues, the needs of the passengers, and the challenges faced by operators.

The Facilitation Panel (FALP) would need to be included as a supporting expert group. The Secretariat noted potential overlap with a job card related to lithium batteries carried by passengers and crew that was assigned to the Flight Operations Panel (FLTOPSP) Specific Working Group on the Safe Carriage of Goods (SWG-SCG) and the potential need to include that group as a supporting expert group.

3.2.2.21 Revisions to Passenger Provisions for Mobility Aids in Table 8-1 (DGP-WG/21-WP/9) and Adequate Protection to the Battery of Mobility Aids (DGP-WG/21-WP/24)

3.2.2.21.1 The provisions for battery-powered mobility aids were refined in the 2019-2020 Edition of the Technical Instructions resulting in those for which the operator was responsible being moved to Part 7;2.13 and those for which the passenger was responsible maintained in Table 8-1. Operators had been faced with challenges with implementing the new provisions, and amendments were proposed to address them.

3.2.2.21.2 One of the provisions that was moved required the operator to verify that the battery was either securely attached to the mobility aid or removed by the user following the manufacturer's instructions. The provisions were included for each battery type listed in Part 7;2.13. It was suggested that the responsibility for doing this was shared between the operator and the passenger and that some of the provisions should be included in Table 8-1 to reflect this. It was noted that provisions related to removing lithium batteries were included in Table 8-1, but not for the other types of batteries. An amendment was therefore proposed which reproduced the provisions from Part 7 in Table 8-1, item 4) so that they applied to all battery types and deleted the existing text from the section specific to lithium batteries. It was also proposed to reproduce provisions related to protecting the batteries from short circuit in Table 8-1.

3.2.2.21.3 Requiring the battery to be either securely attached to the mobility aid or removed by the user created a dilemma for the operator in cases where both could be applied. Batteries that were securely attached would normally provide a greater degree of safety than if they were removed, but there was nothing requiring the operator to make that choice. It was noted that the existing text specific to lithium batteries in item 4) of Table 8-1 required the battery to be removed in accordance with the manufacturer's instructions *when the mobility aid did not provide adequate protection to the battery*, but that the text in Part 7 stated only *if the mobility aid is specifically designed to allow it to be removed*. Not including "did not provide adequate protection" in Part 7 was a deliberate decision of DGP/26 because the wording was considered too subjective, but it was unclear as to why the wording was maintained in Table 8-1. It was proposed to include the text in Part 7, as this made the intent clear and provided clarity to the operator.

3.2.2.21.4 There was support for the intent of the proposals. It was clear the provisions were complicated, which was evident through earlier discussions on the number of batteries permitted for lithium battery-powered mobility aids that led to the conclusion that a job card dedicated to improving the provisions for mobility aids needed to be developed (see paragraph 3.2.2.20). The objectives of the provisions were generally agreed by the panel, but they were not clearly conveyed in the text. The following specific comments were raised during discussion:

- a) There were three safety objectives: for the battery to be securely attached, for the battery to be adequately protected, and for the electrical circuits to be isolated. The battery should only be removed if any of these were not achieved.
- b) There was support for including "when the mobility aid did not provide adequate protection to the battery" to the provision for removing the battery in Part 7. Although this was subjective, it did clarify the intent. Criteria for determining what

was meant by adequate could be developed as part of the holistic review of the mobility aid provisions under the soon-to-be-developed job card.

- c) Requiring the battery to be removed “by the user” was inappropriate because passengers with disabilities might not be physically capable of doing so. The intent was to alert the passenger that they should come prepared with information or instructions to remove the battery, but it did not need to be the user removing the battery. It was therefore proposed to remove these words from the provisions.
- d) The text should accommodate the potential for more than one battery to be involved (see paragraph 3.2.2.20).
- e) Concern was raised that the proposed revisions implied that it was preferable for the battery to be carried in the cargo compartment rather than in the passenger cabin and a view that the latter would be safer. This seemed to be a shift from the current provisions. However, others suggested it was the original intent to only allow batteries that could not be protected in the passenger cabin because carrying them in the cabin could be more hazardous. Some batteries were too large to fit in overhead compartments, and they could cause damage or injure passengers in the event of turbulence. Removing the batteries could potentially result in damage, especially if handled by unqualified staff.
- f) Sometimes batteries could be removed, but have a Watt-hour rating greater than what is permitted in the cabin. Others were not capable of being removed. These scenarios caused challenges for the operator, particularly if the batteries did not meet the criteria for loading in the cargo compartment. It was suggested that mobility aids powered by such batteries should therefore not be permitted on the aircraft and that this should be addressed in the provisions, but denying disabled passengers the ability to carry their mobility aids conflicted with human rights.
- g) Concern was raised that there might be an increased safety risk if a large number of mobility aids were loaded on an aircraft such as when a disabled sport team travelled. This would need to be managed by the operator through their safety risk assessment process.
- h) Acquiring instructions from manufacturers on how to remove batteries from mobility aids was a challenge which placed an undue burden on operator. Guidance should be developed on how the operator could assist passengers in removing the batteries.
- i) There were differences among operators as to how they implemented the provisions. This caused problems for passengers travelling on different airlines from origin to destination.
- j) It was noted that requirements in the Technical Instructions should be clearly worded as such by including the word “must”. Some of the proposed wording in Table 8-1 did not include this word and this should be corrected.

3.2.2.21.5 There was a suggestion to address the issues raised through the more long-term holistic review of the provisions that would be undertaken (see paragraph 3.2.2.20), but industry stressed it was critical to address the issues raised in the near term because of the significant challenges they presented to

operators on a daily basis. A revised amendment was developed to address comments raised during the discussion.

3.2.2.21.6 The amendment, subject to some minor revisions, was agreed (see Appendix C).

3.2.2.22 **Allowance for Large Articles Containing Dangerous Goods n.o.s. (DGP-WG/21-WP/29)**

3.2.2.22.1 An amendment to allow for the transport of articles containing dangerous goods classified as UN 3538 — **Articles containing non-flammable, non toxic gas, n.o.s.**, and UN 3548 — **Articles containing miscellaneous dangerous goods, n.o.s.** on both passenger and cargo aircraft, under certain conditions, was proposed. Similar amendments were presented to the 2020 DGP Working Group Meeting (DGP-WG/20, 19 to 23 October 2020) (see paragraph 3.1.2.1 of the DGP-WG/20 Report) which were supported in principle, but there were concerns with some of the details. A revised proposal was presented to DGP-WG/21 to address these concerns. The proposal included new special provisions assigned to UN 3538 and UN 3548 that limited the allowance to articles in which the only dangerous goods contained within were a Division 2.2 gas that did not have any subsidiary hazards and was not a refrigerated liquefied gas for UN 3538 and environmentally hazardous substances for UN 3548. The proposal also included packing instructions assigned to the two UN numbers. A proposed amendment was ultimately agreed (see Appendix C), but there were revisions to the original proposal developed during the discussion.

3.2.2.22.2 It was noted that some Division 2.2 gases were forbidden for transport on passenger aircraft and that the proposed special provision assigned to UN 3538 should not apply to these. Revisions to the proposed new special provision were developed to reflect this, along with some editorial revisions for the sake of clarity. It was agreed that these revisions would be incorporated in the introduction of proposed new Packing Instruction 975 (see Appendix C).

3.2.2.22.3 It was questioned whether Special Provision A87 should be assigned to UN 3538 and UN 3548. The special provision excepted articles from the marking and labelling requirements of Part 5 when they were not fully enclosed by packaging, crates or other means that prevent ready identification. Special Provision A87 was assigned to articles such as vehicles, engines and machinery, for which the hazards were generally obvious. However, the hazards posed by the dangerous goods contained in articles assigned to UN 3538 and UN 3548 might not be evident. It was therefore agreed not to assign Special Provision A87 to these articles. This was a conservative approach which the panel might decide to revisit if it was determined through experience that the hazards were evident.

3.2.2.22.4 It was noted that environmentally hazardous substances and gases of Division 2.2 with no subsidiary hazards were permitted for transport on both passenger and cargo aircraft, and that this could cause complications during acceptance checks because of the absence of a packing instruction number in Table 3-1 for UN 3548. The packaging instruction number would be provided in the special provision, but this could be easily overlooked. It was suggested that a way to address this might be to take a similar approach as was taken for UN 3363 — **Dangerous goods in articles**, i.e. by providing a reference to the packing instruction number across columns 10 to 11 and 12 to 13 of Table 3-1 (i.e. “see Packing Instruction 975”). However, this was not supported because it would make a separate entry in the dangerous goods list necessary in order to distinguish between the articles for which the packing instructions applied and those that would remain forbidden for transport, and multiple entries in Table 3-1 were not agreed at DGP-WG/20. Regardless, others did not believe the acceptance process would be complicated, because the operator could determine the packing instruction number through the special

provision. This would not be an onerous task given the low volume of articles shipped in accordance with the new special provisions that was expected.

3.2.2.22.5 An anomaly between the quantity limitations in proposed new Packing Instruction 975 and Packing Instruction 962, which applied to UN 3363 — **Dangerous goods in apparatus** or **Dangerous goods in machinery** or **Dangerous goods in articles** was noted, whereby the quantity limits in Packing Instruction 962 were 0.5 L for liquids, 1 kg for solids, and 0.5 kg for gases of Division 2.2 and proposed Packing Instruction 975 limited the quantity of environmentally hazardous substances in the article to 5 L or 5 kg. This would cause confusion for shippers needing to ship quantities greater than the limits in Packing Instruction 962, which would require a State approval in accordance with Special Provision A107, but less than those in Packing Instruction 975. This was a known anomaly that would be addressed at a future date.

3.2.2.22.6 It was questioned whether it was necessary to include drums and jerricans in the list of outer packagings given the fact it would not be practical to pack these articles in such packagings. It was agreed to keep them in the list for the sake of alignment with the associated packing instruction in the UN Model Regulations.

3.2.2.22.7 It was agreed that a reference in proposed Packing Instruction 975 to the general packing requirements for closures in Part 4;1.1.4 was unnecessary.

3.2.2.22.8 The proposal, as amended, was agreed (see Appendix C).

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 2023-2024 Edition

3.2.3.1 Supplement S-3;1.2.3 Referencing Passenger Aircraft (DGP-WG/21-WP/25)

3.2.3.1.1 Special Provision A2 allowed dangerous goods normally forbidden for transport on any aircraft to be transported on cargo aircraft only with the prior approval of the appropriate authorities of the State of Origin and the State of the Operator. Part S-3;1.2.3 incorrectly referred to such dangerous goods being permitted on passenger and cargo aircraft.

3.2.3.1.2 An amendment to correct the error was agreed (see Appendix E). This would be incorporated in the 2021-2022 Edition of the Supplement through a corrigendum.

3.2.3.2 Supplement S-7;2.2.2 Referring to ‘UN 8000’ (DGP-WG/21-WP/26)

3.2.3.2.1 ID 8000 was incorrectly referred to as UN 8000 in Part 2-7;2.2.2 of the Supplement. An amendment to correct the error was agreed (see Appendix E). This would be incorporated in the 2021-2022 Edition of the Supplement through a corrigendum.

3.2.3.3 Clarification for Packing Instruction 910 (DGP-WG/21-WP/27, Revised)

3.2.3.3.1 The DGP Working Group on the Supplement (DGP-WG/Supplement) identified areas that needed clarification in Packing Instruction 910 and proposed amendments to achieve this. Packing Instruction 910 applied to lithium batteries (UN 3090, UN 3091, UN 3480, and UN 3481) manufactured as part of production runs of not more than 100 cells or batteries annually and to pre-production prototype cells or batteries transported for testing. Battery or cell types packed in accordance with this packing instruction would not have been subjected to all of the design type tests specified in Part III, subsection 38.3 of the UN *Manual of Tests and Criteria*.

3.2.3.3.2 DGP-WG/Supplement identified the need for clarification in two areas:

- a) The packing instruction required lithium ion cells and batteries to be offered for transport at a state of charge not exceeding 30 per cent of their rated capacity unless a higher state of charge was specifically approved. There were questions as to whether this requirement applied only to lithium ion batteries packed on their own (UN 3480) or if it also applied to lithium ion batteries packed with or contained in equipment (UN 3481). There were some who thought it obvious that the requirement applied to both UN numbers since the packing instruction applied to all, but DGP-WG/Supplement proposed specifying both UN numbers in the requirement to remove any potential for misinterpretation of a significant safety measure.
- b) Provisions for rigid large packagings were included under the section for cells and batteries, including when packed with equipment. Even though the section heading did not refer to lithium batteries contained in equipment, the provision included a reference to these batteries while no provision for rigid large packagings was contained in the section for cells and batteries contained in equipment. DGP-WG/Supplement proposed adding a provision to the section for cells and batteries contained in equipment and removing the reference to contained in equipment in the other section.

3.2.3.3.3 The amendments were agreed (see Appendix E) with a recommendation to consider whether they could be incorporated in the current edition of the Supplement by way of corrigendum. The Secretariat would consult with its document management colleagues to determine whether the changes could be considered as editorial, therefore meeting the criteria for a corrigendum or whether they would be subject to Council approval, in which case they could not be incorporated through a corrigendum.

3.2.3.4 Clarification for Packing Instruction 974 (DGP-WG/21-WP/28)

3.2.3.4.1 DGP-WG/Supplement proposed an amendment to Packing Instruction 974, which applied to lithium cells or batteries having a mass exceeding 35 kg, that clearly limited the requirement for lithium ion cells and batteries to be offered for transport at a state of charge not exceeding 30 per cent to lithium ion batteries packed on their own (UN 3480). It made this recommendation with the understanding that this was clarifying the original intent of the packing instruction and despite recommending that all lithium ion batteries be subject to the reduced state of charge requirement when packed in accordance with Packing Instruction 910 (see paragraph 3.2.3.3 of this report). It made this distinction because it considered the safety risk associated with cells and batteries packed in accordance with Packing Instruction 974 to be less than the one associated with cells and batteries packed in

accordance with Packing Instruction 910 on account of the former having passed the design type test requirements in Part III, subsection 38.3 of the UN *Manual of Tests and Criteria* and the latter having not. This approach was also in alignment with how lithium batteries were regulated by Packing Instructions 965 and 968 of the Technical Instructions, whereby only lithium ion batteries on their own were subject to the reduced state of charge requirement.

3.2.3.4.2 The amendment was not supported. The packing instruction clearly stated in its introduction that it applied to all lithium batteries (UN 3090, UN 3091, UN 3480, and UN 3481), so panel members saw the amendment limiting the state of charge to UN 3480 as a contradiction and a change to what was originally intended. They maintained that a 30 per cent state of charge contributed significantly to safety which was considered even more important for these large batteries. Shipping at a higher state of charge might still be possible if the applicant could demonstrate it provided an acceptable level of safety and the State of the Operator and the State of Origin specifically allowed for this through the approval process. It was also noted that testing of large batteries was not always possible because of their size and State exemptions from the testing requirements were sometimes provided.

3.2.3.4.3 It was noted that the Supplement was intended as guidance but that the word “must” was often used. There was a concern that States interpreted this to mean that because it was written as a mandatory requirement, that the packing instructions provided an acceptable level of safety and that nothing else had to be taken into consideration. The new Annex 6 safety risk assessment provisions made it clear that elements other than packing needed to be taken into account. It was suggested that DGP-WG/Supplement review the use of “must” and consider replacing it with “should” when appropriate to better reflect the purpose of the Supplement. It was also suggested that provisions were needed in the Supplement for States similar to what was developed for operators in Annex 6 to make it clear that States needed to do risk assessments when granting approvals.

3.2.3.4.4 It was suggested that DGP-WG/Supplement consider referring to both UN 3480 and UN 3481 to make it clear that the state of charge limit did apply to all lithium ion batteries as was done in the amendment to Packing Instruction 910 (see paragraph 3.2.3.3). There was some opposition to this, with a view that the risk level was lower for Packing Instruction 974 and that clearly listing the UN numbers in it might infer an unnecessary requirement when the battery design type had met the criteria of the UN testing. However, providing the UN numbers in Packing Instruction 910 and not 974 might create ambiguity. It was pointed out that the intent of the UN design type test was to prevent thermal runaway while the intent of the reduced state of charge was to limit the consequences of thermal runaway if it did occur. Reducing the state of charge was a proven safety measure that should be applied whenever possible, and every effort should be made to make this clear.

3.2.3.4.5 While the amendment was not supported, DGP-WG/Supplement would further review the packing instruction taking into account the comments raised. A new proposal would be presented to DGP/28 if deemed necessary.

3.2.3.5 Report of the DGP Working Group on the Supplement (DGP-WG/21-IP/2)

3.2.3.5.1 A summary of the work of the DGP Working Group on the Supplement (DGP-WG/Supplement) was provided by the rapporteur of the group. The group was established with the mission of providing guidance to States that supplemented the Technical Instructions and explaining in greater depth the basic information contained in Annex 18. The working group developed the following high-level summary of the work it would undertake:

- a) document a criteria for the DGP to use in assessing new UN numbers for addition to the list of dangerous goods that can be carried in the main deck compartment of a passenger aircraft, as prescribed within S-7;2.2 of the Supplement.

Note.— DGP-WG/Supplement identified this as a significant task which is still in the initial phases. New criteria may need to be developed if original criteria for inclusion in the list could not be located.

- b) develop a process for the DGP to assist in future maintenance and amendments for the Supplement;
- c) review and correct any anomalies or inconsistencies identified in Table S-3-1 — the Supplementary Dangerous Goods List;
- d) add guidance/information within Table S-3-1 where identified as deficient, inconsistent or missing;
- e) consider issues brought to DGP-WG/Supplement for potential amendments; and
- f) develop working papers, as needed, for consideration by the DGP.

3.2.3.5.2 The work of the group generated four working papers proposing amendments to the Supplement which were discussed by DGP-WG/21 (see paragraphs 3.2.3.1 through 3.2.3.4 of this report). The next steps for DGP-WG/Supplement would be to:

- a) continue working on identifying the criteria for the list with S-7;2.2 of the Supplement, including reviewing previous DGP reports and working papers;
- b) review and update the guidance material in Attachment I to Chapter 1;
- c) develop a process for future maintenance and amendment of the Supplement; and
- a) review and correct any anomalies or inconsistencies identified within Table S-3-1 – the Supplementary Dangerous Goods List.

3.2.3.5.3 There was some discussion on how panel members who were not members of DGP-WG/Supplement, or any of the other DGP working groups, should raise issues. This is reported under Agenda Item 8 (see paragraph 3.8).

3.2.3.5.4 Appreciation was expressed by the rapporteur for the assistance of her co-rapporteur and the other working group members. The chair expressed his appreciation to the working group, with special mention to the rapporteur for taking on the task of leading the work.

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 2023-2024 Edition

3.2.4.1 Accessibility of Dangerous Goods (DGP-WG/21-WP/31)

3.2.4.1.1 UN 3528 (**Engine, internal combustion, flammable liquid powered, Engine, fuel cell, flammable liquid powered, or Machinery, internal combustion, flammable liquid powered and Machinery, fuel cell, flammable liquid powered**) and UN 3529 (**Engine, internal combustion, flammable gas powered or Engine, fuel cell, flammable gas powered or Machinery, internal combustion, flammable gas powered or Machinery, fuel cell, flammable gas powered**) were excepted from the applicable accessibility requirements in Part 7;2.4.1.1 but had not been added to the list of dangerous goods that are not required to be accessible in flight contained in Section 1.5 of the *Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods* (Doc 9481). An amendment adding these UN numbers to Section 1.5 of Doc 9481 was therefore proposed.

3.2.4.1.2 The proposed amendment was agreed (see Appendix F).

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

3.3.1.1 Revisions to Packing Instructions 967 and 970 (DGP-WG/21-WP/23)

3.3.1.1.1 Amendments to the packing instructions for lithium batteries contained in equipment (Packing Instructions 967 and 970) were proposed to:

- a) ensure that multiple pieces of equipment packed into the same outer packaging were packed in such a way to prevent damage due to contact between the pieces of equipment; and
- b) eliminate conflicting provisions between the general requirements and the additional requirements in both Section I and Section II with respect to the need for equipment containing lithium batteries to be packed in strong outer packagings.

3.3.1.1.2 With respect to the conflicting provisions, there was a requirement for strong outer packagings under General requirements in Sections I.1 and II.1 and another similar requirement under Additional requirements in Sections I.2 and II.2. The requirement in I.2 and II.2 elaborated on the need for strong rigid outer packaging while providing an exception from this if the battery afforded equivalent protection by the equipment in which it was contained. The proposed amendment removed the provision from I.2 and II.2 and added a reworded version of the exception from strong outer packaging to I.1 and II.1 that aligned with text in the UN Model Regulations. The amendment shown in the working paper removed this exception from Section II, but the proposer requested it be added based on the needs of the industry.

3.3.1.1.3 There was support for the proposal with some suggested editorial changes. The reworded version of the exception referred to large equipment, and there were concerns that this was too subjective. However, there were no objections to maintaining it since it aligned with the provision in the UN Model Regulations. It was questioned whether the new text to address multiple pieces of equipment was necessary since there was already a requirement for equipment to be secured against movement within the outer packaging and to be equipped with an effective means of preventing accidental activation. However, the proposed provision reinforced the need to prevent damage from multiple pieces of equipment banging into each other which was considered necessary based on incidents involving damage from loose equipment.

3.3.1.1.4 A revised proposal was agreed (see Appendix C).

3.3.1.2 Report of the Dangerous Goods Panel Working Group on Energy Storage Devices (DGP-WG/Energy Storage Devices) (DGP-WG/21-IP/1)

3.3.1.2.1 A summary of the work of the DGP Working Group on Energy Storage Devices (DGP-WG/Energy Storage Devices) was provided by the rapporteur of the group. The group was established to progress the work identified on Air Navigation Commission (ANC) job card DGP.003.03: Mitigating safety risks posed by the carriage of lithium batteries by air. DGP-WG/Energy Storage Devices prioritized the work on the job card and determined it would initially focus on:

- a) the performance-based packaging standard for lithium batteries;
- b) a review of the Technical Instructions applicable to lithium batteries and the ability of an operator to comply with Annex 6, Part I, Chapter 15; and
- c) the provisions for the transport and use of data loggers and cargo tracking devices.

Other work items on the job card needed more time to mature. While there were no amendments proposed in the information paper, DGP-WG/21 was invited to provide specific feedback to DGP-WG/Energy Storage Device regarding progress in these three areas as detailed in paragraphs 3.3.1.2.3, 3.3.1.2.4, and 3.3.1.2.5 below.

3.3.1.2.2 SAE package performance standard for lithium batteries

3.3.1.2.2.1 SAE established the G-27 Lithium Battery Packaging Committee to develop a package performance standard to safely transport lithium batteries by air. The standard was reaching a level of maturity, but there remained questions on the committee as to how it might be implemented. This was affecting the ability of the SAE committee to reach consensus in certain areas. It recognized the need for

regulatory oversight to give the entities in the supply chain confidence that the package met the standard. The SAE committee was therefore seeking feedback from the DGP and other technical groups to help facilitate their decision-making process.

3.3.1.2.2.2 DGP-WG/Energy Storage Devices presented some options for implementing the standard for DGP-WG/21 to consider. DGP-WG/Energy Storage Devices developed these options with the recognition that the original intent was to directly incorporate the full SAE standard into the Technical Instructions. However, there had been questions as to whether this was still appropriate. Ensuring compliance with the standard was going to be challenging, particularly since mitigation measures were provided at the battery or cell level, and there were some suggestions that it may need to be implemented in a more limited manner. The options developed by DGP-WG/Energy Storage Devices were:

a) Options for passenger aircraft:

- 1) Option P1: Required in the Technical Instructions as a condition for carriage of lithium ions. Lithium metals remain forbidden. (removes ban on ions);
- 2) Option P2: Same as P1 above, but include the slash sheets to address external fire requirement;

Note.— A slash sheet was SAE terminology for a separate document that augmented the main standard and was approved separately from that standard. In the case of the draft G27 standard, there were two slash sheets related to test methods to address the threats from an external cargo fire under development. One was to address the threat of external heat throughout the cargo compartment and the other to address the threat from external flame. Slash sheets were being used to address external fire as a compromise between the battery industry, which generally objected to subjecting lithium battery/cell packages to the test, and those who considered it necessary for external fire to be addressed. The battery industry was more comfortable having the external fire tests separate from the main standard to avoid communicating a perception that external fire needed to be addressed under all circumstances. This approach allowed the committee to focus on the internal threat, which was referred to as the baseline standard, separately from the external fire threat.

- 3) Option P3: Required in the Technical Instructions as a condition for carriage of both ions and metals (removes ban on both ions and metals); and
- 4) Option P4: Added to the Supplement for use with or without external fire for approvals/exemptions;

Note.— DGP-WG/Energy Storage Devices considered this approach as one that would make verifying compliance less challenging.

b) Options for all cargo aircraft:

- 1) Option C1: Required in the Technical Instructions as a condition for carriage of both ions and metals;

- 2) Option C2: Same as C1 above, but include the slash sheets to address external fire requirement;
- 3) Option C3: Required in the Technical Instructions as a condition only for carriage of metals (conditions for carriage of ions would remain unchanged);
- 4) Option C4: Same as C3 above, but include the slash sheets to address external fire requirement; and
- 5) Option C5: For use by aircraft operator as mitigation.

3.3.1.2.2.3 There was an understanding by some that the original request from ICAO for SAE to develop the standard was so that the ban on the transport of lithium batteries on passenger aircraft could be removed, and that this meant the standard should be implemented only for batteries transported on passenger aircraft (Option P3). It was also suggested that ICAO never requested for the standard to address external fire. There were concerns that a precedent would be set if external fire tests were implemented in that this would lead to a requirement for other dangerous goods to be subject to it. This would incur a significant cost to the industry. This needed to be taken into account, as it could result in a higher rate of non-compliance from entities wanting to avoid the cost.

3.3.1.2.2.4 The Secretariat clarified that the request for a package performance standard was prompted by the ANC's discussions that led to the ban on the transport of lithium ion batteries as cargo on passenger aircraft and that ICAO did not limit the request to passenger aircraft. The ANC had directed the Secretariat and specific technical panels to develop safety measures in three main areas:

- a) a performance-based packaging standard for lithium batteries;
- b) safety risk assessment provisions; and
- c) provisions to improve the transparency of lithium battery shipments and an improved hazard communication system.

The safety risk assessment provisions were complete and were intended to be used hand in hand with the other measures. The ANC did recognize that cost and the need to transport lithium batteries were factors. However, safety could not be compromised because of cost. The safety risk assessment provisions made it clear that the operator was responsible for what they put on their aircraft, but they also provided flexibility on how the safety risks could be addressed. The intent was a risk-based system in which all three of the components would be used. The package-based standard was one measure, but there might be multiple ways to mitigate the safety risk that could be accepted, particularly with respect to the external fire risk. The risk might be addressed at the package level, or through unit load devices, or the cargo compartment level. The package level might be the only option on certain aircraft or for certain operators depending on their capabilities, but other measures could be permitted provided they allowed for an acceptable level of safety.

3.3.1.2.2.5 There was a concern raised with respect to the option of implementing the standard for batteries transported on passenger aircraft but not for cargo aircraft. The thirty percent state of charge limit was implemented with the recognition that it significantly reduced the risk of propagation from thermal runaway for most, but not for all batteries and cells. There remained a threat to safety for cargo

aircraft as evidenced by continued incidents on or near aircraft involving lithium batteries and cells. There was a view that any standard developed should apply to all commercial aircraft.

3.3.1.2.2.6 It was noted that the ban on passenger aircraft was causing significant problems in certain parts of the world for which cargo aircraft were not an option. It was questioned whether the standard could be applied to allow lithium ion on passenger aircraft as a first step instead of trying to address all batteries in the standard at once. There were likely many on the SAE committee who would not oppose this approach, although there were likely others who would not approve the standard unless it was complete, especially with regard to external fire. The structure of the SAE standard would allow for a phased approach and might be something that the committee could work towards if directed by ICAO and other regulatory authorities. There would also need to be clear direction from these authorities with respect to external fire, as there were many on the G27 committee who would not approve the standard if it was not addressed. While there may be other ways to address the risk, how this would be implemented would need to be clarified.

3.3.1.2.2.7 Some SAE G27 members noted that the standard was not yet mature. The committee was focusing on lithium ion cells, and there had yet to be any validation tests done on lithium ion batteries or lithium metal batteries or cells. It was questioned whether the standard could ensure safety for lithium metal batteries. There were also serious concerns with respect to ensuring compliance, with some of the view that the only approach would be to ensure competent authority oversight through an approval process.

3.3.1.2.2.8 It was questioned whether the likelihood of a cargo compartment fire on an aircraft on which lithium batteries were affected warranted external fire testing. It was reported that the likelihood of a cargo compartment fire was in the order of 10^{-7} per flight hour. There were a combination of events that had to occur for a package of lithium batteries to be significantly impacted by the fire. If the package happened to be next to the fire, it was expected that it would be exposed to a direct flame for period a time. If the fire was suppressed, the batteries/cells in the cargo compartment would be subject to a sustained elevated temperature until the aircraft could land. Some aircraft were certified to operate three hours away from an airport, so there was potential for three hours of exposure. It was noted that approximately 70 per cent of the world's aircraft were narrow-body and most were not equipped with a cargo loading system designed to use unit load devices in the underfloor cargo compartment. The only level of protection on these aircraft would be at the package level or with additional package containment by other than unit load devices. There was therefore a desire by airworthiness experts to have objective criteria to demonstrate that if a package was exposed to a fire, it would have a level of protection to prevent hazards that would overwhelm the aircraft fire protection features.

3.3.1.2.2.9 The Secretariat reiterated that the safety risk assessment provisions in Annex 6, Chapter 15 supported the fact that the risks varied for different aircraft and operators depending on the capabilities and region of operation. Chapter 15 provided a certain amount of flexibility with respect to mitigation measures. The Secretariat also emphasized that the SAE standard was based on performance-based criteria developed by an ICAO lithium battery multidisciplinary group established for that purpose. There had been consensus among airworthiness and operations experts on that group that external fire needed to be addressed, although not necessarily at the package level. While implementation of the SAE standard would require significant input from the DGP, input from airworthiness and operations experts would also be required to ensure the standard achieved an acceptable level of safety from an airworthiness and operational point of view.

3.3.1.2.2.10 The rapporteur of DGP-WG/Energy Storage Device expressed his appreciation to DGP-WG/21 for the feedback provided. The views were diverse, but this was not a surprise as the issue was

complex. The feedback would help DGP-WG/Energy Storage Device work towards developing a compromised approach that was acceptable to all.

3.3.1.2.3 **How the Technical Instructions support operators in meeting their safety risk assessment obligations under Annex 6, Chapter 15**

3.3.1.2.3.1 DGP-WG/Energy Storage Devices had focused their discussions on Section II of Packing Instructions 965 and 968, which applied to UN 3480 — **Lithium ion batteries** and UN 3090 — **Lithium metal batteries** respectively. Section II was designed to facilitate the movement of small batteries through the transport system by excepting them from some of the usual requirements in the Technical Instructions, including some that were designed to communicate hazards to the operator. This made it challenging for operators to fulfil their safety risk assessment obligations. DGP-WG/Energy Storage Devices discussed whether there remained a need to maintain Section II in Packing Instructions, noting that many operators had filed operator variations indicating they would not accept them and that the number of operators doing this continued to grow. Removing Section II would increase visibility to the operator of properly declared lithium battery shipments, enhance operators' ability to comply with the Annex 6 risk assessment provisions, and enhance safety. It would also increase responsibilities for the shipper, particularly with regard to training. There was some desire among DGP-WG/Energy Storage Devices members to maintain exceptions for low energy cells or batteries that posed little hazard in transport and for packages that met the test criteria in the G27 standard. However, the standard and the new UN hazard communication system, which would provide a mechanism for identifying low-hazard batteries or cells, would not be completed for quite some time. DGP-WG/Energy Storage Devices therefore considered removing Section II as an incremental step to be a possibility and invited DGP-WG/21 to provide feedback in this regard.

3.3.1.2.3.2 There was general support for removing Section II from Packing Instructions 965 and 968. While the topic had been discussed several times in the past, the new safety risk assessment Standards in Annex 6 made a disconnect with the Technical Instructions very clear. It was reported that Section II would be removed from industry regulations in response to requests from operators who were not in a position to accept such shipments because of safety risk assessment challenges. Allowing exceptions from the requirements made these batteries less visible to the operator and created an anomaly in that they were required to bear a cargo aircraft only label. How could the operator be sure that such packages were not loaded on a passenger aircraft if they were not subject to regular hazard communication and dangerous goods acceptance check requirements?

3.3.1.2.3.3 While there was support, there was a suggestion to consider alternate ways to provide the operator with the necessary information before deciding to completely remove Section II. There were concerns that the increased cost to shippers who would no longer benefit from the exceptions if it were removed would lead to higher rates of non-compliance by those seeking to avoid these costs, particularly with respect to training and larger packaging sizes that would be needed to meet marking and labelling requirements. However, while sympathetic to cost, the level of concern was not shared by all. It was noted that industry practice with regard to Section II training was generally not so different from full dangerous goods training. Additionally, the new training provisions in the Technical Instructions that supported a competency-based approach to training and assessment made it clear that training beyond what was necessary to achieve competence was not required. It was recognized that larger packaging relative to the size of the cells or batteries may be needed to accommodate marks and labels which would be required to appear on the same side of the box if Section II were removed. Statistical information from a battery manufacturer in one State was provided. That battery manufacturer handled about 1000 shipments of Section II batteries each year around the world and received over 100 inquiries from general users on how to transport small batteries, especially button cells. It was projected that the volume of

shipments would be reduced substantially if batteries needed to be packed in accordance with Section IB because of the larger packaging needed. It was suggested that some exceptions from the marking and labelling requirements could be considered such as removing the requirement for a lithium battery mark. However, although the Class 9 lithium battery hazard label might make the lithium battery mark unnecessary for the air mode, the lack of a mark could cause multimodal problems. Regardless, a marking or labelling exception was something that DGP-WG/Energy Storage Devices could consider.

3.3.1.2.3.4 Despite the support, the need to consider potential consequences, including increased non-compliance was emphasized. However, there was also a view that non-compliance was something that needed to be addressed separately. It was an existing problem, particularly with lithium batteries. It was noted that not all non-compliance was deliberate, but rather a result of misinterpretation of the complex regulations. Eliminating Section II might actually contribute to reducing this complexity.

3.3.1.2.3.5 The rapporteur expressed his appreciation for the feedback received, noting that there was general consensus among the panel members who spoke that Section II should be deleted. He noted the benefits of data to make quantifiable decisions and thanked the battery manufacturer for providing some. He encouraged others to do the same. DGP-WG/Energy Storage Devices would work at developing a formal proposal for DGP/28 taking the feedback provided into account. The group would consider any other consequential amendments that may be necessary, including the deletion of references to Section II from other parts of the Technical Instructions, and if there were ways to further simplify the provisions.

3.3.1.2.4 **Transport of data loggers and cargo tracking devices containing lithium batteries**

3.3.1.2.4.1 Provisions that excepted data loggers and cargo tracking devices from the Technical Instructions had been recommended for inclusion in the 2021-2022 Edition by the twenty-seventh meeting of the DGP (DGP/27, 16 to 20 September 2019) (see paragraph 1.2.1.3 of the DGP/27 Report). These were based on what was contained in the UN Model Regulations, with additional restrictions appropriate for air transport. The ANC agreed these devices were outside the scope of the Technical Instructions and supported excepting them, but were seeking reassurance that the energy capacity limits proposed were safe given the fact that the batteries would be active during flight and installed in devices that might be more vulnerable to damage than those transported as cargo. The ANC acknowledged the extensive use of these devices and the lack of any serious incidents involving them, but wanted data on the energy capacity of the devices that were currently being used along with data that would provide confidence that higher capacities that may be used in the future would not introduce additional risk. The ANC therefore removed the exception from the amendments to the Technical Instructions proposed by DGP/27 pending further work by the DGP and, given the need for airworthiness and operational considerations, the Flight Operations Panel Safe Carriage of Goods Specific Working Group (FLTOSP-SCG-SWG).

3.3.1.2.4.2 The devices posed two potential risks to air transport, electromagnetic interference and thermal runaway from the lithium batteries that powered them. The Technical Instructions included provisions for radio frequency identification (RFID) tags, watches and temperature loggers when intentionally active, but these were not sufficient to address all the risks. There were no ICAO airworthiness or operations provisions addressing electromagnetic interference or potential hazards from such devices from an operational standpoint. The devices were widely used, and their use was on the rise. Industries such as the pharmaceutical industry were sometimes required to use them to meet the demands of regulatory authorities. The need for provisions to address the risks were considered essential for industry. DGP-WG/Energy Storage Devices was aiming to provide a recommendation specific to dangerous goods to FLTOSP-SCG-SWG. While recognizing that input from airworthiness and operations experts was necessary, panel members emphasized the need for provisions developed by

FLTOPSPS-SCG-SWG to be reviewed by the DGP to ensure dangerous goods concerns were met. The amendment proposed by DGP/27 was provided as a basis for discussion.

3.3.1.2.4.3 There was some support for forwarding the amendments as proposed to FLTOSP-SCG-SWG for reasons consistent with the justification proved at DGP/27. The panel had spent considerable time developing them and had taken risks specific to the air mode into account. The amendments outlined the concerns from a dangerous goods perspective, and this would assist the FLTOSP-SCG-SWG in their discussions. However, recognizing that the ANC had rejected this proposal on account of there being a lack of safety data and that there was no new data available, it was suggested that a better approach might be to develop a general exception similar to what was contained in the UN Model Regulations and guidance material specific to air transport to support it. Consideration could be given to incorporating the prescriptive provisions developed by DGP/27 in the guidance material. The fact that the devices were already subject to the new Annex 6 safety risk assessment requirements, and were subject to some form of an approval from an airworthiness perspective, provided some confidence in this approach. The Secretariat noted that prescriptive limits on their own in the Technical Instructions implied that they provided an acceptable level of safety. In reality, this was difficult to ensure or sustain at a global level when it came to articles such as data loggers and cargo tracking devices. What might be considered safe today may not be in the future. This was the reason that the exception from the lithium battery marking and documentation requirements for packages containing COVID-19 pharmaceuticals accompanied by data loggers and/or cargo tracking devices introduced through Addenda Nos. 1 and 2 to the Technical Instructions (2021-2022 Edition) in Special Provision A220 did not explicitly specify prescriptive limits. Not everyone agreed with this rationale given the fact that limits were implicitly specified in Special Provision A220 through a reference to Section II of Packing Instructions 967 and 969. However, the justification for the limits in Section II had also been questioned, so explicitly repeating them in the special provision was considered inappropriate by operations experts. Instead, the need for safety risk assessments related to such consignments was highlighted through newly-developed guidance. Addendum No. 2 to the Technical Instructions (2021-2022 Edition) added a link to this guidance under the operator safety risk assessment provisions in Part 7;1.7. While supporting the development of guidance material, there remained a view that limits in the Technical Instructions were necessary. Without them, operators would be played against each other by device manufacturers seeking competitive advantage. The Secretariat emphasized that the ANC was not completely opposed to the DGP/27 recommendation or to imposing limits, but wanted reassurance that the higher limits were safe. It was true that the limits proposed by DGP/27 were based on existing limits in Section II of the lithium battery packing instructions, but they were also introduced without supporting safety data. Additionally, there was a different risk associated with devices shipped as cargo in accordance with Section II and those used in transport.

3.3.1.2.4.4 The rapporteur of DGP-WG/Energy Storage Devices expressed appreciation for the feedback provided. He noted that it was important for the DGP to coordinate with airworthiness and operations experts and acknowledged that FLTOSP-SCG-SWG was the agreed forum for doing this. DGP members who participated in this group were encouraged to emphasize the urgent need for these provisions, noting that input from Airworthiness Panel (AIRP) had been requested several years before. DGP-WG/Energy Storage Devices would take the feedback provided by DGP-WG/21 and consider the two approaches mentioned, one being more of a performance-based approach and the other more prescriptive. There would be implementation challenges with a performance-approach, but justifying prescriptive limits would also be challenging.

3.3.1.2.5 **Conclusion**

3.3.1.2.6 The chair expressed his appreciation to the rapporteur and the DGP-WG/Energy Storage Devices for their work, recognizing the challenges involved.

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

3.4.1.1 **Joint Form for Exemptions (DGP-WG/21-WP/30) and Presentation on Joint Exemption Form (DGP-WG/21-IP/3)**

3.4.1.1.1 The panel was presented with a joint exemption application form that was developed by several European States to facilitate the application process. The number of applications for exemptions was on the rise, and the number of States concentrated in a small area within Europe meant that several States were often involved when an exemption was sought, and different processes and procedures were used. It was intended for use as a single application form that could be submitted to the multiple States involved in the exemption process. The form facilitated the complexities associated with applying, analysing, evaluating and granting exemptions. It simplified the process for the applicants by allowing them to use the same form for multiple States and also ensured that more detailed, complete and harmonized information was provided to States which allowed them to analyse and evaluate the applications more effectively and efficiently. It was emphasized that although there was only one form, each State was still responsible for evaluating the application. While the form was intended for exemptions, the same approach would be implemented for approvals. The working group was invited to provide feedback on the form and to consider incorporating such a form into the Supplement sometime in the future.

3.4.1.1.2 The initiative was appreciated by all and strongly supported by some panel members who reported positive feedback from within States who were already using the form. The form simplified the process and made the minimum amount of information an applicant needed to provide clear. It was reported that the quality of applications had improved in States that had begun using the forms. Other panel members recognized the benefits a form would provide in a region such as Europe, but did not think it would provide the same benefits in all parts of the world. It would not work in some States and could not be mandated in some jurisdictions. There were concerns that a form could oversimplify the exemption process by making it overly prescriptive. This could discourage a thorough demonstration by the applicant and evaluation by the authority of an acceptable level of safety.

3.4.1.1.3 All supported improving the guidance that was already provided in the Supplement, recognizing that many States faced challenges, and the form could be used as a basis for developing this guidance.

3.4.1.1.4 The presenter expressed appreciation for the feedback provided. He noted that many of the concerns raised had also been discussed by those developing the form. While understanding the need for a performance-based approach, they also considered simplifying the process to be important. Clear guidance was needed to provide the minimum information necessary to get the process started. He emphasized that there was no intention to mandate the form internationally, it was meant simply as guidance to facilitate the process.

3.4.1.1.5 DGP-WG/Supplement would take on the task of developing further guidance.

3.4.1.2 **Oral report from rapporteur of DGP WG on Annex 18**

3.4.1.2.1 A summary of the work of the DGP Working Group on Annex 18 (DGP-WG/Annex 18) was provided by the rapporteur of the group. The work of the group had been delayed on account of the COVID-19 pandemic. However, work was progressing virtually by a smaller group. That group was:

- a) developing an action plan for the way forward;
- b) consolidating material based on the output already provided by the working group;
- c) developing a draft framework for a restructured Annex 18;
- d) identifying areas that needed attention and input from the full DGP-WG/Annex 18 to consider; and
- e) developing a working document for the full group to consider.

A working group meeting would be scheduled to finalize the draft material for DGP/28.

3.4.1.2.2 The chair expressed his appreciation to the rapporteur for leading the group and to the member nominated by the United Arab Emirates and his delegation for their on-going support. He noted the importance, complexity and large amount of work to be done. A lot had been accomplished, and he was encouraged by the new steps taken to progress the work.

3.5 **Agenda Item 5: Aviation Security/Dangerous Goods Coordination (Job Card DGP.001.02)**

3.5.1 There were no working papers submitted under this agenda item.

3.6 **Agenda Item 6: Coordination with other panels**

3.6.1 **Agenda Item 6.1: Flight Operations Panels (FLTOSP)**

3.6.1.1 No papers were submitted under this item.

3.6.2 **Agenda Item 6.2: Airworthiness Panel (AIRP)**

3.6.2.1 No papers were submitted under this item.

3.6.3 **Agenda Item 6.3: Safety Management Panel (SMP)**

3.6.3.1 No papers were submitted under this item.

3.6.3.2 **Agenda Item 6.4: Remotely Piloted Aircraft Systems Panel (RPASP)**

3.6.3.3 **Review of Draft Annex 6, Part IV — Remotely Piloted Aircraft (DGP-WG/21-WP/1)**

3.6.3.3.1 The Remotely Piloted Aircraft System Panel (RPASP) was seeking the endorsement of DGP of draft Standards and Recommended Practices (SARPs) for a new Part IV — *International IFR Operations — Remotely Piloted Aircraft Systems* to Annex 6 — *Operation of Aircraft* which were provided to DGP-WG/21. A previous version of the SARPs had been reviewed by a working group of the DGP prior to DGP-WG/20 and discussed at that meeting. Comments from DGP-WG/20 had been forwarded to RPASP. RPASP reviewed all comments from the DGP and from several other ICAO panels and working groups. The comments were reproduced along with action taken by RPASP in a matrix provided in the working paper. DGP-WG/21 was invited to review the SARPs and the matrix before endorsing them ahead of the second meeting of the RPAS Working Group of the Whole (RPASP-WGWHL/2), which was scheduled from 25 to 29 October 2021.

3.6.3.3.2 The working group was reminded that the scope of the SARPs was limited to international, instrument flight rules (IFR) RPAS operations within controlled airspace and from controlled aerodromes, and an RPAS operator undertaking such activities would be required to hold an RPAS operator certificate (ROC). The draft SARPs in Part IV were based on the SARPs in Annex 6, Part I — *International Commercial Air Transport — Aeroplanes*.

3.6.3.3.3 Panel members expressed the need to address smaller unmanned aircraft such as drones. Regulations for drones had already been developed by some States, and it was hoped that the RPAS SARPs would support them. The Secretariat explained that drones were beyond the scope of the SARPs and that smaller unmanned aircraft would continue to be regulated through individual State legislation, with ICAO guidance provided when applicable. However, there was a need to adapt the Technical Instructions to accommodate RPAS operations and that this would likely require a performance-based approach that could be applied to smaller unmanned aircraft within States.

3.6.3.3.4 DGP-WG/21 agreed that the best approach would be to have a smaller dedicated working group review the SARPs as they were too lengthy and detailed to review by the full panel. The outcome of this review would then be provided to the full panel and, once approved, forwarded to RPASP. This would be done through correspondence given the fact that DGP/28 would be convened after RPASP-WGWHL/2. Those interested in participating in the smaller dedicated working group were invited to inform the Secretariat via e-mail.

3.6.4 **Agenda Item 6.5: Any other panels**

3.6.4.1 There were no working papers submitted under this agenda item.

3.7 **Agenda Item 7: 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**

3.7.1 There were no working papers submitted under this agenda item.

3.8 Agenda Item 8: Other business

3.8.1 Working methods of the DGP working groups

3.8.1.1 There was some discussion on how panel members who were not members of any of the DGP dedicated working groups should raise issues. The chair recommended that the specific working groups avoid taking on any new work if it was significant until the panel had approved it. However, if members had issues related to tasks the working groups were already dealing with, it would be appropriate to contact the rapporteur directly. The rapporteurs should use their own discretion in determining what they could informally take and what went beyond the scope of the group's terms of reference and associated tasks. The need for a practical approach was emphasized, one which would not inhibit the work of the group while at the same time ensuring the work was manageable and transparent to the larger panel. The chair advised that the rapporteurs would meet following DGP-WG/21 to discuss working methods in more detail. These would be communicated to the full panel.

3.8.2 Update on development of competency-based training application developed in France

3.8.3 An update on efforts taken in France to implement competency-based training and assessment and to develop an application to assist authorities and regulated entities through the process of developing and approving training programmes was provided. The project had been described at the 2019 DGP Working Group Meeting (see paragraph 3.2.2.6 of the DGP-WG/19 Report). It was expected to be published in the coming months on the State's public website along with guidance to support it. Although the website was in French, training material would be available in English. A link to the application would be provided to the panel through the Secretariat when it was published.

APPENDIX A

REVISIONS TO DRAFT AMENDMENTS TO THE TECHNICAL INSTRUCTIONS TO ALIGN WITH THE UN RECOMMENDATIONS IDENTIFIED DURING DGP-WG/21 DISCUSSIONS THAT ARE ADDITIONAL TO THOSE SHOWN IN DGP-WG/21-WPS/11, 12, 13, 14, 15, 16 AND 20

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

Working Paper number	Page number from working paper	TI reference	Amendment
DGP-WG/21-WP/11 (see paragraph 3.1.2.4.2 of this report)	5	Proposed new definition for Model Regulations	<i>Replace</i> “Rev.21” with “Rev.22”.
DGP-WG/21-WP/12 (see paragraph 3.1.2.5.2 of this report)	9	2;9.3 g)	<i>Delete</i> “This test summary must be made available from 1 January 2020.”
DGP-WG/21-WP/14 (see paragraph 3.1.2.7.2 of this report)	14	Packing Instruction 621, Spanish Edition	<i>Align</i> structure of Spanish version of Packing Instruction 621 with English version.
DGP-WG/21-WP/15 (see paragraph 3.1.2.8.1 a) of this report)	3	5;2.4.16.2, Note 2	<i>Replace</i> “Figure 3” with “Figure 5-3” and “2020-2021” Edition with “2021-2022 Edition”.
DGP-WG/21-WP/15 (see paragraph 3.1.2.8.2 of this report)	5	5;4.1.5.10	<i>Replace</i> “must be included in” with “must be included on”
DGP-WG/21-WP/16 (see paragraph 3.1.2.9.2 of this report)	13	6;5.2.3	<i>Move</i> ISO 17871:2020 before ISO 17879:2017
DGP-WG/21-WP/20 (see paragraph 3.1.2.10 of this report)	2	Attachment 1;2	<i>Replace</i> second reference to “ SCO-II ” in the proper shipping name for UN 2913 with “ SCO-III ”

APPENDIX B

CONSOLIDATION OF AMENDMENTS TO THE TECHNICAL INSTRUCTIONS DEVELOPED AT DGP-WG/20 AND DGP-WG/21 FOR THE SAKE OF HARMONIZATION WITH UN RECOMMENDATIONS ON THE TRANSPORT OF DANGEROUS GOODS

FOREWORD

...

GENERAL PRINCIPLES USED IN DEVELOPING THE PROVISIONS OF THE TECHNICAL INSTRUCTIONS

...

Paragraph 3.1.2.4 of the DGP-WG/21 report:

Consequential to the addition of a definition for the IAEA Regulations in 1;3:

The provisions are based on material produced by the United Nations, which is contained in the Recommendations on the Transport of Dangerous Goods (ST/SG/AC.10/1), the Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria (ST/SG/AC.10/11), and, for radioactive materials, the International Atomic Energy Agency Regulations for the Safe Transport of Radioactive Material, ~~2012~~ 2018 Edition, ~~IAEA Safety Standards Series No. SSR-6, IAEA, Vienna 2012~~. Using a United Nations system ensures compatibility between the international modes of transport so a consignment may be carried by more than one mode without intermediate reclassification and repacking. Modifications are made to the system to take account of the peculiarities of air transport, while keeping in mind the need to ensure modal compatibility.

...

Part 1

GENERAL

...

Chapter 1

SCOPE AND APPLICABILITY

...

Paragraph 3.1.2.4 of the DGP-WG/21 report:

UN Model Regulations, Chapter 1.1, Note 1 (see ST/SG/AC.10/48/Add.1)

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.7 and Amend.1), 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;

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.

...

Chapter 3

GENERAL INFORMATION

...

3.1 DEFINITIONS

...

Paragraph 3.1.2.4 of the DGP-WG/21 report:

UN Model Regulations, Chapter 1.2.1 (see ST/SG/AC.10/48/Add.1)

Bundle of cylinders. Not permitted for air transport. ~~An assembly of cylinders~~ A pressure receptacle comprising an assembly of cylinders or cylinder shells that are fastened together and which are interconnected by a manifold and transported as a unit.

...

Closed ~~C~~cryogenic receptacle. ~~A transportable,~~ thermally insulated pressure receptacle for refrigerated liquefied gases, of a water capacity of not more than 1 000 litres.

Closure. A device which closes an opening in a receptacle.

Revisions to text in UN Model Regulations of an editorial nature:

Note.— Examples of closures for pressure receptacles are valves, pressure relief devices, pressure gauges or level indicators.

...

Cylinder. ~~A transportable~~ pressure receptacle of a water capacity not exceeding 150 litres.

...

GHS. ~~The seventh~~ ninth revised edition of the *Globally Harmonized System of Classification and Labelling of Chemicals*, published by the United Nations as document ST/SG/AC.10/30/Rev.79.

...

IAEA Regulations for the Safe Transport of Radioactive Material. One of the editions of those Regulations, as follows:

a) for the 1985, 1985 (as amended 1990) editions: IAEA Safety Series No. 6;

b) for the 1996 edition: IAEA Safety Series No. ST-1;

c) for the 1996 (revised) edition: IAEA Safety Series No. TS-R-1 (ST-1, Revised);

d) for the 1996 (as amended 2003), 2005, 2009 editions: IAEA Safety Standards Series No. TS-R-1;

e) for the 2012 edition: IAEA Safety Standards Series No. SSR-6; or

f) for the 2018 edition: IAEA Safety Standards Series No. SSR-6 (Rev.1).

Inner vessel. For a closed cryogenic receptacle, the pressure vessel intended to contain the refrigerated liquefied gas.

...

Liquids. A substance classified as Dangerous goods which at 50°C ~~have~~ has a vapour pressure of not more than 300 kPa (3 bar), which ~~are~~ is not completely gaseous at 20°C and at a pressure of 101.3 kPa, and which ~~have~~ has a melting point or initial melting point of 20°C or less at a pressure of 101.3 kPa. A viscous substance for which a specific melting point cannot be determined must be subjected to the ASTM D 4359-90 test; or to the test for determining fluidity (penetrometer test) prescribed in section 2.3.4 of Annex A of the ~~European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR)~~ (United Nations publication: ECE/TRANS/257/300 (Sales No. E.4621.VIII.1).

...

UN Model Regulations, Chapter 1.2.1 (see ST/SG/AC.10/1/Rev.21, Vol. I and II Corrigendum 1)

Manual of Tests and Criteria. The ~~sixth~~ seventh revised edition of the United Nations publication ~~entitled Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria bearing this title~~ (ST/SG/AC.10/11/Rev.7 and Amend.1).

...

UN Model Regulations, , Chapter 1.2.1 (see ST/SG/AC.10/48/Add.1)

Metal hydride storage system. A single complete hydrogen storage system, including a pressure receptacle shell, metal hydride, pressure relief device, shut-off valve, service equipment and internal components used for the transport of hydrogen only.

...

DGP-WG/21 (see paragraph 3.1.2.4.1 a) of DGP-WG/21 Report):

Model Regulations. The twenty-second revised edition of the United Nations publication entitled Recommendations on the Transport of Dangerous Goods, Model Regulations (ST/SG/AC.10/1/Rev.22).

...

DGP-WG/21 (see paragraph 3.1.2.4 of DGP-WG/21 Report):

UN Model Regulations, , Chapter 1.2.1 (see ST/SG/AC.10/48/Add.1)

Pressure drum. (Not permitted for air transport.) A welded ~~transportable~~ pressure receptacle of a water capacity exceeding 150 litres and of not more than 1 000 litres (e.g. cylindrical receptacles equipped with rolling hoops, spheres on skids).

Pressure receptacle. A transportable receptacle intended for holding substances under pressure including its closure(s) and other service equipment and a collective term that includes cylinders, tubes, pressure drums, closed cryogenic receptacles, metal hydride storage systems, bundles of cylinders and salvage pressure receptacles.

Pressure receptacle shell. A cylinder, a tube, a pressure drum or a salvage pressure receptacle without its closures or other service equipment, but including any permanently attached device(s) such as a neck ring or a foot ring.

Note.— The terms “cylinder shell”, “pressure drum shell” and “tube shell” are also used.”

...

Recycled plastic material. Material recovered from used industrial packagings that has been cleaned and prepared for processing into new packagings. The specific properties of the recycled material used for production of new packagings must be assured and documented regularly as part of a quality assurance programme recognized by the appropriate national authority. The quality assurance programme must include a record of proper pre-sorting and verification that

each batch of recycled plastic material has the proper melt flow rate, density, and tensile yield strength, consistent with that of the design type manufactured from such recycled material. This necessarily includes knowledge about the packaging material from which the recycled plastic has been derived, as well as awareness of the prior contents of those packagings if those prior contents might reduce the capability of new packagings produced using that material. In addition, the packaging manufacturer's quality assurance programme must include performance of the mechanical design type test in Part 6, Chapter 4 on packagings manufactured from each batch of recycled plastic material. In this testing, stacking performance may be verified by appropriate dynamic compression testing rather than static load testing.

Note.— ISO 16103:2005 "Packaging — Transport packages for dangerous goods — Recycled plastics material", provides additional guidance on procedures to be followed in approving the use of recycled plastics material. These guidelines have been developed based on the experience of the manufacturing of drums and jerricans from recycled plastics material and as such may need to be adapted for other types of packagings, IBCs and large packagings made of recycled plastics material.

...

Service equipment. For pressure receptacles, includes:

- a) closure(s);
- b) manifold(s);
- c) piping;
- d) porous, absorbent or adsorbent material; and
- e) any structural devices such as those used for handling.

Tube. (Not permitted for air transport.) A ~~transportable~~ pressure receptacle of seamless or composite construction having a water capacity exceeding 150 litres but not more than 3 000 litres.

...

Working pressure. Either:

- a) for a compressed gas, the settled pressure of a compressed gas at a reference temperature of 15°C in a full pressure receptacle;
- b) for UN 1001 acetylene, dissolved, the calculated settled pressure at a uniform reference temperature of 15°C in an acetylene cylinder containing the specified solvent content and the maximum acetylene content; or
- c) for UN 3374 acetylene, solvent free, the working pressure which was calculated for the equivalent cylinder for UN 1001 acetylene, dissolved.

...

Chapter 5

DANGEROUS GOODS SECURITY

...

Paragraph 3.1.2.4 of the DGP-WG/21 report:

UN Model Regulations, Chapter 1.2.1 (see ST/SG/AC.10/48/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 ([INFCIRC/274/Rev.1, IAEA, Vienna \(1980\)](#)), and the IAEA circular

1. [INFCIRC/274/Rev.1, IAEA, Vienna \(1980\)](#).

on “Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities”² [INFCIRC/225/Rev.5, IAEA, Vienna \(2011\)](#), are applied.

...

Chapter 6

GENERAL PROVISIONS CONCERNING RADIOACTIVE MATERIAL

...

6.1 SCOPE AND APPLICATION

Paragraph 3.1.2.4 of the DGP-WG/21 report:

Consequential to the addition of a definition for the IAEA Regulations in 1;3:

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

...

² [INFCIRC/225/Rev.5, IAEA, Vienna \(2011\)](#).

Part 2

CLASSIFICATION OF DANGEROUS GOODS

...

Paragraph 3.1.2.5 of the DGP-WG/21 report:

Chapter 1

CLASS 1 — EXPLOSIVES

...

1.4 COMPATIBILITY GROUPS

...

1.4.2.1 Certain Division 1.4S explosives, identified by Special Provision A165 in Table 3-1, are subject to Test Series 6 (d) of Part I of the ~~UN~~ UN *Manual of Tests and Criteria* (see ~~ST/SG/AC.10/11/Rev.6 and Amend.1~~) to demonstrate that any hazardous effects arising from functioning are confined within the package. Evidence of a hazardous effect outside the package includes:

- a) denting or perforation of the witness plate beneath the package;
- b) a flash or flame capable of igniting such as a sheet of 80 ± 3 g/m² paper at a distance of 25 cm from the package;
- c) disruption of the package causing projection of the explosives contents; or
- d) a projection which passes completely through the packaging (a projection or fragment retained or stuck in the wall of the packaging is considered as non-hazardous).

The appropriate national authority may wish to take into account the expected effect of the initiator when assessing the results of the test, if these are expected to be significant when compared to the articles being tested. If there are hazardous effects outside the package, then the product is excluded from Compatibility Group S.

...

Chapter 4

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

Paragraph 3.1.2.5 of the DGP-WG/21 report:

...

4.2.3.2.4 List of currently assigned self-reactive substances in packages

The following table (Table 2-6) is reproduced from 2.4.2.3.2.3 of the UN ~~Recommendations on the Transport of Dangerous Goods (Eighteenth revised edition)~~ Model Regulations, with irrelevant material removed.

Table 2-6. List of currently assigned self-reactive substances in packagings

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

<i>Self-reactive substance</i>	<i>Concentration (%)</i>	<i>Control temperature (°C)</i>	<i>Emergency temperature (°C)</i>	<i>UN generic entry</i>	<i>Notes</i>
...					
<hr/>					
UN Model Regulations, 2.4.2.3.2.3 (see ST/SG/AC.10/48/Add.1)					
3-(2-Hydroxyethoxy)-4-(pyrrolidin-1-yl) benzenediazonium zinc chloride	100	+40	+45	3236	
<u>(7-Methoxy-5-methyl-benzothiophen-2-yl) boronic acid</u>	<u>88-100</u>			<u>3230</u>	<u>9</u>
...					

NOTES:

Proposed to replace reference with “Model Regulations” because a definition for Model Regulations is proposed for Part 1;3 (see DGP-WG/21-WP/11):

1. Azodicarbonamide formulations which fulfil the criteria of 2.4.2.3.3.2 (b) of the UN ~~Recommendations~~ Model Regulations.
 2. “EXPLOSIVE” subsidiary hazard label required and consequently forbidden for transport by air under any circumstance.
 3. Azodicarbonamide formulations which fulfil the criteria of 2.4.2.3.3.2 (c) of the UN ~~Recommendations~~ Model Regulations.
 4. Azodicarbonamide formulations which fulfil the criteria of 2.4.2.3.3.2 (d) of the UN ~~Recommendations~~ Model Regulations.
 5. With a compatible diluent having a boiling point of not less than 150°C.
 6. See 4.2.3.2.6.
 7. This entry applies to mixtures of esters of 2-diazo-1-naphthol-4-sulphonic acid and 2-diazo-1-naphthol-5-sulphonic acid meeting the criteria of 2.4.2.3.3.2 d) of the UN ~~Recommendations~~ Model Regulations.
 8. This entry applies to the technical mixture in n-butanol within the specified concentration limits of the (Z) isomer.
 9. The technical compound with the specified concentration limits may contain up to 12% water and up to 1% organic impurities.
-

...

Chapter 5

CLASS 5 — OXIDIZING SUBSTANCES; ORGANIC PEROXIDES

Paragraph 3.1.2.5 of the DGP-WG/21 report:

...

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
UN Model Regulations, 2.5.3.2.4 (see ST/SG/AC.10/48/Add.1)									
Acetyl acetone peroxide	≤42	≥48			≥8			3105	2
<u>Acetyl acetone peroxide</u>	<u>≤35</u>	<u>≥57</u>			<u>≥8</u>			<u>3107</u>	<u>32</u>
tert-Butylperoxy isopropylcarbonate	≤77	≥23						3103	
1-(2-tert-Butylperoxyisopropyl)-3-isopropenylbenzene	≤77	≥23						3105	
<u>tert-Butylperoxy isopropylcarbonate</u>	<u>≤62</u>		<u>≥38</u>					<u>3105</u>	
...									
tert-Hexyl Peroxypivalate	≤72		≥28			+10	+15	3115	
<u>tert-Hexyl peroxypivalate</u>	<u>≤52 as a stable dispersion in water</u>					<u>+15</u>	<u>+20</u>	<u>3117</u>	

...

Notes:

...

31. Active oxygen ≤6.7 per cent.

32. Active oxygen ≤4.15 per cent.

...

Chapter 6

CLASS 6 — TOXIC AND INFECTIOUS SUBSTANCES

...

Paragraph 3.1.2.5 of the DGP-WG/21 report:

INTRODUCTORY NOTE

UN Model Regulations, Chapter 2.6 (see ST/SG/AC.10/48/Add.1)

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 or UN 3462.

...

Chapter 7

CLASS 7 — RADIOACTIVE MATERIAL

Paragraph 3.1.2.5 of the DGP-WG/21 report:

...

7.2.3 Determination of other material characteristics

7.2.3.1 *Low specific activity (LSA) material*

7.2.3.1.1 (Reserved)

...

UN Model Regulations, 2.7.2.3.1.4 and 2.7.2.3.1.5 (see ST/SG/AC.10/48/Add.1)

7.2.3.1.4 ~~LSA-III material must be tested as follows:~~

~~A solid material sample representing the entire contents of the package 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. The total activity of the free volume of water must be measured following the 7 day immersion of the test sample. Deleted~~

~~7.2.3.1.5 Demonstration of compliance with the performance standards in 7.2.3.1.4 must be in accordance with 6;7.11.1 and 6;7.11.2. Deleted~~

...

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:

- a) The 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 A₂. A separate specimen may be used for each test; and

UN Model Regulations, 2.7.2.3.4.1 (c) (see ST/SG/AC.10/48/Add.1)

- c) If subjected to the test specified in ~~7.2.3.4.4~~ 7.2.3.4.3, the activity in the water would not exceed 100 A₂. 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.

UN Model Regulations, 2.7.2.3.4.3 (see ST/SG/AC.10/48/Add.1)

7.2.3.4.3 A solid material sample representing the entire contents of the package 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 shall 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. The total activity of the free volume of water must be measured following the 7-day immersion of the test sample.

~~7.2.3.4.3.4~~ 7.2.3.4.4 Demonstration of compliance with the performance standards in 7.2.3.4.1 ~~and~~, 7.2.3.4.2 and 7.2.3.4.3 must be in accordance with 6;7.11.1 and 6;7.11.2.

...

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 dose rate 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;
- 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);
- 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

UN Model Regulations, 2.7.2.4.1.3 (f) (see ST/SG/AC.10/1/Rev.21, Vol. I and II Corrigendum 1):

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

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:

- a) the package retains its radioactive contents under routine conditions of transport;

- 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

UN Model Regulations, 2.7.2.4.1.4 (c) (see ST/SG/AC.10/1/Rev.21, Vol. I and II Corrigendum 1):

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

...

UN Model Regulations, 2.7.2.4.1.7 (e) (see ST/SG/AC.10/1/Rev.21, Vol. I and II Corrigendum 1):

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;
- 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;
- 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 the definition for fissile nuclides in 7.1.3, ~~must apply~~ applies.

...

Chapter 8

CLASS 8 — CORROSIVE SUBSTANCES

Paragraph 3.1.2.5 of the DGP-WG/21 report:

...

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.10/48/Add.1)

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, 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, 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 or non-classified in accordance with No. 439, *In Vitro Skin Irritation: Reconstructed Human Epidermis Test Method, 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. If the test results indicate that the substance or mixture is corrosive,

but the test method does not allow discrimination between packing groups, it must be assigned to Packing Group I if no other test results indicate a different packing group.

8.3.3 Packing groups are assigned to corrosive substances in accordance with the following criteria (see Table 2-15):

- a) *Packing Group I* is assigned to substances that cause irreversible damage of intact skin tissue within an observation period of up to 60 minutes starting after the exposure time of 3 minutes or less.
- b) *Packing Group II* is assigned to substances that cause irreversible damage of intact skin tissue within an observation period of up to 14 days starting after the exposure time of more than 3 minutes but not more than 60 minutes.
- c) *Packing Group III* is assigned to substances that:
 - i) cause irreversible damage of intact skin tissue within an observation period of up to 14 days starting after the exposure time of more than 60 minutes but not more than 4 hours; or

UN Model Regulations, 2.8.3.3 (c) (ii) (see ST/SG/AC.10/48/Add.1)

- ii) are judged not to cause irreversible damage of intact skin tissue but which exhibit a corrosion rate on either steel or aluminium surfaces exceeding 6.25 mm a year at a test temperature of 55°C when tested on both materials. For the purposes of testing steel, type S235JR+CR (1.0037 resp. St 37-2), S275J2G3+CR (1.0144 resp. St 44-3), ISO 3574 or Unified Numbering System (UNS) G10200 or a similar type or SAE 1020, and for testing aluminium, non-clad types 7075-T6 or AZ5GU-T6, must be used. An acceptable test is prescribed in the UN *Manual of Tests and Criteria*, Part III, Section 37.

Note.— Where an initial test on either steel or aluminium indicates the substance being tested is corrosive, the follow up test on the other metal is not required.

...

Chapter 9

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

...

9.3 LITHIUM BATTERIES

Cells and batteries, cells and batteries contained in equipment, or cells and batteries packed with equipment, containing lithium in any form must be assigned to UN Nos. 3090, 3091, 3480 or 3481, as appropriate. They may be transported under these entries if they meet the following provisions:

...

Paragraph 3.1.2.5.2 of the DGP-WG/21 report:

UN Model Regulations, 2.9.4 (g) (see ST/SG/AC.10/48/Add.1)

- g) except for button cells installed in equipment (including circuit boards), manufacturers and subsequent distributors of cells or batteries manufactured after 30 June 2003 must make available the test summary as specified in the UN *Manual of Tests and Criteria*, Part III, subsection 38.3, paragraph 38.3.5. ~~This test summary must be made available from 1 January 2020.~~

...

Part 3

DANGEROUS GOODS LIST, SPECIAL PROVISIONS AND LIMITED AND EXCEPTED QUANTITIES

 Paragraph 3.1.2.6 of the DGP-WG/21 report:

...

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.10/48/Add.1):

Air, compressed	1002	2.2		Gas non-flammable		<u>A221</u>		E1	200	75 kg	200	150 kg
------------------------	------	-----	--	-------------------	--	-------------	--	----	-----	-------	-----	--------

 Paragraph 3.1.2.6.1 a) of the DGP-WG/21 report:

Batteries, wet, filled with acid, electric storage †	2794	8		Corrosive		A51 A164 A183		E0	870	30 kg	870	No limit <u>400 kg</u>
Batteries, wet, filled with alkali, electric storage †	2795	8		Corrosive		A51 A164 A183		E0	870	30 kg	870	No limit <u>400 kg</u>

 Paragraph 3.1.2.6 of the DGP-WG/21 report:

 UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/48/Add.1):

Butylene	1012	2.1		Gas flammable	AU 1 CA 7 IR 3 NL 1 US 3	A1 <u>A222</u>		E0	FORBIDDEN		200	150 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

Paragraph 3.1.2.6.1 a) of the DGP-WG/21 report:

Cells, containing sodium †	3292	4.3		Danger if wet		A94		E0	492	25 kg	492	No limit <u>400 kg</u>
----------------------------	------	-----	--	---------------	--	-----	--	----	-----	-------	-----	------------------------

Paragraph 3.1.2.6 of the DGP-WG/21 report:

UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/48/Add.1):

<u>Cobalt dihydroxide powder, containing not less than 10% respirable particles</u>	<u>3550</u>	<u>6.1</u>		<u>Toxic</u>				<u>I</u>	<u>E5</u>	<u>666</u>	<u>5 kg</u>	<u>673</u>	<u>50 kg</u>
Ethyl bromide	1891	<u>6.1</u>	<u>6.1</u>	<u>Liquid flammable & Toxic</u>				II	<u>E4</u> <u>E2</u>	<u>654</u> <u>352</u> <u>Y644</u> <u>Y341</u>	<u>5 L</u> <u>1 L</u> <u>1 L</u>	<u>662</u> <u>364</u>	60 L
Extracts, aromatic, liquid †	1169	3		Liquid flammable	A3			II III	E2 E4	353 Y341 355 Y344	5 L 1 L 60 L 10 L	364 366	60 L 220 L
Extracts, flavouring, liquid, for flavour or aroma †	1197	3		Liquid flammable	A3			II III	E2 E1	353 Y341 355 Y344	5 L 1 L 60 L 10 L	364 366	60 L 220 L

Paragraph 3.1.2.6 of the DGP-WG/21 report:

UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/1/Rev.21, Vol. I and II Corrigendum 1):

Radioactive material, surface contaminated objects (SCO-I or SCO-II or SCO-III), non-fissile or fissile excepted	2913	7		Radioactive	CA 1	A78 A139 A159							See Part 2;7 and Part 4;9
--	------	---	--	-------------	------	---------------------	--	--	--	--	--	--	---------------------------

...

Chapter 3

SPECIAL PROVISIONS

...

Table 3-2. Special provisions

TIs UN

...

 Paragraph 3.1.2.6.1 b) of the DGP-WG/21 report:

 UN Model Regulations, Chapter 3.3, SP 225 (see ST/SG/AC.10/48/Add.1):

- A19 (225) Fire extinguishers under this entry may include installed actuating cartridges (cartridges, power device of Division 1.4C or 1.4S), without changing the classification of Division 2.2 provided the total quantity of deflagrating (propellant) explosives does not exceed 3.2 grams per extinguishing unit.

Fire extinguishers must be manufactured, tested, approved and labelled according to the provisions applied in the State of Manufacture. Fire extinguishers under this entry include:

Note.— Provisions applied in the State of Manufacture means the provisions applicable in the State of Manufacture or those applicable in the State of use.

- a) portable fire extinguishers for manual handling and operation;

Note.— Fire extinguishers may be considered portable even if some components that are necessary for their proper functioning (e.g. hoses and nozzles) are temporarily detached, as long as the safety of the pressurized extinguishing agent containers is not compromised and the fire extinguishers continue to be identified as a portable fire extinguisher.

- b) fire extinguishers for installation in aircraft;

- c) fire extinguishers mounted on wheels for manual handling;

- d) fire extinguishing equipment or machinery mounted on wheels or wheeled platforms or units transported similar to (small) trailers; and

- e) fire extinguishers composed of a non-rollable pressure drum and equipment, and handled, for example, by fork lift or crane when loaded or unloaded.

Cylinders which contain gases for use in the above-mentioned extinguishers or for use in stationary firefighting installations must meet the requirements in Part 6;5 and all requirements applicable to the relevant dangerous goods when these cylinders are transported separately.

TIs UN

...

Paragraph 3.1.2.6 of the DGP-WG/21 report:

UN Model Regulations, Chapter 3.3, SP 397 (see ST/SG/AC.10/48/Add.1):

A221 (397) Mixtures of nitrogen and oxygen containing not less than 19.5 per cent and not more than 23.5 per cent oxygen by volume may be transported under this entry when no other oxidizing gases are present. A Division 5.1 subsidiary hazard label is not required for any concentrations within this limit.

...

UN Model Regulations, Chapter 3.3, SP 398 (see ST/SG/AC.10/48/Add.1):

A222 (398) This entry applies to mixtures of butylenes, 1-butylene, cis-2-butylene and trans-2-butylene. For isobutylene, see UN 1055.

...

Part 4**PACKING INSTRUCTIONS**

...

Chapter 1**GENERAL PACKING REQUIREMENTS**

*Parts of this Chapter are affected by State Variations JP 24;
see Table A-1*

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

...

Paragraph 3.1.2.7.1 a) of the DGP-WG/21 report:

UN Model Regulations, 6.1.1.2 (see ST/SG/AC.10/48/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.~~

...

1.1.20 For plastic drums and jerricans, rigid plastic IBCs and composite IBCs with plastic inner receptacles, unless otherwise approved by the appropriate national authority, the period of use permitted for the transport of dangerous goods must be not more than five years from the date of manufacture of the receptacles, except where a shorter period of use is prescribed because of the nature of the substance to be transported.

Paragraph 3.1.2.7 of the DGP-WG/21 report:

UN Model Regulations, 4.1.1.15 (see ST/SG/AC.10/48/Add.1)

~~*Note. — For composite IBCs the period of use refers to the date of manufacture of the inner receptacle.*~~

1.1.21 Where ice is used as a coolant it must not affect the integrity of the packaging.

...

Chapter 2

GENERAL

2.1 Each of the succeeding Chapters of this Part is devoted to the specific packing instructions applicable to an individual class of dangerous goods. In some cases the Chapters start with general requirements which apply to all goods in that class.

2.2 The Dangerous Goods List (Table 3-1) shows for each article or substance, in columns 10 and 12, the number of the packing instruction that must be used.

Paragraph 3.1.2.7 of the DGP-WG/21 report:

UN Model Regulations, 4.1.3.3 (see ST/SG/AC.10/48/Add.1)

2.3 Each instruction shows, where applicable, the acceptable single and combination packagings. For combination packagings, tables show the acceptable outer packagings and associated inner packagings with the maximum net quantity permitted in each inner packaging. Where provisions for particular articles or substances apply, a table shows the inner packagings with associated quantity limitations, the permitted quantity per package and, where applicable, an indication if single packagings are permitted. Where appropriate, additional packing requirements are also indicated at the end of a packing instruction. These additional packing requirements may impose a higher standard of packaging than would normally apply to the packing group, or may require specific packaging considerations. Where packagings which need not meet the requirements of 1.1.2 (e.g. crates, pallets, etc.) are authorized in a packing instruction or the special provisions named in the dangerous goods list, these packages are not subject to the mass or volume limits generally applicable to packagings conforming to the requirements of Part 6, unless otherwise indicated in the relevant packing instruction or special provision.

...

Chapter 3**CLASS 1 — EXPLOSIVES**

...

 Paragraph 3.1.2.7 of the DGP-WG/21 report:

 UN Model Regulations, 4.1.4.1, P137 (see ST/SG/AC.10/48/Add.1)

Packing Instruction 137*Inner packagings*

Bags
 plastics

Boxes
 fibreboard
 wood

Tubes
 fibreboard
 metal
 plastics

Dividing partitions in the
outer packagings

Intermediate packagings

Not necessary

Outer packagings

Boxes
 aluminium (4B)
 fibreboard (4G)
 natural wood, ordinary (4C1)
 natural wood, with siftproof walls (4C2)
 other metal (4N)
 plastics, solid (4H2)
 plywood (4D)
 reconstituted wood (4F)
 steel (4A)

PARTICULAR PACKING REQUIREMENTS OR EXCEPTIONS:

— For UN 0059, 0439, 0440 and 0441, when the shaped charges are packed singly, the conical cavity must face downwards and the package must be marked in accordance with 4.1.4.13, as illustrated in Figure 5-29. When the shaped charges are packed in pairs, the conical cavities must face inwards to minimize the jetting effect in the event of accidental initiation.

...

Chapter 4**CLASS 2 — GASES**

...

**4.1 SPECIAL PACKING PROVISIONS
FOR DANGEROUS GOODS OF CLASS 2****4.1.1 General requirements**

...

 Paragraph 3.1.2.7 of the DGP-WG/21 report:

 UN Model Regulations, 4.1.6.1.6 (see ST/SG/AC.10/48/Add.1)

4.1.1.6 Cylinders and closed cryogenic receptacles must be filled according to the working pressures, filling ratios and provisions specified in the appropriate packing instruction for the specific substance and taking into account the lowest pressure rating of any component. Service equipment having a pressure rating lower than other components must nevertheless comply with 6.5.1.3.1. Reactive gases and gas mixtures must be filled to a pressure such that if complete decomposition of the gas occurs, the working pressure of the cylinder must not be exceeded.

...

UN Model Regulations, 4.1.6.1.8 (see ST/SG/AC.10/48/Add.1)

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.

For cylinders and closed cryogenic receptacles with valves as described in b) and c), the requirements of ISO 11117:1998, [ISO 11117:2008 + Cor 1:2009](#) or [ISO 11117:2019](#) must be met; for valves with inherent protection, the requirements of 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 or [ISO 16111:2018](#) must be met.

...

UN Model Regulations, 4.1.6.1.10 (see ST/SG/AC.10/48/Add.1)

4.1.1.10 Refillable cylinders, other than closed cryogenic receptacles, must be periodically inspected according to the provisions of 6;5.1.6 and Packing Instruction 200-~~or~~, 214, [218](#) or [219](#). Cylinders and closed cryogenic receptacles must not be filled after they become due for periodic inspection but may be transported after the expiry of the time limit.

...

UN Model Regulations, 4.1.4.1, P200(5) (see ST/SG/AC.10/48/Add.1)

Packing Instruction 200

...

6) "Special packing provisions":

Material compatibility

- a) Aluminium alloy cylinders are forbidden.
- b) Copper valves are forbidden.
- c) Metal parts in contact with the contents must not contain more than 65 per cent copper.
- d) When steel cylinders [or composite cylinders with steel liners](#) are used, only those bearing the "H" mark in accordance with 6;5.2.7.4 p) are permitted.

...

...

Paragraph 3.1.2.7.1 c) of the DGP-WG/21 report:

UN Model Regulations, 4.1.4.1, P205 (see ST/SG/AC.10/48/Add.1)

Packing Instruction 214

Cargo aircraft only for UN 3468 only

This Instruction applies to storage systems containing hydrogen absorbed in a metal hydride (UN 3468) individually or when contained in equipment and apparatus when transported on cargo aircraft.

- 1) For metal hydride storage systems, the general packing requirements of 4;4.1 must be met.
- 2) Only cylinders not exceeding 150 L in water capacity and having a maximum developed pressure not exceeding 25 MPa are covered by this packing instruction.
- 3) Metal hydride storage systems meeting the applicable requirements of 6;5 for the construction and testing of cylinders containing gas may be used for the transport of hydrogen only.
- 4) When steel cylinders or composite cylinders with steel liners are used, only those bearing the "H" mark, in accordance with 6;5.2.9.2 j) are permitted.
- 5) Metal hydride storage systems must meet the service conditions, design criteria, rated capacity, type tests, batch tests, routine tests, test pressure, rated charging pressure and provisions for pressure relief devices for transportable metal hydride storage systems specified in ISO 16111:2008 or ISO 16111:2018, and their conformity and approval must be assessed in accordance with 6;5.2.5.
- 6) Metal hydride storage systems must be filled with hydrogen at a pressure not exceeding the rated charging pressure shown in the permanent mark on the system as specified in ISO 16111:2008 or ISO 16111:2018.
- 7) The periodic test requirements for a metal hydride storage system must be in accordance with ISO 16111:2008 or ISO 16111:2018 and carried out in accordance with 6;5.2.6, and the interval between periodic inspections must not exceed five years. See 6;5.2.4.2 to determine which standard is applicable at the time of periodic inspection and test.
- 8) Storage systems with a water capacity of less than 1 L must be packaged in rigid outer packagings constructed of suitable material of adequate strength and design in relation to the packaging capacity and its intended use. They must be adequately secured or cushioned so as to prevent damage during normal conditions of transport.
- 9) Maximum net quantity per package for cargo aircraft is 100 kg of metal hydride storage systems, including when such storage systems are packed with equipment or contained in equipment.

...

Paragraph 3.1.2.7 of the DGP-WG/21 report:

UN Model Regulations, 4.1.4.1, P208 (1)(a) and (11) (see ST/SG/AC.10/48/Add.1)

Packing Instruction 219

For cylinders, the general packing requirements of 4.1.1 and 4.4.1.1 must be met.

This Instruction applies to Class 2 adsorbed gases.

- 1) The following packagings are permitted provided the general packing requirements of 4.1.1 are met:
 - a) Cylinders constructed as specified in 6.5.2 and in accordance with ISO 11513:2011 ~~or~~ [ISO 11513:2019](#), ISO 9809-1:2010 ~~or~~ [ISO 9809-1:2019](#); and
 - b) Cylinders constructed before 1 January 2016 in accordance with 6.5.3 and a specification approved by the appropriate national authorities of the countries of transport and use.
- 2) The pressure of each filled cylinder must be less than 101.3 kPa at 20°C and less than 300 kPa at 50°C.
- 3) The minimum test pressure of the cylinder is 21 bar.
- 4) The minimum burst pressure of the cylinder is 94.5 bar.
- 5) The internal pressure at 65°C of the filled cylinder must not exceed the test pressure of the cylinder.
- 6) The adsorbent material must be compatible with the cylinder and must not form harmful or dangerous compounds with the gas to be adsorbed. The gas in combination with the adsorbent material must not affect or weaken the cylinder or cause a dangerous reaction (e.g. a catalyzing reaction).
- 7) The quality of the adsorbent material must be verified at the time of each fill to assure the pressure and chemical stability requirements of this packing instruction are met each time an adsorbed gas package is offered for transport.
- 8) The adsorbent material must not meet the criteria of any of the classes or divisions in these Instructions.
- 9) The filling procedure must be in accordance with Annex A of ISO 11513:2011 [\(applicable until 31 December 2024\)](#) ~~or Annex A of ISO 11513:2019~~.
- 10) The maximum period for periodic inspections is five years.
- 11) The construction materials of the cylinders and their accessories must be compatible with the contents and must not react to form harmful or dangerous compounds therewith.

Paragraph 3.1.2.7.1 d) of the DGP-WG/21 report:

UN Model Regulations, 4.1.4.1, P005 (see ST/SG/AC.10/48/Add.1)

Packing Instruction 220

Cargo aircraft only for UN 3529 only

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

General requirements

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

Compatibility requirements

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

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

ADDITIONAL PACKING REQUIREMENTS

General

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

ADDITIONAL PACKING REQUIREMENTS

If the engine or machinery is constructed and designed so that the means of containment containing the dangerous goods affords adequate protection, an outer packaging is not required. Dangerous goods in engines or machinery must otherwise be packed in outer packagings constructed of suitable material, and of adequate strength and design in relation to the packaging capacity and its intended use, and meeting the applicable requirements of 4.1.1.1, or they must be fixed in such a way that they will not become loose during normal conditions of transport, e.g. in cradles or crates or other handling devices.

Flammable gas vessels

- 1) for flammable gas-powered machines or equipment, pressurized vessels containing the flammable gas must be completely emptied of flammable gas. Lines from vessels to gas regulators, and gas regulators themselves, must also be drained of all trace of flammable gas. To ensure that these conditions are met, gas shut-off valves must be left open and connections of lines to gas regulators must be left disconnected upon delivery of the engine or machinery to the operator. Shut-off valves must be closed and lines reconnected at gas regulators before loading aboard the aircraft;

or alternatively,

- 2) flammable gas-powered machines or equipment that have pressure receptacles (fuel tanks) equipped with electrically operated valves that close automatically in case the power is disconnected, or with manual shut-off valves, may be transported under the following conditions:
 - i) the tank shut-off valves must be in the closed position and in the case of electrically operated valves, power to those valves must be disconnected;

- ii) after closing the tank shut-off valves, the equipment or machinery must be operated until it stops from lack of fuel before being loaded aboard the aircraft;
- iii) in no part of the closed system must the remaining pressure of compressed gases exceed 5 per cent of the maximum allowable working pressure of the pressure receptacle (fuel tank) system, or more than 2 000 kPa (20 bar), whichever is the lower.

Batteries

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

- 1) if spillable batteries are installed, and it is possible for the machine or equipment to be handled in such a way that batteries would not remain in their intended orientation, they must be removed and packed according to Packing Instruction 492 or 870 as applicable;
- 2) if lithium batteries are installed, they must meet the provisions of Part 2;9.3, unless otherwise approved by the appropriate authority of the State of Origin, must be securely fastened in the machinery or equipment and must be protected in such a manner so as to prevent damage and short circuits; and
- 3) if sodium batteries are installed they must conform to the requirements of Special Provision A94.

Other operational equipment

- 1) Dangerous goods required for the operation or safety of the machine or equipment, such as fire extinguishers, tire inflation canisters or safety devices, must be securely mounted in the machine or equipment.

Internal combustion or fuel cell engine shipped separately (not installed)

- 1) When internal combustion engines or fuel cell engines are being shipped separately, all fuel, coolant or hydraulic systems remaining in or on the engine must be drained as far as practicable and all disconnected fluid pipes must be sealed with leakproof caps, which are positively retained.
- 2) This requirement also applies to machines or equipment containing internal combustion engines or fuel cell engines which are being shipped in a dismantled state such that fuel lines have been disconnected.

...

Chapter 5

CLASS 3 — FLAMMABLE LIQUIDS

...

 Paragraph 3.1.2.7.1 d) of the DGP-WG/21 report:

 UN Model Regulations, 4.1.4.1, P005 (see ST/SG/AC.10/48/Add.1)

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)

General requirements

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

Compatibility requirements

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

<i>UN number and proper shipping name</i>	<i>Quantity — passenger</i>	<i>Quantity — cargo</i>
UN 3528 Engine, internal combustion, flammable liquid powered or Machinery, internal combustion, flammable liquid powered or Engine, fuel cell, flammable liquid powered or Machinery, fuel cell, flammable liquid powered	No limit	No limit

ADDITIONAL PACKING REQUIREMENTS

General

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

ADDITIONAL PACKING REQUIREMENTS

If the engine or machinery is constructed and designed so that the means of containment containing the dangerous goods affords adequate protection, an outer packaging is not required. Dangerous goods in engines or machinery must otherwise be packed in outer packagings constructed of suitable material, and of adequate strength and design in relation to the packaging capacity and its intended use, and meeting the applicable requirements of 4.1.1.1, or they must be fixed in such a way that they will not become loose during normal conditions of transport, e.g. in cradles or crates or other handling devices.

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.

Batteries

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

- 1) if spillable batteries are installed, and it is possible for the machine or equipment to be handled in such a way that batteries would not remain in their intended orientation, they must be removed and packed according to Packing Instruction 492 or 870 as applicable;
- 2) if lithium batteries are installed, they must meet the provisions of Part 2;9.3, unless otherwise approved by the appropriate authority of the State of Origin, must be securely fastened in the machine or equipment and must be protected in such a manner so as to prevent damage and short circuits; and
- 3) if sodium batteries are installed they must conform to the requirements of Special Provision A94.

Other operational equipment

Dangerous goods required for the operation or safety of the machine or equipment, such as fire extinguishers, tire inflation canisters or safety devices, must be securely mounted in the machine or equipment.

Internal combustion or fuel cell engine shipped separately (not installed)

- 1) When internal combustion engines or fuel cell engines are being shipped separately, all fuel, coolant or hydraulic systems remaining in or on the engine must be drained as far as practicable and all disconnected fluid pipes must be sealed with leakproof caps, which are positively retained.
- 2) This requirement also applies to vehicles containing internal combustion engines or fuel cell engines which are being shipped in a dismantled state such that fuel lines have been disconnected.

...

Chapter 6

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

...

 Paragraph 3.1.2.7.1 e) of the DGP-WG/21 report:

 UN Model Regulations, 4.1.4.1, P408 (2) (see ST/SG/AC.10/48/Add.1)

Packing Instruction 492

Passenger and cargo aircraft for UN 3292 only

General requirements

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

1) **Compatibility requirements**

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

2) **Closure requirements**

- Closures must meet the requirements of 4;1.1.4.

<i>UN number and proper shipping name</i>	<i>Packing conditions</i>	<i>Total quantity per package — passenger</i>	<i>Total quantity per package — cargo</i>
UN 3292 Batteries, containing sodium	Batteries may be offered for transport and transported unpacked or in protective enclosures such as fully enclosed or wooden slatted crates that are not subject to the requirements of Part 6 of these Instructions.	Forbidden	No limit
UN 3292 Cells, containing sodium	There must be sufficient cushioning material to prevent contact between cells and between cells and the internal surfaces of the outer packaging and to ensure that no dangerous movement of the cells within the outer packaging occurs in transport.	25 kg	No limit 400 kg

ADDITIONAL PACKING REQUIREMENTS

- Packagings for cells must meet the Packing Group II performance requirements.
- Cells and batteries must be protected against short circuit and must be isolated in such a manner as to prevent short circuits.

PACKAGINGS

Boxes

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

Drums

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

Jerricans

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

...

Chapter 8

CLASS 6 — TOXIC AND INFECTIOUS SUBSTANCES

...

 Paragraph 3.1.2.7.1 f) of the DGP-WG/21 report:

 UN Model Regulations, 4.1.4.1, P621 (1) (see ST/SG/AC.10/48/Add.1)

Packing Instruction 621

General requirements

~~The general packing Part 4, Chapter 1 requirements of 4.4 except 1.1.20 must be met.~~

ADDITIONAL PACKING REQUIREMENTS

~~—~~ 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).~~

Moved to end of list:

~~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.

Moved from above with addition of "the" to align with other packing instructions:

~~— Packagings must meet the Packing Group II performance requirements.~~

Reformatted from list above:

OUTER PACKAGINGS

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

...

Chapter 10

CLASS 8 — CORROSIVE SUBSTANCES

...

Paragraph 3.1.2.7.1 e) of the DGP-WG/21 report:

UN Model Regulations, 4.1.4.1, P801 (see ST/SG/AC.10/48/Add.1)

Packing Instruction 870

Passenger and cargo aircraft for UN 2794 and 2795 only

General requirements

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

1) **Compatibility requirements**

- 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.

<i>UN number and proper shipping name</i>	<i>Packing conditions</i>	<i>Total quantity per package — passenger</i>	<i>Total quantity per package — cargo</i>
UN 2794 Batteries, wet, filled with acid UN 2795 Batteries, wet, filled with alkali	Batteries must be placed in an acid/alkali-proof liner of sufficient strength and adequately sealed to positively preclude leakage in the event of spillage. The batteries must be packed so that the fill openings and vents, if any, are upward; they must be incapable of short-circuiting and be securely cushioned in the packagings. The upright position of the package must be indicated on it by "Package orientation" labels (Figure 5-29) as required by 5;3. The words "This side up" or "This end up" may also be displayed on the top of the package.	30 kg	No limit 400 kg
	<i>Batteries installed in equipment</i> If batteries are shipped as an integral component of assembled equipment, they must be securely installed and fastened in an upright position and protected against contact with other articles so as to prevent short circuits. Batteries must be removed and packed according to this packing instruction if the assembled equipment is likely to be carried in other than an upright position.		

ADDITIONAL PACKING REQUIREMENTS

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

PACKAGINGS*Boxes*

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

Drums

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

Jerricans

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

...

Chapter 11**CLASS 9 — MISCELLANEOUS DANGEROUS GOODS**

...

Paragraph 3.1.2.7 of the DGP-WG/21 report:

Packing Instruction 965

Cargo aircraft only for UN 3480

IA. SECTION IA

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

...

IA.2 Additional requirements

- Lithium ion cells and batteries must be protected against short circuits.
- Lithium ion cells and batteries must be placed in inner packagings that completely enclose the cell or battery then placed in an outer packaging. The completed package for the cells or batteries must meet the Packing Group II performance requirements.
- Lithium ion cells and batteries must not be packed in the same outer packaging with substances and articles of Class 1 (explosives) other than Division 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers).

UN Model Regulations, 4.1.4.1, P903(2) (see ST/SG/AC.10/48/Add.1)

- A Lithium ion cell or battery with a mass of 12 kg or greater and having a strong, impact-resistant outer casing, ~~or assemblies of such batteries,~~ may be transported when packed in strong outer packagings or protective enclosures (e.g. in fully enclosed or wooden slatted crates) not subject to the requirements of Part 6 of these Instructions, if approved by the appropriate authority of the State of Origin. A copy of the document of approval must accompany the consignment.
- Batteries manufactured after 31 December 2011 must be marked with the Watt-hour rating on the outside case.

...

...

Paragraph 3.1.2.7 of the DGP-WG/21 report:

UN Model Regulations, 4.1.4.1, P903(2) (see ST/SG/AC.10/48/Add.1)

Packing Instruction 968

Cargo aircraft only for UN 3090

...

IA.2 Additional requirements

- Lithium metal cells and batteries must be protected against short circuits.
- Lithium metal cells and batteries must be placed in inner packagings that completely enclose the cell or battery, then placed in an outer packaging. The completed package for the cells or batteries must meet the Packing Group II performance requirements.
- Lithium metal cells and batteries must not be packed in the same outer packaging with substances and articles of Class 1 (explosives) other than Division 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers).
- ~~A Lithium metal cell or batteries battery~~ with a mass of 12 kg or greater and having a strong, impact-resistant outer casing, ~~or assemblies of such batteries,~~ may be transported when packed in strong outer packagings or protective enclosures (e.g. in fully enclosed or wooden slatted crates) not subject to the requirements of Part 6 of these Instructions, if approved by the appropriate authority of the State of Origin. A copy of the document of approval must accompany the consignment.

...

...

Part 5

SHIPPER'S RESPONSIBILITIES

...

Chapter 1

GENERAL

...

1.2 GENERAL PROVISIONS FOR CLASS 7

1.2.1 Approval of shipments and notification

...

Paragraph 3.1.2.8 of the DGP-WG/21 report:

UN Model Regulations, 5.1.5.1.3 (see ST/SG/AC.10/48/Add.1)

1.2.1.3 Shipment approval by special arrangement

Provisions may be approved by a A competent authority may approve provisions under which a consignment s, which does that do not satisfy all of the applicable requirements of these Instructions may be transported under special arrangement (see 1;6.4).

...

1.5 SALVAGE PACKAGINGS

Before a person offers any salvage packaging for transport by air, that person must ensure that:

- it is marked with the proper shipping name and UN number of, and bear all the labels appropriate for, the dangerous goods contained therein;
- it is marked with the word “Salvage” and the lettering of the “Salvage” mark must be at least 12 mm high;

UN Model Regulations, 5.4.1.5.3 (see ST/SG/AC.10/48/Add.1) (see also revision to 5;4.1.5.2 of Technical Instructions below)

- the words “Salvage ~~package~~ packaging” are added after the description of the goods in the dangerous goods transport document required by 4.1; and
- where the package contains dangerous goods restricted to transport on cargo aircraft only, it bears a “Cargo aircraft only” label and the dangerous goods transport document contains the necessary statement according to 4.1.5.8.1 c).

In addition, that person must ensure that all other applicable requirements are met.

...

Chapter 2**MARKING**

...

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.

Paragraph 3.1.2.8 of the DGP-WG/21 report:

UN Model Regulations, 5.2.1.9.2 (see ST/SG/AC.10/48/Add.1)

2.4.16.2 The mark must indicate:

a) ~~the~~ appropriate UN number preceded by the letters “UN” as follows:

- ~~1a)~~ “UN 3090” for lithium metal cells or batteries;
- ~~2b)~~ “UN 3480” for lithium ion cells or batteries;
- ~~3c)~~ “UN 3091” for lithium metal cells or batteries contained in, or packed with, equipment; or
- ~~4d)~~ “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.~~

...

Paragraph 3.1.2.8.1 a) and 3.1.2.8.3 of the DGP-WG/21 report:



Figure 5-3. Lithium battery mark

Note 1.— The mark illustrated in Figure 5-3 of the 2019-2020 Edition of the Technical Instructions with minimum dimensions of 120 mm x 110 mm may continue to be used.

Note 2.— The mark shown in Figure 5-3 of the 2021-2022 Edition of the Technical Instructions may continue to be applied until 31 December 2026.

...

Chapter 4

DOCUMENTATION

...

4.1.4.3 Information which supplements the proper shipping name in the dangerous goods description

The proper shipping name in the dangerous goods description must be supplemented as follows:

- a) *Technical names for “n.o.s.” and other generic descriptions:* Proper shipping names that are assigned an asterisk in column 1 of the Dangerous Goods List must be supplemented with their technical or chemical group names as described in 3;1.2.7;
- b) *Empty uncleaned packagings:* Empty means of containment which contain the residue of dangerous goods of classes other than Class 7 must be described as such by, for example, placing the words “Empty uncleaned” or “Residue last contained” before or after the dangerous goods description specified in 4.1.4.1 a) to e);

Paragraph 3.1.2.8.1 b) of the DGP-WG/21 report:

UN Model Regulations, 5.4.1.4.3 (see ST/SG/AC.10/48/Add.1)

- c) *Wastes*: For waste dangerous goods (other than radioactive wastes) which are being transported for disposal, or for processing for disposal, the proper shipping name must be preceded by the word "Waste", unless this is already a part of the proper shipping name;
- d) *Molten substances*: When a substance, which is solid in accordance with the definition in 1:3.1, is offered for transport in the molten state, the qualifying word "Molten" must be added as part of the proper shipping name, unless it is already part of the proper shipping name (see 3:1.2.4);
- d) ~~*Elevated temperature substances*~~: For solid substances, unless the word "Molten" is already included in the proper shipping name, it must be added to the proper shipping name on the dangerous goods transport document when a substance is offered for air transport in the molten state (see Part 3, Chapter 1).
- e) *Stabilized substances*: Unless already part of the proper shipping name the word "Stabilized" must be added to the proper shipping name if stabilization is used.

...

Paragraph 3.1.2.8 of the DGP-WG/21 report:

4.1.5 Information required in addition to the dangerous goods description

...

UN Model Regulations, 5.4.1.5.3 (see ST/SG/AC.10/48/Add.1) (see also revision to 5:1.4 of Technical Instructions above)

4.1.5.2 *Salvage packagings*

For dangerous goods transported in salvage packagings in accordance with 4:1.4, the words "Salvage ~~package~~ packaging" must be included.

...

Paragraph 3.1.2.8.2 of the DGP-WG/21 report:

UN Model Regulations, 5.4.1.5.12 (see ST/SG/AC.10/48/Add.1)

4.1.5.10 *Application of special provisions*

Where, in accordance with a special provision in Table 3-2, additional information is necessary, this additional information must be included on the dangerous goods transport document.

...

Part 6

PACKAGING NOMENCLATURE, MARKING, REQUIREMENTS AND TESTS

...

Chapter 1

APPLICABILITY, NOMENCLATURE AND CODES

1.1 APPLICABILITY

...

Paragraph 3.1.2.9 of the DGP-WG/21 report:

UN Model Regulations, 6.1.1.2 (see ST/SG/AC.10/48/Add.1)

1.1.2 The requirements for packagings in Chapter 3 are based on packagings currently used. In order to take into account progress in science and technology, there is no objection to the use of packagings having specifications different from those in Chapter 3, provided they are equally effective, acceptable to the appropriate authority and able to successfully ~~to withstand the tests~~ fulfil the requirements described in 4;1.1.18 and Chapter 4. Methods of testing other than those described in these Instructions are acceptable, provided they are equivalent.

Added for sake of alignment with 6.1.1.4 of the UN Model Regulations:

1.1.3 Packagings must be manufactured and tested under a quality assurance programme which satisfies the appropriate national authority in order to ensure that each packaging meets the requirements of Chapters 1 to 4.

UN Model Regulations, 6.3.2.2 (see ST/SG/AC.10/48/Add.1):

The following note was moved from 4;1.1.2 and amended to align with the UN Model Regulations:

~~Note.— ISO 16106:2006/2020 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.~~

4-31.1.4 Manufacturers and subsequent distributors of packagings must provide information regarding procedures to be followed (including closure instructions for inner packagings and receptacles), a description of the types and dimensions of the closures (including required gaskets) and any other components needed to ensure that packages, as presented for transport, are capable of passing the applicable performance tests of Chapters 4 to 7 and the pressure differential requirements of 4;1.1.6 as applicable.

...

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

...

5.1 GENERAL REQUIREMENTS

5.1.1 Design and construction

Paragraph 3.1.2.9 of the DGP-WG/21 report:

UN Model Regulations, 6.2.1.1.1 (see ST/SG/AC.10/48/Add.1)

5.1.1.1 Cylinders and closed cryogenic receptacles ~~and their closures~~ must be designed, manufactured, tested and equipped in such a way as to withstand all conditions, including fatigue, to which they will be subjected during normal conditions of transport and intended use.

...

UN Model Regulations, 6.2.1.1.4 (see ST/SG/AC.10/48/Add.1)

5.1.1.4 For welded cylinders and closed cryogenic receptacles, only metals of weldable quality must be ~~used~~ welded.

UN Model Regulations, 6.2.1.1.5 (see ST/SG/AC.10/48/Add.1)

5.1.1.5 The test pressure of cylinders shells must be in accordance with Packing Instruction 200 or, for a chemical under pressure, with Packing Instruction 218. The test pressure for closed cryogenic receptacles must be in accordance with Packing Instruction 202. The test pressure of a metal hydride storage system must be in accordance with Packing Instruction 214. The test pressure of a cylinder shell for an adsorbed gas must be in accordance with Packing Instruction 219.

...

UN Model Regulations, 6.2.1.1.8.2 (see ST/SG/AC.10/48/Add.1)

5.1.1.8.2 The closed cryogenic receptacles must be thermally insulated. The thermal insulation must be protected against impact by means of a jacket. If the space between the ~~closed cryogenic receptacle~~ inner vessel and the jacket is evacuated of air (vacuum-insulation), the jacket must be designed to withstand without permanent deformation an external pressure of at least 100 kPa (1 bar) calculated in accordance with a recognized technical code or a calculated critical collapsing pressure of not less than 200 kPa (2 bar) gauge pressure. If the jacket is so closed as to be gas-tight (e.g. in the case of vacuum-insulation), a device must be provided to prevent any dangerous pressure from developing in the insulating layer in the event of inadequate gas-tightness of the ~~closed cryogenic receptacle~~ inner vessel or its ~~fittings~~ service equipment. The device must prevent moisture from penetrating into the insulation.

...

UN Model Regulations, 6.2.1.1.9 (see ST/SG/AC.10/48/Add.1)

5.1.1.9 Additional requirements for the construction of ~~pressure receptacles~~ for acetylene cylinders

Cylinders shells for UN 1001— **Acetylene, dissolved** and UN 3374 — **Acetylene, solvent free** must be filled with a porous mass, uniformly distributed, of a type that conforms to the requirements and testing specified by a standard or technical code recognized by the appropriate national authority and which:

- a) is compatible with the cylinder shell and does not form harmful or dangerous compounds either with the acetylene or with the solvent in the case of UN 1001; and
- b) is capable of preventing the spread of decomposition of the acetylene in the porous material.

In the case of UN 1001, the solvent must be compatible with those parts of the cylinders that are in contact with it.

5.1.2 Materials

UN Model Regulations, 6.2.1.2.1 (see ST/SG/AC.10/48/Add.1):

5.1.2.1 Construction materials of cylinders and closed cryogenic receptacles ~~and their closures~~ which are in direct contact with dangerous goods must not be affected or weakened by the dangerous goods intended and must not cause a dangerous effect (e.g. catalysing a reaction or reacting with the dangerous goods).

UN Model Regulations, 6.2.1.2.2 (see ST/SG/AC.10/48/Add.1):

5.1.2.2 Cylinders and closed cryogenic receptacles ~~and their closures~~ must be made of the materials specified in the design and construction technical standards and the applicable packing instruction for the substances intended for transport in the cylinder and closed cryogenic receptacle. The materials must be resistant to brittle fracture and to stress corrosion cracking as indicated in the design and construction technical standards.

5.1.3 Service equipment

UN Model Regulations, 6.2.1.3.1 (see ST/SG/AC.10/48/Add.1):

Broke the sentence up into a list for better readability:

5.1.3.1 ~~Valves, piping and other fittings~~ Service equipment subjected to pressure, excluding:

- a) porous, absorbent or adsorbent material;
- b) pressure relief devices;
- c) pressure gauges; or
- d) indicators;

must be designed and constructed so that the burst pressure is at least 1.5 times the test pressure of the cylinders and closed cryogenic receptacles.

UN Model Regulations, 6.2.1.3.2 (see ST/SG/AC.10/48/Add.1) (did not include last new sentence from UN because manifolds are not permitted in air transport, i.e. “Manifold piping leading to shut-off valves must be sufficiently flexible to protect the shut-off valves and the piping from shearing or releasing the pressure receptacle contents”):

5.1.3.2 Service equipment must be configured or designed to prevent damage and unintended opening that could result in the release of the cylinder and closed cryogenic receptacle contents during normal conditions of handling and transport. ~~The filling and discharge valves and any protective caps must be capable of being secured against unintended opening. Valves must~~ All closures must be protected in the same manner as specified is required for valves in 4.4.1.1.8.

UN Model Regulations, 6.2.1.3.3 (see ST/SG/AC.10/48/Add.1):

5.1.3.3 Cylinders and closed cryogenic receptacles that are not capable of being handled manually or rolled must be fitted with handling devices (skids, rings, straps) ensuring that they can be safely handled by mechanical means and arranged so as not to impair the strength of, nor cause undue stresses in, the cylinder and closed cryogenic receptacle.

5.1.3.4 Individual cylinders and closed cryogenic receptacles must be equipped with pressure relief devices as specified in Packing Instruction 200(1), 202 or 214, or 5.1.3.6.4 and 5.1.3.6.5. Pressure-relief devices must be designed to prevent the entry of foreign matter, the leakage of gas and the development of any dangerous excess pressure.

5.1.3.5 Cylinders and closed cryogenic receptacles whose filling is measured by volume must be provided with a level indicator.

...

UN Model Regulations, 6.2.1.4.1 (see ST/SG/AC.10/48/Add.1):

5.1.4 Approval of cylinders and closed cryogenic receptacles

5.1.4.1 The conformity of cylinders and closed cryogenic receptacles must be assessed at the time of manufacture as required by the appropriate national authority. ~~Cylinders and closed cryogenic receptacles must be inspected, tested and approved by an inspection body.~~ The technical documentation must include full specifications on design and construction, and full documentation on the manufacturing and testing.

5.1.4.2 Quality assurance systems must conform to the requirements of the appropriate national authority.

...

UN Model Regulations, 6.2.1.4.3 and 6.2.1.4.4 (see ST/SG/AC.10/48/Add.1):

5.1.4.3 Cylinder shells and the inner vessels of closed cryogenic receptacles must be inspected, tested and approved by an inspection body.

5.1.4.4 For refillable cylinders, the conformity assessment of the shell and the closure(s) may be carried out separately. In these cases, an additional assessment of the final assembly is not required.

5.1.4.4.1 For closed cryogenic receptacles, the inner vessels and the closures may be assessed separately, but an additional assessment of the complete assembly is required.

5.1.4.4.2 For acetylene cylinders, conformity assessment must comprise either:

a) one assessment of conformity covering both the cylinder shell and the contained porous material; or

b) a separate assessment of conformity for the empty cylinder shell and an additional assessment of conformity covering the cylinder shell with the contained porous material.

...

5.1.5 Initial inspection and testing

UN Model Regulations, 6.2.1.5.1 (see ST/SG/AC.10/48/Add.1):

5.1.5.1 New cylinders, other than closed cryogenic receptacles and metal hydride storage systems, must be subjected to inspection and testing during and after manufacture in accordance with the applicable design standards or recognized technical codes including the following:

On an adequate sample of cylinders shells:

- a) testing of the mechanical characteristics of the material of construction;
- b) verification of the minimum wall thickness;
- c) verification of the homogeneity of the material for each manufacturing batch;
- d) inspection of the external and internal conditions ~~of the cylinders~~;
- e) inspection of the ~~neck threads~~ used to fit closures;

- f) verification of the conformance with the design standard;

For all cylinders shells:

- g) a hydraulic pressure test. Cylinders shells must meet the acceptance criteria specified in the design and construction technical standard or technical code;

Note.— With the agreement of the appropriate national authority, the hydraulic pressure test may be replaced by a test using a gas, where such an operation does not entail any danger.

- h) inspection and assessment of manufacturing defects and either repairing them or rendering the cylinders shells unserviceable. In the case of welded cylinders shells, particular attention must be paid to the quality of the welds;
- i) an inspection of the marks on the cylinders shells;
- j) in addition, cylinders shells intended for the transport of UN 1001 — **Acetylene, dissolved**, and UN 3374 — **Acetylene, solvent free**, must be inspected to ensure proper installation and condition of the porous material and, if applicable, the quantity of solvent.

On an adequate sample of closures:

- k) verification of materials;
- l) verification of dimensions;
- m) verification of cleanliness;
- n) inspection of completed assembly;
- o) verification of the presence of marks;

For all closures:

- p) testing for leakproofness;

~~5.1.5.2 On an adequate sample of closed cryogenic receptacles, the inspections and tests specified in 5.1.5.1 a), b), d) and f) must be performed. In addition, welds must be inspected by radiographic, ultrasonic or another suitable non-destructive test method on a sample of closed cryogenic receptacles according to the applicable design and construction standard. This weld inspection does not apply to the jacket. Additionally, all closed cryogenic receptacles must undergo the inspections and tests specified in 5.1.5.1 g), h) and i), as well as a leakproofness test and a test of the satisfactory operation of the service equipment after assembly must be subjected to testing and inspection during and after manufacture in accordance with the applicable design standards or recognized technical codes including the following:~~

On an adequate sample of inner vessels:

- a) testing of the mechanical characteristics of the material of construction;
- b) verification of the minimum wall thickness;
- c) inspection of the external and internal conditions;
- d) verification of the conformance with the design standard or code;
- e) inspection of welds by radiographic, ultrasonic or other suitable non-destructive test method according to the applicable design and construction standard or code;

For all inner vessels:

- f) a hydraulic pressure test. The inner vessel must meet the acceptance criteria specified in the design and construction technical standard or technical code;

Note.— With the agreement of the competent authority, the hydraulic pressure test may be replaced by a test using a gas, where such an operation does not entail any danger.

- g) inspection and assessment of manufacturing defects and either repairing them or rendering the inner vessel unserviceable;
- h) an inspection of the marks;

On an adequate sample of closures:

- i) verification of materials;
- j) verification of dimensions;
- k) verification of cleanliness;
- l) inspection of completed assembly;
- m) verification of the presence of marks.

For all closures:

- n) testing for leakproofness.

On an adequate sample of completed closed cryogenic receptacles:

- o) testing the satisfactory operation of service equipment;
- p) verification of the conformance with the design standard or code.

For all completed closed cryogenic pressure receptacles:

- q) testing for leakproofness.

UN Model Regulations, 6.2.1.5.3 (see ST/SG/AC.10/48/Add.1):

5.1.5.3 For metal hydride storage systems, it must be verified that the inspections and tests specified in 5.1.5.1 a), b), c), d), e) if applicable, f), g), h) and i) have been performed on an adequate sample of the pressure receptacles shells used in the metal hydride storage system. In addition, on an adequate sample of metal hydride storage systems, the inspections and tests specified in 5.1.5.1 c) and f) must be performed, as well as 5.1.5.1 e) if applicable, and inspection of the external conditions of the metal hydride storage system. Additionally, all metal hydride storage systems must undergo the initial inspections and tests specified in 5.1.5.1 h) and i), as well as a leakproofness test and a test of the satisfactory operation of the service equipment.

UN Model Regulations, 6.2.1.5.4 (see ST/SG/AC.10/48/Add.1):

Did not incorporate in Technical Instructions because it applies to bundles of cylinders which are not permitted for air transport.

5.1.6 Periodic inspection and testing

UN Model Regulations, 6.2.1.6.1 (see ST/SG/AC.10/48/Add.1):

5.1.6.1 Refillable cylinders other than cryogenic receptacles must be subjected to periodic inspections and tests by a body authorized by the appropriate national authority, in accordance with the following:

- a) check of the external conditions of the cylinder and verification of the equipment and the external marks;
- b) check of the internal conditions of the cylinder (e.g. internal inspection, verification of minimum wall thickness);
- c) check of the threads either:
 - i) if there is evidence of corrosion; or
 - ii) if the fittings closures or other service equipment are removed;
- d) a hydraulic pressure test of the cylinder shell and, if necessary, verification of the characteristics of the material by suitable tests;

Note 1.— With the agreement of the appropriate national authority, the hydraulic pressure test may be replaced by a test using a gas, where such an operation does not entail any danger.

Note 2.— For seamless steel cylinders shells the check of 5.1.6.1 b) and hydraulic pressure test of 5.1.6.1 d) may be replaced by a procedure conforming to ISO 16148:2016 "Gas cylinders — Refillable seamless steel gas

cylinders and tubes — Acoustic emission examination (AT) and follow-up ultrasonic examination (UT) for periodic inspection and testing”.

Note 3.— The check of internal conditions of 5.1.6.1 b) and the hydraulic pressure test of 5.1.6.1.d) may be replaced by ultrasonic examination carried out in accordance with ~~ISO 10461:2005 + A1:2006~~ 18119:2018 for seamless steel and seamless aluminium alloy ~~gas cylinders shells~~ and in accordance with ~~ISO 6406:2005 for seamless steel gas cylinders~~. For a transitional period until 31 December 2024 the standard ISO 10461:2005 +A1:2006 may be used for seamless aluminium alloy cylinders and ISO 6406:2005 may be used for seamless steel cylinder shells for this same purpose.

- e) check of service equipment, ~~other accessories and pressure relief devices~~, if to be reintroduced into service. This check may be carried out separately from the inspection of the cylinder shell.

Note.— For the periodic inspection and test frequencies, see Packing Instruction 200 or, for a chemical under pressure, Packing Instruction 218.

...

5.1.7 Requirements for manufacturers

5.1.7.1 The manufacturer must be technically able and must possess all resources required for the satisfactory manufacture of cylinders and closed cryogenic receptacles; this relates in particular to qualified personnel:

- a) to supervise the entire manufacturing process;
- b) to carry out joining of materials; and
- c) to carry out the relevant tests.

UN Model Regulations, 6.2.1.7.2 (see ST/SG/AC.10/48/Add.1):

5.1.7.2 ~~The~~ A proficiency test of ~~a the~~ manufacturers of cylinder shells and the inner vessels of closed cryogenic receptacle must in all instances be carried out by an inspection body approved by the ~~appropriate national~~ competent authority of the country of approval. Proficiency testing of manufacturers of closures must be carried out if the competent authority requires it. This test must be carried out either during design type approval or during production inspection and certification.

...

5.2 REQUIREMENTS FOR UN CYLINDERS AND CLOSED CRYOGENIC RECEPTACLES

In addition to the general requirements of 5.1, UN cylinders and closed cryogenic receptacles must comply with the requirements of this section, including the standards, as applicable. Manufacture of new UN cylinders and closed cryogenic receptacles or service equipment according to any particular standard in 5.2.1 and 5.2.3 is not permitted after the date shown in the right hand column of the tables.

Note 1.— With the agreement of the appropriate national authority, more recently published versions of the standards, if available, may be used.

UN Model Regulations, 6.2.2 (see ST/SG/AC.10/48/Add.1):

Note 2.— ~~UN cylinders and closed cryogenic receptacles and service equipment~~ constructed according to standards applicable at the date of manufacture may continue in use subject to the periodic inspection provisions of these Instructions.

UN Model Regulations, 6.2.2.1.1 (see ST/SG/AC.10/48/Add.1):

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 refillable UN cylinders shells, except that inspection requirements related to the conformity assessment system and approval must be in accordance with 5.2.5:

Reference	Title	Applicable for manufacture
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 31 December 2026
ISO 9809-1:2019	Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 1: Quenched and tempered steel cylinders and tubes with tensile strength less than 1 100 MPa.	Until further notice
ISO 9809-2:2000	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 2: Quenched and tempered steel cylinders with tensile strength greater than or equal to 1 100 MPa.	Until 31 December 2018
ISO 9809-2:2010	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 2: Quenched and tempered steel cylinders with tensile strength greater than or equal to 1 100 MPa.	Until further notice 31 December 2026
ISO 9809-2:2019	Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 2: Quenched and tempered steel cylinders and tubes with tensile strength greater than or equal to 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 31 December 2026
ISO 9809-3:2019	Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 3: Normalized steel cylinders and tubes.	Until further notice
ISO 9809-4:2014	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 4: Stainless steel cylinders with an Rm value of less than 1 100 MPa	Until further notice
ISO 7866:1999	Gas cylinders — Refillable seamless aluminium alloy gas cylinders — Design, construction and testing. <i>Note.— The note concerning the F factor in section 7.2 of this standard must not be applied for UN cylinders. Aluminium alloy 6351A — T6 or equivalent must not be authorized.</i>	Until 31 December 2020
ISO 7866: 2012+ Cor 1:2014	Gas cylinders — Refillable seamless aluminium alloy gas cylinders — Design, construction and testing <i>Note.— Aluminium alloy 6351A or equivalent must not be used.</i>	Until further notice
ISO 4706:2008	Gas cylinders — Refillable welded steel cylinders — Test pressure 60 bar and below.	Until further notice
ISO 18172-1:2007	Gas cylinders — Refillable welded stainless steel cylinders — Part 1: Test pressure 6 MPa and below.	Until further notice
ISO 20703:2006	Gas cylinders — Refillable welded aluminium-alloy cylinders — Design, construction and testing.	Until further notice
ISO 11118:1999	Gas cylinders — Non-refillable metallic gas cylinders — Specification and test methods.	Until 31 December 2020
ISO 11118:2015	Gas cylinders — Non-refillable metallic gas cylinders — Specification and test methods.	Until further notice
ISO 11119-1:2002	Gas cylinders of composite construction — Specification and test methods — Part 1: Hoop wrapped composite gas cylinders.	Until 31 December 2020
ISO 11119-1:2012	Gas cylinders — Refillable composite gas cylinders and tubes — Design, construction and testing — Part 1: Hoop wrapped fibre reinforced composite gas cylinders and tubes up to 450 L	Until further notice

Reference	Title	Applicable for manufacture
ISO 11119-2:2002	Gas cylinders of composite construction — Specification and test methods — Part 2: Fully wrapped fibre reinforced composite gas cylinders with load-sharing metal liners.	Until 31 December 2020
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
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. <i>Note.— This standard must not be used for linerless cylinders manufactured from two parts joined together.</i>	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. <i>Note.— This standard must not be used for linerless cylinders manufactured from two parts joined together.</i>	Until further notice
ISO 11119-4: 2016	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.	Until further notice

Note 1.— In the above-referenced standards, composite cylinders shells must be designed for a design life of not less than fifteen years.

Note 2.— Composite cylinders shells with a design life longer than fifteen years must not be filled after fifteen years from the date of manufacture, unless the design has successfully passed a service life test programme. The programme must be part of the initial design type approval and must specify inspections and tests to demonstrate that composite cylinders shells manufactured accordingly remain safe to the end of their design life. The service life test programme and the results must be approved by the appropriate national authority of the country of approval that is responsible for the initial approval of the cylinder design. The service life of a composite cylinder shell must not be extended beyond its initial approved design life.

5.2.1.2 Not used.

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).

UN Model Regulations, 6.2.2.1.3 (see ST/SG/AC.10/48/Add.1):

For the cylinder shell:

Reference	Title	Applicable for manufacture
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 <u>31 December 2026</u>
<u>ISO 9809-1:2019</u>	<u>Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 1: Quenched and tempered steel cylinders and tubes with tensile strength less than 1 100 MPa.</u>	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 <u>31 December 2026</u>

	ISO 9809-3:2019	Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 3: Normalized steel cylinders and tubes.	Until further notice
+	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 aluminium alloy gas cylinders — Design, construction and testing <i>Note.— Aluminium 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

UN Model Regulations, 6.2.2.1.4 (see ST/SG/AC.10/48/Add.1):

5.2.1.4 The following standard applies for the design, construction and initial inspection and test of UN closed cryogenic receptacles, 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 21029-1:2004	Cryogenic vessels — Transportable vacuum insulated vessels of not more than 1 000 L volume — Part 1: Design, fabrication, inspection and tests.	Until further notice 31 December 2026
ISO 21029-1:2018 + Amd.1:2019	Cryogenic vessels — Transportable vacuum insulated vessels of not more than 1 000 L volume — Part 1: Design, fabrication, inspection and tests.	Until further notice

UN Model Regulations, 6.2.2.1.5 (see ST/SG/AC.10/48/Add.1):

5.2.1.5 The following standards apply for the design, construction, and initial inspection and test of UN metal hydride storage systems, 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 16111:2008	Transportable gas storage devices — Hydrogen absorbed in reversible metal hydride.	Until further notice 31 December 2026
ISO 16111:2018	Transportable gas storage devices — Hydrogen absorbed in reversible metal hydride.	Until further notice

5.2.1.6 Not used.

UN Model Regulations, 6.2.2.1.7 (see ST/SG/AC.10/48/Add.1):

5.2.1.7 The following standards apply for the design, construction and initial inspection and test of UN cylinders for adsorbed gases except that the 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 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 <u>31 December 2026</u>
<u>ISO 11513:2019</u>	<u>Gas cylinders — Refillable welded steel cylinders containing materials for sub-atmospheric gas packaging (excluding acetylene) — Design, construction, testing, use and periodic inspection.</u>	Until further notice
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 <u>31 December 2026</u>
<u>ISO 9809-1:2019</u>	<u>Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 1: Quenched and tempered steel cylinders and tubes with tensile strength less than 1 100 MPa.</u>	Until further notice

5.2.1.8 Not used.

UN Model Regulations, 6.2.2.1. (see ST/SG/AC.10/48/Add.1):

5.2.1.9 The following standards apply for the design, construction and initial inspection and test of non-refillable UN cylinders except that the inspection requirements related to the conformity assessment system and approval must be in accordance with 6:5.2.5.

<i>Reference</i>	<i>Title</i>	<i>Applicable for manufacture</i>
<u>ISO 11118:1999</u>	<u>Gas cylinders — Non-refillable metallic gas cylinders — Specification and test methods.</u>	Until 31 December 2020
<u>ISO 13340:2001</u>	<u>Transportable gas cylinders — Cylinder valves for non-refillable cylinders — Specification and prototype testing.</u>	Until 31 December 2020
<u>ISO 11118:2015</u>	<u>Gas cylinders — Non-refillable metallic gas cylinders — Specification and test methods.</u>	Until 31 December 2026
<u>ISO 11118:2015 + Amd.1:2019</u>	<u>Gas cylinders — Non-refillable metallic gas cylinders — Specification and test methods.</u>	Until further notice

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:

<i>Reference</i>	<i>Title</i>	<i>Applicable for manufacture</i>
ISO 11114-1:2012 + A1:2017	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

UN Model Regulations, 6.2.2.3 (see ST/SG/AC.10/48/Add.1):

5.2.3 ~~Service equipment~~ **Closures and their protection**

The following standards apply to the design, construction, and initial inspection and test of closures and their protection:

<i>Reference</i>	<i>Title</i>	<i>Applicable for manufacture</i>
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 <u>31 December 2026</u>
<u>ISO 11117:2019</u>	<u>Gas cylinders — Valve protection caps and guards — Design, construction and tests.</u>	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 31 December 2022
+	ISO 10297:2014 A1:2017	Gas cylinders — Cylinder valves — Specification and type testing	Until further notice
	ISO 13340:2004	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 31 December 2024
+	ISO 14246:2014 A1:2017	Gas cylinders — Cylinder valves — Manufacturing tests and examination	Until further notice
	ISO 17871:2015	Gas cylinders — Quick-release cylinders valves — Specification and type testing <i>Note.— This standard must not be used for flammable gases.</i>	Until further notice <u>31 December 2026</u>
Paragraph 3.1.2.9.2 of the DGP-WG/21 report:			
	<u>ISO 17871:2020</u>	<u>Gas cylinders — Quick-release cylinder valves — Specification and type testing.</u>	<u>Until further notice</u>
+	ISO 17879:2017	Gas cylinders — Self-closing cylinder valves — Specification and type testing <i>Note.— This standard must not be applied to self-closing valves in acetylene cylinders.</i>	Until further notice

Paragraph 3.1.2.9 of the DGP-WG/21 report:

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 <u>31 December 2026</u>
<u>ISO 16111:2018</u>	<u>Transportable gas storage devices — Hydrogen absorbed in reversible metal hydride.</u>	<u>Until further notice</u>

UN Model Regulations, 6.2.2.4 (see ST/SG/AC.10/48/Add.1):

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 <u>31 December 2024</u>
<u>ISO 18119:2018</u>	<u>Gas cylinders — Seamless steel and seamless aluminium-alloy gas cylinders and tubes — Periodic inspection and testing.</u>	<u>Until further notice</u>
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 <u>31 December 2024</u>
<u>ISO 10460:2018</u>	<u>Gas cylinders — Welded aluminium-alloy, carbon and stainless steel gas cylinders — Periodic inspection and testing.</u>	<u>Until further notice</u>
ISO 10461:2005/A1:2006	Seamless aluminium-alloy gas cylinders — Periodic inspection and testing.	Until further notice <u>31 December 2024</u>
ISO 10462:2013	Gas cylinders — Acetylene cylinders — Periodic inspection and maintenance.	Until further notice <u>31 December 2024</u>
<u>ISO 10462:2013 + Amd1:2019</u>	<u>Gas cylinders — Acetylene cylinders — Periodic inspection and maintenance.</u>	<u>Until further notice</u>

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 <u>31 December 2024</u>
<u>ISO 11513:2019</u>	<u>Gas cylinders — Refillable welded steel cylinders containing materials for sub-atmospheric gas packaging (excluding acetylene) — Design, construction, testing, use and periodic inspection.</u>	<u>Until further notice</u>
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
+ ISO 20475:2018	Gas cylinders — Cylinder bundles — Periodic inspection and testing	Until further notice
<u>ISO 23088:2020</u>	<u>Gas cylinders — Periodic inspection and testing of welded steel pressure drums — Capacities up to 1 000 L.</u>	<u>Until further notice</u>

5.2.4.2 The following standard applies to the periodic inspection and testing of UN metal hydride storage systems.

Reference	Title	Applicable for manufacture
ISO 16111:2008	Transportable gas storage devices — Hydrogen absorbed in reversible metal hydride	Until further notice <u>31 December 2024</u>
<u>ISO 16111:2018</u>	<u>Transportable gas storage devices — Hydrogen absorbed in reversible metal hydride.</u>	<u>Until further notice</u>

5.2.5 Conformity assessment system and approval for manufacture of cylinders and closed cryogenic receptacles

Paragraph 3.1.2.9.1 c) of the DGP-WG/21 report:

UN Model Regulations, 6.2.2.5 (see ST/SG/AC.10/48/Add.1):

5.2.5.1 General

5.2.5.1.1 Definitions

___ For the purposes of this section:

Conformity assessment system: a system for appropriate national authority approval of a manufacturer, by cylinder and closed cryogenic receptacle design type approval, approval of manufacturer's quality system and approval of inspection bodies.

Design type: a cylinder and closed cryogenic receptacle design as specified by a particular cylinder and closed cryogenic receptacle standard.

Verify: confirm by examination or provision of objective evidence that specified requirements have been fulfilled.

Paragraph 3.1.2.9.1 a) of the DGP-WG/21 report (To be considered: The Technical Instructions refer specifically to cylinder, cylinder shells and inner vessel of closed cryogenic receptacles receptacle. Is the note needed in the Technical Instructions?):

Note.— In this subsection when separate assessment is used the term pressure receptacle must refer to pressure receptacle, pressure receptacle shell, inner vessel of the closed cryogenic receptacle or closure, as appropriate.

5.2.5.1.2 The requirements of 5.2.5 must be used for the conformity assessments of [cylinders and closed cryogenic receptacles]. Paragraph 5.1.4.3 gives details of which parts of [cylinders] may be conformity assessed separately. However, the requirements of 5.2.5 may be replaced by requirements specified by the competent authority in the following cases:

a) conformity assessment of closures:

Paragraph 3.1.2.9.1 b) of the DGP-WG/21 report (Bundles of cylinders are not permitted for air transport. Should following be replaced with “Not used”?)

b) conformity assessment of the complete assembly of bundles of cylinders provided the cylinder shells have been conformity assessed in accordance with the requirements of 5.2.5; and

Paragraph 3.1.2.9 of the DGP-WG/21 report:

c) conformity assessment of the complete assembly of closed cryogenic receptacles provided the inner vessel has been conformity assessed in accordance with the requirements of 5.2.5.

...

5.2.5.4.9 Procedure for design type approval

5.2.5.4.9.1 The inspection body must:

- a) examine the technical documentation to verify that:
 - i) the design is in accordance with the relevant provisions of the standard; and
 - ii) the prototype lot has been manufactured in conformity with the technical documentation and is representative of the design;
 - b) verify that the production inspections have been carried out as required in accordance with 5.2.5.5;
-

Paragraph 3.1.2.9.1 a) of the DGP-WG/21 report:

UN Model Regulations, 6.2.2.5.4.9 (see ST/SG/AC.10/48/Add.1):

- c) ~~select cylinders and closed cryogenic receptacles from a prototype production lot and supervise the tests of these cylinders and closed cryogenic receptacles~~ as required by the cylinder and closed cryogenic receptacle standard or technical code, carry out or supervise the tests of pressure receptacles as required for design type approval;
- d) perform or have performed the examinations and tests specified in the cylinder and closed cryogenic receptacle standard to determine that:
 - i) the standard has been applied and fulfilled; and
 - ii) the procedures adopted by the manufacturer meet the requirements of the standard; and
- e) ensure that the various type approval examinations and tests are correctly and competently carried out.

5.2.5.4.9.2 After prototype testing has been carried out with satisfactory results and all applicable requirements of 5.2.5.4 have been satisfied, a Design Type Approval Certificate must be issued which must include the name and address of the manufacturer, results and conclusions of the examination, and the necessary data for identification of the design type. If it was not possible to evaluate exhaustively the compatibility of the materials of construction with the contents of the cylinder or closed cryogenic receptacle when the certificate was issued, a statement that compatibility assessment was not completed must be included in the design type approval certificate.

...

5.2.7 Marking of UN refillable cylinders and closed cryogenic receptacles

Paragraph 3.1.2.9 of the DGP-WG/21 report:

UN Model Regulations, 6.2.2.7 (see ST/SG/AC.10/48/Add.1):

Note.— Marking requirements for UN metal hydride storage systems are given in 5.2.9 and marking requirements for closures are given in 5.2.11.

5.2.7.1 Refillable UN cylinders shells 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 shell 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;

Paragraph 3.1.2.9. d) of the DGP-WG/21 report:

UN Model Regulations, 6.2.2.7.2 b) (see ST/SG/AC.10/48/Add.1):

- b) The technical standard (e.g. ISO 9809-1) used for the design, construction and testing and, for acetylene cylinders, the standard ISO 3807.
- 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.

Note 2.— For the purpose of this mark the State of approval means the State of the appropriate national 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. “/”).

Paragraph 3.1.2.9 of the DGP-WG/21 report:

UN Model Regulations, 6.2.2.7.2 (see ST/SG/AC.10/48/Add.1):

Note.— When an acetylene cylinder is conformity assessed in accordance with 5.1.4.4.2 b) and the inspection bodies for the cylinder shell and the acetylene cylinder are different, their respective marks (d) are required. Only the initial inspection date (e) of the completed acetylene cylinder is required. If the country of approval of the inspection body responsible for the initial inspection and test is different a second mark (c) must be applied.

5.2.7.3 The following operational marks must be applied:

- f) The test pressure in bar, preceded by the letters “PH” and followed by the letters “BAR”;

UN Model Regulations, 6.2.2.7.3 g) (see ST/SG/AC.10/48/Add.1):

- g) The mass of the empty cylinder and closed cryogenic receptacle including all permanently attached integral parts (e.g. neck ring, foot ring, etc.) in kilograms, followed by the letters “KG”. This mass must not include the mass of ~~valve, valve cap~~ closure(s), valve protection cap or valve guard, any coating, or porous mass for acetylene. The mass must be expressed to three significant figures rounded up to the last digit. For cylinders and closed cryogenic receptacles of less than 1 kg, the mass must be expressed to two significant figures rounded up to the last digit. In the case of cylinders for UN 1001 **Acetylene, dissolved** and UN 3374 **Acetylene, solvent free**, at least one decimal must be shown after the decimal point and two digits for cylinders of less than 1 kg;
- h) The minimum guaranteed wall thickness of the cylinder in millimetres followed by the letters “MM”. This mark is not required for cylinders with a water capacity less than or equal to 1 litre or for composite cylinders or for closed cryogenic receptacles;

 UN Model Regulations, 6.2.2.7.3 i) (see ST/SG/AC.10/48/Add.1):

- i) In the case of cylinders for compressed gases, UN 1001 **Acetylene, dissolved**, and UN 3374 **Acetylene, solvent free**, the working pressure in bar, preceded by the letters "PW". In the case of closed cryogenic receptacles, the maximum allowable working pressure preceded by the letters "MAWP";

Note.— When a cylinder shell is intended for use as an acetylene cylinder (including the porous material), the working pressure mark is not required until the acetylene cylinder is completed.

 UN Model Regulations, 6.2.2.7.3 j) (see ST/SG/AC.10/48/Add.1):

- j) In the case of cylinders for liquefied gases **and dissolved gases** and closed cryogenic receptacles, the water capacity in litres expressed to three significant figures rounded down to the last digit, followed by the letter "L". If the value of the minimum or nominal water capacity is an integer, the digits after the decimal point may be neglected;
-

 UN Model Regulations, 6.2.2.7.3 k) and l) (see ST/SG/AC.10/48/Add.1):

- k) In the case of cylinders for UN 1001 **Acetylene, dissolved**:
- i) ~~the tare in kilograms consisting of the total of the mass of the empty receptacle, the fittings and accessories not removed during filling, any coating, the porous mass, the solvent and the saturation gas~~ cylinder shell, the service equipment (including porous material) not removed during filling, any coating, the solvent and the saturation gas expressed to three significant figures rounded down to the last digit followed by the letters "KG". At least one decimal must be shown after the decimal point. For cylinders of less than 1 kg, the mass must be expressed to two significant figures rounded down to the last digit;
 - ii) the identity of the porous material (e.g. name or trademark); and
 - iii) the total mass of the filled acetylene cylinder in kilograms followed by the letters "KG";
- l) In the case of cylinders for UN 3374 **Acetylene, solvent free**:
- i) ~~the tare in kilograms consisting of the total of the mass of the empty receptacle, the fittings and accessories not removed during filling, any coating, and the porous mass~~ cylinder shell, the service equipment (including porous material) not removed during filling and any coating expressed to three significant figures rounded down to the last digit followed by the letters "KG". At least one decimal must be shown after the decimal point. For cylinders of less than 1 kg, the mass must be expressed to two significant figures rounded down to the last digit;
 - ii) the identity of the porous material; and
 - iii) the total mass of the filled acetylene cylinder in kilograms followed by the letters "KG".

5.2.7.4 The following manufacturing marks must be applied:

- m) Identification of the cylinder thread (e.g. 25E). This mark is not required for closed cryogenic receptacles;

Note.— Information on marks that may be used for identifying threads for cylinders is given in ISO/TR 11364, Gas cylinders — Compilation of national and international valve stem/gas cylinder neck threads and their identification and marking system.

- n) The manufacturer's mark registered by the appropriate national authority. When the country of manufacture is not the same as the country of approval, then the manufacturer's mark must be preceded by the character(s) identifying the country of manufacture, as indicated by the distinguishing signs used on vehicles in international road traffic. The country mark and the manufacturer's mark must be separated by a space or slash;
-

 UN Model Regulations, 6.2.2.7.4 n) (see ST/SG/AC.10/48/Add.1):

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 acetylene cylinders, if the manufacturer of the acetylene cylinder and the manufacturer of the cylinder shell are different, only the mark of the manufacturer of the completed acetylene cylinder is required.

...

UN Model Regulations, 6.2.2.7.8 (see ST/SG/AC.10/48/Add.1):

5.2.7.8 ~~For acetylene cylinders, with the agreement of the national authority, the date of the most recent periodic inspection and the stamp of the body performing the periodic inspection and test~~ The marks in accordance with 5.2.7.7 may be engraved on a metallic ring held on affixed to the cylinder by when the valve is installed. ~~The ring must be configured so that it can be and which is removed~~ removable only by disconnecting the valve from the cylinder.

UN Model Regulations, 6.2.2.8.1 (see ST/SG/AC.10/48/Add.1):

5.2.8 Marking of non-refillable UN cylinders and closed cryogenic receptacles

5.2.8.1 ~~Non-refillable UN cylinders and closed cryogenic receptacles~~ must be marked clearly and legibly with certification and gas or cylinder ~~and closed cryogenic receptacle~~ specific marks. These marks must be permanently affixed (e.g. stencilled, stamped, engraved or etched) on the cylinder. Except when stencilled, the marks must be on the shoulder, top end or neck of the cylinder ~~shell and closed cryogenic receptacle~~ or on a permanently affixed component of the cylinder ~~and closed cryogenic receptacle~~ (e.g. welded collar). Except for the “UN” mark and the “DO NOT REFILL” mark, 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 ~~and closed cryogenic receptacles~~ for cylinders with a diameter less than 140 mm. The minimum size of the “UN” mark 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. The minimum size of the “DO NOT REFILL” mark must be 5 mm.

5.2.8.2 The marks listed in 5.2.7.2 to 5.2.7.4 must be applied with the exception of g), h) and m). The serial number o) may be replaced by the batch number. In addition, the words “DO NOT REFILL” in letters of at least 5 mm in height are required.

5.2.8.3 The requirements of 5.2.7.5 must apply.

UN Model Regulations, 6.2.2.8.3 (see ST/SG/AC.10/48/Add.1):

Note.— Non-refillable cylinders ~~and closed cryogenic receptacles~~ may, on account of their size, substitute a label for these permanent marks.

5.2.8.4 Other marks are allowed provided they are made in low stress areas other than the side wall and are not of a size and depth that will create harmful stress concentrations. Such marks must not conflict with required marks.

5.2.9 Marking of UN metal hydride storage systems

5.2.9.1 UN metal hydride storage systems must be marked clearly and legibly with the marks listed in 5.2.9.2. These marks must be permanently affixed (e.g. stamped, engraved, or etched) on the metal hydride storage system. The marks must be on the shoulder, top end or neck of the metal hydride storage system or on a permanently affixed component of the metal hydride storage system. Except for the United Nations packaging symbol, the minimum size of the marks must be:

- 5 mm for metal hydride storage systems with a smallest overall dimension greater than or equal to 140 mm; and
- 2.5 mm for metal hydride storage systems with a smallest overall dimension less than 140 mm.

The minimum size of the United Nations packaging symbol must be:

- 10 mm for metal hydride storage systems with a smallest overall dimension greater than or equal to 140 mm; and
- 5 mm for metal hydride storage systems with a smallest overall dimension less than 140 mm.

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;

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 State of the appropriate national authority that authorized the initial inspection and test of the individual system 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) and separated by a slash (i.e. “/”);
- f) The test pressure of the cylinder in bar, preceded by the letters “PH” and followed by the letters “BAR”;
- g) The rated charging pressure of the metal hydride storage system in bar, preceded by the letters “RCP” and followed by the letters “BAR”;
- h) The manufacturer’s mark registered by the appropriate national authority. When the country of manufacture is not the same as the country of approval, then the manufacturer’s mark must be preceded by the character(s) identifying the country of manufacture, as indicated by the distinguishing signs used on vehicles in international road traffic. The country mark and the manufacturer’s mark must be separated by a space or slash;

Note.— 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.

- i) The serial number assigned by the manufacturer;
- j) In the case of steel cylinders and composite cylinders with steel liner, the letter “H” showing compatibility of the steel (see ISO 11114-1:2012); and
- k) In the case of metal hydride storage systems having limited life, the date of expiry, denoted by the letters “FINAL” followed by the year (four digits), followed by the month (two digits) and separated by a slash (i.e. “/”).

The certification marks specified in a) to e) above must appear consecutively in the sequence given. The test pressure referred to in f) must be immediately preceded by the rated charging pressure referred to in g). The manufacturing marks specified in h) to k) must appear consecutively in the sequence given.

5.2.9.3 Other marks are allowed in areas other than the side wall, provided they are made in low stress areas and are not of a size and depth that will create harmful stress concentrations. Such marks must not conflict with required marks.

5.2.9.4 In addition to the preceding marks, each metal hydride storage system that meets the periodic inspection and test requirements of 5.2.4 must be marked indicating:

- a) the character(s) identifying the country authorizing the body performing the periodic inspection and test, as indicated by the distinguishing sign used on vehicles in international road traffic. This mark is not required if this body is approved by the appropriate national authority of the country approving manufacture;

Note.— 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.

- b) the registered mark of the body authorized by the appropriate national authority for performing periodic inspection and test;
- c) the date of the periodic inspection and test, the year (two digits), followed by the month (two digits) and separated by a slash (i.e. “/”). Four digits may be used to indicate the year.

The above marks must appear consecutively in the sequence given.

5.2.10 Not used.

UN Model Regulations, 6.2.2.11 (see ST/SG/AC.10/48/Add.1):

Should the following be “Marking of closures for refillable UN cylinders *and closed cryogenic receptacles*”? UN text is “Marking of closures for refillable UN pressure receptacles”.

5.2.11 Marking of closures for refillable UN cylinders

5.2.11.1 For closures the following permanent marks must be applied clearly and legibly (e.g. stamped, engraved or etched):

- a) manufacturer's identification mark;
- b) design standard or design standard designation;
- c) date of manufacture (year and month or year and week); and
- d) the identity mark of the inspection body responsible for the initial inspection and test, if applicable.

5.2.11.2 The valve test pressure must be marked when it is less than the test pressure which is indicated by the rating of the valve filling connection.

...

5.4 REQUIREMENTS FOR AEROSOL DISPENSERS, SMALL RECEPTACLES CONTAINING GAS (GAS CARTRIDGES) AND FUEL CELL CARTRIDGES CONTAINING LIQUEFIED FLAMMABLE GAS

UN Model Regulations, 6.2.4 (see ST/SG/AC.10/48/Add.1):

5.4.1 The internal pressure of aerosol dispensers at 50 °C must not exceed 1.2 MPa (12 bar) when using flammable liquefied gases, 1.32 MPa (13.2 bar) when using non-flammable liquefied gases, and 1.5 MPa (15 bar) when using non-flammable compressed or dissolved gases. In case of a mixture of several gases, the stricter limit applies.

5.4.2 Each filled aerosol dispenser or gas cartridge or fuel cell cartridge must be subjected to a test in a hot water bath in accordance with 5.4.2.1 or an approved water bath alternative in accordance with 5.4.2.2.

5.4.2.1 HOT WATER BATH TEST

5.4.2.1.1 The temperature of the water bath and the duration of the test must be such that the internal pressure reaches that which would be reached at 55°C (50°C if the liquid phase does not exceed 95 per cent of the capacity of the aerosol dispenser, gas cartridge or fuel cell cartridge at 50°C). If the contents are sensitive to heat or if the aerosol dispensers, gas cartridges or fuel cell cartridges are made of plastics material which softens at this test temperature, the temperature of the bath must be set at between 20°C and 30°C but, in addition, one aerosol dispenser, gas cartridge or fuel cell cartridge in 2 000 must be tested at the higher temperature.

5.4.2.1.2. No leakage or permanent deformation of an aerosol dispenser, gas cartridge or fuel cell cartridge may occur, except that a plastic aerosol dispenser, gas cartridge or fuel cell cartridge may be deformed through softening provided that it does not leak.

5.4.2.2 ALTERNATIVE METHODS

With the approval of the appropriate national authority, alternative methods which provide an equivalent level of safety may be used provided that the requirements of 5.4.2.2.1 and, as appropriate, 5.4.2.2.2 or 5.4.2.2.3 are met.

5.4.2.2.1 Quality system

5.4.2.2.1.1 Aerosol dispenser, gas cartridge or fuel cell cartridge fillers and component manufacturers must have a quality system. The quality system must implement procedures to ensure that all aerosol dispensers, gas cartridges or fuel cell cartridges that leak or that are deformed are rejected and not offered for transport.

5.4.2.2.1.1.1 The quality system must include:

- a) a description of the organizational structure and responsibilities;
- b) the relevant inspection and test, quality control, quality assurance, and process operation instructions that will be used;
- c) quality records, such as inspection reports, test data, calibration data and certificates;
- d) management reviews to ensure the effective operation of the quality system;
- e) a process for control of documents and their revision;
- f) a means for control of non-conforming aerosol dispensers, gas cartridges or fuel cell cartridges;
- g) training programmes and qualification procedures for relevant personnel; and
- h) procedures to ensure that there is no damage to the final product.

5.4.2.2.1.1.2 An initial audit and periodic audits must be conducted to the satisfaction of the appropriate national authority. These audits must ensure the approved system is and remains adequate and efficient. Any proposed changes to the approved system must be notified to the appropriate national authority in advance.

5.4.2.2.2 *Aerosol dispensers*

5.4.2.2.2.1 *Pressure and leak testing of aerosol dispensers before filling*

Each empty aerosol dispenser must be subjected to a pressure equal to or in excess of the maximum expected in the filled aerosol dispensers at 55°C (50°C if the liquid phase does not exceed 95 percent of the capacity of the receptacle at 50°C). This must be at least two-thirds of the design pressure of the aerosol dispenser. If any aerosol dispenser shows evidence of leakage at a rate equal to or greater than 3.3×10^{-2} mbar.l.s⁻¹ at the test pressure, distortion or other defect, it must be rejected.

5.4.2.2.2.2 *Testing of the aerosol dispensers after filling*

5.4.2.2.2.2.1 Prior to filling, the filler must ensure that the crimping equipment is set appropriately and the specified propellant is used.

5.4.2.2.2.2.2 Each filled aerosol dispenser must be weighed and leak tested. The leak detection equipment must be sufficiently sensitive to detect at least a leak rate of 2.0×10^{-3} mbar.l.s⁻¹ at 20°C.

5.4.2.2.2.3 Any filled aerosol dispenser which shows evidence of leakage, deformation or excessive mass must be rejected.

5.4.2.2.3 *Gas cartridges and fuel cell cartridges*

5.4.2.2.3.1 *Pressure testing of gas cartridges and fuel cell cartridges*

5.4.2.2.3.1.1 Each gas cartridge or fuel cell cartridge must be subjected to a test pressure equal to or in excess of the maximum expected in the filled receptacle at 55°C (50°C if the liquid phase does not exceed 95 per cent of the capacity of the receptacle at 50°C). This test pressure must be that specified for the gas cartridge or fuel cell cartridge and must not be less than two thirds the design pressure of the gas cartridge or fuel cell cartridge. If any gas cartridge or fuel cell cartridge shows evidence of leakage at a rate equal to or greater than 3.3×10^{-2} mbar.l.s⁻¹ at the test pressure, distortion or any other defect, it must be rejected.

5.4.2.2.3.2 Leak testing gas cartridges and fuel cell cartridges

5.4.2.2.3.2.1 Prior to filling and sealing, the filler must ensure that the closures (if any) and the associated sealing equipment are closed appropriately and the specified gas is used.

5.4.2.2.3.2.2 Each filled gas cartridge or fuel cell cartridge must be checked for the correct mass of gas and must be leak tested. The leak detection equipment must be sufficiently sensitive to detect at least a leak rate of 2.0×10^{-3} mbar.l.s⁻¹ at 20°C.

5.4.2.2.3.2.3 Any gas cartridge or fuel cell cartridge that has a gas mass not in conformity with the declared mass limits or shows evidence of leakage or deformation, must be rejected.

5.4.2.3 With the approval of the appropriate national authority, aerosols and receptacles, small, are not subject to 5.4.2.1 and 5.4.2.2 if they are required to be sterile, but may be adversely affected by water bath testing, provided:

- a) they contain a non-flammable gas and either:
 - i) contain other substances that are constituent parts of pharmaceutical products for medical, veterinary or similar purposes; or
 - ii) contain other substances used in the production process for pharmaceutical products; or
 - iii) are used in medical, veterinary or similar applications;
- b) an equivalent level of safety is achieved by the manufacturer's use of alternative methods for leak detection and pressure resistance, such as helium detection and water bathing using a statistical sample of at least 1 in 2 000 from each production batch; and
- c) for pharmaceutical products according to a) i) and iii) above, they are manufactured under the authority of a national health administration. If required by the appropriate national authority, the principles of Good Manufacturing Practice (GMP) established by the World Health Organization (WHO)³ must be followed.

...

Chapter 6

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

...

Paragraph 3.1.2.9 of the DGP-WG/21 report:

UN Model Regulations, 6.3.2.1 (see ST/SG/AC.10/48/Add.1):

6.2 REQUIREMENTS FOR PACKAGINGS

6.2.1 The requirements for packagings in this section are based on packagings, as specified in Chapter 2, currently used. In order to take into account progress in science and technology, there is no objection to the use of packagings having specifications different from those in this chapter provided that they are equally effective, acceptable to the competent authority and able to successfully to withstand the tests fulfil the requirements described in 6.5. Methods of testing other than those described in these Instructions are acceptable provided they are equivalent.

³. WHO Publication: Quality assurance of pharmaceuticals. A compendium of guidelines and related materials. Volume 2: Good manufacturing practices and inspection.

6.2.2 Packagings must be manufactured and tested under a quality assurance programme which satisfies the competent authority in order to ensure that each packaging meets the requirements of this chapter.

The following note is in the Model Regulations but not the Technical Instructions, so added for sake of alignment:

Note.— ISO 16106:2020 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.

6.2.3 Manufacturers and subsequent distributors of packagings must provide information regarding procedures to be followed (including closure instructions for inner packagings and receptacles), a description of the types and dimensions of the closures (including required gaskets) and any other components needed to ensure that packages, as presented for transport, are capable of passing the applicable performance tests of this chapter.

...

UN Model Regulations, 6.4.12.1 (see Corrigendum No. 1 to ST/SG/AC.10/1/Rev.21, Vol. I and II):

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

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

...

Chapter 7

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

...

7.11 TEST PROCEDURES AND DEMONSTRATION OF COMPLIANCE

Paragraph 3.1.2.9 of the DGP-WG/21 report:

UN Model Regulations, 6.4.12.1 (see Corrigendum No. 1 to ST/SG/AC.10/1/Rev.21, Vol. I and II):

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, 2;7.2.3.4.3~~ and 6;7.1 to 6;7.10 must be accomplished by any of the methods listed below or by a combination thereof:

- a) Performance of tests with specimens representing 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.

7.11.2 After the specimen, prototype or sample has been subjected to the tests, appropriate methods of assessment must be used to assure that the requirements for the test procedures have been fulfilled in compliance with the performance and acceptance standards prescribed 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, 2;7.2.3.4.3~~ and 6;7.1 to 6;7.10.

7.11.3 All specimens must be inspected before testing in order to identify and record faults or damage including the following:

- a) divergence from the design;
- b) defects in manufacture;
- c) corrosion or other deterioration; and
- d) distortion of features.

The containment system of the package must be clearly specified. The external features of the specimen must be clearly identified so that reference may be made simply and clearly to any part of such a specimen.

UN Model Regulations, 6.4.24.1 (see ST/SG/AC.10/48/Add.1):

7.24 TRANSITIONAL MEASURES FOR CLASS 7

7.24.1 Packages not requiring competent authority approval of design under the 1985, 1985 (As AMENDED 1990), 1996 edition, 1996 edition (revised), 1996 (as amended 2003), 2005, 2009 and 2012 editions of ~~the IAEA Safety Series No. 6 and 2012 edition of IAEA Safety Standards Series No. SSR-6~~ Regulations for the Safe Transport of Radioactive Material

≠ 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 Safety Series No.6~~ the IAEA Regulations for the Safe Transport of Radioactive Material:
 - 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;
 - ii) may continue to be used, provided that all of the following conditions are met:
 - 1) they were not designed to contain uranium hexafluoride;
 - 2) the applicable requirements of 1;6.3 of these Instructions are applied;
 - 3) the activity limits and classification in Part 2;7 of these Instructions are applied;
 - 4) the requirements and controls for transport in Parts 1, 3, 4, 5 and 7 of these Instructions are applied;
 - 5) 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 or 2012 Editions of ~~IAEA Safety Series No. 6, or 2012 Edition of IAEA Safety Standards Series No. SSR-6~~ the IAEA Regulations for the Safe Transport of Radioactive Material:
 - 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 Part 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.

UN Model Regulations, 6.4.24.2 (see ST/SG/AC.10/48/Add.1):

7.24.2 Package designs approved under the 1985, 1985 (As amended 1990), 1996, 1996 (revised), 1996 (as amended 2003), 2005 and, 2009 and 2012 Editions of ~~the IAEA Safety Series No. 6 and 2012 Edition of IAEA Safety Standards Series No. SSR-6~~ Regulations for the Safe Transport of Radioactive Material

7.24.2.1 Packages requiring competent authority approval of the design must meet these Instructions in full except that:

- a) packagings that were manufactured to a package design approved by the competent authority under the provisions of the 1985 or 1985 (As Amended 1990) Editions of ~~the IAEA Safety Series No.6~~ Regulations for the Safe Transport of Radioactive Material may continue to be used provided that all of the following conditions are met:
 - i) the package design is subject to multilateral approval;
 - 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 in Parts 1, 3, 4, 5 and 7 of these Instructions are applied;

- v) for a package containing fissile material and transported by air, the requirement of 7.10.11 is met;
- 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 ~~or~~ 2012 Editions of ~~the IAEA Safety Series No. 6, or 2012 Edition of IAEA Safety Standards Series No. SSR-6~~ Regulations for the Safe Transport of Radioactive Material 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 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.

UN Model Regulations, 6.4.24.3 (see Corrigendum No. 1 to ST/SG/AC.10/1/Rev.21, Vol. I and II):

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 the IAEA Safety Series No. 6~~ Regulations for the Safe Transport of Radioactive Material is permitted to commence.

UN Model Regulations, 6.4.24.4 (see ST/SG/AC.10/48/Add.1):

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 ~~or~~ 2012 Editions of ~~the IAEA Safety Series No. 6, or 2012 Edition of IAEA Safety Standards Series No. SSR-6~~ Regulations for the Safe Transport of Radioactive Material is permitted to commence after 31 December 2028.

UN Model Regulations, 6.4.24.6 (see ST/SG/AC.10/48/Add.1):

~~7.24.3 Special FORM form radioactive material approved under the 1985, 1985 (As amended 1990), 1996, 1996 (revised), 1996 (as amended 2003), 2005 or, 2009 and 2012 Editions of the IAEA Safety Series No. 6 or 2012 Edition of IAEA Safety Standards Series No. SSR-6~~ Regulations for the Safe Transport of Radioactive Material

Special form radioactive material manufactured to a design that which had received unilateral approval by the competent authority under the 1985, 1985 (As Amended 1990), 1996, 1996 (revised), 1996 (as amended 2003), 2005 ~~and~~ 2009 ~~and~~ 2012 editions of ~~the IAEA Safety Series No. 6 and 2012 Edition of IAEA Safety Standards Series No. SSR-6~~ Regulations for the Safe Transport of Radioactive Material may continue to be used when in compliance with the mandatory management system in accordance with the applicable requirements of 1;6.3. There must be no new manufacture of special form radioactive material to a design that had received unilateral approval by the competent authority under the 1985 or 1985 (As amended 1990) Editions of ~~the IAEA Safety Series No. 6~~ Regulations for the Safe Transport of Radioactive Material. 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 Editions of the IAEA~~ Regulations for the Safe Transport of Radioactive Material ~~Safety Standards Series No. SSR-6~~ is permitted to commence after 31 December 2025.

...

Attachment 1**LISTS OF PROPER SHIPPING NAMES**

Editorial Note.—Consequential amendments to Attachment 1;1 will be generated automatically based on changes to Table 3-1.

...

Chapter 2**LIST OF N.O.S. AND
GENERIC PROPER SHIPPING NAMES**

...

THE MOST SPECIFIC APPLICABLE NAME MUST ALWAYS BE USED

Paragraph 3.1.2.10 of the DGP-WG/21 report:

UN Model Regulations, Appendix A (see ST/SG/AC.10/48/Add.1):

<i>Class or Division</i>	<i>Subsidiary hazard</i>	<i>UN No.</i>	<i>Proper shipping name</i>
------------------------------	------------------------------	-------------------	-----------------------------

...

CLASS 7*General entries*

7		2908	Radioactive material, excepted package — empty packaging
7		2909	Radioactive material, excepted package — articles manufactured from natural uranium or depleted uranium or natural thorium
7		2910	Radioactive material, excepted package — limited quantity of material
7		2911	Radioactive material, excepted package — instruments or articles
7		2912	Radioactive material, low specific activity (LSA-I), non-fissile or fissile excepted
7		2913	Radioactive material, surface contaminated objects (SCO-I, <u>SCO-II</u> or SCO-III), non-fissile or fissile excepted

...

APPENDIX C

AMENDMENTS TO THE TECHNICAL INSTRUCTIONS AGREED AT DGP-WG/20 AND DGP-WG/21 TO ADDRESS AIR-SPECIFIC SAFETY RISKS AND IDENTIFIED ANOMALIES

Part 1

GENERAL

...

Chapter 2

LIMITATION OF DANGEROUS GOODS ON AIRCRAFT

...

DGP-WG/20-WP/2 (see paragraph 3.2.2.1 of the DGP-WG/20 Report) (incorporated in 2021-2022 Edition of Technical Instructions through Addendum No. 1):

2.2 EXCEPTIONS FOR DANGEROUS GOODS OF THE OPERATOR

2.2.1 The provisions of these Instructions do not apply to the following:

- a) articles and substances which would otherwise be classified as dangerous goods but which are required to be aboard the aircraft in accordance with the pertinent airworthiness requirements and operating regulations or that are authorized by the State of the Operator to meet special requirements;
- b) aerosols, alcoholic beverages, perfumes, colognes, liquefied gas lighters and portable electronic devices containing lithium metal or lithium ion cells or batteries provided that the batteries meet the provisions of Table 8-1, Item 1) carried aboard an aircraft by the operator for use or sale on the aircraft during the flight or series of flights, but excluding non-refillable gas lighters and those lighters liable to leak when exposed to reduced pressure;
- c) dry ice intended for use in food and beverage service aboard the aircraft;

~~d) alcohol-based hand sanitizers and cleaning products carried aboard an aircraft by the operator for use on the aircraft during the flight or series of flights for the purposes of passenger and crew hygiene;~~

~~e)~~ electronic devices, such as electronic flight bags, personal entertainment devices, and credit card readers, containing lithium metal or lithium ion cells or batteries and spare lithium batteries for such devices carried aboard an aircraft by the operator for use on the aircraft during the flight or series of flights, provided that the batteries meet the provisions of Table 8-1, Item 1). Spare lithium batteries must be individually protected so as to prevent short circuits when not in use. Conditions for the carriage and use of these electronic devices and for the carriage of spare batteries must be provided in the operations manual and/or other appropriate manuals as will enable flight crew, cabin crew and other employees to carry out the functions for which they are responsible.

2.2.2 Unless otherwise authorized by the State of the Operator, articles and substances intended as replacements for those referred to in 2.2.1 a), or articles and substances referred to in 2.2.1 a) which have been removed for replacement, must be transported in accordance with the provisions of these Instructions, except that when consigned by operators, they may be carried in containers specially designed for their transport, provided such containers are capable of meeting at least the requirements for the packagings specified in these Instructions for the items packed in the containers.

2.2.3 Unless otherwise authorized by the State of the Operator, articles and substances intended as replacements for those referred to in 2.2.1 b) ~~and c)~~ and d) must be transported in accordance with the provisions of these Instructions.

2.2.4 Unless otherwise authorized by the State of the Operator, battery-powered devices with installed batteries and spare batteries intended as replacements for those referred to in 2.2.1 ~~d)~~ e) must be transported in accordance with the provisions of these Instructions.

...

Part 2

CLASSIFICATION OF DANGEROUS GOODS

...

Chapter 4

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

...

4.2 FLAMMABLE SOLIDS, SELF-REACTIVE SUBSTANCES, DESENSITIZED EXPLOSIVES AND POLYMERIZING SUBSTANCES

...

4.2.3 Division 4.1 — Self-reactive substances

...

To be introduced into 2021-2022 Edition of the Technical Instructions through a corrigendum
DGP-WG/20-WP/20 (see paragraph 3.2.2.12 of the DGP-WG/20 Report):

4.2.3.2.4 List of currently assigned self-reactive substances in packages

The following table (Table 2-6) is reproduced from 2.4.2.3.2.3 of the UN *Recommendations on the Transport of Dangerous Goods* (~~Eighteenth~~-Twenty-first revised edition), with irrelevant material removed.

Table 2-6. List of currently assigned self-reactive substances in packagings

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

<i>Self-reactive substance</i>	<i>Concentration (%)</i>	<i>Control temperature (°C)</i>	<i>Emergency temperature (°C)</i>	<i>UN generic entry</i>	<i>Notes</i>
...					
2-(N,N -Ethoxycarbonylphenylamino)-3-methoxy-4-(N -methyl- N -cyclohexylamino) benzenediazonium zinc chloride	63-92	+40	+45	3236	
2-(N,N -Ethoxycarbonylphenylamino)-3-methoxy-4-(N -methyl- N -cyclohexylamino) benzenediazonium zinc chloride	62	+35	+40	3236	
2-(N,N -Methylaminoethylcarbonyl)-4-(3,4-dimethylphenylsulphonyl) benzenediazonium hydrogen sulphate	96	+45	+50	3236	
...					
...					

DGP-WG/21-WP/2 (see paragraph 3.2.2.1 of DGP-WG/21 Report):

4.2.3.3 *Temperature control requirements*

With the exception of self-reactive solids of type B, which are forbidden for transport by air under any circumstance, self-reactive substances which require temperature control during transport are forbidden for transport by air unless exempted (see 1;1.1.2.3). Self-reactive substances must be subject to temperature control if their self-accelerating decomposition temperature (SADT) is less than or equal to 55°C. Test methods for determining the SADT are given in the current edition of the UN *Manual of Tests and Criteria*. The test selected must be conducted in a manner which is representative of the package to be transported both in size and material of construction.

...

Chapter 5

CLASS 5 — OXIDIZING SUBSTANCES; ORGANIC PEROXIDES

...

5.3 ORGANIC PEROXIDES (DIVISION 5.2)

...

5.3.3 TEMPERATURE CONTROL REQUIREMENTS

DGP-WG/21-WP/2 (see paragraph 3.2.2.1 of DGP-WG/21 Report):

5.3.3.1 An organic peroxide formulation must be regarded as possessing explosive properties when, in laboratory testing, the formulation is liable to detonate, to deflagrate rapidly or to show a violent effect when heated under confinement. With the exception of organic peroxides of type B, which are forbidden for transport by air under any circumstance, organic peroxides requiring temperature control during transport are forbidden for transport by air unless approved or exempted, as applicable (see 1;1.1.2 and 1;1.1.3).

...

Part 3

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

...

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

...

DGP-WG/21-WP/29 (see paragraph 3.2.2.22 of DGP-WG/21 Report):

Articles containing miscellaneous dangerous goods, n.o.s.*	3548	9	See 2;0.6	Miscellaneous		A2 A224			FORBIDDEN		FORBIDDEN	
Articles containing non-flammable, non-toxic gas, n.o.s.*	3538	2.2	See 2;0.6	Gas non-flammable		A2 A225			FORBIDDEN		FORBIDDEN	

...

DGP-WG/21-WP/21, Revised (see paragraph 3.2.2.4 of DGP-WG/21 Report):

Life-saving appliances, not self-inflating containing dangerous goods as equipment	3072	9		Miscellaneous		A48 A87 A182 A223		E0	see-955	No limit	see-955	No limit
Life-saving appliances, self-inflating	2990	9		Miscellaneous		A48 A87 A223		E0	see-955	No limit	see-955	No limit

...

Chapter 3

SPECIAL PROVISIONS

...

Table 3-2. Special provisions

TIs UN

DGP-WG/21-WP/3 (see paragraph 3.2.2.14 of DGP-WG/21 Report):

A1 This article or substance may be transported on passenger 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. The conditions must include the quantity limitations and packing requirements and these must comply with S-3;1.2.2 of the Supplement. A copy of the document(s) of approval, showing the quantity limitations and packing requirements, must accompany the consignment. Transport in accordance with this special provision must be noted on the dangerous goods transport document. The article or substance may be carried on cargo aircraft in accordance with columns 12 and 13 of Table 3-1.

When States, other than the State of Origin and the State of the Operator, have notified ICAO that they require prior approval of shipments made under this special provision, approval must also be obtained from these States, as appropriate.

A2 This article or substance 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.

When States, other than the State of Origin and the State of the Operator, have notified ICAO that they require prior approval of shipments made under this special provision, approval must also be obtained from the States of transit, overflight and destination, as appropriate.

In each case, the conditions must include the quantity limitations and packing requirements and these must comply with S-3;1.2.3 of the Supplement. A copy of the document(s) of approval, showing the quantity limitations and the packing and labelling requirements, must accompany the consignment. Transport in accordance with this special provision must be noted on the dangerous goods transport document.

...

DGP-WG/21-WP/34 (see paragraph 3.2.2.7 of DGP-WG/21 Report):

A35 This substance is not subject to these Instructions when:

- mechanically produced, particle size ~~more than~~ of 53 microns or more; or
- chemically produced, particle size ~~more than~~ of 840 microns or more.

...

To be introduced into 2021-2022 Edition of the Technical Instructions through a corrigendum
DGP-WG/20-WP/6 (see paragraph 3.2.2.5 of DGP-WG/20 Report):

A46 (≈216) Mixtures of solids which are not subject to these Instructions and flammable liquids may be transported under this entry without first applying the classification criteria of Division 4.1, providing there is no free liquid visible at the time the substance is packaged and, for single packagings, the packaging must pass a leakproofness test at the Packing Group II level. ~~Small inner packagings consisting of~~ Sealed packets or ~~and~~ and articles containing less than 10 mL of a Packing Group II or III flammable liquid absorbed into a solid material are not subject to these Instructions provided there is no free liquid in the packet or articles.

...

TIs UN

DGP-WG/20-WP/8 (see paragraph 3.2.2.7 of DGP-WG/20 Report):

- A61 (168) Asbestos which is immersed or fixed in a natural or artificial binder (such as cement, plastics, asphalt, resins or mineral ore) in such a way that no escape of hazardous quantities of respirable asbestos fibres can occur during transport is not subject to these Instructions. Manufactured articles, containing asbestos and not meeting this requirement, are nevertheless not subject to these Instructions, when packed so that no escape of hazardous quantities of respirable asbestos fibres can occur during transport.

The words “not restricted” and the special provision number A61 must be provided on the air waybill when an air waybill is issued.

...

DGP-WG/21-WP/4, Revised (see paragraph 3.2.2.15 of DGP-WG/21 Report):

- A99 Irrespective of the quantity limits for cargo aircraft specified in column 13 of Table 3-1, and in Section I of Packing Instructions 965, 966, 967, 968, 969 and 970, a lithium battery or battery assembly (i.e. UN 3090 or UN 3480), including when packed with equipment or contained in equipment (i.e. UN 3091 or UN 3481) that meets the other requirements of Section I of the applicable packing instruction, may have a mass exceeding 35 kg, if approved by the appropriate authority of the State of Origin and the State of the Operator and the requirements in Packing Instruction 974 of the Supplement are met.

A copy of the document of approval must accompany the consignment. Transport in accordance with this special provision must be noted on the dangerous goods transport document.

...

DGP-WG/21-WP/10 (see paragraph 3.2.2.3 of DGP-WG/21 Report):

- A117 Wastes containing Category A infectious substances must be assigned to UN 2814, ~~or~~ UN 2900, or UN 3549, as applicable. Wastes transported under UN 3291 are wastes containing infectious substances in Category B or wastes that are reasonably believed to have a low probability of containing infectious substances. Decontaminated wastes which previously contained infectious substances may be considered as not subject to these Instructions unless the criteria of another class or division are met.

DGP-WG/21-WP/33 (see paragraph 3.2.2.6 of DGP-WG/21 Report):

- A132 (204) Articles containing smoke-producing substance(s) corrosive according to the criteria for Class 8 must be labelled with a “Corrosive” subsidiary hazard label. Articles containing smoke-producing substance(s) toxic by inhalation according to the criteria for Division 6.1 must be labelled with a “TOXIC” subsidiary hazard label (Figure 5-18), ~~except that those manufactured before 31 December 2016 may be offered for transport until 31 December 2018 without a “TOXIC” subsidiary label.~~

TIs UN

DGP-WG/20-WP/18 (see paragraph 3.2.2.11 of DGP-WG/20 Report):

A180 Non-infectious specimens, such as specimens of mammals, birds, amphibians, reptiles, fish, insects and other invertebrates containing small quantities of UN 1170, UN 1198, UN 1987 or UN 1219 are not subject to these Instructions provided the following packing and marking requirements are met:

- a) specimens are:
 - 1) wrapped in paper towel and/or cheesecloth moistened with alcohol ~~or~~ an alcohol solution or a formaldehyde solution and then placed in a plastic bag that is heat-sealed. Any free liquid in the bag must not exceed 30 mL; or
 - 2) placed in vials or other rigid containers with no more than 30 mL of alcohol ~~or~~ an alcohol solution or a formaldehyde solution;
- b) the prepared specimens are then placed in a plastic bag that is then heat-sealed;
- c) the bagged specimens are then placed inside ~~a~~ another plastic bag with absorbent material then heat-sealed;
- d) the finished bag is then placed in a strong outer packaging with suitable cushioning material;
- e) the total quantity of flammable liquid per outer packaging must not exceed 1 L; and
- f) the completed package is marked "scientific research specimens, not restricted Special Provision A180 applies".

The words "not restricted" and the special provision number A180 must be provided on the air waybill when an air waybill is issued.

...

DGP-WG/21-WP/21, Revised (see paragraph 3.2.2.4 of DGP-WG/21 Report):

A223 (~296) Life-saving appliances packed in strong rigid outer packagings with a total maximum gross mass not exceeding 40 kg, containing no dangerous goods other than Division 2.2 compressed or liquefied gases (with no subsidiary hazard) contained in receptacles with a capacity not exceeding 120 mL and installed solely for the purpose of the activation of the appliance, are not subject to these Instructions when carried as cargo.

DGP-WG/21-WP/29 (see paragraph 3.2.2.22 of DGP-WG/21 Report):

A224 UN 3548 — Articles containing miscellaneous dangerous goods, n.o.s. may be transported on passenger and cargo aircraft irrespective of the indication of "forbidden" in columns 10 to 13 of Table 3-1, provided:

- a) the only dangerous goods contained in the article is an environmentally hazardous substance;
- b) the articles are packed in accordance with Packing Instruction 975; and
- c) reference to Special Provision A224 is made on the dangerous goods transport document as required by Part 5;4.1.5.8

All other provisions of these Instructions apply. If the above conditions are met, the requirements of Special Provision A2 do not apply.

TIs UN

DGP-WG/21-WP/29 (see paragraph 3.2.2.22 of DGP-WG/21 Report):

A225 UN 3538 — Articles containing non-flammable, non-toxic gas, n.o.s. may be transported on passenger and cargo aircraft irrespective of the indication of “forbidden” in columns 10 to 13 of Table 3-1, provided:

- a) the only dangerous goods contained in the article is a Division 2.2 gas without a subsidiary hazard, but excluding refrigerated liquefied gases and gases forbidden for transport on passenger aircraft;
- b) the articles are packed in accordance with Packing Instruction 222; and
- c) reference to Special Provision A225 is made on the dangerous goods transport document as required by Part 5.4.1.5.8.

All other provisions of these Instructions apply. If the above conditions are met, the requirements of Special Provision A2 do not apply.

...

Part 4**PACKING INSTRUCTIONS**

...

DGP-WG/21-WP/29 (see paragraph 3.2.2.22 of DGP-WG/21 Report):

Packing Instruction 222Passenger and cargo aircraft for UN 3538 only**Introduction**

This packing instruction is only permitted for articles which do not have an existing proper shipping name and which contain only gases of Division 2.2 without a subsidiary hazard, but excluding refrigerated liquefied gases and gases forbidden for transport on passenger aircraft, where the quantity of the Division 2.2 gas exceeds the quantity limits for UN 3363 as prescribed in Packing instruction 962.

General requirements

Part 4:1.1.1, 4:1.1.3, 4:1.1.12 and 4:2 requirements must be met.

<u>UN number and proper shipping name</u>	<u>Maximum net quantity of gas — passenger</u>	<u>Maximum net quantity of gas — cargo</u>
<u>UN 3538 Articles containing non-flammable, non-toxic gas, n.o.s.*</u>	<u>75 kg</u>	<u>150 kg</u>

ADDITIONAL PACKING REQUIREMENTS

- Packagings must meet the Packing Group II performance requirements.
- Receptacles within articles containing gases must meet the requirements of 4:4.1.1 and 6:5 as appropriate or meet a national or regionally recognized pressure receptacle standard such as the European Pressure Equipment Directive (2014/68/EU) or ASME Section VII, Div.1 R that is capable of providing an equivalent level of protection as Packing Instructions 200 or 219.
- Articles must be packed to prevent movement and inadvertent operation during normal conditions of transport.

ROBUST ARTICLES

Robust articles may alternatively be transported in strong outer packagings constructed of suitable material and of adequate strength and design in relation to the packaging capacity and its intended use. The packagings must achieve a level of protection that is at least equivalent to that provided by 6:1. Articles may be transported unpackaged or on pallets when the dangerous goods are afforded equivalent protection by the article in which they are contained. In such cases the additional requirement related to Packing Group II performance requirements and the requirement for UN specification packagings do not apply.

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

Jerricans

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

DGP-WG/21-WP/22 (see paragraph 3.2.2.12 of DGP-WG/21 Report):

Packing Instruction 621

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.

...

DGP-WG/21-WP/8 (see paragraph 3.2.2.11 of DGP-WG/21 Report):

Packing Instruction 870

Passenger and cargo aircraft for UN 2794 and 2795 only

General requirements

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

1) Compatibility requirements

- 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.

UN number and proper shipping name	Packing conditions	Total quantity per package — passenger	Total quantity per package — cargo
UN 2794 Batteries, wet, filled with acid UN 2795 Batteries, wet, filled with alkali	<p>Batteries must be placed in an acid/alkali-proof liner of sufficient strength and adequately sealed to positively preclude leakage in the event of spillage. The batteries must be packed so that the fill openings and vents, if any, are upward; they must be incapable of short-circuiting and be securely cushioned in the packagings. The upright position of the package must be indicated on it by "Package orientation" labels (Figure 5-29) as required by 5;3. The words "This side up" or "This end up" may also be displayed on the top of the package.</p> <p><i>Batteries installed in equipment</i></p> <p>If batteries are shipped as an integral component of assembled equipment, they must be securely installed and fastened in an upright position and protected against contact with other articles so as to prevent short circuits. Batteries must be removed and packed according to this packing instruction if the assembled equipment is likely to be carried in other than an upright position.</p>	30 kg	No limit

...

...

DGP-WG/21-WP/21, Revised (see paragraph 3.2.2.4 of DGP-WG/21 Report):

Packing Instruction 955

Passenger and cargo aircraft for UN 2990 and UN 3072 only

...

ADDITIONAL PACKING REQUIREMENTS

...

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

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

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

...

DGP-WG/20-WP/4 (see paragraph 3.3.6.1 of DGP-WG/20 Report) and DGP-WG/20-WP/16 (see paragraph 3.3.6.2 of DGP-WG/20 Report):

Packing Instruction 966

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

...

I. SECTION I

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

...

I.2 Additional requirements

- Lithium ion cells and batteries must be protected against short circuits. This includes protection against contact with conductive materials within the same packaging that could lead to a short circuit.
- Lithium ion cells ~~or~~ and batteries must:
 - be placed in inner packagings that completely enclose the cell or battery, then placed in ~~an outer~~ packaging of a type shown below that meets the Packing Group II performance requirements, then placed with the equipment in a strong, rigid outer packaging. ~~The completed package for the cells or batteries must meet the Packing Group II performance requirements;~~
 - be placed in inner packagings that completely enclose the cell or battery, then placed with the equipment in a packaging of a type shown below that meets the Packing Group II performance requirements.
- The equipment must be secured against movement within the outer packaging ~~and must be equipped with an effective means of preventing accidental activation.~~
- The number of cells or batteries in each package must not exceed the number required for the equipment's operation, plus two spare sets. A "set" of cells or batteries is the number of individual cells or batteries that are required to power each piece of equipment.
- Batteries manufactured after 31 December 2011 must be marked with the Watt-hour rating on the outside case.

...

Packing Instruction 966

II. SECTION II

...

II.2 Additional requirements

- Lithium ion cells and batteries must: be placed in inner packagings that completely enclose the cell or battery, then placed with the equipment in a strong rigid outer packaging.
 - ~~be placed in inner packagings that completely enclose the cell or battery, then placed in a strong rigid outer packaging; or~~
 - ~~be placed in inner packagings that completely enclose the cell or battery, then placed with the equipment in a strong rigid outer packaging.~~
- Cells and batteries must be protected so as to prevent against short circuits. This includes protection against contact with electrically conductive material within the same packaging that could lead to a short circuit.
- The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.
- The number of cells or batteries in each package must not exceed the number required for the equipment's operation, plus two spare sets. A "set" of cells or batteries is the number of individual cells or ~~batters~~ batteries that are required to power each piece of equipment.

...

DGP-WG/21-WP/23 (see paragraph 3.3.1.1 of DGP-WG/21 Report):

Packing Instruction 967

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

...

I. SECTION I

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

I.1 General requirements

Equipment must be packed in strong rigid outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1). Large equipment can be offered for transport unpackaged or on pallets when the cells or batteries are afforded equivalent protection by the equipment in which they are contained.

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

I.2 Additional requirements

- The equipment must be secured against movement within the outer packaging and be packed so as to prevent accidental operation during air transport must be equipped with an effective means of preventing accidental activation.
- ~~The equipment must be packed in strong rigid outer packagings constructed of suitable material of adequate strength and design in relation to the packaging's capacity and its intended use unless the battery is afforded equivalent protection by the equipment in which it is contained.~~ Where multiple pieces of equipment are packed in the same outer packaging, each piece of equipment must be packed to prevent contact with other equipment.
- Batteries manufactured after 31 December 2011 must be marked with the Watt-hour rating on the outside case.

I.3 Outer packagings

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

II. SECTION II

...

II.1 General requirements

Equipment must be packed in strong rigid outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1). Large equipment can be offered for transport unpackaged or on pallets when the cells or batteries are afforded equivalent protection by the equipment in which they are contained.

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

II.2 Additional requirements

- The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.
- Cells and batteries must be protected so as to prevent short circuits.
- ~~The equipment must be packed in strong rigid outer packagings constructed of suitable material of adequate strength and design in relation to the packaging's capacity and its intended use unless the battery is afforded equivalent protection by the equipment in which it is contained.~~ Where multiple pieces of equipment are packed in the same outer packaging, each piece of equipment must be packed to prevent contact with other equipment.
- Each package must be marked with the appropriate lithium battery mark (Figure 5-3). The package must be of such size that there is adequate space to affix the mark on one side without the mark being folded.
 - This requirement does not apply to:
 - packages containing only button cell batteries installed in equipment (including circuit boards); and
 - packages containing no more than four cells or two batteries installed in equipment, where there are not more than two packages in the consignment.
 - Where a consignment includes packages bearing the lithium battery mark, the words "lithium ion batteries, in compliance with Section II of PI967" must be placed on the air waybill, when an air waybill is used. Where packages of Section II lithium batteries from multiple packing instructions are included on one air waybill, the compliance statement for the different lithium battery types and/or packing instructions may be combined into a single statement provided that the statement identifies the applicable lithium battery type(s), packing instruction numbers and "CAO", when applicable.
- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with the functions for which they are responsible.

...

DGP-WG/20-WP/4 (see paragraph 3.3.6.1 of DGP-WG/20 Report) and DGP-WG/20-WP/16 (see paragraph 3.3.6.2 of DGP-WG/20 Report):

Packing Instruction 969

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

I. SECTION I

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

...

I.2 Additional requirements

- Lithium metal cells and batteries must be protected against short circuits. This includes protection against contact with conductive materials within the same packaging that could lead to a short circuit.
- Lithium metal cells or and batteries must:
 - be placed in inner packagings that completely enclose the cell or battery, then placed in an ~~outer~~ packaging of a type shown below that meets the Packing Group II performance requirements, then placed with the equipment in a strong, rigid outer packaging. ~~The completed package for the cells or batteries must meet the Packing Group II performance requirements;~~ or
 - be placed in inner packagings that completely enclose the cell or battery, then placed with the equipment in a packaging of a type shown below that meets the Packing Group II performance requirements.
- The equipment must be secured against movement within the outer packaging ~~and must be equipped with an effective means of preventing accidental activation.~~
- The number of cells or batteries in each package must not exceed the number required for the equipment's operation, plus two spare sets. A "set" of cells or batteries is the number of individual cells or batteries that are required to power each piece of equipment.
- For lithium metal cells and batteries prepared for transport on passenger aircraft as Class 9:
 - cells and batteries offered for transport on passenger aircraft must be packed in intermediate or outer rigid metal packaging surrounded by cushioning material that is non-combustible and non-conductive and placed inside an outer packaging.

...

II. SECTION II

...

II.2 Additional requirements

- Lithium metal cells and batteries must: be placed in inner packagings that completely enclose the cell or battery, then placed with the equipment in a strong rigid outer packaging.
- ~~be placed in inner packagings that completely enclose the cell or battery, then placed in a strong rigid outer packaging; or~~
- ~~be placed in inner packagings that completely enclose the cell or battery, then placed with the equipment in a strong rigid outer packaging.~~
- Cells and batteries must be protected ~~so as to prevent~~ against short circuits. This includes protection against contact with electrically conductive material within the same packaging that could lead to a short circuit.
- The equipment must be secured against movement within the outer packaging ~~and must be equipped with an effective means of preventing accidental activation.~~

...

...

DGP-WG/21-WP/23 (see paragraph 3.3.1.1 of DGP-WG/21 Report):

Packing Instruction 970

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

1. Introduction

...
I. SECTION I

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

I.1 General requirements

Equipment must be packed in strong rigid outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1). Large equipment can be offered for transport unpackaged or on pallets when the cells or batteries are afforded equivalent protection by the equipment in which they are contained.

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

I.2 Additional requirements

- The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.
- ~~The equipment must be packed in strong rigid outer packagings constructed of suitable material of adequate strength and design in relation to the packaging's capacity and its intended use unless the battery is afforded equivalent protection by the equipment in which it is contained.~~ Where multiple pieces of equipment are packed in the same outer packaging, each piece of equipment must be packed to prevent contact with other equipment.
- The quantity of lithium metal contained in any piece of equipment must not exceed 12 g per cell and 500 g per battery.

...
II. SECTION II

...
II.1 General requirements

Equipment must be packed in strong rigid outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1). Large equipment can be offered for transport unpackaged or on pallets when the cells or batteries are afforded equivalent protection by the equipment in which they are contained.

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

II.2 Additional requirements

- The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.
- Cells and batteries must be protected so as to prevent short circuits.
- ~~The equipment must be packed in strong rigid outer packaging constructed of suitable material of adequate strength and design in relation to the packaging's capacity and its intended use unless the battery is afforded equivalent protection by the equipment in which it is contained.~~ Where multiple pieces of equipment are packed in the same outer packaging, each piece of equipment must be packed to prevent contact with other equipment.
- Each package must be marked with the appropriate lithium battery mark (Figure 5-3). The package must be of such size that there is adequate space to affix the mark on one side without the mark being folded.
 - This requirement does not apply to:
 - packages containing only button cell batteries installed in equipment (including circuit boards); and
 - packages containing no more than four cells or two batteries installed in equipment, where there are not more than two packages in the consignment.
 - Where a consignment includes packages bearing the lithium battery mark, the words "lithium metal batteries, in compliance with Section II of PI970" must be placed on the air waybill, when an air waybill is used. Where packages of Section II lithium batteries from multiple packing instructions are included on one air waybill, the compliance statement for the different lithium battery types and/or packing instructions may be combined into a single statement provided that the statement identifies the applicable lithium battery type(s), packing instruction numbers and "CAO", when applicable.
- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with the functions for which they are responsible.

...

...

DGP-WG/21-WP/29 (see paragraph 3.2.2.22 of DGP-WG/21 Report):

Packing Instruction 975

Passenger and cargo aircraft for UN 3548 only

Introduction

This packing instruction is only permitted for articles which do not have an existing proper shipping name and which contain only environmentally hazardous substances where the quantity of the environmentally hazardous substance in the article exceeds 5 L or 5 kg.

General requirements

Part 4;1.1.1, 4;1.1.3, 4;1.1.12 and 4;2 requirements must be met.

<u>UN number and proper shipping name</u>	<u>Quantity — passenger</u>	<u>Quantity — cargo</u>
<u>UN 3548 Articles containing miscellaneous dangerous goods, n.o.s.*</u>	<u>No limit</u>	<u>No limit</u>

ADDITIONAL PACKING REQUIREMENTS

- Packagings must meet the Packing Group II performance requirements.
- Receptacles containing liquids or solids within articles must be constructed of suitable materials and secured in the article in such a way that, under normal conditions of transport, they cannot break, be punctured or leak their contents into the article itself or the outer packaging.
- Receptacles containing liquids with closures must be packed with their closures correctly oriented. The receptacles must in addition conform to the internal pressure test provisions of 6;4.5.
- Receptacles that are liable to break or be punctured easily, such as those made of glass or of certain plastics materials must be properly secured, and any leakage of the contents must not substantially impair the protective properties of the article or of the outer packaging.
- Where there is no receptacle within the article, the article must fully enclose the dangerous goods and prevent their release under normal conditions of transport.
- Articles must be packed to prevent movement and inadvertent operation during normal conditions of transport.

ROBUST ARTICLES

Robust articles may alternatively be transported in strong outer packagings constructed of suitable material and of adequate strength and design in relation to the packaging capacity and its intended use. The packagings must achieve a level of protection that is at least equivalent to that provided by 6;1. Articles may be transported unpackaged or on pallets when the dangerous goods are afforded equivalent protection by the article in which they are contained. In such cases the additional requirement related to Packing Group II performance requirements and the requirement for UN specification packagings do not apply.

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

Jerricans

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

...

Part 5

SHIPPER'S RESPONSIBILITIES

...

Chapter 4

DOCUMENTATION

...

4.1.5 Information required in addition to the dangerous goods description

...

DGP-WG/20-WP/9 (see paragraph 3.2.2.8 of DGP-WG/20 Report):

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;

Note.— For radionuclides not listed in Table 2-12, refer to 5:4.1.5.8.1 g) for additional information required on the dangerous goods transport document.

- 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.

...

4.1.5.8 *Additional requirements*

4.1.5.8.1 The dangerous goods transport document must also contain:

- a) except for radioactive material, the packing instruction applied. For shipments of lithium batteries prepared in accordance with Section IB of Packing Instruction 965 or Packing Instruction 968, the letters "IB" must be added following the packing instruction number;

*Note.— Packing Instruction 622 from the 2019-2020 Edition of these Instructions was renumbered as 621 in this edition. Until 31 March 2021, Packing Instruction 622 may continue to be indicated on the dangerous goods transport document when applied to UN 3291, **Biomedical waste, n.o.s., Clinical waste, unspecified, n.o.s., Medical waste, n.o.s., or Regulated medical waste, n.o.s.***

DGP-WG/21-WP/3 and DGP-WG/21-WP/4, revised (see paragraphs 3.2.2.14 and 3.2.2.15 of DGP-WG/21 Report):

- b) when applicable, reference to Special Provision A1, A2, A4, A5, A51, A78, A88, A99, A190, A191, A201, A202, ~~A208~~, A211-~~or~~, A212, A224 or A225;
- c) a statement indicating that the shipment is within the limitations prescribed for either passenger and cargo aircraft or cargo-only aircraft, as appropriate;

Note.— To qualify as acceptable for transport aboard passenger aircraft, passenger aircraft packing instruction number(s) must be used, and the package must not bear the "Cargo aircraft only" label. To qualify as acceptable for transport aboard cargo-only aircraft, cargo aircraft packing instruction number(s) must be used, and the package must bear the "Cargo aircraft only" label; or passenger aircraft instruction number(s) must be shown and no "Cargo

aircraft only” label applied. However, where the packing instruction number(s) and the permitted quantity per package are identical for passenger and cargo aircraft, the “Cargo aircraft only” label should not be used.

- d) special handling information, when appropriate;
- e) an indication that an overpack has been used, when appropriate;~~and~~

DGP-WG/20-WP/9 (see paragraph 3.2.2.8 of DGP-WG/20 Report):

- f) the “Q” value rounded up to the first decimal place, if substances are packed in accordance with 3;4.3.3 or 4;1.1.9 e); and

[g) for radioactive material, where a radionuclide value in Table 2-13 is used for an individual nuclide not listed in Table 2-12, the type of radioactive contents and the use of Table 2-13 must be referenced. For example: “Table 2-13 used. Only beta- or gamma- emitting nuclides are known to be present”.]

...

Part 7**OPERATOR'S RESPONSIBILITIES**

...

Chapter 2**STORAGE AND LOADING**

...

DGP-WG/21-WP/7, Revised (see paragraph 3.2.2.16 of DGP-WG/21 Report):

2.7 REPLACEMENT OF MARKS AND LABELS

When an operator discovers that any of the marks required by 5:2.4.9, 5:2.4.11, 5:2.4.12 or 5:2.4.16 or labels for packages of dangerous goods have become lost, detached or illegible the operator must replace them with appropriate marks or labels in accordance with the information provided on the dangerous goods transport document or other transport document, such as an air waybill, when applicable.

...

DGP-WG/21-WP/9 and DGP-WG/21-WP/24 (see paragraph 3.2.2.21 of DGP-WG/21 Report):

2.13 LOADING OF BATTERY-POWERED MOBILITY AIDS CARRIED UNDER THE PROVISIONS OF PART 8**2.13.1 LOADING OF 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) adequately protected against damage by the design of the mobility aid and securely attached to the mobility aid ~~and the~~. The electrical circuits are ~~are~~ must be isolated following the manufacturer's instructions; or
 - 2) ~~removed by the user, if the mobility aid is specifically designed to allow it to be,~~ from the mobility aid, following the manufacturer's instructions; ~~and~~
- d) a maximum of one non-spillable wet 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

2.13.2.1 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.

2.13.2.2 An operator must verify that:

- a) the battery terminals are protected from short circuits (e.g. by being enclosed within a battery container);
- b) the battery is fitted, where feasible, with spill resistant-vent caps; and
- c) the battery is either:
 - 1) ~~adequately protected against damage by the design of the mobility aid and~~ securely attached to the mobility aid ~~and the .The~~ electrical circuits ~~are~~ must be isolated following the manufacturer's instructions; or
 - 2) removed from the mobility aid, following the manufacturer's instructions when required by 2.13.2.3.

2.13.2.3 An operator must load, stow, secure, and unload a spillable battery-powered mobility aid in an upright position. If the mobility aid cannot be loaded, stowed, secured and unloaded always in an upright position or if the mobility aid does not adequately protect the battery, the operator must remove the batteries and carry them in strong, rigid packagings, as follows:

- a) packagings must be leak-tight, impervious to battery fluid and be protected against being overturned by securing them to pallets or by securing them in cargo compartments using appropriate means of securement;
- b) batteries must be protected against short circuits, secured upright in these packagings and surrounded by compatible absorbent material sufficient to absorb their total liquid contents; and
- c) these packagings must be marked "Battery, wet, with wheelchair" or "Battery, wet, with mobility aid" and be labelled with a Corrosive" label (Figure 5-24) and with package orientation labels (Figure 5-29) as required by 5;3.

2.13.2.4 The operator must inform the pilot-in-command of the location of any mobility aids with installed spillable batteries and removed batteries.

2.13.3 LOADING OF MOBILITY AIDS POWERED BY LITHIUM ION BATTERIES

2.13.3.1 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.

2.13.3.2 An operator must verify that:

- a) the battery terminals are protected from short circuits (e.g. by being enclosed within a battery container);
- b) the battery is either:
 - 1) ~~adequately protected against damage by the design of the mobility aid and~~ securely attached to the mobility aid ~~and the .The~~ electrical circuits ~~are~~ must be isolated following the manufacturer's instructions; or
 - 2) removed ~~by the user, if the mobility aid is specifically designed to allow it to be,~~ from the mobility aid, following the manufacturer's instructions; and
- c) the removed battery does not exceed 300 Wh and that its spare battery does not exceed 300 Wh or its two spare batteries do not exceed 160 Wh each.

2.13.3.3 An operator must ensure that any battery removed from the mobility aid and any spare batteries are carried in the cabin and protected from damage (e.g., by placing each battery in a protective pouch) and the battery terminals protected from short circuit (by insulating the terminals, e.g. by taping over exposed terminals).

2.13.3.4 The operator must inform the pilot-in-command of the location of any mobility aids with installed lithium ion batteries, removed batteries and spare batteries.

...

DGP-WG/21-WP/36 (see paragraph 3.2.2.17 of DGP-WG/21 Report):

Chapter 4

PROVISION OF INFORMATION

4.1 INFORMATION TO THE PILOT-IN-COMMAND

...

Table 7-9. Dangerous goods not required to appear in the information to the pilot-in-command

<i>UN Number</i>	<i>Item</i>	<i>Reference</i>
...		
UN 3091	Lithium metal batteries contained in equipment (including lithium alloy batteries) when meeting the requirements of Packing Instruction 970, Section II	Packing Instruction 970, Section II
UN 3091	Lithium metal batteries packed with equipment (including lithium alloy batteries) when meeting the requirements of Packing Instruction 969, Section II	Packing Instruction 969, Section II
<u>UN 3164</u>	<u>Articles, pressurized, hydraulic containing non-flammable gas when meeting the requirements of Packing Instruction 208 a)</u>	<u>Packing Instruction 208, a)</u>
<u>UN 3164</u>	<u>Articles, pressurized, pneumatic containing non-flammable gas when meeting the requirements of Packing Instruction 208 a)</u>	<u>Packing Instruction 208, a)</u>
UN 3245	Genetically modified micro-organisms	Packing Instruction 959
...		

...

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

<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				

...

DGP-WG/21-WP/9 and DGP-WG/21-WP/24 (see paragraph 3.2.2.21 of DGP-WG/21 Report):

4)	Mobility aids (e.g. wheelchairs) powered by:	Yes	(see e)ii)	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>c) <u>the battery is either:</u></p> <p>i) <u>adequately protected against damage by the design of the mobility aid and securely attached to the mobility aid. The electrical circuits must be isolated following the manufacturer's instructions; or</u></p> <p>ii) <u>removed from the mobility aid, following the manufacturer's instructions;</u></p> <p>d) <u>the battery terminals must be protected from short circuits (e.g. by being enclosed in a battery container);</u></p> <p>e) <u>all removed and spare batteries must be protected from damage (e.g. by placing each battery in a strong, rigid packaging);</u></p> <p>f) <u>in the case of a spillable battery, if the mobility aid cannot be loaded, stowed, secured and unloaded always in an upright position, the battery must be removed and carried in a strong, rigid packaging;</u></p>
	<ul style="list-style-type: none"> – spillable batteries; – non-spillable wet batteries; – dry batteries; – nickel-metal hydride batteries; or – lithium ion batteries 				

Dangerous Goods	Location		Approval of the operator(s) is required	Restrictions
	Checked baggage	Carry-on baggage		
				<p>eg) in the case of a dry battery or nickel-metal hydride battery, each battery must comply with Special Provision A123 or A199, respectively;</p> <p>dh) 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; 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; if the battery is removed: <ul style="list-style-type: none"> the battery must not exceed 300 Wh; 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.

...

French version and verify Chinese, Russian and Spanish
DGP-WG/20-IP/1 (see paragraph 3.3.4.1 of DGP-WG/20 Report):

Partie 8

DISPOSITIONS RELATIVES AUX PASSAGERS ET AUX MEMBRES D'ÉQUIPAGE

...

Tableau 8-1. Dispositions relatives aux transport de marchandises dangereuses par les passagers ou les membres d'équipage

<i>Marchandises dangereuses</i>	<i>Location</i>		<i>Approbation de l'exploitant ou des exploitants requise</i>	<i>Restrictions</i>
	<i>Bagages enregistrés</i>	<i>Bagages de cabine</i>		
Accumulateurs et batteries				
1) Batteries au lithium (y compris les appareils électroniques portables)	Oui [sauf dans le cas des alinéas g) et h)]	Oui	[voir les alinéas c) et d)]	<p>...</p> <p>g) les batteries de rechange (y compris les chargeurs <u>y compris les batteries externes (power banks)</u>) :</p> <ul style="list-style-type: none"> — doivent être placées dans les bagages de cabine ; — doivent être protégées individuellement contre les courts-circuits (par l'utilisation de l'emballage original de vente au détail ou par un autre moyen pour isoler les bornes, par exemple par la pose de ruban sur les bornes non protégées ou l'utilisation de pochettes de protection ou de sacs de plastique distincts pour chaque batterie) ; <p>...</p>

APPENDIX D

AMENDMENTS TO THE SUPPLEMENT TO THE TECHNICAL
INSTRUCTIONS DEVELOPED AT DGP-WG/21 FOR THE SAKE OF HARMONIZATION
WITH UN RECOMMENDATIONS ON THE TRANSPORT OF DANGEROUS GOODS

Note.— There were no amendments to the Supplement developed at DGP-WG/20.

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

DGP-WG/21-WP/19 (see paragraph 3.1.3.1.1 a) of DGP-WG/21 Report):

UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/48/Add.1)

Articles containing non-flammable, non toxic gas, n.o.s.*	3538	2.2	See 2;0.6			A2 A333 <u>A335</u>			FORBIDDEN		221	150 kg No limit
---	------	-----	-----------	--	--	---------------------------	--	--	-----------	--	-----	----------------------------

...

Chapter 6

SPECIAL PROVISIONS

...

Table S-3-4. Special Provisions

Supplementary special provisions

...

DGP-WG/21-WP/19 (see paragraph 3.1.3.1 of DGP-WG/21 Report):

UN Model Regulations, Chapter 3.3, SP 396 (see ST/SG/AC.10/48/Add.1)

A335 (396) Large and robust articles may be transported with connected gas cylinders with the valves open regardless of Part 4;4.1.1.5 of the Technical Instructions provided:

- a) the gas cylinders contain nitrogen of UN 1066 or compressed gas of UN 1956 or compressed air of UN 1002;
- b) the gas cylinders are connected with the article through pressure regulators and fixed piping in such a way that the pressure of the gas (gauge pressure) in the article does not exceed 35 kPa (0.35 bar);
- c) the gas cylinders are properly secured so that they cannot move in relation to the article and are fitted with strong and pressure resistant hoses and pipes;
- d) the gas cylinders, pressure regulators, piping and other components are protected from damage and impacts during transport by wooden crates or other suitable means; and
- e) the transport document includes a statement indicating that transport is in accordance with this special provision.

DGP-WG/21-WP/19 (see paragraph 3.1.3.1.1 b) of DGP-WG/21 Report):

- f) operators must be made aware when the gas contained in the gas cylinder poses an asphyxiation hazard so that the appropriate precautions can be taken.

...

Chapter 4

CLASS 2 — GASES

DGP-WG/21-WP/19 (see paragraph 3.1.3.1.1 c) of DGP-WG/21 Report):

UN Model Regulations, 4.1.4.1, P200(5) (see ST/SG/AC.10/48/Add.1)

Packing Instruction 200

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

...

6) "Special packing provisions":

Material compatibility

- a) Aluminium alloy cylinders are forbidden.
- b) Copper valves are forbidden.
- c) Metal parts in contact with the contents must not contain more than 65 per cent copper.
- d) When steel cylinders or composite cylinders with steel liners are used, only those bearing the "H" mark in accordance with 6;5.2.7.4 p) are permitted.

...

- z) The construction materials of the cylinders and their accessories must be compatible with the contents and must not react to form harmful or dangerous compounds therewith.

The test pressure and filling ratio must be calculated in accordance with the relevant requirements of PI 200.

For cylinders containing pyrophoric gases or flammable mixtures of gases containing more than 1 per cent pyrophoric compounds, the requirements of special packing provision "q" shall be met.

The necessary steps must be taken to prevent dangerous reactions (i.e. polymerization or decomposition) during transport. If necessary, stabilization or addition of an inhibitor may be required.

Note.— For the carriage of oxygen to provide life support to aquatic animals, see Note 7 of the Introductory Notes to this Part.

...

...

DGP-WG/21-WP/19 (see paragraph 3.1.3.1 of DGP-WG/21 Report):

UN Model Regulations, 4.1.4.1, P208 (1)(a) and (11) (see ST/SG/AC.10/48/Add.1)

Packing Instruction 219

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

This Instruction applies to Class 2 adsorbed gases.

- 1) The following packagings are permitted provided the general packing requirements of 4.1.1 are met:

Cylinders specified in 6;5 and in accordance with ISO 11513:2011, [ISO 11513:2019](#), ~~or~~ ISO 9809-1:2010 [or ISO 9809-1:2019](#).

- 2) The pressure of each filled cylinder must be less than 101.3 kPa at 20°C and less than 300 kPa at 50°C.
- 3) The minimum test pressure of the cylinder is 21 bar.
- 4) The minimum burst pressure of the cylinder is 94.5 bar.
- 5) The internal pressure at 65°C of the filled cylinder must not exceed the test pressure of the cylinder.
- 6) The adsorbent material must be compatible with the cylinder and must not form harmful or dangerous compounds with the gas to be adsorbed. The gas in combination with the adsorbent material must not affect or weaken the cylinder or cause a dangerous reaction (e.g. a catalyzing reaction).
- 7) The quality of the adsorbent material must be verified at the time of each fill to assure the pressure and chemical stability requirements of this packing instruction are met each time an adsorbed gas package is offered for transport.
- 8) The adsorbent material must not meet the criteria of any of the classes or divisions in these Instructions.
- 9) The filling procedure must be in accordance with Annex A of ISO 11513:2011 [\(applicable until 31 December 2024\)](#) [or Annex A of ISO 11513:2019](#).
- 10) The maximum period for periodic inspections is five years.
- 11) The construction materials of the cylinders and their accessories must be compatible with the contents and must not react to form harmful or dangerous compounds therewith.

...

Chapter 8

**CLASS 6 — TOXIC AND
INFECTIOUS SUBSTANCES**

...

DGP-WG/21-WP/19 (see paragraph 3.1.3.1 of DGP-WG/21 Report):

UN Model Regulations, 4.1.4.1, P622, Additional requirement (1) (see ST/SG/AC.10/48/Add.1)

Packing Instruction 622

Cargo aircraft only for UN 3549 only

...

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 a 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~~ of 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~~ of 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.

...

...

Chapter 11

CLASS 9 — MISCELLANEOUS DANGEROUS GOODS

DGP-WG/21-WP/19 (see paragraph 3.1.3.1 of DGP-WG/21 Report):

Packing Instruction 910

Cargo aircraft only

Introduction

This packing instruction applies to UN Nos. 3090, 3091, 3480 and 3481 annual production runs consisting of not more than 100 cells or batteries and to pre-production prototypes of cells or batteries when these prototypes are transported for testing.

General requirements

Part 4, Chapter 1 requirements of the Technical Instructions must be met.

Lithium ion cells and batteries must be offered for transport at a state of charge not exceeding 30 per cent of their rated capacity unless a higher state of charge is specifically approved by the States of Origin and the State of the Operator.

...

Packagings not subject to Part 6 of the Technical Instructions

The equipment or batteries may be packed in outer packagings or protective enclosures not subject to the requirements of Part 6 of the Technical Instructions under conditions specified by the appropriate national authority. Additional conditions that may be considered in the approval process include, but are not limited to:

- 1) The equipment or the battery must be strong enough to withstand the shocks and loadings normally encountered during transport, including trans-shipment between unit load devices and between unit load devices and warehouses as well as any removal from a pallet or unit load device for subsequent manual or mechanical handling; and
- 2) The equipment or the battery must be fixed in cradles or crates or other handling devices in such a way that it will not become loose during normal conditions of transport.

UN Model Regulations, 4.1.4.1, P910 (3) (see ST/SG/AC.10/48/Add.1)

Note.— The packagings authorized may exceed a net mass of 400 kg (see 2.3).

...

...

Packing Instruction 974

Cargo aircraft only

Introduction

This packing instruction applies to UN Nos. 3090, 3091, 3480 and 3481 where the lithium cell or battery has a mass exceeding 35 kg.

General requirements

...

Packagings not subject to Part 6 of the Technical Instructions

Lithium cells or batteries employing a strong, impact resistant outer casing may be transported:

- 1) in strong outer packagings;
- 2) in protective enclosures (e.g. in fully enclosed or wooden slatted crates); or
- 3) on pallets or other handling devices.

Cells or batteries must be secured to prevent inadvertent movement and the terminals must not support the weight of other superimposed elements.

UN Model Regulations, 4.1.4.1, P903 (see ST/SG/AC.10/48/Add.1)

Note.— The packagings authorized may exceed a net mass of 400 kg (see 2.3).

...

...

APPENDIX E

**AMENDMENTS TO THE SUPPLEMENT TO THE TECHNICAL INSTRUCTIONS AGREED
AT DGP-WG/21 TO ADDRESS AIR-SPECIFIC SAFETY RISKS AND IDENTIFIED
ANOMALIES**

Note.— There were no amendments to the Supplement developed at DGP-WG/20.

Part S-3

**DANGEROUS GOODS LIST,
SPECIAL PROVISIONS AND QUANTITY LIMITATIONS**

...

Chapter 1

GENERAL

...

1.2 QUANTITY LIMITATIONS AND PACKING REQUIREMENTS

...

DGP-WG/21-WP/25 (see paragraph 3.2.3.1 of DGP-WG/21 Report):

1.2.3 In the case of Special Provision A2, dangerous goods may be transported on ~~passenger and~~ cargo aircraft only with the prior approval of the appropriate authority of the State of Origin and the State of the Operator provided that the quantity per package does not exceed the quantity shown in Table S-3-1 and the packing is in accordance with the packing instruction indicated by Table S-3-1. The detailed requirements of the packing instruction are given in Part S-4, unless they already appear in the Technical Instructions. The consignment must be accompanied by a copy of the documents of approval showing the quantity limitations and packing and labelling requirements.

...

Part S-4

PACKING INSTRUCTIONS

...

Chapter 11

CLASS 9 – MISCELLANEOUS DANGEROUS GOODS

...

DGP-WG/21-WP/27, Revised (see paragraph 3.2.3.3 of DGP-WG/21 Report):

Packing Instruction 910

Cargo aircraft only

Introduction

This instruction applies to UN Nos. 3090, 3091, 3480 and 3481 annual production runs consisting of not more than 100 cells or batteries and to pre-production prototypes of cells or batteries when these prototypes are transported for testing.

General requirements

Part 4, Chapter 1 requirements of the Technical Instructions must be met.

Lithium ion cells and batteries (UN 3480), including when packed with or contained in equipment (UN 3481), must be offered for transport at a state of charge not exceeding 30 per cent of their rated capacity unless a higher state of charge is specifically approved by the States of Origin and the State of the Operator.

ADDITIONAL PACKING REQUIREMENTS

- Packagings, including large packagings, must meet the Packing Group I performance requirements.
- Cells and batteries must be protected against short circuit. Protection against short circuits includes, but is not limited to:
 - individual protection of the battery terminals;
 - inner packaging to prevent contact between cells and batteries;
 - batteries with recessed terminals designed to protect against short circuits; or
 - the use of an electrically non-conductive and non-combustible cushioning material to fill empty space between the cells or batteries in the packaging.

Cells and batteries, including when packed with equipment

- 1) Batteries and cells, including equipment, of different sizes, shapes or masses must be packaged in an outer packaging of a tested design type listed below provided the total gross mass of the package does not exceed the gross mass for which the design type has been tested. Rigid large packagings, as shown below, are permitted for a single battery, ~~including when packed with or contained in equipment~~;
- 2) Each cell or battery must be individually packed in an inner packaging and placed inside an outer packaging;
- 3) Each inner packaging must be completely surrounded by sufficient non-combustible and electrically non-conductive thermal insulation material to protect against a dangerous evolution of heat;
- 4) Appropriate measures must be taken to minimize the effects of vibration and shocks and prevent movement of the cells or batteries within the package that may lead to damage and a dangerous condition during transport. Cushioning material that is non-combustible and electrically non-conductive may be used to meet this requirement;
- 5) Non-combustibility must be assessed according to a standard recognized in the State where the packaging is designed or manufactured;
- 6) A cell or battery with a net mass of more than 30 kg is limited to one cell or battery per outer packaging.

Cells and batteries contained in equipment

- 1) Equipment of different sizes, shapes or masses must be packed in an outer packaging of a tested design type listed below provided the total gross mass of the package does not exceed the gross mass for which the design type has been tested. Rigid large packagings, as shown below, are permitted for a single item of equipment containing cells or batteries;
- 2) The equipment must be constructed or packaged in such a manner as to prevent accidental operation during transport;
- 3) Appropriate measures must be taken to minimize the effects of vibration and shocks and prevent movement of the equipment within the package that may lead to damage and a dangerous condition during transport. When cushioning material is used to meet this requirement it must be non-combustible and electrically non-conductive; and
- 4) Non-combustibility must be assessed according to a standard recognized in the State where the packaging is designed or manufactured.

Packagings not subject to Part 6 of the Technical Instructions

The equipment or batteries may be packed in outer packagings or protective enclosures not subject to the requirements of Part 6 of the Technical Instructions under conditions specified by the appropriate national authority. Additional conditions that may be considered in the approval process include, but are not limited to:

- 1) The equipment or the battery must be strong enough to withstand the shocks and loadings normally encountered during transport, including trans-shipment between unit load devices and between unit load devices and warehouses as well as any removal from a pallet or unit load device for subsequent manual or mechanical handling; and
- 2) The equipment or the battery must be fixed in cradles or crates or other handling devices in such a way that it will not become loose during normal conditions of transport.

OUTER PACKAGINGS*Boxes*

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

Drums

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

Jerricans

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

RIGID LARGE PACKAGINGS*Boxes*

Aluminium (50B)
Fibreboard (50G)
Natural wood (50C)
Other metal (50N)
Plastics (50H)
Plywood (50D)
Reconstituted wood (50F)
Steel (50A)

...

DGP-WG/21-WP/26 (see paragraph 3.2.3.2 of DGP-WG/21 Report):

Part S-7

STATE'S RESPONSIBILITIES WITH RESPECT TO OPERATORS

...

Chapter 2

STORAGE AND LOADING

...

Chapter 2

STORAGE AND LOADING

...

2.2 LOADING ON PASSENGER AIRCRAFT

...

2.2.2 The dangerous goods may only be in the following classes or divisions:

...

Class 9 (except UN 1931, UN 1941, UN 1990, UN 2211, UN 2590, UN 3268, UN 3314, UN 3316, UN 3363, ~~UN~~
~~ID~~ 8000)

...

APPENDIX F

AMENDMENTS TO THE EMERGENCY RESPONSE GUIDANCE FOR AIRCRAFT INCIDENTS INVOLVING DANGEROUS GOODS AGREED AT DGP-WG/21 TO ADDRESS AIR-SPECIFIC SAFETY RISKS AND IDENTIFIED ANOMALIES

DGP-WG/21-WP/31 (see paragraph 3.2.4.1 of DGP-WG/21 Report):

...

Section 1

GENERAL INFORMATION

...

1.5 ACCESSIBILITY OF DANGEROUS GOODS

...

b) classified as:

- 1) flammable liquids (Class 3), Packing Group III, other than those with a subsidiary hazard of Class 8;
- 2) toxic substances (Division 6.1) with no subsidiary hazard other than Class 3;
- 3) infectious substances (Division 6.2);
- 4) radioactive materials (Class 7); and
- 5) miscellaneous dangerous goods (Class 9);
- 6) UN 3528 — Engine, internal combustion, flammable liquid powered or Engine, fuel cell, flammable liquid powered or Machinery, internal combustion, flammable liquid powered or Machinery, fuel cell, flammable liquid powered; and
- 7) UN 3529 — Engine, internal combustion, flammable gas powered or Engine, fuel cell, flammable gas powered or Machinery, internal combustion, flammable gas powered or Machinery, fuel cell, flammable gas powered.

Other dangerous goods (those which do not bear “cargo aircraft only” labels) are not required to be accessible.

Part 7, Chapter 2 of the Technical Instructions sets out the full requirements on the accessibility of dangerous goods on cargo aircraft.

...

— END —