International Civil Aviation Organization

DANGEROUS GOODS PANEL (DGP)

TWENTY-EIGHTH MEETING

Virtual, 15 – 19 November 2021

REPORT FOLDER

The material in this report has not been considered by the Air Navigation Commission. The views expressed therein should be taken as advice of a panel of experts to the Air Navigation Commission but not as representing the views of the Organization. After the Air Navigation Commission has reviewed this report, a supplement setting forth the action taken by the Air Navigation Commission thereon will be issued to this report.

TWENTY-EIGHTH MEETING OF THE
DANGEROUS GOODS PANEL (DGP) (2021)

LETTER OF TRANSMITTAL

To: President, Air Navigation Commission

From: Chairperson, Dangerous Goods Panel (DGP) (2021)

I have the honour to submit the report of the twenty-eighth meeting of the Dangerous Goods Panel (DGP) which was held virtually from 15 to 19 November 2021.

Teun Muller
Chairperson

Virtual meeting, 19 November 2021

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LIST OF RECOMMENDATIONS*

* Recommendations annotated “RSPP” relate to proposals for amendment of Standards, Recommended Practices and Procedures for Air Navigation Services or guidance material in an Annex.

DANGEROUS GOODS PANEL (DGP)

TWENTY-EIGHTH MEETING

Virtual, 15 to 19 November 2021

HISTORY OF THE MEETING

1. DURATION

1.1 The twenty-eighth meeting of the Dangerous Goods Panel (DGP) was opened by Mr. Nabil Naoumi, President of the ANC of the Air Navigation Commission, at 1100 hours on 15 November 2021 in a virtual meeting. It was preceded by a four-day virtual working group meeting from 8 to 11 November 2021. The meeting ended on 19 November 2021.

2. ATTENDANCE

2.1 The meeting was attended by members and observers nominated by twenty-one Contracting States and seven international organizations, as well as by advisers and others as shown in the list below:

Members	Advisers	Nominated By
S. Bitossi		Australia
L. Cascardo	P.F. Macário	Brazil
S. Cumberbirch	D. Bolton D. Evans N. Prince G. Sansoucy	Canada
P. Guo	S. Au (Hong Kong) T. Feng F. Lam (Hong Kong) A. Lee (Hong Kong) Y. Qiang J. Ying (Hong Kong) J. Wan (Hong Kong) Q. Zhenhua	China
P. Tatin		France
S. Weizenhöfer		Germany
P. Privitera	C. Carboni A. Pellas E. Toriello	Italy

M. Araya	Y. Funai N. Iki K. Nakano T. Tanaka K. Yanagawa	Japan
T. Muller	E. Boon R. Dardenne H. Strijbosch K. Vermeersch	Netherlands
E. Gillett	M. Cowlishaw W. Herath	Qatar
S. Kang		Republic of Korea
P. Pavlov	D. Kurdchenko	Russian Federation
L. Gqeke	S. Maharaj B. Ngiba	South Africa
M. De Castro	Á. de Marcos F. Rodríguez Guzmán S. García Wolfrum	Spain
H. Al Muhairi	H. Abdel-Monem K. Alblooshi H. Al Hooti T. Howard A.Wagih	United Arab Emirates
J. Hanafin	M. Ranito C. Ruzicka	United Kingdom
D. Pfund	M. Cameron M. Givens R. Hill K. Leary E. Petrie K. Ranck	United States
D. Brennan	C. Chan	International Air Transport Association (IATA)
D. Ferguson		International Coordinating Council of Aerospace Industries Associations (ICCAIA)
S. Schwartz	T. Guitierrez T. Lempiainen M. Phaneuf D. Schlichting	International Federation of Air Line Pilots' Associations (IFALPA)

Advisers

A. Altemos G. Leach	Dangerous Goods Advisory Council (DGAC)
S. Schultes E. Sigrist	European Chemical Industry Council (CEFIC)

Observers

N. J. Luro	Argentina
R. Machuca	Chile
H. Senja	Finland
R. Cataldo N. Hagmann	Switzerland
L. Calleja Barcena	European Union Aviation Safety Agency (EASA)
A. McCulloch T. Rogers	Global Express Association (GEA)
S. Rossetti	Medical Device Battery Transport Council (MDTC)
E. Remy	North Atlantic Treaty Organization (NATO)
G. Kerchner	PRBA – The Rechargeable Battery Association
P. Balasubramanian	Strategic Aviation Solutions International (SASI)
J. Jeevarajan	UL
D. Wilkes	Universal Postal Union (UPU)

3. OFFICERS AND SECRETARIAT

3.1 Mr. Teun Muller (Netherlands) was elected Chairman of the meeting and Mr. Leonardo Cascardo (Brazil) was elected Vice-Chairperson.

3.2 The Secretary of the meeting was Dr. Katherine Rooney, Chief of the Cargo Safety Section, who was assisted by Mr. Virgilio Alegría and Ms. Lynn McGuigan, technical officers of the same section.

4. AGENDA OF THE MEETING

4.1 The agenda for the meeting shown hereunder was approved by the Air Navigation Commission on 6 August 2021.

Agenda Item 1: Harmonizing ICAO dangerous goods provisions with UN Recommendations on the Transport of Dangerous Goods (*Ref: REC-A-DGS-2023*)

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

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

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

Agenda Item 2: Managing air-specific safety risks and identifying anomalies (*Ref: REC-A-DGS-2023*)

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

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

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

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

Agenda Item 3: Facilitating safe transport of dangerous goods by air (*Ref: REC-A-DGS-2023*)

Agenda Item 4: Managing safety risks posed by the carriage of lithium batteries by air (*Ref: Job Card DGP.003.03)*

Agenda Item 5: Clarifying State oversight responsibilities in Annex 18 (*Ref: Job Card DGP.005.03*)

Agenda Item 6: Coordination with other panels

6.1: Flight Operations Panels (FLTOPSP) (*Ref: SCGSWG.001.01, SCGSWG.002.01, SCGSWG.003.01*)
6.2: Airworthiness Panel (AIRP) (*Ref: AIRP.012.04*)
6.3: Safety Management Panel (SMP) (*Ref: SMP.017.03, SMP.019.02, SMP.020.01, SMP.021.01*)
6.4: Remotely Piloted Aircraft Systems Panel (RPASP) *(Ref: ROI-7-2020-2)*
6.5: Aviation Security (AVSECP) (*Ref: REC-A-DGS 2023*)
6.6: Any other panels

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

Agenda Item 8: Other business

5. WORKING ARRANGEMENTS

5.1 The panel met as a single body, with ad hoc drafting groups as required. Discussions in the main meeting were conducted in Arabic, Chinese, English, French, Russian and Spanish. Some working papers were presented in English only. The four-day working group meeting was conducted in English only. The outcome of the working group's discussions were approved by the panel. The DGP/28 report, which included the outcome of the working group's discussions, was issued in Arabic (narrative only), Chinese, English, French, Russian and Spanish.

6. OPENING REMARKS BY THE PRESIDENT OF THE AIR NAVIGATION COMMISSION

6.1 Good morning. My name is Nabil Naoumi, and I am the President of the Air Navigation Commission. I would like to welcome you all on behalf of the Air Navigation Commission to this twenty-eighth meeting of the Dangerous Goods Panel. I do wish I was seeing you all in Montreal, but I will have to settle with seeing you virtually.

6.2 You will be formally meeting this week as a panel of experts. I understand that an informal working group meeting was held last week. I hope that the informal setting allowed you to constructively progress many of the items in your work programme before formally reviewing them this week.

6.3 Working virtually since the start of the COVID-19 pandemic has been challenging for us all, but it is remarkable how much we have been able to accomplish. I know it has not been easy, particularly for members in certain time zones who join meetings very late in the evening or very early in the morning on a regular basis. The Commission is grateful to all members for the efforts you have taken to progress your work programme despite these challenges. I note in particular the quick contribution the panel made towards facilitating the safe transport of cargo necessary for the containment of the

COVID-19 virus and the saving of lives. This resulted in the Commission supporting and the Council approving two addenda to the Technical Instructions through the fast track amendment procedure. We are grateful to the panel for its ability to quickly develop provisions that were accepted by all. This was achieved through effective collaboration among DGP members and coordination with members on other panels and of course with the support of the Secretariat.

6.4 There have been a number of changes in membership to your panel since the twenty-seventh meeting. Let me summarize these changes:

— Ms. Paquette left the panel after successfully chairing it for several years. She was well respected as chairperson and will be missed. The Commission subsequently approved the nomination of her replacement by Canada, Ms. Cumberbirch.

— Mr. Gillet left the panel as the member nominated by the United Kingdom, and the Commission approved the nomination of Ms. Hanafin as his replacement. Mr. Gillet was later nominated as a new panel member by Qatar, for which the Commission approved.

— Mr. Brockhaus left the panel after being one of the longest-standing members, and I have the privilege of knowing him and working with him in the past. The Commission approved the nomination by Germany of Ms. Weizenhoefer as his replacement.

— Mr. Song left the panel and the Commission approved the nomination by China of Mr. Guo as his replacement.

— Mr. Yoo left the panel and the Commission approved the nomination by the Republic of Korea of Mr. Kang.

The Commission is very grateful for the contributions of each of the outgoing members and welcomes the new members. The membership changes resulted in the panel being composed of twenty members nominated by seventeen Member States and three international organizations. The work of all members is highly appreciated.

6.5 Your work programme has grown and become much more complex in recent years. The Commission recognizes the challenges involved and appreciates your efforts to collaborate with each other and with experts from other panels to reach well-thought out conclusions. I have been informed that the DGP has established several dedicated working groups to progress its work programme. I would like to particularly thank members who volunteered to lead these newly-established working groups as well as the leaders of the long-standing working groups on dangerous goods training and Annex 18.

6.6 It is important for me to remind each of you that you are here as an expert in a personal capacity. Although you have been nominated by your government or organization, you have been accepted by the Air Navigation Commission as an expert in your field. Your advice may not necessarily be the same as your administration’s or organization’s. I also want to remind you of the importance of reaching consensus-driven solutions and outcomes. This will help ensure that amendments are processed and then implemented effectively at the State level.

6.7 I would like to inform you that the Commission recently reviewed the priorities given to each of its work programme items, and the items tasked to your panel were all identified as high. I look forward to hearing the outcome of your discussions on these items through an informal briefing with the Commission on Friday, particularly with respect to managing the risks associated with lithium batteries and clarifying States' responsibilities through Annex 18.

6.8 Finally, I would like to advise you that informing ICAO of difficulties encountered in the application of the Technical Instructions and of any amendments that would be desired should be directly to the Secretariat or through individual panel members and not through members of the Commission or the Council.

6.9 It remains for me to wish you well as we declare open the twenty-eighth meeting of the Dangerous Goods Panel and to wish you every success in your work. The Commission is confident that you will maintain the high standards that you have shown at previous meetings. I do hope it will not be long before we can welcome you back to Montreal.

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Agenda Item 1: Harmonizing ICAO dangerous goods provisions with UN Recommendations on the Transport of Dangerous Goods *(Ref: REC-A-DGS-2023)*

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

There were no proposals for amendment to Annex 18 developed under this agenda sub-item.

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Agenda Item 1: Harmonizing ICAO dangerous goods provisions with UN Recommendations on the Transport of Dangerous Goods *(Ref: REC-A-DGS-2023)*

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

1.2.1 DRAFT AMENDMENTS TO THE TECHNICAL INSTRUCTIONS TO ALIGN WITH THE UN RECOMMENDATIONS PROPOSED BY THE DGP WORKING GROUP ON UN HARMONIZATION (DGP-WG/UN HARMONIZATION)

Background

1.2.1.1 The meeting reviewed amendments to the Technical Instructions to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals (subsequently referred to in the report, for the sake of brevity, as "UNCOE") at its tenth session (Geneva, 11 December 2020). The amendments 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.

1.2.1.2 The output from DGP-WG/UN Harmonization was initially reviewed at the Dangerous Goods Panel Working Group Meeting (DGP-WG/21, 24 to 28 May 2021) (see paragraph 3.1.2 of the DGP-WG/21 Report). DGP-WG/UN Harmonization continued its review after DGP-WG/21 and recommended additional revisions described in the report of the DGP/28 discussions below.

Part 1 (DGP/28-WP/11 and DGP/28-WP/54)

1.2.1.3 The amendments to Part 1 presented to DGP-WG/21 were agreed, subject to an additional amendment to a reference in the definition for aerosol or aerosol dispenser made as a consequence to amendments to provisions for aerosols in Parts 4 and 6 (see also amendments to Parts 4, 6 and the Supplement described in paragraphs 1.2.1.6, 1.2.1.8, 1.3.1.1 and Appendix A to the report on this agenda item).

Part 2 (DGP/28-WP/12, DGP/28-WP/51 and Appendix A to DGP/28-WP/53)

1.2.1.4 The amendments to Part 2 presented to DGP-WG/21 were agreed, subject to the incorporation of the following additional amendments recommended by DGP-WG/UN Harmonization:

a) The addition of details from the UN Model Regulations for the classification of self-reactive substances of Division 4.1 to Part 2;4.2.3.2.1 and Division 5.2 to Part 2;5.3.2.2 of the Technical Instructions.

b) The addition of an organic peroxide listed in a packing instruction for intermediate bulk containers in the UN Model Regulations (IBC520) to Table 2-7. The UN document included organic peroxides in a corresponding table and permitted others by listing them in this packing instruction. There was no corresponding packing instruction in the Technical Instructions, since IBCs were generally not permitted in air transport. Adding the entry to Table 2-7 made the table different from the corresponding table in the UN Model Regulations, but this was considered necessary for the sake of overall harmonization.

Part 3 (DGP/28-WP/13 and DGP/28-WP/51)

1.2.1.5 The amendments to Part 3 presented to DGP-WG/21 were agreed, subject to the incorporation of the following additional amendments recommended by DGP-WG/UN Harmonization and the correction of inconsistencies identified in the Spanish version (see Appendix B to the report on this agenda item):

a) Revisions to the entries in Table 3-1 for UN 3221 — **Self-reactive liquid type B** and UN 3231 — **Self-reactive liquid type B, temperature controlled** to make them forbidden under any circumstances to align with how the entries for Self-reactive solid type B and Self-reactive solid type B, temperature controlled were treated in Table 3-1 and with the recognition that the UN Model Regulations identified self-reactive substances of Division 4.1, type B as having explosive properties.

b) Replacement of text in Special Provision A57 with “Not used” and removal of it from Table 3-1. The text was redundant as it was already included in the packing instructions assigned to the substances that the special provision was assigned to.

Part 4 (DGP/28-WP/14 and DGP/28-WP/54)

1.2.1.6 The amendments to Part 4 presented to DGP-WG/21 were agreed, subject to additional amendments to the provisions for aerosols in Packing Instructions 203, Y203 and Y963 recommended by DGP-WG/UN Harmonization (see also amendments to Parts 1, 6 and the Supplement described in paragraphs described in paragraph 1.2.1.3, 1.2.1.8, 1.3.1.1 and Appendix A to the report on this agenda item) and the correction of inconsistencies identified in the Spanish version (see Appendix B to the report on this agenda item).

Part 5 (DGP/28-WP/15 and Appendix B to DGP/28-WP/53)

1.2.1.7 The amendments to Part 5 presented to DGP-WG/21 were agreed, subject to an additional amendment related to the removal of the requirement for a telephone number to appear on the lithium battery mark (Figure 5-3). This was to delete the existing note under Figure 5-3 that allowed the rectangular mark illustrated in the 2019-2020 Edition of the Technical Instructions to be used. DGP-WG/UN Harmonization considered the note unnecessary. The square mark had been in use for two years, and maintaining the existing note in addition to a new note allowing the use of the mark with the telephone number from the 2021-2022 Edition until 2026 caused confusion. It was questioned whether lithium battery marks, which were pre-printed with a statement such as "For additional information call: …" (i.e. with a space left blank for manual completion of a telephone number) could continue to be used after 1 January 2023 without a telephone number being stated. There was agreement that it could be, with some discussion on whether or not raising the issue to the UN Sub-Committee and/or providing guidance was necessary. It was concluded that this summary of discussions would be sufficient.

Part 6 (DGP/28-WP/16, Appendix C to DGP/28-WP/53 and DGP/28-WP/54)

1.2.1.8 The amendments to Part 6 presented to DGP-WG/21 were agreed, subject to the incorporation of the following additional amendments recommended by DGP-WG/UN Harmonization and the panel:

a) Revisions to the provisions for aerosols in Parts 6;3 and 6;5 (see also amendments to Parts 1, 4 and the Supplement described in paragraphs 1.2.1.3, 1.2.1.6, 1.3.1.1 and Appendix A to the report on this agenda item).

b) A note specifying what the term "pressure receptacle" referred to in the conformity assessment system and approval for manufacture of pressure receptacles section added under 6.2.2.5 of the UN Model Regulations was not adopted in the Technical Instructions (6;5.2.5.1.1), because the Technical Instructions referred to the specific terms "cylinder", "cylinder shell" and "inner vessel of closed cryogenic receptacle" and not "pressure receptacle".

c) References to "pressure receptacles" in new 6.2.2.5.1 and 6.2.2.11 of the UN Model Regulations were replaced with "cylinders and closed cryogenic receptacles" in the Technical Instructions (Part 6;5.2.5.1.2 and 6;5.2.11).

d) A new sub-paragraph related to bundles of cylinders in 6.2.2.5.1 of the UN Model Regulations was replaced with "Not used" in the Technical Instructions (Part 6;5.2.5.1.2 b)), since bundles of cylinders were not permitted for air transport.

1.2.1.9 A potential inconsistency with respect to the use of "and" and "or" in 6;7.24 was also identified, although some thought the wording was intentional and appropriate. Regardless, the provisions were aligned with the UN Model Regulations, so revisions would not be appropriate.

Attachments (DGP/28-WP/20)

1.2.1.10 The amendments to the attachments presented to DGP-WG/21 were agreed. It was noted that additional amendments to Chapter 1 that were consequential to the amendments to Table 3-1 would be automatically generated when the Technical Instructions were published.

1.2.2 REVISION TO RADIOACTIVE MATERIAL CLASSIFICATION AS EXCEPTED PACKAGES (DGP/28-WP/34)

1.2.2.1 Part 2;7.2.4.1.1.2 specified that "a package containing radioactive material may be classified as an excepted package provided that the dose rate at any point on its external surface does not exceed 5 μSv/h". The provision in previous paragraph 2;7.2.4.1.1.1 specified that a package may be classified as an excepted package if it met one of five listed conditions. It was questioned whether the 5 μSv/h dose rate limit in 2;7.2.4.1.1.2 applied for each of the conditions in 2;7.2.4.1.1.1 or whether it was meant to be taken in isolation from them, as another option, which appeared to introduce contradictions. The text in the Technical Instructions aligned with the UN Model Regulations, but not the IAEA Regulations for the Safe Transport of Radioactive Material. The IAEA Regulations made it clear that the 5 μSv/h limit always applied by simply stating "The dose rate at any point on the external surface of an excepted package shall not exceed 5 μSv/h." An amendment to Part 2;7.2.4.1.1.2 was proposed to align with the IAEA text. The amendment was agreed. The UN Sub-Committee of Experts on the Transport of Dangerous Goods would be advised of the panel's decision.

1.2.3 PRECEDENCE OF CLASSIFICATION ENVIRONMENTALLY HAZARDOUS SUBSTANCE VS AVIATION REGULATED SUBSTANCE (DGP/28-WP/42)

1.2.3.1 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. The amendment was withdrawn due to a lack of consensus. Details on the proposal and the discussion are provided in Appendix A to the report on this agenda item.

1.2.4 **RECOMMENDATION**

1.2.4.1 In light of the foregoing discussions, the meeting developed the following recommendation:

Recommendation 1/1 — Amendment to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284) proposed for the sake of alignment with the UN Recommendations on the Transport of Dangerous Goods for incorporation in the 2023-2024 Edition

That the amendments identified as "UN harmonization amendments" in Appendix A to the report be incorporated in the Technical Instructions.

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Agenda Item 1: Harmonizing ICAO dangerous goods provisions with UN Recommendations on the Transport of Dangerous Goods *(Ref: REC-A-DGS-2023)*

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

1.3.1 DRAFT AMENDMENTS TO THE SUPPLEMENT TO THE TECHNICAL INSTRUCTIONS TO ALIGN WITH THE UN RECOMMENDATIONS (DGP/28-WP/19, APPENDIX D TO DGP/28-WP/53 AND APPENDIX C TO DGP/28-WP/54)

1.3.1.1 Draft amendments to the Supplement to the Technical Instructions were developed by DGP-WG/UN Harmonization to reflect the decisions taken by the UNCOE. The output from DGP-WG/UN Harmonization was initially reviewed at DGP-WG/21. DGP-WG/UN Harmonization continued its review after DGP-WG/21 and recommended the following additional revisions:

a) Removal of text from Packing Instruction 200 that had been proposed for the sake of alignment with the UN Model Regulations. The text indirectly referred to substances that were not listed in Packing Instruction 200 in the Supplement. DGP-WG/UN Harmonization identified the need for a thorough review of the packing instruction over the next biennium.

b) Amendments to the provisions for aerosols in Packing Instructions 203 (see also amendments to Parts 1, 4 and 6 of the Technical Instructions described in paragraphs 1.2.1.3, 1.2.1.6 and 1.2.1.8 and Appendix A to the report on this agenda item).

1.3.1.2 The amendments to the Supplement were agreed.

1.3.2 RECOMMENDATION

1.3.2.1 In light of the foregoing discussions, the meeting developed the following recommendation:

Recommendation 1/2 — Amendment to the *Supplement to Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284SU) proposed for the sake of alignment with the UN Recommendations on the Transport of Dangerous Goods for incorporation in the 2023-2024 Edition

That the amendments identified as “UN harmonization amendments” in Appendix B to the report be incorporated in the Supplement to the Technical Instructions.

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APPENDIX A TO THE REPORT ON AGENDA ITEM 1
(English only)

ADDITIONAL DETAILS ON DISCUSSIONS RELATED TO AEROSOLS AND GAS CARTRRIDGES AND ENVIRONMENTAL HAZARDOUS AND AVIATION REGUALTED SUBSTANCES PRECEDENCE OF HAZARDS

1. RECOMMENDED REVISIONS TO THE REQUIREMENTS FOR AEROSOLS AND GAS CARTRIDGES TO ALIGN WITH THE UN RECOMMENDATIONS (DGP/28 WP/54 AND ADDENDUM/CORRIGENDUM)

Revisions to the provisions for aerosols in Packing Instruction 203, Packing Instruction Y203, Part 6;3 and Part 6;5 were proposed to address inconsistencies between the provisions in the UN Model Regulations and the Technical Instructions (see paragraphs 1.2.1.6 and 1.2.1.9 of the report on this agenda item). These were identified with the introduction of paragraph 5.4.1 in Part 6;5 that was added for the sake of alignment with the 22nd revised edition of the UN document. The new paragraph limited the pressure in aerosols based on the classification of the aerosol and the form of the gas. However, Packing Instructions 203 and Y203 applied one pressure limit regardless of the classification or the form of the gas making them less restrictive than the provisions for aerosols in the UN Model Regulations. It was further identified that the very detailed requirements set out in Packing Instructions 203, Y203 and in Part 6;3.2.7 and 3.2.8 for dimensions and manufacture of aerosols, including references to inner packagings IP.7, IP.7A, IP.7B and IP.7C, did not appear in the UN Model Regulations. It was noted that these were developed over thirty years ago and that provisions for aerosols developed by the UN Sub-Committee since that time were not incorporated in the Technical Instructions. This created a misalignment between the Technical Instructions and the regulations for other modes of transport. Amendments were therefore proposed to:

a) remove the detailed requirements that did not appear in the UN Model Regulations from Packing Instructions 203 and Y203 and introduce a reference to Part 6;5.4 in the packing instructions;

b) include a reference to Part 6;5.4;

c) simplify the requirements for hydraulic pressure testing in Part 6;3.2.7 and move them to Part 6;5.4; and

d) remove the remaining provisions from Part 6;3.2.7 and 6;3.2.8.

2. PRECEDENCE OF CLASSIFICATION ENVIRONMENTALLY HAZARDOUS SUBSTANCE VS AVIATION REGULATED SUBSTANCE (DGP/28-WP/42)

A proposed amendment to the classification criteria for UN 3334 — **Aviation regulated liquid, n.o.s.** and UN 3335 — **Aviation regulated solid, n.o.s.** was withdrawn (see paragraph 1.2.3 to the report on this agenda item), but the following provides details on the proposal and the discussion.

The amendment required UN 3334 AND UN 3335 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. Introducing a precedence of hazard would facilitate acceptance checks. It was noted that both environmentally hazardous substances and aviation regulated substances were assigned to the same packing instructions. An amendment was first considered at DGP-WG/21 (see paragraph 3.2.2.2 of the DGP-WG/21 Report), and while there was some support for it, there were concerns that the aviation hazard would be ignored if not classified as UN 3334 or UN 3335, given that the drill code assigned to aviation regulated substances ("9A", with "A" an indication that the substance could be anaesthetic) was different to the one assigned to environmentally hazardous substances ("9L", with "L" an indication that additional hazards were low or none). There were also concerns that the exception for environmentally hazardous substances in Special Provision A197 could make substances previously classified as aviation regulated unregulated. Special Provision A97 would also create an anomaly if the amendment was adopted in that it specified that substances could not be assigned to UN 3077 or UN 3082 if they met the classification criteria of another class or another substance within Class 9.

The amendment proposed to DGP-WG/21 was revised so that Special Provision A197 would not apply to substances meeting the criteria for an aviation regulated substance. The text in Special Provision A97 was moved to the classification criteria for UN 3077 and UN 3082 in Table 2-16 for the sake of alignment with the UN Model Regulations and revised to specify that UN 3077 or UN 3082 were used for substances and mixtures dangerous to the aquatic environment not meeting the classification criteria of any other class or substance within Class 9 *other than aviation substances, where environmentally hazardous takes precedence*. The revised amendment did not address the concern with respect to the different drill codes. The proposer suggested this was unnecessary because the packing, labelling, handling and loading requirements were the same for aviation regulated and environmentally hazardous substances.

While many supported the amendment, with some editorial suggestions, there remained opposition by one member because of the specific hazard to air transport that aviation regulated substances posed, versus no hazard to air transport for environmentally hazardous substances. The drill codes were different for each because of this. It was noted that the specific drill code for aviation regulated substances was assigned in response to an accident.

The proposer remained concerned that classifying something as aviation regulated substances instead of environmentally hazardous substances would cause problems in the event of an accident because of the lack of harmonization with the UN Model Regulations. However, he would accept not adopting the amendment if there was opposition. While it would benefit the shipping community, it was not critical.

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APPENDIX B TO THE REPORT ON AGENDA ITEM 1
(Spanish only)

REVISIONS TO THE SPANISH VERSION OF THE TECHNICAL INSTRUCTIONS

PROPUESTAS DE ENMIENDA DE LA PARTE 3 DE LAS INSTRUCCIONES TÉCNICAS

Denominación	*Núm. ONU*	*Clase o división*	*Peligros secundarios*	*Etiquetas*	*Discrepancias estatales*	*Disposiciones especiales*	*Grupo de embalaje ONU*	*Cantidad exceptuada*	*Aeronaves de pasajeros y aeronaves de carga*		*Aeronaves de carga*	
									Instrucciones de embalaje	*Cantidad neta máxima por bulto*	*Instrucciones de embalaje*	*Cantidad neta máxima por bulto*
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
Bolsa de resina poliestérica, material **de base** ~~básico~~ líquido†	3269	3		Líquido inflamable		A66 A163	II	E0	370 Y370	5 kg 1 kg	370	5 kg
							III	E0	370 Y370	10 kg 5 kg	370	10 kg
Bolsa de resina poliestérica, material **de base** ~~básico~~ sólido†	3527	4.1		Sólido inflamable		A66 A163	II	E0	450 Y450	5 kg 1 kg	450	5 kg
							III	E0	450 Y450	10 kg 5 kg	450	10 kg

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A66 (236) Los equipos de resina de poliéster constan de dos componentes: un material **de base** ~~básico~~ (ya sea de la Clase 3 o de la División 4.1, Grupo de embalaje II o III) y un activador peróxido orgánico). El peróxido orgánico será de los tipos D, E o F y no requerirá regulación de temperatura. El grupo de embalaje debe ser el II o el III, según los criterios de la Clase 3 o la División 4.1 que se apliquen al material **de base** ~~básico~~.

PROPUESTAS DE ENMIENDA DE LA PARTE 4 DE LAS INSTRUCCIONES TÉCNICAS

Instrucción de embalaje 450

Aeronaves de pasajeros y de carga para ONU 3527 (Grupo de embalaje II o III) únicamente

EMBALAJES COMBINADOS						EMBALAJES ÚNICOS
Condiciones de embalaje	*Embalaje interior (véase 6;3.2)*	*Embalaje interior cantidad (por recipiente)— para material de base ~~líquido~~ **sólido***	*Embalaje interior cantidad (por recipiente)— para líquido activador*	*Embalaje interior cantidad (por recipiente)— para activador sólido*	*Cantidad total por bulto*	

Instrucción de embalaje Y450

Cantidades limitadas

EMBALAJES COMBINADOS							EMBALAJES ÚNICOS
Condiciones de embalaje	*Embalaje interior (véase 6;3.2)*	*Embalaje interior cantidad (por recipiente) — para material de base ~~líquido~~ **sólido***	*Embalaje interior cantidad (por recipiente) — para activador líquido*	*Embalaje interior cantidad (por recipiente) — para activador sólido*	*Cantidad total por bulto*	*Masa bruta total por bulto*	

PROPUESTAS DE ENMIENDA AL CAPÍTULO 1 DEL ADJUNTO 1 DE LAS INSTRUCCIONES TÉCNICAS

Adjunto 1: Lista de las denominaciones del artículo expedido

3269 Bolsa de resina poliestérica, material ~~básico~~ **de base** líquido

3527 Bolsa de resina poliestérica, material ~~básico~~ **de base** sólido

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Agenda Item 2: Managing air-specific safety risks and identifying anomalies *(Ref: REC A DGS 2023)*

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

2.1.1 There were no amendments to Annex 18 proposed under this agenda sub-item.

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Agenda Item 2: Managing air-specific safety risks and identifying anomalies *(Ref: REC A DGS 2023)*

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

2.2.1 DRAFT AMENDMENTS TO THE TECHNICAL INSTRUCTIONS TO ADDRESS AIR SPECIFIC SAFETY RISKS AND IDENTIFIED ANOMALIES AGREED AT DGP-WG/20 AND DGP-WG/21 (DGP/28-WP/22)

2.2.1.1 The meeting reviewed amendments to the Technical Instructions to address air-specific safety risks and identified anomalies related to the transport of dangerous goods that were agreed at DGP-WG/20 and DGP-WG/21. The amendments were agreed, subject to the following additional amendments:

a) A redundant note for a transition period under 4.1.5.8.1 a) was deleted; and

b) Amendments to the provisions for information to be provided by the shipper for radioactive material consignments in Part 5;4.1.5.7.1 and 4.1.5.8.1 g) were agreed in principle at DGP-WG/20 pending further consideration of the wording (see paragraph 3.2.2.8 of the DGP-WG/20 Report (DGP/28-WP/2)) were revised to further clarified the intent.

2.2.2 REVISIONS TO PACKING INSTRUCTION INVOLVING GROSS WEIGHT (DGP/28-WP/26 AND CORRIGENDUM)

2.2.2.1 Packing Instructions Y956, Y958 and Y964 contained total quantity per package limits of 30 kg and total gross mass per package limits of 30 kg G. Table 3-1 aligned with the latter by setting the maximum net quantity per package at 30 kg G for dangerous goods for which Packing Instructions Y956, Y958 and Y964 were assigned. It was suggested that the total quantity per package column in the packing instructions was unnecessary and contradicted the other limits when the total quantity of a package was 30 kg, since the gross mass would exceed 30 kg. An amendment to delete the column was agreed. Additional amendments to correct an error with the proper shipping name referenced in Packing Instructions 958 and Y958 for UN 2071 were also agreed. The name would be aligned with the entry in Table 3-1.

2.2.3 ASSIGNMENT OF SPECIAL PROVISION A1 TO UN 2881 (DGP/28-WP/30) AND SPECIAL PROVISION A36 (DGP/28-WP/50)

2.2.3.1 An amendment to Table 3-1 was proposed to assign 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 was 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. The amendment was agreed.

2.2.3.2 In reviewing the amendment and the rationale behind it, it was identified that the assignment of Special Provision A36 could be removed from two of the entries it was assigned to (UN 1693 — **Tear gas substance, liquid, n.o.s.** and UN 1228 — **Mercaptan mixture, liquid, flammable, toxic, n.o.s.** and **Mercaptans, liquid, flammable, toxic, n.o.s.**), because transport was only forbidden for one of the packing groups for these substances. The clarification that the special provision provided was therefore unnecessary. UN 1693 had been the only entry for which both Special Provisions A2 and A36 had been assigned. By removing the assignment of A36 from this entry, it was no longer necessary to refer to Special Provision A2 in the special provision. Amendments to remove the assignment of A36 from UN 1228 and UN 1693 and to remove the reference to Special Provision A2 in Special Provision A36 were agreed.

2.2.4 ADDITION OF PACKING GROUPS TO THE DANGEROUS GOODS LIST FOR SUBSTANCES FORBIDDEN ON PASSENGER AND CARGO AIRCRAFT (DGP/28-WP/52)

2.2.4.1 The packing group was not included in Table 3-1 for substances forbidden for transport on both passenger and cargo aircraft. It was proposed that it should be included, as it was part of the full classification of a substance and would also facilitate the extraction of data from entries with more than one packing group which might not be forbidden on both passenger and cargo aircraft. An amendment to include the packing group, when applicable, to all entries in Table 3-1 was agreed, subject to the replacement of an erroneous assignment of Packing Group II to UN 1838 — **Titanium tetrachloride** with Packing Group I. DGP-WG/UN Harmonization would consider whether modifications to the *Guidance Material for the DGP* were needed on account of the amendment.

2.2.5 REQUIREMENTS FOR DRY ICE LOADING (DGP/28-WP/31)

2.2.5.1 Revised provisions for the loading of dry ice were proposed to address the transport of increased quantities, which was necessary during the COVID-19 pandemic to ensure the viability of COVID-19 pharmaceuticals, including large quantities of vaccines. The amendment included a reference to the sublimation rate of dry ice, recognizing that this would have an impact on the quantities that could be safely carried, and additional requirements for the operator to equip the cockpit and cabin with CO_2 gas concentration detection equipment, to develop emergency procedures to respond to an event where concentration limits were exceeded, and to evaluate the aircraft's centre of gravity before take-off and before landing, as it may have shifted as a result of the sublimation of large quantities of dry ice.

2.2.5.2 The amendment was not supported. It was acknowledged that guidance based on lessons learned during the COVID-19 could be helpful, but the amendment proposed was considered too prescriptive. CO_2 gas concentration detection equipment was considered unnecessary given the fact that aircraft manufacturers provided safe limits to operators. There were some who supported incorporating

the need to take the sublimation rate into account, while noting the wording proposed would need to be modified to refer to the sublimation rate of the *package* containing dry ice. Others did not think this to be appropriate in the Technical Instructions. Standardized limits for specific aircraft types were normally developed by engineers, and the sublimation rate would only need to be taken into account when these limits would be exceeded.

2.2.5.3 While not supported, there were suggestions that guidance could be developed, but this should be done by a multidisciplinary group such as the FLTOPSP-SCG-SWG. Material could be considered for inclusion in the *Guidance for Safe Operations Involving Aeroplane Cargo Compartments* (Doc 10102). Accordingly, Recommendation 2/2 was formulated (see paragraph 2.2.10).

2.2.6 REVISIONS TO SPECIAL PROVISION A136 (DGP/28-WP/33)

2.2.6.1 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. An amendment to Special Provision A136 requiring a statement on the dangerous goods transport document to this effect and the application of the keep away from heat label was proposed to ensure the operator might need to keep these packages away from sunlight or sources of heat.

2.2.6.2 The amendment was not supported. The special provision had initially been developed for sea transport to address the risk associated with decomposition of large quantities of substances in transit for long durations. This risk was not a factor for air transport, since such large quantities would not be transported. Substances that needed temperature control were forbidden for transport by air because of the inability to do so. The amended text was therefore considered irrelevant.

2.2.7 PROPOSAL TO ADD SPECIAL PROVISION A4 TO THE ENTRY UN2922 AND A5 TO UN2923 IN TABLE 3-1 (DGP/28-WP/35)

2.2.7.1 Special Provisions A4 and A5 prohibited liquids and solids respectively, having an inhalation toxicity (mist for liquids) of Packing Group I from transport on passenger aircraft. Special Provision A4 additionally prohibited liquids with a vapour inhalation toxicity of Packing Group I from transport on both passenger and cargo aircraft. Both specified conditions under which these substances could be transported on cargo aircraft. It was proposed to assign Special Provision A4 to UN 2922 — **Corrosive liquid, toxic, n.o.s.** and A5 to UN 2923 — **Corrosive solid, toxic, n.o.s.**, both Class 8 substances with a Division 6.1 subsidiary hazard, with the recognition that liquids with a Packing Group I inhalation toxicity of mists or solids could be assigned to UN 2922 and solids with a Packing Group I inhalation toxicity of dusts could be assigned to UN 2923 in accordance with Part 2;0.4.1 g).

2.2.7.2 There was general support for the proposal, but a conflict was identified whereby Special Provision A4 limited the maximum net quantity per package to 5 L while Table 3-1 limited it to 2.5 L for UN 2922. It was further identified that this was an existing anomaly for several other UN numbers assigned to A4. Modified text that addressed the anomaly was agreed, subject to additional editorial revisions that would be made by the Secretariat for the sake of clarity.

2.2.8 PROVISIONS FOR THE USE OF ELECTRONIC NOTICES TO PILOT-IN-COMMAND (DGP/28-WP/36)

2.2.8.1 An amendment allowing for electronic information to be provided to the pilot-in-command in accordance with Part 7;4.1.1 of the Technical Instructions was proposed at the twenty-seventh meeting of the DGP (DGP/27, Montréal, 16 to 20 September 2019) (see paragraph 2.2.9 of the DGP/27 Report). DGP/27 agreed to wait until a study on the emergency response information needs of relevant stakeholders and how the information could be provided was complete before considering any amendments to the provisions. The study was being conducted by a group of relevant stakeholders to analyse the information needs. The group included pilots, rescue and firefighting personnel and dangerous goods experts.

2.2.8.2 A new proposal referring specifically to electronic transmission as a means of providing information to the pilot-in-command was presented to DGP/28. It was made in response to operators wanting to follow the migration of air waybills and shipper declarations to electronic format, to take advantage of existing electronic data processing (EDP)/electronic data interchange (EDI) formatting, and to minimize face-to-face interactions during the COVID-19 pandemic. The amendment was not supported with the following comments being made:

a) Some felt the proposed amendment to be unnecessary, since the existing provisions did not preclude the transmission of information to the pilot-in-command electronically. Others noted that while this was true, there was still a requirement to provide a printed or written copy.

b) The terminology used in the current provisions was inconsistent and needed clarification, particularly with respect to “written” and “printed”. There were also inconsistencies with Annex 18, which referred only to “written” information.

c) How information was provided to the pilot-in-command should be left to the operator, subject to the State’s approval through the operations manual.

d) The amendment proposed was too prescriptive. The provisions should be performance-based.

e) Concerns expressed at DGP/27 that the amendment would result in flight crews not having a paper copy of the information remained. The member nominated by the International Federation of Air Line Pilots’ Associations (IFALPA) was accompanied by advisers who reiterated these concerns. They explained how electronic data could be lost during flight. They did not oppose electronic transmission and understood the benefits, but could not support allowing an exclusively-electronic notification to captain without a way to provide information to first responders. While acknowledging that electronic information to the flight crew was becoming more and more prevalent, paper copies of emergency checklists were still required.

f) A fire chief from an international airport and board member of the Aircraft Rescue and Fire Fighting Working Group was on hand to explain the needs of emergency responders worldwide. He explained that they prefer paper dangerous goods information due to the fact that they would not always have access to necessary information if it was only available electronically.

2.2.8.3 The panel felt any revisions to the provisions to be premature, given that the work of the stakeholder group was not yet complete. Progress had been made prior to the start of the COVID-19 pandemic, but had stalled because of it. There were also related activities underway at ICAO, including multidisciplinary work on electronic signatures by a joint Flight Operations Panel (FLTOPSP)/Airworthiness Panel (AIRP)/Personnel Training and Licensing Panel (PTLP) working group and amendments to the *Airport Services Manual*, Part 1 — *Rescue and Fire Fighting* and Part 7 — *Airport Emergency Planning* (Doc 9137) were expected. A holistic review of the provisions for information to the pilot-in-command following the completion of the stakeholder group and ICAO working groups was the preferred approach. The fire chief had expressed a need for more concise information to be provided to emergency responders than what was included with the information to pilot-in-command. This could also be considered by the panel once the work of the two working groups was complete.

2.2.9 REVISION TO REQUIRED SPECIAL PROVISION NUMBERS ON TRANSPORT DOCUMENT (DGP/28-WP/41)

2.2.9.1 An amendment to Special Provisions A1 and A2 to specify that the special provision must be annotated on the dangerous goods transport document along with amendments to the list of special provisions required to be annotated on the dangerous goods document provided in Part 5;4.1.5.8.1 b) were agreed at DGP-WG/21 (see paragraph 3.2.2.14 of the DGP-WG/21 Report).

2.2.9.2 Further review following DGP-WG/21 identified the need for a similar amendment to Special Provision A176 and for it to be added to the list in Part 5;4.1.5.8.1 b). Special Provision A176 specified that metal hydride storage systems installed or intended to be installed in vehicles, vessels, machinery, engines or aircraft or in completed components needed to be approved by the appropriate national authority before being accepted for transport. Annotation of the special provision number on the transport document was considered necessary to prevent acceptance staff from overlooking this fact.

2.2.9.3 The need to consider whether Special Provision A78 should be on the list in Part 5;4.1.5.8.1 b) was identified during the discussion of the amendment at DGP-WG/21. It was proposed that it was unnecessary to capture the special provision on the transport document and should therefore be removed from the list in 5;4.1.5.8.1.

2.2.9.4 The amendments were agreed.

2.2.10 **RECOMMENDATIONS**

2.2.10.1 In light of the foregoing discussions, the meeting developed the following recommendations:

Recommendation 2/1 — Amendment to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284) to address air-specific safety risks and identified anomalies for incorporation in the 2023-2024 Edition

That the amendments identified as "Amendments to manage aviation specific risks" in Appendix A to the report be incorporated in the Technical Instructions.

Recommendation 2/2 — Guidance material for the carriage of dry ice

That the Flight Operations Panel (FLTOPSP) Specific Working Group on the Safe Carriage of Goods (SWG-SCG) consider the need for guidance material for the carriage of large quantities of dry ice.

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Agenda Item 2: Managing air-specific safety risks and identifying anomalies *(Ref: REC A DGS 2023)*

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

2.3.1 DRAFT AMENDMENTS TO THE SUPPLEMENT TECHNICAL INSTRUCTIONS TO ADDRESS AIR SPECIFIC SAFETY RISKS AND IDENTIFIED ANOMALIES AGREED AT DGP-WG/20 AND DGP-WG/21 (DGP/28-WP/23)

2.3.1.1 The meeting reviewed amendments to the Supplement to the Technical Instructions to address air-specific safety risks and identified anomalies related to the transport of dangerous goods that were agreed at DGP-WG/20 and DGP-WG/21.

2.3.1.2 The amendments to the Supplement were agreed.

2.3.2 RECOMMENDATION

2.3.2.1 In light of the foregoing discussions, the meeting developed the following recommendation:

Recommendation 2/3 — Amendment to the *Supplement to the Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284SU) to address air-specific safety risks and identified anomalies for incorporation in the 2023-2024 Edition

That the amendments identified as “Amendments to manage aviation specific risks” in Appendix B to the report be incorporated in the Supplement to the Technical Instructions.

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Agenda Item 2: Managing air-specific safety risks and identifying anomalies *(Ref: REC A DGS 2023)*

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

2.4.1 DRAFT AMENDMENTS TO THE *EMERGENCY RESPONSE GUIDANCE FOR AIRCRAFT INCIDENTS INVOLVING DANGEROUS GOODS* (DOC 9481) FOR INCORPORATION IN THE 2023-2024 EDITION (DGP/28-WP/21)

2.4.1.1 The meeting reviewed amendments to the drill codes in the *Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods* (Doc 9481) consequential to the decisions taken by UNCOE at its tenth session (Geneva, 11 December 2021). The amendments also reflected proposals related to accessibility of dangerous goods agreed by DGP-WG/21.

2.4.1.2 The amendments were agreed.

2.4.2 RECOMMENDATIONS

2.4.2.1 In light of the foregoing discussions, the meeting developed the following recommendations:

Recommendation 2/4 — Amendment to the *Emergency Response Guidance for Aircraft Incidents involving Dangerous Goods* (Doc 9481) to address air-specific safety risks and identified anomalies for incorporation in the 2023-2024 Edition

That the *Emergency Response Guidance for Aircraft Incidents involving Dangerous Goods* (Doc 9481) be amended as indicated in Appendix C to the report.

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Agenda Item 3: Facilitating safe transport of dangerous goods by air *(Ref: REC-A-DGS-2023)*

3.1 APPLICABILITY OF DANGEROUS GOODS WITHIN DIVISION 4.1 IN LIMITED QUANTITIES (DGP/28-WP/27)

3.1.1 Part 3;4.1.2 specified that Division 4.1 substances of Packing Groups II and III, other than self-reactive substances, were permitted in limited quantities. However, several substances classified as such were not permitted in accordance with both Table 3-1 and the dangerous goods list in the UN Model Regulations. An amendment to Part 3;4.1.2 was proposed to correct this anomaly by specifying that these specific substances were not permitted in limited quantities.

3.1.2 There was support for the intent of the proposal, with suggestions for minor revisions. These included listing the UN numbers in numerical order and removing "irrespective of the packing group" as it was considered irrelevant. A revised amendment was agreed.

3.2 REVISIONS TO THE EXCEPTED QUANTITY CODE E0 (DGP/28-WP/28)

3.2.1 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 One member opposed adding "E0" to UN 0501 and UN 0509, but did not object to the amendment being adopted given the strong support for it. Others acknowledged that there were some slight deviations from how the "E0" appeared in the UN Model Regulations, but these were considered appropriate for aviation. The Rapporteur of DGP-WG/UN Harmonization noted that the proposed amendment aligned with criteria for assigning excepted quantity codes contained in the *Guidance Material for the Dangerous Goods Panel (DGP) to Aid in the Preparation of the Technical Instructions and Supporting Documents*.

3.2.3 The amendment was agreed. It was pointed out that there were additional inconsistencies with respect to "E0" being assigned to some dangerous goods with Special Provisions A2 and others not. These could be considered during the next biennium.

3.3 REVISION TO PACKING INSTRUCTION Y960 (DGP/28-WP/29)

3.3.1 An amendment to Packing Instruction Y960 was proposed to include aluminium and steel boxes to the list of outer packagings of combination packagings permitted and to add a column to the quantity limit table for the maximum quantity of dangerous goods permitted per package. Not including steel and aluminium boxes was considered 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.

3.3.2 There was some discussion on whether or not the existing "maximum quantity of dangerous goods per kit" column was needed, but it was concluded that it was, as it formed part of the total gross mass per package limit calculation and aligned with a bullet point under "additional packing requirements for combination packagings".

3.3.3 The amendment was agreed.

3.4 PROPOSED EDITORIAL REVISIONS TO TECHNICAL INSTRUCTIONS (DGP/28-WP/32)

3.4.1 An editorial revision to the UN numbers provided in a cross reference to **Engine, internal combustion** from the entry for Gas turbine engines in Table 3-1 and to UN number references associated with aircraft engines, fuel cell engines, 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 incorporated these numbers.

3.4.2 There was support for the proposal in principle, but it was questioned whether the proper shipping names should be spelled out in Table 3-1 and whether reference to "gas turbine engines" was appropriate, since the term was not defined in the glossary, although turbine engines was. It was further questioned whether UN 3530 should be referenced in Table 3-1, as engines assigned to this entry would not be turbine engines. A revised proposal was developed which added the proper shipping names for UN 3528 and UN 3529, removed the reference to UN 3530, added "Gas" to the entry in the glossary for turbine engines and revised the associated UN numbers for this entry. The revised proposal was agreed. The need for amendments to the Russian version of Table 3-1 and the glossary to align with the English version were also identified.

3.5 PROVISIONS FOR PORTABLE INSULIN REFRIGERATORS POWERED BY LITHIUM BATTERIES CARRIED BY PASSENGERS (DGP/28-WP/37)

3.5.1 An amendment to add portable insulin refrigerators powered by lithium batteries to the provisions for dangerous goods carried by passengers and crew contained in Table 8-1 was proposed. While these devices would be considered a battery-powered portable electronic device and permitted under the entry for lithium batteries (including portable electronic devices), there was a concern that check-in staff might prevent passengers from carrying them because refrigerators were listed in the list of items that could potentially contain dangerous goods provided in Part 7;6 as an aid to recognizing undeclared dangerous goods.

3.5.2 The amendment was not supported given the fact that the devices were already permitted under the existing Table 8-1 provisions. Adding a specific item went against an earlier decision of the panel to keep Table 8-1 general. The proposer was satisfied with an acknowledgement in the DGP/28 report that the panel agreed that passengers and crew were permitted to carry portable insulin refrigerators powered

by lithium batteries in accordance with the entry for lithium batteries in Table 8-1, which included portable electronic devices.

3.6 REVISION TO CALCULATION OF THE "Q" VALUE REQUIREMENT FOR UN 3316 (DGP/28-WP/38)

3.6.1 A revision to the exceptions from the calculation of the "Q" value in Part 4;1.1.9 e) was proposed to include UN 3316 — **Chemical kit**s or **First aid kits** containing a total net quantity of dangerous goods in the package within the limits established in Table 3-1. The intent of the revision was to ensure the exception from the "Q" value applied even if the physical states or most stringent packing group assigned to any individual substance in each kit were different. It was suggested that calculating the "Q" value would be irrelevant for UN 3316 because it would always be less than or equal to 1. This was on account of the maximum net quantity per package limit established in Table 3-1 being the same for each kit regardless of the physical state or the most stringent packing group assigned to any individual substance in each kit.

3.6.2 The amendment was not supported. Panel members believed it would create confusion and considered it unnecessary, given that the "Q" value was not required for chemical or first aid kits containing various dangerous goods. Packing Instruction 960 prohibited the kits from being packed with other dangerous goods in the same outer packaging (with the exception of dry ice), but other dangerous goods within the kits were permitted without the need for a "Q" value.

3.6.3 The proposer appreciated the comments and would conduct more research on the issue following DGP/28.

3.7 REVISION TO INNER PACKAGING MATERIAL OF POLYESTER RESIN KIT (DGP/28-WP/39)

3.7.1 Editorial amendments to the packing instructions assigned to UN 3527— **Polyester resin kit, solid base material** and UN 3269 — **Polyester resin kit, liquid base material** were proposed. Packing Instructions 450 and Y450, which were assigned to UN 3527, set inner packaging quantity limits for the base liquid material despite the fact that UN 3527 was a solid base material. An amendment to replace "base liquid material" with " solid base material" was agreed. Packing Instructions 370 and Y370, which applied to UN 3269, also set inner packaging quantity limits for the "base liquid material". It was agreed to replace this reference with" liquid base material" for the sake of consistency with the proper shipping name. There were no objections to the proposal. It was noted that the UN Model Regulations did not distinguish between a liquid or solid base material, they simply referred to a base material. The need for additional amendments to the Spanish version of the Technical Instructions were also identified. The amendments were agreed.

3.8 BATTERY-POWERED MOBILITY AIDS (DGP/28-WP/43)

3.8.1 Amendments to the provisions for battery-powered mobility aids carried by passengers and crew in Part 7;2.13 and Table 8-1 were proposed based on feedback provided at DGP-WG/21 (see paragraph 3.2.2.20 of the DGP-WG/21 Report). The intent of the amendments was to make it clear that the existing requirement for "the battery" to be either securely attached to the mobility aid or removed from the mobility aid did not mean that only one battery could be removed and to clarify that a single spare

battery could not have a Watt-hour rating exceeding 300 Wh, and two spare batteries could not have a Watt-hour rating exceeding 160 Wh each.

3.8.2 A revised proposal which clarified the intent of 7;2.13.3.2 and Table 8-1 with respect to the Watt-hour limits for batteries removed from the mobility aid was agreed. There was some discussion on whether or not the intent was appropriate, recognizing that the amendment made it clear that multiple high-capacity batteries could be removed, but the panel had agreed to this during its discussions at DGP-WG/21. There was a limit for spare batteries so that only one not exceeding 300 Wh or two not exceeding 160 Wh could be carried, but there was no limit on the number of batteries installed in the mobility aid permitted. While acknowledging the potential for a significant number of high capacity batteries, the panel had agreed that it would be up to the operator to assess the risk and implement any necessary mitigation measures.

3.9 REVISION TO PACKING INSTRUCTION 962 (DGP/28-WP/48 (ENGLISH ONLY))

3.9.1 An amendment to Packing Instruction 962 was proposed to increase the maximum net quantity of environmentally hazardous substances permitted in a package consigned as UN 3363 — **Dangerous goods in articles** or **Dangerous goods in apparatus** or **Dangerous goods in machinery**. The amendment was made to address a gap introduced through an amendment agreed at DGP-WG/21 allowing for articles containing environmentally hazardous substances to be transported by air as UN 3548 — **Articles containing miscellaneous dangerous goods, n.o.s.** The agreed amendment included a minimum net quantity of environmentally hazardous substances needed to use this entry (5 L for liquids and 5 kg for solids), which was established to ensure that classification of articles containing environmentally hazardous substances for the air mode was consistent with the UN Model Regulations. However, this created a gap between the upper net quantity of environmentally hazardous substances limits established for UN 3363, which was 0.5 L for liquids and 1 kg for solids, and the lower quantity limits established for UN 3548. This meant that the only way to transport articles containing quantities of environmentally hazardous greater than 0.5 L/1 kg but less than 5 L/5 kg would be through an approval in accordance with Special Provision A107, and this was considered unnecessary.

3.9.2 While there was support for closing the gap, members were not convinced the amendment proposed effectively solved the problem and were concerned it might have other unintended consequences. More work was needed. The amendment was not agreed.

3.10 LARGE ARTICLES CONTAINING DANGEROUS GOODS N.O.S. (DGP28-WP/49 (ENGLISH ONLY))

3.10.1 Amendments were agreed at DGP-WG/21 that would allow for the transport of UN 3538 — **Articles containing non-flammable, non-toxic gas, n.o.s.** and UN 3548 — **Articles containing miscellaneous dangerous goods, n.o.s.** under specific conditions. One of the conditions was that for UN 3538 the only dangerous goods permitted in the articles was a Division 2.2 gas without a subsidiary hazard, but excluding refrigerated liquefied gases and gases forbidden for transport on passenger aircraft and for UN 3548 the only dangerous goods permitted in the article were environmentally hazardous substances. It was identified following the DGP-WG/21 discussions that some articles that would be assigned to UN 3538, such as magnetic resonance imaging (MRI) scanners, could also contain small lithium cells or batteries. While Part 2;0.6.2 permitted lithium batteries to be contained in the articles, it was

considered beneficial to specify they were permitted in the new special provisions agreed at DGP-WG/21. A revision to the new Special Provisions A224 assigned to UN 3548 and A225 assigned to UN 3538 was therefore proposed to allow lithium cells or batteries that comply with the Section II provisions of Packing Instruction 967 or Packing Instruction 970, as applicable.

3.10.2 There were no objections to the proposal. There was some discussion on how the batteries would be classified if they were larger than what was permitted by Section II. The proposer noted that limiting what was permitted to Section II batteries was intentional based on industry needs, which were smaller batteries, and to avoid complications associated with fully regulated batteries. The amendment was agreed, subject to some minor editorial revisions.

3.11 RECOMMENDATION

3.11.1 In light of the foregoing discussions, the meeting developed the following recommendation:

Recommendation 3/1 — Amendment to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284) to facilitate transport for incorporation in the 2023-2024 Edition

That the amendments identified as “Amendments to facilitate transport” in Appendix A to the report be incorporated in the Technical Instructions.

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Agenda Item 4: Managing safety risks posed by the carriage of lithium batteries by air *(Ref: Job Card DGP.003.03)*

4.1 DELETION OF SECTION II OF PACKING INSTRUCTIONS 965 AND 968 (DGP-WG/21-WP/4) AND DELETION OF SECTION II OF PACKING INSTRUCTIONS 965 AND 968 (RELATED TO DGP/28-WP/4) (DGP-WG/21-IP/1)

4.1.1 The meeting discussed a proposal to eliminate the exceptions from the Technical Instructions that were provided in Section II of the packing instructions for UN 3480 — **Lithium ion batteries** (Packing Instructions 965) and UN 3090 — **Lithium metal batteries** (Packing Instruction 968) by deleting that section. Section II had been designed to facilitate the transport of small lithium cells and batteries from most of the provisions of the Technical Instructions, including requirements for operators to perform an acceptance check and for information to be provided to the pilot-in-command. These exceptions made the batteries less visible to the operator, which affected its ability to conduct specific safety risk assessments on the carriage of items in the cargo compartment as required by Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes*. The reduced transparency also increased the risk of UN 3480 or UN 3090, which were permitted for transport on cargo aircraft only, being inadvertently loaded on a passenger aircraft. It was noted that for these reasons, the IATA Dangerous Goods Board had unanimously decided to remove the exceptions from the IATA Dangerous Goods Regulations from 1 January 2022. There were no objections to removing the exceptions, although some members expressed concern that this would result in an increase in incidents of undeclared lithium batteries being offered by shippers wanting to save money. These concerns were not shared by all. Undeclared dangerous goods were an on-going concern that needed to be addressed regardless of whether or not the exceptions were in place, and most panel members did not believe the number of dishonest shippers would increase if the exceptions were removed. The impact on the shipper was discussed, with one industry advisor requesting an exception from the full training requirements and from the marking and labelling requirement, if the package dimensions were inadequate for the Class 9 lithium battery hazard label and the cargo aircraft only label to appear on the same surface of the package. Panel members did not believe there was sufficient justification for these alleviations. The amendment as proposed was agreed. A detailed report of the discussions is provided in Appendix A to the report on this agenda item.

4.2 PACKAGING STANDARD FOR LITHIUM BATTERIES, SECTION IB AND II (DGP/28-WP/5) AND RECOMMENDATIONS TO FURTHER ENHANCE THE SAFETY IN THE TRANSPORT OF LITHIUM BATTERIES CONTAINED IN EQUIPMENT (DGP/28-IP/2)

4.2.1 An amendment to Section IB of Packing Instructions 965 and 968 and Section II of Packing Instructions 966, 967, 969 and 970 was proposed to mitigate against the risk of damage to batteries. The amendments introduced requirements for a 3 metre stack test in Sections IB and II of the lithium battery packing instructions (Packing Instructions 965 to 970) and a 1.2 metre drop test in Section II of the lithium battery packing instructions for batteries contained in equipment (Packing Instructions 967 and 970). The 1.2 metre drop test was an existing requirement in all of the other packing instructions. Requiring a 3 metre stack test and a 1.2 metre drop test was consistent to what was required for dangerous goods shipped in

limited quantities in accordance with Part 3;5 of the Instructions. The need for the amendment was prompted by an incident involving mobile phones catching fire on a ramp while waiting to be loaded on an aircraft. There was no evidence of non-compliance, including from the UN *Manual of Tests and Criteria* design type testing requirements, and the investigation into the cause was inconclusive. The mobile phones were stacked approximately 2 metres high on a pallet, and it was questioned whether they could have been damaged by the force applied by other packages stacked on top. A number of recommendations to enhance the safety of lithium battery transport, including packaging for lithium ion and lithium metal batteries contained in equipment, were provided in an information paper.

4.2.2 While there was support for the proposal in principle, the need for a drop test for large equipment containing batteries was considered problematic and unnecessary, particularly since the equipment often contained very small batteries that would not pose any risk. It was also questioned whether a stack and a drop test for batteries contained in equipment in accordance with Section II of Packing Instructions 967 and 970 was reasonable, given that the amended packing requirements would make Section II more stringent than what was required by Section I. The proposal to include the requirements for a stack test for batteries packed with or contained in equipment in Section II of Packing Instructions 966, 967, 969 and 970 and the drop test for batteries contained in equipment in Section II of Packing Instructions 967 and 970 was therefore withdrawn. The proposal to include the requirements for a stack test in Section IB of Packing Instructions 965 and 968 was agreed.

4.2.3 While considering the amendments, deficiencies in amendments to Section II.2 of Packing Instructions 966 and 969 agreed at DGP-WG/20 (see paragraph 3.3.6.1.3 of the DGP-WG/20 Report) were identified. The amendments resulted in certain packaging configurations being excluded from the provisions. Attempts to correct the deficiencies were unsuccessful, and the amendments agreed at DGP-WG/20 were withdrawn. A solution would be worked on during the next biennium.

4.3 REDUCED STATE OF CHARGE NOT EXCEEDING 30 PERCENT FOR UN 3480 THROUGH PACKING INSTRUCTION 965 (DGP/28-WP/6), REDUCED STATE OF CHARGE NOT EXCEEDING 30 PERCENT FOR UN 3481 THROUGH PACKING INSTRUCTIONS 966 AND 967 (DGP/28-WP/7) AND REDUCED STATE OF CHARGE NOT EXCEEDING 30 PER CENT FOR UN 3171 (DGP/28-WP/10)

4.3.1 The meeting discussed amendments to several lithium ion battery packing instructions that proposed requiring cells and batteries to be shipped at the lowest practical state of charge, but not exceeding 30 per cent. The amendments included a revision to the existing 30 per cent limit required for UN 3480 — **Lithium ion batteries** and an extension of the limit to all lithium ion battery shipments. The proposer explained that his intent was to minimize risk of thermal runaway, the propagation of thermal runaway from cell to cell, and the generation of explosive gases during transport.

4.3.2 The packing instructions for which amendments were proposed were:

a) Packing Instructions 965 assigned to UN 3480 — **Lithium ion batteries**;

b) Packing Instruction 966 assigned to UN 3481 — **Lithium ion batteries packed with equipment**;

c) Packing Instruction 967 assigned to UN 3481 — **Lithium ion batteries contained in equipment**; and

d) Packing Instruction 952 assigned to UN 3171 — **Battery-powered equipment** and **Battery-powered vehicle.**

Amendments to Packing Instructions 910 and 974 of the Supplement to the Technical Instructions were also proposed. The report of the discussion on these packing instructions is provided in paragraph 4.4.

4.3.3 The meeting discussed the proposals in principle with a focus on:

a) requiring the lowest practical state of charge, but not exceeding 30 per cent, without reviewing the proposed amendment to each specific packing instruction; and

b) extending the state of charge limit contained in Packing Instruction 965 to other lithium ion battery packing instructions with a focus on lithium ion batteries packed with and contained in equipment.

4.3.4 **Lowest practical state of charge, but not exceeding 30 per cent**

4.3.4.1 The panel supported the intent of requiring the lowest practical state of charge (not exceeding 30 per cent), but could not agree to the proposal as written as it was considered ambiguous and difficult to implement and enforce. There was some support for a recommendation, but wording could not be agreed. The majority of panel members considered it premature to make any changes to the Technical Instructions, but supported having DGP-WG/Energy Storage Devices giving the issue careful consideration over the next biennium. A detailed list of comments made during the discussion is provided in Appendix B to the report on this agenda item.

4.3.5 **Extending the state of charge limit contained in Packing Instruction 965 to other lithium ion battery packing instructions**

4.3.5.1 While there was some support for extending the existing state of charge limit for UN 3480 to UN 3481, particularly for lithium batteries packed with equipment, the panel could not reach consensus on mandating such a requirement without first conducting a thorough safety risk assessment. Time constraints made this impossible during DGP/28. It was recommended it be conducted by DGP-WG/Energy Storage Devices as soon as possible following DGP/28, preferably during the first half of 2022. Given the complexity of the task, it was further recommended that the safety risk assessment be conducted under the guidance of safety management experts through coordination with the Secretariat. If the safety risk assessment identified an intolerable risk, the panel would recommend risk mitigation measures, which might include a mandatory reduced state of charge. Battery industry participants stressed that there would be an enormous economic impact should a state of charge limit to equipment be required. The need to assess the safety risk before considering the industry impact was stressed. The impact on the battery industry would be considered when considering risk mitigation measures, should they be necessary. An addendum to the 2023-2024 Edition of the Technical Instructions to incorporate agreed amendments would be recommended if considered necessary. A detailed list of comments made during the discussion is provided in Appendix B to the report on this agenda item.

4.4 REDUCED STATE OF CHARGE NOT EXCEEDING 30 PER CENT FOR UN 3481 THROUGH PACKING INSTRUCTION 910 OF THE SUPPLEMENT (DGP/28-WP/9) AND REDUCED STATE OF CHARGE NOT EXCEEDING 30 PER CENT FOR LITHIUM ION BATTERIES WITH A MASS EXCEEDING 35 KG THROUGH PACKING INSTRUCTION 974 DGP/28-WP/8)

4.4.1 The amendment requiring batteries to be shipped at the lowest practical state of charge, but not exceeding 30 per cent that was proposed for the lithium batter packing instructions in the Technical Instructions (see paragraph 4.3) was also proposed to Packing Instructions 910 and 974 of the Supplement. Packing Instruction 910 applied to low production run and prototype lithium batteries and cells not meeting the UN 38.3 test criteria shipped under an approval and Packing Instruction 974 applied to lithium cells or batteries having a mass exceeding 35 kg shipped under an approval. The amendment was not agreed for the same reason it was not agreed for the packing instructions in the Technical Instructions. It would be given further consideration once the safety risk was assessed.

4.4.2 Packing Instructions 910 and 974 applied to UN Nos. 3090, 3091, 3480 and 3481. Each contained a provision requiring lithium ion cells and batteries to be offered for transport at a state of charge not exceeding 30 per cent of their rated capacity but did not specify that this applied to both UN 3480 and 3481. An amendment to Packing Instructions 974 to clarify it applied to both was agreed. A similar amendment to Packing Instruction 910 had been agreed at DGP-WG/21 (see paragraph 3.2.3.3.2 of the DGP-WG/21 Report).

4.5 PROHIBITING PASSENGERS AND CREW FROM CARRYING DAMAGED OR DEFECTIVE LITHIUM BATTERIES IN THE CABIN OR CHECKED BAGGAGE (DGP/28-WP/24)

4.5.1 An amendment to the provisions for dangerous goods carried by passengers or crew contained in Table 8-1 was proposed to prohibit passengers and crew from carrying damaged or defective lithium batteries in the cabin or checked baggage. The amendment was made to mitigate against the risk of a fire, which was known to be greater when batteries were damaged or defective. It was the reason that Special Provision A154 prohibited their transport as cargo on aircraft.

4.5.2 The amendment was not agreed. The panel recognized there was a risk, but did not consider the proposed amendment to be an effective measure to mitigate it. Assessing whether or not there was damage would be difficult, as would implementing the requirement. Prohibiting damaged and defective batteries from being shipped as cargo versus prohibiting passengers from carrying damaged or defective batteries were very different in that it would be difficult to prevent a passenger from carrying their personal items on board the aircraft. A distinction between lithium battery-powered devices that were recalled due to manufacturing defects and a personal device carried by a passenger that had been damaged through use was also made. Regulatory text might have an impact on the former, but it was unlikely to have an impact on passengers' behaviour. Educating passengers on the safety risks associated with all dangerous goods and how to empower them to take appropriate measures to reduce the risks would be a better approach to change passenger behaviour.

4.5.3 The panel did support further work on the issue. This might result in additional regulations and/or guidance on how to reach passengers. It was recognized that the FLTOPSP-SCG-SWG was tasked with developing guidance on how to develop procedures for preventing and responding to incidents involving lithium batteries carried by crew, passengers and the operator. There was some discussion on whether the scope of this work was limited to responding to incidents or if it also involved measures to prevent passengers and crew from introducing safety risks through the items they brought on board the aircraft. The Secretariat would coordinate within ICAO to clarify the scope.

4.6 REQUIREMENT FOR DEVICES CONTAINING LITHIUM BATTERIES TO BE SWITCHED OFF WHEN OFFERED FOR TRANSPORT AS CARGO (DGP/28-WP/25)

4.6.1 An amendment to the packing instructions for lithium batteries contained in equipment (Packing Instructions 967 and 970) was proposed to require the equipment to be switched off. The amendment was made to mitigate against the risk of a fire, which was greater when equipment containing batteries was turned on. For this reason, batteries contained in portable electronic devices carried by passengers or crew in checked baggage was required to be completely switched off. The packing instructions did contain provisions to prevent accidental activation during transport, but none that explicitly required the equipment to be switched off. The amendment included an exception for radio frequency identification (RFID) tags, watches and temperature loggers used during transport.

4.6.2 Although there was sympathy for the intent, the amendment as proposed was not supported. There were concerns it would have unintended consequences for devices that were not listed with the exceptions and needed to remain powered on, including certain medical devices. The amendment was not agreed, but there were some who thought a requirement for devices that did not need to remain powered on was appropriate and agreed to work with the proposer on a revised proposal during the next biennium.

4.7 DELETION OF SPECIAL PROVISION A206 (DGP/28-WP/40)

4.7.1 The panel was invited to consider deleting Special Provision A206, which was assigned to the lithium ion and lithium metal battery entries in Table 3-1 to specify that the Miscellaneous dangerous goods — lithium batteries, Class 9 label must be applied to packages containing them. It had value when it was originally introduced, because it contained a transition period during which the general miscellaneous dangerous goods label could be applied which had since expired. It was redundant without the transition period, since the label to be applied was specified in Column 5 of Table 3-1, in Section IB of the lithium battery packing instructions, and in Part 5;3. A similar special provision was included in the UN Model Regulations, but it was necessary there because the dangerous goods list in the UN Model Regulations did not have a label column, and the special provision included a requirement for placarding cargo transport units, which did not apply to the air mode. The amendment was agreed.

4.8 DAMAGED OR DEFECTIVE LITHIUM BATTERY INSTALLED IN ENGINE, MACHINERY, VEHICLE OR LIFE-SAVING APPLIANCE (DGP/28-WP/45) (ENGLISH ONLY)

4.8.1 Packing Instructions for engines and machinery, vehicles, and life-saving appliances (Packing Instructions 220, 378, 950, 951, 952, 955 and 972) contained provisions for lithium batteries but not for damaged or defective batteries. This was a misalignment with the UN Model Regulations, which included specific requirements for articles containing damaged or defective batteries through special provisions or within packing instructions assigned to most of these entries. The Technical Instructions prohibited damaged and defective batteries from transport in the packing instructions assigned to UN 3090 — **Lithium metal batteries**, UN 3091 — **Lithium metal batteries contained in** or **packed with equipment**, UN 3480 — **Lithium ion batteries**, and UN 3481 — **Lithium ion batteries contained in** or **packed with equipment** and through Special Provision A154, which was assigned to UN Nos. 3090, 3091, 3480 and 3481. Accordingly, an amendment assigning Special Provision A154 to the entries for engines and machinery, vehicles, and life-saving appliances in Table 3-1 (UN Nos. 2990, 3072, 3166, 3171, 3528, 3529 and 3530) and amendments to the associated packing instructions (Packing Instructions 220, 378, 950, 951, 952, 955 and 972) was proposed to prohibit these articles from transport by air if they contained damaged or defective lithium batteries.

4.8.2 The amendment was agreed, subject to editorial amendments to align the text with additional provisions for lithium batteries not tested in accordance with Section 38.3 of the UN Manual of Test and Criteria that the panel agreed to add (see paragraph 4.12). It was noted that the UN Model Regulations did not have provisions for damaged or defective batteries in relation to UN No. 2990 — **Life-saving appliances, self-inflating** or UN 3072 — **Life-saving appliances, not self-inflating**. The UN Sub-Committee would be informed of the panel's decision to apply Special Provision A154 to these entries.

4.9 CLARIFICATION OF PACKAGING PERFORMANCE FOR SECTION II OF PACKING INSTRUCTIONS 966 AND 969 (DGP/28-WP/46) (ENGLISH ONLY)

4.9.1 Amendments to packaging performance provisions in Section II of Packing Instructions 966 and 969 were proposed to align with proposed amendments to Section II of Packing Instructions 967 and 970 that were agreed at DGP-WG/21 (see paragraph 3.3.1.1 of the DGP-WG/21 Report). The need for a similar amendment to Packing Instructions 966 and 969 had been overlooked at that time. The amendments combined two sentences related to the packing requirements (one in Section II.1 and the other in Section II.2) into a single sentence and, in so doing, removed an inappropriate reference to the cells and batteries being packed in strong outer packagings. This was not the case for lithium batteries and cells packed with equipment, as the packaging containing the cells or batteries was inner packaging. The amendment was agreed.

4.10 REQUIREMENTS FOR OVERPACKS FOR SECTION II LITHIUM BATTERIES (DGP/28-WP/47) (ENGLISH ONLY)

4.10.1 Section II of the packing instructions for lithium batteries (Packing Instructions 965 to 970) excepted packages from all of the provisions of the Technical Instructions other than those specifically

referenced in the packing instructions. The exceptions included one from the requirements for packages placed in overpacks to be secured and the intended function of each package not impaired by the overpack (Part 5;1.1 f) and i)). Concerns had been raised by operators and some regulatory authorities with inadequately protected lithium battery packages placed in overpacks and non-rigid bags, predominately those shipped via e-commerce, and the potential for the lithium batteries contained in these packages to be damaged. An amendment was therefore proposed to incorporate the Part 5;1.1 f) and i) requirements in Section II of the lithium batteries packing instructions. The amendment was agreed.

4.11 ALIGNMENT OF SPECIAL PROVISIONS A88 AND A99 OF THE TECHNICAL INSTRUCTIONS WITH PACKING INSTRUCTION 974 OF THE SUPPLEMENT (DGP/28-WP/56)

4.11.1 An amendment to Special Provisions A88 and A99 was proposed to replace references to "battery or battery assembly" with " cell or battery". The amended text aligned with text in the associated packing instructions, which did not refer to battery assemblies, and with the definition for lithium battery and its accompanying note in Attachment 2 to the Technical Instructions. The amendment was agreed.

4.12 LITHIUM BATTERIES INSTALLED IN VEHICLES THAT ARE NOT UN 38.3 TESTED (DGP/28-WP/57)

4.12.1.1.1 An amendment was proposed to the lithium battery provisions contained in packing instructions for vehicles and battery-powered vehicles or equipment to correct an inconsistency with Special Provision A88. Each packing instruction specified that lithium batteries were subject to the provisions of Part 2;9.3, unless otherwise approved by the appropriate authority of the State of Origin. Part 2;9.3 included the requirement for each cell or battery to be of a type meeting the requirements of Part III, subsection 38.3 of the UN *Manual of Tests and Criteria*. Special Provision A88 permitted low production runs and pre-production prototypes of lithium batteries or cells transported for testing to be shipped on cargo aircraft without meeting these requirements, if approved by the appropriate authority of the State of Origin and the State of the Operator. This created an inconsistency with respect to shipping untested battery types in the vehicles or equipment whereby the packing instructions required an approval from the appropriate national authority of the State of Origin, while Special Provision A88 required an approval from the State of Origin and the State of the Operator. It was suggested that the risk posed by a battery of a type not subject to the UN tests was equivalent, at a minimum, regardless of whether or not it was installed in a vehicle or equipment. The proposed amendment therefore introduced a new provision to the packing instructions to include the State of the Operator in the approval process for untested lithium batteries.

4.12.1.1.2 A second amendment was also proposed to the battery provisions in the packing instructions which removed redundant text regarding the need for the batteries to be securely fastened in the vehicle and protected from short circuit.

4.12.2 The amendments were agreed, subject to editorial revisions.

4.13 REPORT OF THE DANGEROUS GOODS PANEL WORKING GROUP ON ENERGY STORAGE DEVICES (DGP-WG/ENERGY STORAGE DEVICES) (DGP/28-IP/3)

4.13.1 An update on the work of the Dangerous Goods Panel Working Group on Energy Storage Devices (DGP-WG/Energy Storage Devices) was provided by its rapporteur. Details of this update are provided in Appendix C to the report on this agenda item.

4.13.2 The new items assigned to DGP-WG/Energy Storage Devices during DGP/28, including the conduct of a safety risk assessment on lithium batteries packed with or contained in equipment that the panel agreed should be done (see paragraph 4.3 of this report), would be scheduled in 2022. The work would include the assessment of safety risks associated with both batteries packed with and contained in equipment and battery-powered vehicles and equipment. It was recognized that the outcome of the assessment would likely be different for each, as would any mitigating measures that might be recommended. DGP-WG/Energy Storage Devices would also be developing proposed text to address the objective of having lithium batteries shipped at the lowest state of charge practicable, but not more than 30 per cent of their rated capacity, at least as a best practice.

4.14 RECOMMENDATION

4.14.1 In light of the foregoing discussions, the meeting developed the following recommendation:

Recommendation 4/1 — Amendment to lithium battery provisions for incorporation in the 2023-2024 Edition of the *Technical Instructions for the Safe Transport of Dangerous Goods by Air (Doc 9284)*

That the amendments identified as “Amendments to lithium battery provisions” in Appendix A to the report be incorporated in the Technical Instructions.

Recommendation 4/2 — Amendment to lithium battery provisions for incorporation in the 2023-2024 Edition of the *Supplement to the Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284SU)

That the amendments identified as “Amendments to lithium battery provisions” in Appendix B to the report be incorporated in the Supplement to the Technical Instructions.

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APPENDIX A TO THE REPORT ON AGENDA ITEM 4
(English only)

DETAILED REPORT ON PROPOSAL TO REMOVE EXCEPTIONS FROM FULL REGULATION CONTAINED IN SECTION II OF PACKING INSTRUCTIONS 965 AND 968

The following are comments provided during discussions on proposals to remove exceptions from full regulation contained in Section II of Packing Instructions 965 and 968.

1. UNDECLARED LITHIUM BATTERIES

There was wide support for the proposal, although some members expressed concern that removing the exceptions would result in an increase in incidents of undeclared lithium batteries being offered by shippers wanting to save money. However, these concerns were not shared by all. Undeclared dangerous goods were an on-going concern that needed to be addressed regardless of whether or not the exceptions were in place, and most panel members did not believe the number of dishonest shippers would increase if the exceptions were removed. Maintaining the exceptions affected the ability of the operator to assess and manage the safety risks associated with the batteries because they were not visible in the system and because some of the existing mitigation measures built into the Technical Instructions did not apply to Section II batteries. Operators were implementing measures to reduce the risk of undeclared lithium batteries being loaded on aircraft, including additional security screening. They were requesting that regulatory authorities increase measures, including enforcement, as well. Some panel members noted that most operators in their States were already not accepting or would stop accepting Section II batteries because of challenges in managing the safety risk. Others, from both State authorities and airlines, noted that there was no increase in undeclared lithium batteries once Section II batteries stopped being accepted.

2. IMPACT ON SHIPPERS

The impact on shippers and whether or not there was data to assess the impact should the exceptions be removed was discussed, although one panel member suggested this was irrelevant in that there should be an impact, otherwise implementing a change was pointless. While there would be an additional cost to shippers who had been using Section II, this was necessary so that operators were provided with what they needed to manage the safety risk. Members of the battery industry advised that there would be minimal impact on large shippers but that there could be an impact in certain regions, notably Asia, where the Section II provisions were used more often. An adviser, while acknowledging that there might be little impact on large shippers if the exceptions were removed, noted that the majority of shippers who used the Section II provisions were small. It was questioned whether some relaxation could be provided to them. An industry adviser expressed particular concern with the added cost to shippers that would result from them being subject to the full training requirements of the Technical Instructions, the requirement for the Class 9 lithium battery hazard label and cargo aircraft only label to appear on the same surface of the package (which might result in a need for a larger packaging), and the operator being subject to a full acceptance check (which would likely result in a charge levied on the shipper). He suggested that these added costs would increase the risk of lithium batteries being shipped without being declared as dangerous goods. He therefore requested the panel consider providing an exception from the full training requirements and from the "same surface" marking and labelling requirement if the package dimensions were inadequate for them

to appear on the same surface of the package. While there was some sympathy expressed for an exception from the "same surface" marking and labelling requirement, there was little support for an exception from training. It was considered contradictory to not require training to ship lithium batteries when it was required for dangerous goods that posed a much lower safety risk. It was also considered contradictory to prohibit lithium batteries from transport on passenger aircraft because of the safety risk but to allow exceptions from some of the major mitigation measures that the Technical Instructions provided, including training, for transport on cargo only aircraft. The term "adequate instruction", which was the existing requirement for Section II batteries, was also considered vague and inconsistent with the new training provisions that supported a competency-based approach to training and assessment. The potential need for much larger packaging relative to the cells or batteries inside, in order to accommodate marks and labels on the same surface, was raised. It was suggested the empty volume could affect the quality of packaging and introduce a safety risk. However, not having the hazard label with the cargo aircraft only label on the same surface also introduced a safety risk in that the information the labels conveyed might not be visible to the operator. An industry observer noted the millions of lithium battery packages moved by his airline and the importance of being able to see the labels clearly. If not clearly visible there was a risk that a cargo aircraft only label would be missed and a forbidden package loaded on a passenger aircraft. The impact exceptions had on the complexity of the provisions was also raised, as this went against the objective of simplifying the lithium battery provisions to aid with compliance.

3. IMPLEMENTATION

Whether an addendum to the current edition of the Technical Instructions would be appropriate was discussed, recognizing that the exceptions would be removed from the IATA Dangerous Goods Regulations beginning 1 January 2022. The panel did not consider this necessary.

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APPENDIX B TO THE REPORT ON AGENDA ITEM 4
(English only)

DETAILED REPORT ON PROPOSALS TO INTRODUCE STATE OF CHARGE RESTRICTIONS TO LITHIUM BATTERY PACKING INSTRUCTIONS IN THE TECHNICAL INSTRUCTIONS

The following are comments provided during discussions on proposals to introduce state of charge restrictions to lithium battery packing instructions in the Technical Instructions

1. REDUCED STATE OF CHARGE NOT EXCEEDING 30 PERCENT FOR UN 3480 THROUGH PACKING INSTRUCTION 965 (DGP/28-WP/6)

Support for requiring the lowest practical state of charge for lithium ion cells and batteries but not exceeding 30 per cent of their rated capacity

a) All panel members supported the objective with agreement that shipping at the lowest, or safest, state of charge possible, without introducing a cell degradation hazard, was a good practice and might be something that could be recommended.

b) There was data that indicated a problem, and proactive measures needed to be taken to prevent an accident.

c) A 30 per cent state of charge limit for UN 3480 — **Lithium ion batteries** was introduced in the 2015-2016 Edition of the Technical Instructions based on FAA data that focused on 18650 cells, but this data was not extensive. It demonstrated that this limit significantly reduced the risk of thermal propagation for the majority of cell and battery types that were being transported at that time, but it was never accepted as providing a safe level for all. It was implemented to quickly and easily reduce the general risk the batteries posed to air transport. It was a prescriptive target. Some cells and batteries posed significant risk if they entered thermal runaway even at a 30 per cent state of charge. “Lowest practical” would reduce that risk.

d) A reduced state of charge might not be possible for certain devices, including medical devices, and something could be done to address this, but it was unacceptable to put passengers at risk so that consumer devices could be ready for use when delivered.

e) The wording of the amendment proposed was ambiguous, but could adapt it to clarify the intent. “Practicable” would be a more appropriate word choice than “practical”.

Justification for maintaining the status quo

a) The language used was not appropriate for regulations.

b) "Lowest practical state of charge" was not defined, which would make it very difficult to implement, particularly further down the supply chain. Manufacturers might be capable of determining the safest state of charge, but it would be challenging for others in the distribution chain.

c) It would be difficult to enforce.

d) What determined the lowest state of charge practical was not fixed for a given battery. The optimal level would change over the lifespan of a battery.

e) A mandatory requirement was unjustified without data demonstrating that a 30 per cent limit was inadequate. Could be a best practice, but not a mandatory requirement.

2. EXTENDING 30 PERCENT STATE OF CHARGE LIMIT TO UN 3481 THROUGH PACKING INSTRUCTIONS 966, 967 AND UN 3171 THROUGH PACKING INSTRUCTION 952 (DGP/28-WP/7 AND DGP/28-WP/10)

Support for extending 30 per cent State of charge to Packing Instructions 966, 967 and 952

a) There was some support to recommend state of charge limits for batteries packed with equipment through Packing Instruction 966 immediately, as these were not considered to be much different to batteries packed on their own. There was little data to demonstrate that equipment provided adequate protection from both thermal runaway propagation and explosive gas generation.

b) Limiting the state of charge was accepted as a significant safety benefit for batteries packed on their own, and extending the requirement to UN 3481 would further reduce the risk of a lithium battery incident during transport.

c) Not applying a state of charge limit to batteries packed with or contained in equipment may have been justified when the limit was applied to batteries packed on their own because of the protection the equipment provided, but there was an increased trend towards more powerful and energetic batteries, the numbers transported, and a diminishing ratio of equipment to batteries which meant less protection. The author of the proposal suggested that devices in the past usually consisted mostly of equipment that contained a battery, but that there was now a trend toward devices being composed mostly of batteries.

d) Publicly-available FAA data and data from a reporting system established by UL (Thermal Runaway Incident Program (TRIP)) suggested that more air cargo incidents involving lithium battery powered equipment occurred than what was reported through mandatory reporting mechanisms. The number of airlines reporting to TRIP was a small subset of the aviation industry, but yet sixty-three cargo operation incidents involving lithium batteries had been reported between 2017-2021. This was just one system, and it was known that many incidents went unreported. While the number may have been small relative to the number of shipments, the severity of potential

consequences from an incident needed to be taken into account to assess risk. There was also an overwhelming amount of data identifying a reduced state of charge as a valuable mitigation measure against both the likelihood and the severity of an event. There was a need to be proactive, not reactive.

e) A lack of confidence with a member from the battery industry's conclusion that the data from the cited report on the heat release analysis justified status quo was expressed (see 2 b) below). The batteries in the study were tested at 50 per cent state of charge, but there was no requirement in the Technical Instructions for them to be shipped at that rate. They could be shipped at 100 per cent state of charge in compliance with the Technical Instructions. The tests were conducted more than ten years ago, and a 50 per cent state of charge then may not be comparable to 50 per cent now because of increased energy density. There were significant differences in gas volume at different states of charge, which was concerning given the fact that greater volumes of gas made fires more hazardous.

f) A fire incident involving mobile phones being shipped as cargo that were on a skid waiting to be loaded on the aircraft had led some stakeholders to explore the feasibility of extending the state of charge limit to UN 3481, and it was known that one manufacturer implemented this limit following the incident (see DGP/28-IP/2).

g) While sympathetic to the impact on industry (see 2 c) below), concerns that there would be an enormous impact were also expressed when other restrictions were introduced. The industry adapted, significant safety measures were implemented, and the industry's growth was maintained. Shippers had learned how to reduce the state of charge for batteries packed on their own. It would be no different for batteries packed with equipment. The impact did not justify ignoring safety risks if they existed. Nevertheless, the impact on the lithium battery industry and any other areas would be considered when developing mitigating measures, if the safety risk assessment identified the need for them.

h) Test data from UL further demonstrated the safety benefits of a reduced state of charge (see DGP/28-IP/9). It also demonstrated no significant drop in voltage over a nine month period, suggesting the concern that a lower state of charge could result in cell degradation over time (see 2 f) below) was not a factor for air transport.

Support for not extending 30 per cent state of charge to Packing Instructions 966, 967 and 952

a) Most panel members considered it premature to implement measures for lithium ion batteries contained in equipment because the safety risk had not been properly assessed and the impact would be much more severe than it would be for batteries packed with equipment, particularly with respect to medical devices. The risks associated with batteries contained in equipment were different to the risks with batteries packed with equipment. They wanted more time to consider with targeted discussions.

b) Requiring a reduced state of charge for batteries packed on their own and not for batteries packed with or contained in equipment was a conscious decision the panel made. Batteries on their own were considered a much higher risk because of the

increased energy density, the known ability for thermal runaway to propagate from cell to cell and package to package, and the potential for a fire involving high density batteries to overwhelm the aircraft's fire protection features.

c) Members of the battery industry reported that implementation of a state of charge limit to equipment would be difficult to do and that the economic impact would be enormous. They were of the opinion that there was insufficient data to justify a state of charge limit, including a lack of testing. They were also of the opinion that there was sufficient data to support not introducing a state of charge limit, including an extremely low incident rate relative to the number of electronic devices transported and their belief that most incidents reported involved lithium batteries carried in the cabin and in checked baggage. A report on a heat release analysis and tests of lithium ion batteries packed with and contained in equipment was cited, one of the conclusions from it being that batteries, when at 50 per cent state of charge, did not significantly contribute to the total heat released during combustion.

d) Establishing a 30 per cent state of charge was routine for battery manufacturers, but not so easy for others in the supply chain.

e) Specific difficulties with regard to medical devices were raised, and it was suggested a limit was unjustified for them as they were manufactured to high standards and had an excellent safety record. Some, such as pacemakers, were extremely small. The requirement would increase the cost of medical devices and have an impact on life-saving measures if adequately charged batteries were not available to medical staff.

f) A lower state of charge could result in cell degradation over time which increased the risk of thermal runaway.

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APPENDIX C TO THE REPORT ON AGENDA ITEM 4
(English only)

UPDATE ON ACTIVITIES OF THE DGP WORKING GROUP ON ELECTRONIC STORAGE DEVICES (DGP-WG/ELECTRONIC STORAGE DEVICES)

1. The DGP Working Group on Electronic Storage Devices (DGP-WG/Electronic Storage Devices) consisted of thirty two members, which included panel members, their advisers and observers. The members were from both States and the aviation industry. The group had met three times in 2021 to progress the tasks assigned to the panel through ANC Job Card DGP.003.03 — Mitigating safety risks posed by the carriage of lithium batteries by air. It had prioritized three items from the job card: The SAE package performance standard and how it might be implemented once it was published, a mechanism to ensure transparency of all lithium battery shipments, and provisions to address the transport of data loggers and cargo tracking devices containing lithium batteries.

2. With respect to the SAE standard, the group had discussed whether it should be implemented through the Technical Instructions or through the Supplement as guidance for issuing approvals. The group had concerns with respect to States' ability for effective oversight to ensure compliance with the standard, and only permitting shipments through State approvals provided some control. The group had yet to formulate any recommendation, but would continue to follow the work of the SAE committee developing the standard.

3. With respect to transparency of shipments, the group had recommended removing the exceptions from full regulation provided in Section II of Packing Instructions 965 and 968, which had been agreed by the panel (see paragraph 4.1 of this report)

4. With respect to data loggers and cargo tracking devices containing lithium batteries, the group recognized that a multidisciplinary approach was needed to address all of the hazards, including electromagnetic interference. DGP-WG/Electronic Devices recommended that the provisions developed by DGP/27 be provided to FLTOPSP-SCG-SWG as a basis for their discussions.

5. The chair expressed appreciation for the work of DGP-WG/Energy Storage Devices on behalf of the panel, noting how broad and challenging the work was.

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Agenda Item 5: Clarifying State oversight responsibilities in Annex 18 *(Ref: Job Card DGP.005.03)*

5.1 REPORT OF THE DANGEROUS GOODS PANEL WORKING GROUP ON THE SUPPLEMENT (DGP-WG/SUPPLEMENT) (DGP/28-IP/4)

5.1.1 An update on the work of the Dangerous Goods Panel Working Group on the Supplement (DGP-WG/Supplement) was provided by its rapporteur. The group, which consisted of sixteen members, was established with the mission of providing guidance to States that supplemented the Technical Instructions or explained in greater depth the information contained in Annex 18. It had convened eight virtual meetings since its inception at DGP-WG/20.

5.1.2 DGP-WG/Supplement had proposed amendments to the Supplement to DGP-WG/21 which were recommended for inclusion in the 2023-2024 by the panel (see paragraph of this report), including safety-related revisions to guidance for Special Provision A2 and revisions to clarify provisions in Packing Instruction 910 for lithium batteries manufactured as part of production runs and pre-production prototype cells or batteries transported for testing.

5.1.3 The working group would next be focusing on developing a process for future maintenance and amendments to the Supplement to be included in Chapter 10 of the DGP *Guidance for the Panel to Aid in the Preparation of the Technical Instructions and Supporting Documents* and on reviewing and updating the guidance material for processing exemptions and approvals contained in the Supplement.

5.1.4 The chair expressed appreciation to DGP-WG/Supplement on behalf of the panel, noting how challenging the work was, particularly during the pandemic. The rapporteur expressed appreciation to her co-rapporteur and to the working group members who generously provided support, often meeting virtually at inopportune times.

5.2 REPORT OF THE DGP WORKING GROUP ON CLARIFYING STATES' RESPONSIBILITIES IN ANNEX 18 (DGP/28-IP/6)

5.2.1 An update on the work of the Dangerous Goods Panel Working Group on Clarifying States' Responsibilities in Annex 18 (DGP-WG/Annex 18) was provided by its rapporteur. The working group had been unable to meet face-to-face since DGP/27 on account of the COVID-19 pandemic, and progressing the work virtually was challenging due to the complexity of its tasks. However, a draft framework for how Annex 18 might be revised and restructured so as to clarify States' responsibilities was developed. It included a draft table of contents, a new chapter on safety of the supply chain, a new draft attachment describing the relationship between Annex 18 and Annexes 6, 8 and 19. It was intended as a starting point for DGP-WG/Annex 18 to develop a new structure.

5.2.2 The next steps for the working group would be to work with the draft framework to develop amendments to Annex 18 that clearly outlined States dangerous goods safety management responsibilities and address identified gaps, including the need to ensure:

a) the traditional safety oversight responsibilities (eight critical elements) that form the foundation of the State safety programme were incorporated taking into account amendments to Annex 19 that were being developed;

b) the proactive State safety programme elements were incorporated;

c) identified misalignments with other ICAO Annexes, based on the interrelationships identified in Appendix C to DGP/27-IP/2, were removed;

d) the output of DGP.002 (Dangerous Goods Accident and Incident Reporting System) aligned with the revised Annex and upcoming amendments to Annex 19;

e) safety risks associated with entities outside the aviation stream (DGP.003.02: Mitigating safety risks posed by the carriage of lithium batteries by air) and undeclared dangerous goods (DGP/27 Recommendation 6/2) were addressed.

5.2.3 Appreciation to the rapporteur and the members of DGP-WG/Annex 18 for progressing the work on this critical task was expressed, recognizing how challenging the work was, particularly during the pandemic.

5.2.4 The meeting was advised that Mr. Hamad Al Muhairi, the DGP member nominated by the United Arab Emirates (UAE), on behalf of His Excellency, Mr. Saif Mohammed Al Suwaidi, Director General of the UAE General Civil Aviation Authority, was offering to host a five-day meeting of the DGP Working Group on Clarifying State Oversight Responsibilities in Annex 18 from 7 to 11 March 2022 at the Emirates Aviation College in Dubai. The meeting was grateful for this invitation and expressed its deep appreciation for the continued support of the UAE in progressing the work on clarifying States' responsibilities in Annex 18. A face-to-face meeting would significantly help with progressing the work.

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Agenda Item 6: Coordination with other panels

6.1: Flight Operations Panels (FLTOPSP) ***(Ref: SCGSWG.001.01, SCGSWG.002.01, SCGSWG.003.01)***

6.1.1 SAFE CARRIAGE OF GOODS SPECIFIC WORKING GROUP (FLTOPSP/SCG-SWG) UPDATE (DGP/28-IP/10)

6.1.1.1 The meeting was provided a detailed briefing on the activities of the Flight Operations Panels Specific Working Group On the Safe Carriage of Goods (FLTOPSP-SWG-SCG). It included background information on the establishment of the specific working group, its membership, terms of reference, work programme and working methods. Details on the progress of each element on the job cards assigned to the specific working group were provided, along with an overview of the challenges the working group was facing.

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Agenda Item 6: Coordination with other panels
6.2: Airworthiness Panel (AIRP) (Ref: AIRP.012.04)

6.2.1 RECOMMENDATIONS OF THE ICAO HIGH-LEVEL CONFERENCE ON COVID-19 (HLCC 2021) RELATED TO DANGEROUS GOODS

6.2.1.1 An update on discussions at the ICAO High Level Safety Conference (Virtual, 12 to 22 October 2021) related to dangerous goods was provided. Two dangerous goods-related working papers were presented under Agenda Item 3.2: Standardization — Risk management. Both highlighted concerns related to risks associated with non-compliance with dangerous goods regulations. One focused on the need for States to strengthen their oversight and enforcement activities with respect to the cargo and mail supply chain. The second focused on the need to implement proactive mitigation measures by building upon collaborative engagements established during the pandemic to share timely safety data and information and by sharing best practices to educate stakeholders on the risks of shipping dangerous goods. The recommendations supported by the conference were incorporated in HLCC 2021 Recommendation 3.2/1 — Improving the effectiveness of aviation safety risk management.

6.2.1.2 It was noted that one of the proposals was for the Airworthiness Panel (AIRP) to review the adequacy of cargo compartment certification standards with regards to fire safety to meet current advances in technology, but that the high-level nature of the conference did not provide the opportunity for a detailed discussion on this. The new Annex 6 cargo compartment safety Standards and Recommended Practices (SARPs) clarified that these capabilities needed to be taken into account by the operator through its required specific safety risk assessment on the transport of items in the cargo compartment. It was explained that the design capability related to cargo compartment fire protection provisions in Annex 8 were performance based and provided a mandate for the State of Design to require design approval holders to make available information related to the capabilities of the cargo compartment to facilitate implementation of the Annex 6 provisions.

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Agenda Item 6: Coordination with other panels
6.3: Safety Management Panel (SMP)

6.3.1 CONSOLIDATED AMENDMENT PROPOSALS FOR ANNEX 19 — SAFETY MANAGEMENT (DGP/28-IP/8)

6.3.1.1 An early preview of draft proposals for Amendment 2 to Annex 19 — *Safety Management* was provided with an emphasis on proposals relevant to the dangerous goods community. It was highlighted that the proposals presented were subject to review and formal endorsement by the Safety Management Panel (SMP) at its' fifth meeting (SMP/5), which would be convened from 29 November to 10 December 2021. The proposed amendments included:

a) an upgrade to a Standard from the current recommended practice for States to establish an enforcement policy specifying the conditions and circumstances under which the service providers with an SMS would be allowed to deal with and resolve certain safety issues within the context of their SMS;

b) an upgrade to a Standard from the current Recommended Practice for States to develop, maintain and document processes to manage safety risks;

c) a new Recommended Practice for States to periodically review the need to extend SMS to additional aviation sectors beyond the ones required to implement SMS in accordance with 3.3.2 of Annex 19. There was some discussion whether the proposed Recommended Practice might apply to freight forwarders. It was explained that each State should tailor its approach to achieving a desired improvement in safety performance by exploring various options including compliance-based requirements, the implementation of alternative management systems promoting voluntary SMS implementation and, finally, the extension of SMS applicability. It was emphasized that extending SMS applicability was not always the most effective approach. States should consider all the safety risk controls available to manage their safety risks, taking into consideration the resources required by the State and the industry along with the potential benefits.

d) an upgrade to a Standard from the current Recommended Practice for States to establish procedures to prioritize surveillance activities towards those areas of greater safety concern or need;

e) the introduction of a new Recommended Practice to develop and maintain a process to proactively manage changes at the State level;

f) the removal of references to "commensurate with size and complexity" from the SMS framework in Appendix 2 of Annex 19;

g) the introduction of a new Standard for SMS to cover a defined scope of products; and

h) the introduction of a new Standard for SMS to include the identification of organizational interfaces necessary for managing the safety of these products and services.

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Agenda Item 6: Coordination with other panels
6.4: Remotely Piloted Aircraft Systems Panel (RPASP) ***(Ref: ROI-7-2020-2)***

6.4.1 REMOTELY PILOTED AIRCRAFT SYSTEM (RPAS) STANDARDS AND RECOMMENDED PRACTICES (SARPS) DEVELOPMENT (DGP/28-IP/11)

6.4.1.1 An officer from the ICAO Remotely Piloted Aircraft System (RPAS) Section provided an overview of draft SARPs for a new Part IV — *International IFR Operations — Remotely Piloted Aircraft Systems* to Annex 6 — *Operation of Aircraft* that were endorsed by the eighteenth meeting of the Remotely Piloted Aircraft Systems Panel (RPASP/18) held from 25 to 29 October 2021. An ad hoc working group of the DGP had reviewed the SARPs prior to the RPASP endorsement. The officer highlighted how comments from this working group were addressed. The SARPs were based on Annex 6, Part I — *International Commercial Air Transport — Aeroplanes*. In reviewing Part IV, the DGP ad hoc working group identified the need for revisions to provisions in Part I that had an impact on dangerous goods. There would also be a need to consider how Annex 18 and the Technical Instructions would need to be amended to accommodate the transport of dangerous goods on unmanned aircraft.

6.4.1.2 In light of the foregoing discussions, the meeting developed the following recommendations:

Recommendation 6/1 — Review of Annex 6 provisions having an impact on dangerous goods

That Annex 6 be reviewed to ensure provisions having an impact on dangerous goods align with dangerous goods provisions as described in the draft job card contained in Appendix A to the report on this agenda item.

Recommendation 6/2 — Dangerous goods provisions to support remotely piloted aircraft system operations

That Annex 18 and the Technical Instructions be reviewed to determine amendments necessary to accommodate the safe transport of dangerous goods on remotely piloted aircraft as described in the draft job card contained in Appendix B to the report on this agenda item.

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Agenda Item 6: Coordination with other panels
6.5: Aviation Security Panel (AVSECP)

6.5.1 There were no updates from the Aviation Security Panel (AVSECP).

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Agenda Item 6: Coordination with other panels
6.6: Any other panels

6.6.1 There were no updates from any other panels.

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APPENDIX A TO THE REPORT ON AGENDA ITEM 6
(English only)

DRAFT ANC JOB CARD FOR REVIEW OF ANNEX 6 PROVISIONS HAVING AN IMPACT ON DANGEROUS GOODS

JOB CARD

Title	Review of Annex 6 provisions having an impact on dangerous goods	**Reference: DGP/28**	**DGP.008.01**
Source	DGP/28		
Problem Statement	There are inconsistencies between provisions having an impact on dangerous goods in Part 6 and the provisions in Annex 18 and its associated dangerous goods documents		
Specific Details	The DGP identified a need for revisions to provisions in Annex 6 that have an impact on dangerous goods during its review of the draft RPAS SARPs proposed as a new Part IV to Annex 6, which is based on Part I. A thorough review is necessary to ensure all provisions align.		
GANP/GASP Link	3.3: Operational safety risks		
Expected Benefits	Clarify States responsibilities with respect to evaluating an operator's ability to manage the risks associated with dangerous goods and provide operators with tools to manage the risks		
References	DGP-WG/20 Report, paragraph 3.6.4.1 DGP/28 Report, paragraph 6.4.1 Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes*, Part II — *International General Aviation — Aeroplanes* and Part III — *International Operations — Helicopters* Annex 18 — *The Safe Transport of Dangerous Goods by Air* Doc 9284, *Technical Instructions for the Safe Transport of Dangerous Goods by Air* Doc 9284SU, *Supplement to the Technical Instructions for the Safe Transport of Dangerous Goods by Air* Doc 9481, *Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods*		
Primary Expert Group:	DGP		

WPE No.	Document Affected or Actions Needed	Description of Amendment proposal or Action	Supporting Expert Group	Status	Expected dates		
					Delivery	**Effective**	**Applicability**
	Annex 6	Draft amendments to Annex 6 provisions having an impact on dangerous goods provisions to ensure alignment with Annex 18, the Technical Instructions, its supplement and the *Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods*	FLTOPSP-SCG-SWG		**Q4 2022**	**Q4 2022**	**Q4 2022**

	Action	Preliminary assessment of impact of the above recommendations in terms of implementation			**Q4 2023**	n/a	n/a
Status:	**Priority:**	**Initial Issue Date:**	**Date Approved:**			**Session / Meeting:**	
	Medium		**ANC:**				

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APPENDIX B TO THE REPORT ON AGENDA ITEM 6
(English only)

DRAFT ANC JOB CARD FOR DANGEROUS GOODS PROVISIONS TO SUPPORT REMOTELY PILOTED AIRCRAFT SYSTEM OPERATIONS

JOB CARD

Title	Dangerous goods provisions to support RPAS operations	**Reference: DGP/28**	**DGP.007.01**
Source	DGP-WG/20 and DGP/28		
Problem Statement	Annex 18 and the Technical Instructions do not support draft Standards and Recommended Practices (SARPs) on the operation of remotely piloted aircraft currently proposed for Annex 6 — *Operation of Aircraft* as a new Part IV — *International Aviation — Remotely Piloted Aircraft Systems*.		
Specific Details	Draft SARPs endorsed by the eighteenth meeting of the Remotely Piloted Aircraft Systems Panel (RPASP/18) (25 to 29 October 2021) on the operation of remotely piloted aircraft developed for inclusion in Annex 6 — *Operation of Aircraft* as a new Part IV — *International Aviation — Remotely Piloted Aircraft Systems* include provisions allowing for the transport of dangerous goods, but Annex 18 — *The Safe Transport of Dangerous Goods by Air*, the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284) and the *Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods* (Doc 9481) do not. The dangerous goods documents include specific requirements and recommendations for the carriage of dangerous goods based on whether an aircraft is a passenger or cargo aircraft, as defined in those documents. A remotely piloted aircraft could be considered a cargo aircraft, but the requirements for cargo aircraft established in the Technical Instructions may not be appropriate. A thorough review of Annex 18 and the Technical Instructions is necessary to determine how they can safely support the transport of dangerous goods on remotely piloted aircraft.		
GANP/GASP Link	3.3: Operational safety risks		
Expected Benefits	Clarify States responsibilities with respect to evaluating an operator's ability to manage the risks associated with dangerous goods on remotely piloted aircraft and provide operators with tools to manage the risks		
References	DGP-WG/20 Report, paragraph 3.6.4.1 DGP/28 Report, paragraph 6.4.1 Annex 18 — *The Safe Transport of Dangerous Goods by Air* Doc 9284, *Technical Instructions for the Safe Transport of Dangerous Goods by Air* Doc 9284SU, *Supplement to the Technical Instructions for the Safe Transport of Dangerous Goods by Air* Doc 9481, *Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods*		
Primary Expert Group:	DGP		

WPE No.	Document Affected or Actions Needed	Description of Amendment proposal or Action	Supporting Expert Group	Status	Expected dates		
					Delivery	Effective	Applicability
	Action	Identify need for amendment or development of new SARPs in Annex 18, Instructions in Doc 9284 and guidance in Docs 9284SU and 9481 to support dangerous goods operations on remotely piloted aircraft in alignment with Annex 6			**Q4 2022**	**Q4 2022**	**Q4 2022**
	Action	Identify areas requiring collaboration between the DGP and other panels	FLTOPSP AIGP ADOP AIRP SMP AVSECP FALP		**Q4 2022**	**Q4 2022**	**Q4 2022**
	Action	Recommendation for amendments to Annex 18, associated dangerous goods documents and other Annexes	FLTOPSP AIGP ADOP AIRP SMP AVSECP FALP		**Q4 2023**	**Q4 2023**	**Q4 2023**
	Action	Preliminary assessment of impact of the above recommendations in terms of implementation			**Q4 2023**	n/a	n/a
Status:	**Priority:**	**Initial Issue Date:**	**Date Approved:**			**Session / Meeting:**	
	High		**ANC:**				

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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

7.1 PROPOSED REVISED EDITION OF GUIDANCE MATERIAL FOR THE DANGEROUS GOODS PANEL (DGP/28-WP/55)

7.1.1 Guidance material to aid in the preparation of the Technical Instructions and supporting documents had been developed by the DGP. It contained general principles used in developing the dangerous goods documents and guidance for deciding how to make changes to them and provided a mechanism for justification behind decisions made by the panel to be preserved. The guidance material was intended as a useful resource for both existing and future panel members. The document was in need of a thorough review, as it had not been updated since 1999. The newly-established DGP Working Group on UN Harmonization was tasked with updating it and maintaining it in the future.

7.1.2 The rapporteur of DGP-WG/UN Harmonization presented a revised edition to the meeting. He noted that the UN guiding principles for the development of the UN Model Regulations served a similar purpose and that DGP-WG/UN Harmonization had taken the content and structure of that document into account when reviewing and revising the DGP guidance. The DGP guidance contained a section on the Supplement to the Technical Instructions. This would be subject to further review by DGP-WG/Supplement.

7.1.3 Panel members expressed appreciation for the work done. The revised document was agreed in principle, pending a more detailed review by panel members with a view to formally approving it at the working group meeting in 2022. DGP-WG/UN Harmonization would continue to fine tune and identify areas that needed improvement before that time. Panel members were encouraged to provide comments to the rapporteur of DGP-WG/UN Harmonization, particularly if there were areas that needed further clarification. One panel member suggested the guiding principles for segregating radioactive materials needed further review, particularly with respect to the maximum distances radioactive materials needed to be stowed from persons and whether or not they ensured the necessary level of protection for flight crew. There was some discussion on whether the document should be published on a public website, as was done for the UN guiding principles. The pros and cons for doing so would be considered by the DGP-WG/UN Harmonization and the panel would make a final decision, keeping Secretariat publication rules in mind. It was agreed that it should be provided to new panel members as part of their welcome packages.

7.1.4 It was agreed that proposed amendments to the Technical Instructions that deviate from the UN Model Regulations or that introduce requirements specific to air transport should be accompanied by proposed amendments to the DGP guidance document and that an agenda item on harmonizing the guidance would remain for all DGP meetings so that a formal mechanism for review was in place.

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Agenda Item 8: Other business

8.1 REPORT OF THE DANGEROUS GOODS PANEL (DGP) WORKING GROUP MEETINGS (DGP-WG/20 AND DGP-WG/21) (DGP/28-WP/2 AND DGP/28-WP/3)

8.1.1 The meeting reviewed the narrative parts of the reports of the 2020 and 2021 DGP Working Group Meetings, DGP-WG/20 (Virtual, 19 to 23 October 2020) and DGP-WG/21 (Virtual, 24 to 28 May 2021). The narratives were approved without comment. The amendments proposed by the working groups were reviewed under DGP/28-WPs/11, 12, 13, 14, 15, 16, 19, 20 (see Report on Agenda Item 1), 21 (see Report on Agenda Item 4), 22 and 23 (see Report on Agenda Item 2) which contained consolidations of these amendments.

8.2 REPORT OF THE DANGEROUS GOODS PRE-DGP/28 WORKING GROUP MEETING (DGP/28-WP/58)

8.2.1 The meeting reviewed the report of the Dangerous Goods Pre-DGP/28 Working Group Meeting in detail with the understanding that it would be incorporated under the appropriate agenda items of this DGP/28 Report. The outcome of the working group's discussions captured in the report were approved by the panel with the understanding that editorial revisions to the narrative and corrections of any identified anomalies in the appendices would be made in this report.

8.3 FUTURE WORK WITH UNIVERSAL POSTAL UNION (UPU)

8.3.1 Risks associated with extra territorial offices of exchange (ETOEs) was an on-going discussion on the UPU/ICAO Contact Committee. The Secretary advised of plans to establish a sub-group of the contact committee to develop provisions and/or guidance material to address these risks, particularly with respect to the lack of State oversight. Membership on the sub-group would be open to all interested parties, even if not members of the contact committee. Those wishing to participate were invited to contact the Secretary.

8.4 FAREWELL

8.4.1 The meeting bid farewell to E. Sigrist, who had served as adviser to the panel from the European Chemical Industry Council (CEFIC) since 2004. The panel expressed its appreciation for his contributions and wished him well in his future endeavours.

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APPENDIX A TO THE REPORT

CONSOLIDATED AMENDMENTS TO THE TECHNICAL INSTRUCTIONS RECOMMENDED UNDER AGENDA ITEMS 1, 2, 3 AND 4

FOREWORD

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GENERAL PRINCIPLES USED IN DEVELOPING THE PROVISIONS OF THE TECHNICAL INSTRUCTIONS

. . .

UN harmonization amendments

Paragraphs 1.2.1.3 and 8.1 of this report and 3.1.2.4 of DGP/28-WP/3:

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.

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Part 1

GENERAL

. . .

Chapter 1

SCOPE AND APPLICABILITY

. . .

UN harmonization amendments

Paragraphs 1.2.1.3 and 8.1 of this report and 3.1.2.4 of DGP/28-WP/3:

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.

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Amendments to manage aviation specific risks

Chapter 2

LIMITATION OF DANGEROUS GOODS ON AIRCRAFT

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Paragraph 3.2.2.1 of DGP/28-WP/2 (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;

~~d~~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.

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Chapter 3

GENERAL INFORMATION

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3.1 DEFINITIONS

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UN harmonization amendments

Paragraph 1.2.1.3 of this report:

Aerosol or aerosol dispenser. An article consisting of a non-refillable receptacle meeting the requirements of ~~6;3.2.7~~ 6;5.4, made of metal, glass or plastics and containing a gas, compressed, liquefied or dissolved under pressure, with or without a liquid, paste or powder, and fitted with a release device allowing the contents to be ejected as solid or liquid particles in suspension in a gas, as a foam, paste or powder or in a liquid state or in a gaseous state.

Paragraphs 1.2.1.3 and 8.1 of this report and 3.1.2.4 of DGP/28-WP/3:

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.~~7~~9.

. . .

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.

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Liquids. A substance classified as ~~D~~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.~~16~~21.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.

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Paragraphs 1.2.1.3 and 8.1 of this report and 3.1.2.4.1 a) of DGP/28-WP/3:

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).

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Paragraphs 1.2.1.3 and 8.1 of this report and 3.1.2.4 of DGP/28-WP/3:

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.

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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.

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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, ~~T~~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.

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Chapter 5

DANGEROUS GOODS SECURITY

. . .

UN harmonization amendments

Paragraphs 1.2.1.3 and 8.1 of this report and 3.1.2.4 of DGP/28-WP/3:

UN Model Regulations, Chapter 1.4 (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 Material[1] (INFCIRC/274/Rev.1, IAEA, Vienna (1980)). and the IAEA circular on "Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities"[2] INFCIRC/225/Rev.5, IAEA, Vienna (2011). are applied.

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Chapter 6

GENERAL PROVISIONS CONCERNING RADIOACTIVE MATERIAL

. . .

6.1 SCOPE AND APPLICATION

UN harmonization amendments

Paragraphs 1.2.1.3 and 8.1 of this report and 3.1.2.4 of DGP/28-WP/3:

UN Model Regulations, Chapter 1.5.1.1 (see ST/SG/AC.10/48/Add.1)

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.

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~~1. INFCIRC/274/Rev.1, IAEA, Vienna (1980).~~
~~2. INFCIRC/225/Rev.5, IAEA, Vienna (2011).~~

Part 2

CLASSIFICATION OF DANGEROUS GOODS

. . .

UN harmonization amendments

Paragraphs 1.2.1.4 and 8.1 of this report and 3.1.2.5 of DGP/28-WP/3:

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.

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Chapter 4

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

4.2.3 Division 4.1 — Self-reactive substances

. . .

UN harmonization amendments

UN Model Regulations, 2.4.2.3.2 (see paragraph 1.2.1.4 a) of this report):

4.2.3.2 *Classification of self-reactive substances*

4.2.3.2.1 Self-reactive substances are classified into seven types according to the degree of danger they present. The types of self-reactive substance range from type A, which is forbidden in any mode of transport, to type G, which is not subject to the provisions for self-reactive substances of Division 4.1. The classification of types B to F is directly related to the maximum quantity allowed in one packaging.

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UN harmonization amendments

Paragraphs 1.2.1.4 and 8.1 of this report and 3.1.2.5 of DGP/28-WP/3:

. . .

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.

Self-reactive substance	*Concentration (%)*	*Control temperature (°C)*	*Emergency temperature (°C)*	*UN generic entry*	*Notes*
. . .					
Introduced into 2021-2022 Edition of the Technical Instructions through a corrigendum (see paragraph 3.2.2.12 of DGP/28-WP/2):					
2-(~~n~~N, ~~n~~N-Ethoxycarbonylphenylamino)-3-methoxy-4-(~~n~~N-methyl- ~~n~~N-cyclohexylamino) benzenediazonium zinc chloride	63-92	+40	+45	3236	

Self-reactive substance	*Concentration (%)*	*Control temperature (°C)*	*Emergency temperature (°C)*	*UN generic entry*	*Notes*
2-(~~n~~N, ~~n~~N-Ethoxycarbonylphenylamino)-3-methoxy-4-(~~n~~N-methyl- ~~n~~N-cyclohexylamino) benzenediazonium zinc chloride	62	+35	+40	3236	
2-(~~n~~N, ~~n~~N-Methylaminoethylcarbonyl)-4-(3,4-dimethylphenylsulphonyl) benzenediazonium hydrogen sulphate	96	+45	+50	3236	
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	
(7-Methoxy-5-methyl-benzothiophen-2-yl) boronic acid	88-100			3230	9

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NOTES:

Proposed to replace reference with “Model Regulations” because a definition for Model Regulations is proposed for Part 1;3 (see 3.1.2.4.1 a) of DGP/28-WP/3):

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.

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Amendments to manage aviation specific risks

Paragraphs 2.2.1 and 8.1 of this report and 3.2.2.1 of DGP/28-WP/3:

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.

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Chapter 5

CLASS 5 — OXIDIZING SUBSTANCES; ORGANIC PEROXIDES

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UN harmonization amendments

Paragraph 1.2.1.4 a) of this report:

5.3.2 Classification of organic peroxides

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UN Model Regulations, 2.5.3.2.2

5.3.2.2 Organic peroxides are classified into seven types according to the degree of danger they present. The types of organic peroxide range from type A, which is forbidden in any mode of transport, to type G, which is not subject to the provisions for organic peroxides of Division 5.2. The classification of types B to F is directly related to the maximum quantity allowed in one packaging.

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Amendments to manage aviation specific risks

5.3 ORGANIC PEROXIDES (DIVISION 5.2)

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5.3.3 TEMPERATURE CONTROL REQUIREMENTS

Paragraphs 1.2.1.4 and 8.1 of this report and 3.2.2.1 of DGP/28-WP/3:

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).

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UN harmonization amendments

Paragraphs 1.2.1.4 and 8.1 of this report and 3.1.2.5 of DGP/28-WP/3:

. . .

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
Acetyl acetone peroxide	≤35	≥57			≥8			3107	32
tert-Butylperoxy isopropylcarbonate	≤77	≥23						3103	
1-(2-tert-Butylperoxyisopropyl)-3-isopropenylbenzene	≤77	≥23						3105	
tert-Butylperoxy isopropylcarbonate	≤62		≥38					3105	
. . .									
tert-Hexyl Peroxypivalate	≤72		≥28			+10	+15	3115	
tert-Hexyl peroxypivalate	≤52 as a stable dispersion in water					+15	+20	3117	
Paragraph 1.2.1.4 b) of this report:									
3,6,9-Triethyl-3,6,9-trimethyl-1,4,7 triperoxonane	≤27	≥83						3109	

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Notes:

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31. Active oxygen ≤6.7 per cent.
32. Active oxygen ≤4.15 per cent.

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Chapter 6

CLASS 6 — TOXIC AND INFECTIOUS SUBSTANCES

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UN harmonization amendments

Paragraphs 1.2.1.4 and 8.1 of this report and 3.1.2.5 of DGP/28-WP/3:

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.

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Chapter 7

CLASS 7 — RADIOACTIVE MATERIAL

UN harmonization amendments

Paragraphs 1.2.1.4 and 8.1 of this report and 3.1.2.5 of DGP/28-WP/3:

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7.2.3 Determination of other material characteristics

7.2.3.1 *Low specific activity (LSA) material*

7.2.3.1.1 (Reserved)

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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 A_2. 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 ~~7.2.3.1.4~~ 7.2.3.4.3, the activity in the water would not exceed 100 A_2. In the application of this test, the damaging effects of the tests specified in b) above must be taken into account.

7.2.3.4.2 Low dispersible material must be tested as follows:

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

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 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.

7.2.3.4.~~3~~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.

. . .

Paragraph 1.2.2 of this report:

7.2.4 Classification of packages

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

7.2.4.1.1 Classification as excepted packages

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

a) it is an empty packaging having contained radioactive material;

b) it contains instruments or articles not exceeding the activity limits specified in columns 2 and 3 of Table 2-14;

c) it contains articles manufactured of natural uranium, depleted uranium or natural thorium; or

d) it contains radioactive material not exceeding the activity limits specified in column 4 of Table 2-14; or

e) it contains less than 0.1 kg of uranium hexafluoride not exceeding the activity limits specified in column 4 of Table 2-14.

7.2.4.1.1.2 ~~A package containing radioactive material may be classified as an excepted package provided that the dose rate at any point on its external surface does not exceed 5 µSv/h.~~ The dose rate at any point on the external surface of an excepted package must not exceed 5 µSv/h.

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

a) the 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 cm^2, does not exceed:

i) 400 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters; and

ii) 40 Bq/cm^2 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.

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Chapter 8

CLASS 8 — CORROSIVE SUBSTANCES

UN harmonization amendments

Paragraphs 1.2.1.4 and 8.1 of this report and 3.1.2.5 of DGP/28-WP/3:

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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.

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Chapter 9

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

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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:

. . .

UN harmonization amendments

Paragraphs 1.2.1.4 and 8.1 of this report and 3.1.2.5.2 of DGP/28-WP/3:

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.~~

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Part 3

DANGEROUS GOODS LIST, SPECIAL PROVISIONS AND LIMITED AND EXCEPTED QUANTITIES

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Table 3-1. Dangerous Goods List

Name	*UN No.*	*Class or division*	*Subsidiary hazard*	*Labels*	*State variations*	*Special provisions*	*UN packing group*	*Excepted quantity*	*Passenger and cargo aircraft*		*Cargo aircraft only*	
									Packing instruction	*Max. net quantity per package*	*Packing instruction*	*Max. net quantity per package*
1	*2*	*3*	*4*		*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
UN harmonization amendments												
UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/48/Add.1), paragraphs 1.2.1.5 and 8.1 of this report and 3.1.2.6 of DGP/28-WP/3:												
Air, compressed	1002	2.2		Gas non-flammable		A221		E1	200	75 kg	200	150 kg
Amendments to facilitate transport												
Paragraphs 2.2.1 and 8.1 of this report and 3.2.2.22 of DGP/28-WP/3:												
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	

Name	UN No.	Class or division	Sub-sidiary 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 harmonization amendments												
Paragraphs 1.2.1.5 and 8.1 of this report and 3.1.2.6.1 a) of DGP/28-WP/3:												
Batteries, wet, filled with acid, electric storage †	2794	8		Corrosive		A51 A164 A183		E0	870	30 kg	870	~~No limit~~ 400 kg
Batteries, wet, filled with alkali, electric storage †	2795	8		Corrosive		A51 A164 A183		E0	870	30 kg	870	~~No limit~~ 400 kg
Amendments to lithium battery provisions												
Paragraph 4.8 of this report:												
Battery-powered equipment	3171	9		Miscella-neous		A67 A87 A94 A154 A164 A182 A214		E0	952	No limit	952	No limit
Battery-powered vehicle	3171	9		Miscella-neous		A67 A87 A94 A154 A164 A214		E0	952	No limit	952	No limit
UN harmonization amendments												
Paragraphs 1.2.1.5 and 8.1 of this report and 3.1.2.6 of DGP/28-WP/3:												
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 A222		E0	FORBIDDEN		200	150 kg

Name	UN No.	Class or division	Sub-sidiary 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
Paragraphs 1.2.1.5 and 8.1 of this report and 3.1.2.6.1 a) of DGP/28-WP/3:												
Cells, containing sodium †	3292	4.3		Danger if wet		A94		E0	492	25 kg	492	~~No limit~~400 kg
Paragraphs 1.2.1.5 and 8.1 of this report and 3.1.2.6 of DGP/28-WP/3:												
UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/48/Add.1):												
Cobalt dihydroxide powder, containing not less than 10% respirable particles	3550	6.1		Toxic			I	E5	666	5 kg	673	50 kg
Amendments to manage aviation specific risks												
Paragraph 2.2.7 of this report:												
Corrosive liquid, toxic, n.o.s.*	2922	8	6.1	Corrosive & Toxic		A3 A4	I II III	E0 E2 E1	850 851 Y840 852 Y841	0.5L 1L 0.5L 5L 1L	854 855 856	2.5L 30L 60L
Corrosive solid, toxic, n.o.s.*	2923	8	6.1	Corrosive & Toxic		A3 A5	I II III	E0 E2 E1	858 859 Y844 860 Y845	1kg 15kg 5kg 25kg 5kg	862 863 864	25kg 50kg 100kg

Name	UN No.	Class or division	Sub-sidiary 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
Amendments to lithium battery provisions												
Paragraph 4.8 of this report:												
Engine, fuel cell, flammable gas powered †	3529	2.1		Gas flammable		A70 A87 A154 A176 A208		E0	FORBIDDEN		220	No limit
Engine, fuel cell, flammable liquid powered †	3528	3		Liquid flammable		A70 A87 A154 A176 A208		E0	378	No limit	378	No limit
Engine, internal combustion	3530	9		Miscella-neous		A87 A154 A208		E0	972	No limit	972	No limit
Engine, internal combustion, flammable gas powered	3529	2.1		Gas flammable		A70 A87 A154 A208		E0	FORBIDDEN		220	No limit
Engine, internal combustion, flammable liquid powered	3528	3		Liquid flammable		A70 A87 A154 A208		E0	378	No limit	378	No limit
UN harmonization amendments												
Paragraphs 1.2.1.5 and 8.1 of this report and 3.1.2.6 of DGP/28-WP/3:												
UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/48/Add.1):												
Ethyl bromide	1891	~~6.1~~3	6.1	Liquid flammable & Toxic			II	~~E4~~E2	~~654~~352 ~~Y641~~Y341	~~5 L~~1 L 1 L	~~662~~364	60 L
~~**Extracts, aromatic, liquid†**~~	~~1169~~	~~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~~

Name	UN No.	Class or division	Sub-sidiary 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
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

Amendments to facilitate transport

Paragraph 3.4 of this report:

Gas turbine engines †, see **Engine, internal combustion, flammable liquid powered** (UN No. ~~3530~~3528) or **Engine internal combustion, flammable gas powered** (UN No. 3529)												

Amendments to manage aviation specific risks

Paragraphs 2.2.1 and 8.1 of this report and 3.2.2.4 of DGP/28-WP/3:

Amendments to lithium battery provisions

Paragraph 4.8 of this report:

Life-saving appliances, not self-inflating containing dangerous goods as equipment	3072	9		Miscella-neous		A48 A87 A154 A182 A223		E0	~~see~~ 955	No limit	~~see~~ 955	No limit
Life-saving appliances, self-inflating	2990	9		Miscella-neous		A48 A87 A154 A223		E0	~~see~~ 955	No limit	~~see~~ 955	No limit

Name	UN No.	Class or division	Subsidiary hazard	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4		6	7	8	9	10	11	12	13
Paragraph 4.7 of this report:												
Lithium ion batteries (including lithium ion polymer batteries)	3480	9		Miscellaneous — Lithium batteries	US 3	A88 A99 A154 A164 A183 A201 ~~A206~~ A213		E0	FORBIDDEN		See 965	
Lithium ion batteries contained in equipment (including lithium ion polymer batteries)	3481	9		Miscellaneous — Lithium batteries	US 3	A48 A88 A99 A154 A164 A181 A185 ~~A206~~ A213		E0	967	5 kg	967	35 kg
Lithium ion batteries packed with equipment (including lithium ion polymer batteries)	3481	9		Miscellaneous — Lithium batteries	US 3	A88 A99 A154 A164 A181 A185 ~~A206~~ A213		E0	966	5 kg	966	35 kg
Lithium metal batteries (including lithium alloy batteries) †	3090	9		Miscellaneous — Lithium batteries	US 2 US 3	A88 A99 A154 A164 A183 A201 ~~A206~~ A213		E0	FORBIDDEN		See 968	
Lithium metal batteries contained in equipment (including lithium alloy batteries) †	3091	9		Miscellaneous — Lithium batteries	US 2 US 3	A48 A88 A99 A154 A164 A181 A185 ~~A206~~ A213		E0	970	5 kg	970	35 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
Lithium metal batteries packed with equipment (including lithium alloy batteries) †	3091	9		Miscellaneous — Lithium batteries	US 2 US 3	A88 A99 A154 A164 A181 A185 ~~A206~~ A213		E0	969	5 kg	969	35 kg
Paragraph 4.8 of this report:												
Machinery, fuel cell, flammable gas powered	3529	2.1		Gas flammable		A70 A87 A154 A176 A208		E0	FORBIDDEN		220	No limit
Machinery, fuel cell, flammable liquid powered	3528	3		Liquid flammable		A70 A87 A154 A176 A208		E0	378	No limit	378	No limit
Machinery, internal combustion	3530	9		Miscellaneous		A87 A154 A208		E0	972	No limit	972	No limit
Machinery, internal combustion, flammable gas powered	3529	2.1		Gas flammable		A70 A87 A154 A208		E0	FORBIDDEN		220	No limit
Machinery, internal combustion, flammable liquid powered	3528	3		Liquid flammable		A70 A87 A154 A208		E0	378	No limit	378	No limit
Amendments to manage aviation specific risks												
Paragraph 2.2.3 of this report:												
Metal catalyst, dry*	2881	4.2		Spontaneous combustion		A1 A3 A36	II III	E0 E1	FORBIDDEN FORBIDDEN 473	 25 kg	FORBIDDEN 473 473	 50 kg 100 kg

Name	UN No.	Class or division	Sub-sidiary 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
Mercaptan mixture, liquid, flammable, toxic, n.o.s*	1228	3	6.1	Liquid flammable & toxic	AU 1 CA 7 IR 3 NL1 US 3	A1 A3 ~~A36~~	II III	E0 E1	FORBIDDEN 373 Y373	 5 L 1 L	373 373	60 L 220 L
Mercaptans, liquid, flammable, toxic, n.o.s*	1228	3	6.1	Liquid flammable & toxic	AU 1 CA 7 IR 3 NL1 US 3	A1 A3 ~~A36~~	II III	E0 E1	FORBIDDEN 373 Y373	 5 L 1 L	373 373	60 L 220 L
Tear gas substance, liquid, n.o.s.*	1693	6.1		Toxic	AU 1 CA 7 IR 3 NL 1 US 3	A2 ~~A36~~	 II	E0	FORBIDDEN FORBIDDEN		FORBIDDEN 659	 5 L

UN harmonization amendments

Paragraph 1.2.1.5 b) of this report:

Nitrocellulose membrane filters with not more than 12.6% nitrogen, by dry mass	3270	4.1		Solid flammable		~~A57~~ A73 A122	II	E2	458 Y458	1 kg 1 kg	458	15 kg
Nitrocellulose, with not more than 12.6% nitrogen, by dry mass, **mixture without plasticizer, without pigment**	2557	4.1		Solid flammable	BE 3	~~A57~~ A86 A217	II	E0	452	1 kg	453	15 kg
Nitrocellulose, with not more than 12.6% nitrogen, by dry mass, **mixture without plasticizer, with pigment**	2557	4.1		Solid flammable	BE 3	~~A57~~ A86 A217	II	E0	452	1 kg	453	15 kg
Nitrocellulose, with not more than 12.6% nitrogen, by dry mass, **mixture with plasticizer, without pigment**	2557	4.1		Solid flammable	BE 3	~~A57~~ A86 A217	II	E0	452	1 kg	453	15 kg

Name	UN No.	Class or division	Sub-sidiary hazard	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4		6	7	8	9	10	11	12	13
Nitrocellulose, with not more than 12.6% nitrogen, by dry mass, **mixture with plasticizer, with pigment**	2557	4.1		Solid flammable	BE 3	~~A57~~ A86 A217	II	E0	452	1 kg	453	15 kg
Nitrocellulose with alcohol, not less than 25% alcohol, by mass and not less than 12.6% nitrogen, by dry mass	2556	4.1		Solid flammable	BE 3	~~A57~~ A217	II	E0	452	1 kg	453	15 kg
Nitrocellulose with water, not less than 25% water by mass	2555	4.1		Solid flammable	BE 3	~~A57~~ A217	II	E0	452	1 kg	453	15 kg

Paragraph 1.2.1.5 a) of this report:

~~**Self-reactive liquid type B***~~Self-reactive liquid type B*	~~3221~~ FORBIDDEN	~~4.1~~							~~FORBIDDEN~~		~~FORBIDDEN~~	
~~**Self-reactive liquid type B, temperature controlled***~~Self-reactive liquid type B, temperature controlled*	~~3231~~ FORBIDDEN	~~4.1~~							~~FORBIDDEN~~		~~FORBIDDEN~~	

. . .

Paragraphs 1.2.1.5 and 8.1 of this report and 3.1.2.6 of DGP/28-WP/3:

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		Radioac-tive	CA 1	A78 A139 A159			See Part 2;7 and Part 4;9			

. . .

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*
Amendments to lithium battery provisions												
Paragraph 4.8 of this report:												
Vehicle, flammable gas powered	3166	9		Miscella-neous		A70 A87 A118 A120 A154 A214		E0	FORBIDDEN		951	No limit
Vehicle, flammable liquid powered	3166	9		Miscella-neous		A70 A87 A118 A120 A154 A214		E0	950	No limit	950	No limit
Vehicle, fuel cell, flammable gas powered†	3166	9		Miscella-neous		A70 A87 A118 A120 A154 A176 A214		E0	FORBIDDEN		951	No limit
Vehicle, fuel cell, flammable liquid powered †	3166	9		Miscella-neous		A70 A87 A118 A120 A154 A176 A214		E0	950	No limit	950	No limit

. . .

Amendments to manage aviation specific risks

Additional amendments to Table 3-1 are presented below. The only column with amended values is Column 8, UN packing group. For the sake of simplicity, only the columns from Table 3-1 that are relevant to the proposal are shown.

Paragraph 2.2.4 of this report:

Proper shipping name (1)	*UN No. (2)*	*Class or divi-sion (3)*	*Sub-sidiary Hazard (4)*	*UN packing group (8)*
Acetone cyanohydrin, stabilized	1541	6.1		I
Acrolein, stabilized	1092	6.1	3	I
Allyl alcohol	1098	6.1	3	I
Allyl chloroformate	1722	6.1	8 3	I
Allylamine	2334	6.1	3	I
Aluminium borohydride	2870	4.2	4.3	I
Aluminium borohydride in devices	2870	4.2	4.3	I
Aluminium phosphide pesticide	3048	6.1		I
Ammonium nitrate emulsion	3375	5.1		II
Ammonium nitrate gel	3375	5.1		II
Ammonium nitrate suspension	3375	5.1		II
Ammonium nitrate, liquid	2426	5.1		
Arsenic trichloride	1560	6.1		I
Articles containing a substance liable to spontaneous combustion, n.o.s.*	3542	4.2	See 2;0.6	
Articles containing a substance which emits flammable gas in contact with water, n.o.s.*	3543	4.3	See 2;0.6	
Articles containing corrosive substance, n.o.s.*	3547	8	See 2;0.6	
Articles containing flammable liquid, n.o.s.*	3540	3	See 2;0.6	
Articles containing flammable solid, n.o.s.*	3541	4.1	See 2;0.6	
Articles containing miscellaneous dangerous goods, n.o.s.*	3548	9	See 2;0.6	
Articles containing oxidizing substance, n.o.s.*	3544	5.1	See 2;0.6	
Articles containing toxic substance, n.o.s.*	3546	6.1	See 2;0.6	
Asbestos, amphibole*	2212	9		II
Azodicarbonamide	3242	4.1		II
Barium alloys, pyrophoric	1854	4.2		I
Bhusa	1327	4.1		
Boron tribromide	2692	8		I
Bromine	1744	8	6.1	I
Bromine pentafluoride	1745	5.1	6.1 8	I
Bromine solution	1744	8	6.1	I
Bromine trifluoride	1746	5.1	8 6.1	I
Bromoacetone	1569	6.1	3	II

Proper shipping name (1)	*UN No. (2)*	*Class or division (3)*	*Subsidiary Hazard (4)*	*UN packing group (8)*
n-Butyl chloroformate	2743	6.1	3 8	II
tert-Butyl hypochlorite	3255	4.2	8	I
tert-Butyl isocyanate	2484	6.1	3	I
n-Butyl isocyanate	2485	6.1	3	I
5-tert-Butyl-2,4,6-trinitro-m-xylene	2956	4.1		III
Calcium alloys, pyrophoric	1855	4.2		I
Calcium, pyrophoric	1855	4.2		I
Carbon	1361	4.2		II
Carbon	1361	4.2		III
Carbon disulphide	1131	3	6.1	I
Celluloid, scrap	2002	4.2		III
Chemical sample, toxic	3315	6.1		I
Chloric acid, aqueous solution	2626	5.1		II
Chloroacetic acid, molten	3250	6.1	8	II
Chloroacetone, stabilized	1695	6.1	8 3	I
Chloroacetonitrile	2668	6.1	3	I
Chloroacetyl chloride	1752	6.1	8	I
2-Chloroethanal	2232	6.1		I
Chloropicrin	1580	6.1		I
Chloropicrin mixture, n.o.s.*	1583	6.1		II
Chloropicrin mixture, n.o.s.*	1583	6.1		III
Chloropicrin mixture, n.o.s.*	1583	6.1		I
Chlorosulphonic acid	1754	8		I
Copra	1363	4.2		III
Corrosive liquid, water-reactive, n.o.s.*	3094	8	4.3	I
Cotton waste, oily	1364	4.2		III
Cotton, wet	1365	4.2		III
Crotonaldehyde	1143	6.1	3	I
Crotonaldehyde, stabilized	1143	6.1	3	I
Cyanogen bromide	1889	6.1	8	I
Cyclohexyl isocyanate	2488	6.1	3	I
Desensitized explosive, liquid, n.o.s.*	3379	3		I
Desensitized explosive, solid, n.o.s.*	3380	4.1		I
Dichlorodimethyl ether, symmetrical	2249	6.1	3	I
Diketene, stabilized	2521	6.1	3	I
Dimethyl disulphide	2381	3	6.1	II
Dimethyl sulphate	1595	6.1	8	I
Dimethylhydrazine, symmetrical	2382	6.1	3	I
Dimethylhydrazine, unsymmetrical	1163	6.1	3 8	I
Dinitrotoluenes, molten	1600	6.1		II
Diphenylamine chloroarsine	1698	6.1		I
Diphenylchloroarsine, liquid	1699	6.1		I
Elevated temperature liquid, n.o.s.*	3257	9		III
Elevated temperature liquid, flammable, n.o.s.*	3256	3		III
Elevated temperature solid, n.o.s.*	3258	9		III
Epibromohydrin	2558	6.1	3	I
Ethyl bromoacetate	1603	6.1	3	II

Proper shipping name (1)	*UN No. (2)*	*Class or division (3)*	*Subsidiary Hazard (4)*	*UN packing group (8)*
Ethyl chloroformate	1182	6.1	3 8	I
Ethyl chlorothioformate	2826	8	3	II
Ethyl isocyanate	2481	6.1	3	I
Ethyl nitrite solution	1194	3	6.1	I
Ethyldichloroarsine	1892	6.1		I
Ethylene chlorohydrin	1135	6.1	3	I
Ethylene dibromide	1605	6.1		I
Ethyleneimine, stabilized	1185	6.1	3	I
Fabrics, animal, n.o.s.	1373	4.2		III
Fabrics, synthetic, n.o.s	1373	4.2		III
Fabrics, vegetable, n.o.s.	1373	4.2		III
Fibres, animal	1372	4.2		III
Fibres, animal, n.o.s.	1373	4.2		III
Fibres, synthetic, n.o.s.	1373	4.2		III
Fibres, vegetable	1372	4.2		III
Fibres, vegetable, dry	3360	4.1		
Fibres, vegetable, n.o.s.	1373	4.2		III
Fish meal, unstabilized	1374	4.2		II
Fish scrap, stabilized	2216	9		III
Fish scrap, unstabilized	1374	4.2		II
Flammable solid, organic, molten, n.o.s.*	3176	4.1		II
Flammable solid, organic, molten, n.o.s.*	3176	4.1		III
Flammable solid, oxidizing, n.o.s.*	3097	4.1	5.1	II
Flammable solid, oxidizing, n.o.s.*	3097	4.1	5.1	III
Fumigated cargo transport unit	3359	9		
Hafnium powder, dry	2545	4.2		I
Hay	1327	4.1		
Heat producing articles, battery operated equipment, such as under-water torches or soldering equipment, which, if accidentally activated, will generate extreme heat and can cause fire	0	9		
Hexachlorocyclopentadiene	2646	6.1		I
Hydrobromic acid	1788	8		II
Hydrocyanic acid, aqueous solution	1613	6.1		I
Hydrogen cyanide, aqueous solution	1613	6.1		I
Hydrogen cyanide, solution in alcohol	3294	6.1	3	I
Hydrogen cyanide, stabilized	1614	6.1		I
Hydrogen cyanide, stabilized	1051	6.1	3	I
Hydrogen fluoride, anhydrous	1052	8	6.1	I
Hydrogen peroxide, aqueous solution	2014	5.1	8	II
Hydrogen peroxide, aqueous solution, stabilized	2015	5.1	8	I
Hydrogen peroxide, stabilized	2015	5.1	8	I
Iodine pentafluoride	2495	5.1	6.1 8	I
Iron oxide, spent	1376	4.2		III
Iron pentacarbonyl	1994	6.1	3	I
Iron sponge, spent	1376	4.2		III
Isobutyl isocyanate	2486	6.1	3	I

Proper shipping name (1)	*UN No. (2)*	*Class or divi-sion (3)*	*Sub-sidiary Hazard (4)*	*UN packing group (8)*
Isopropyl chloroformate	2407	6.1	3 8	I
Isopropyl isocyanate	2483	6.1	3	I
Isosorbide-5-mononitrate	3251	4.1		III
Lithium batteries installed in cargo transport unit	3536	9		
Maleic anhydride, molten	2215	8		III
Matches, 'strike anywhere'	1331	4.1		III
Matches, fusee	2254	4.1		III
Metal catalyst, dry*	2881	4.2		I
Methacrylonitrile, stabilized	3079	6.1	3	I
Methanesulphonyl chloride	3246	6.1	8	I
Methoxymethyl isocyanate	2605	6.1	3	I
Methyl bromide and ethylene dibromide mixture, liquid	1647	6.1		I
Methyl chloroacetate	2295	6.1	3	I
Methyl chloroformate	1238	6.1	3 8	I
Methyl chloromethyl ether	1239	6.1	3	I
Methyl iodide	2644	6.1		I
Methyl isocyanate	2480	6.1	3	I
Methyl isothiocyanate	2477	6.1	3	I
Methyl orthosilicate	2606	6.1	3	I
Methyl vinyl ketone, stabilized	1251	6.1	3 8	I
2-Methyl-2-heptanethiol	3023	6.1	3	I
Methylhydrazine	1244	6.1	3 8	I
Motor fuel anti-knock mixture, flammable	3483	6.1	3	I
Musk xylene	2956	4.1		III
Naphthalene, molten	2304	4.1		III
Nickel carbonyl	1259	6.1	3	I
Nitric acid, red fuming	2032	8	5.1 6.1	I
Nitroglycerin mixture, desensitized, liquid flammable, n.o.s.*	3343	3		
Nitroglycerin mixture, desensitized, liquid, n.o.s.*	3357	3		II
4-Nitrophenylhydrazine	3376	4.1		I
Organometallic substance, liquid, pyrophoric*	3392	4.2		I
Organometallic substance, liquid, pyrophoric, water reactive*	3394	4.2	4.3	I
Organometallic substance, solid, pyrophoric*	3391	4.2		I
Organometallic substance, solid, pyrophoric, water reactive*	3393	4.2	4.3	I
Oxidizing liquid, corrosive, n.o.s.*	3098	5.1	8	I
Oxidizing solid, flammable, n.o.s.*	3137	5.1	4.1	I
Oxidizing solid, self-heating, n.o.s.*	3100	5.1	4.2	I
Oxidizing solid, self-heating, n.o.s.*	3100	5.1	4.2	II
Oxidizing solid, water-reactive, n.o.s.*	3121	5.1	4.3	I
Oxidizing solid, water-reactive, n.o.s.*	3121	5.1	4.3	II
Packagings, discarded, empty, uncleaned	3509	9		
Paper, unsaturated oil treated	1379	4.2		III

Proper shipping name (1)	*UN No. (2)*	*Class or division (3)*	*Subsidiary Hazard (4)*	*UN packing group (8)*
Pentaborane	1380	4.2	6.1	I
Pentaerythrite tetranitrate mixture desensitized, solid, n.o.s.*	3344	4.1		II
Pentaerythritol tetranitrate mixture desensitized, solid, n.o.s.*	3344	4.1		II
Perchloromethyl mercaptan	1670	6.1		I
PETN mixture desensitized, solid, n.o.s.*	3344	4.1		II
Phenol, molten	2312	6.1		II
Phenyl isocyanate	2487	6.1	3	I
Phenyl mercaptan	2337	6.1	3	I
Phenylcarbylamine chloride	1672	6.1		I
Phosphorus oxybromide, molten	2576	8		II
Phosphorus oxychloride	1810	6.1	8	I
Phosphorus trichloride	1809	6.1	8	I
Phosphorus, white, dry	1381	4.2	6.1	I
Phosphorus, white, in solution	1381	4.2	6.1	I
Phosphorus, white, molten	2447	4.2	6.1	I
Phosphorus, white, under water	1381	4.2	6.1	I
Phosphorus, yellow, dry	1381	4.2	6.1	I
Phosphorus, yellow, in solution	1381	4.2	6.1	I
Phosphorus, yellow, under water	1381	4.2	6.1	I
Plastics, nitrocellulose-based, self-heating, n.o.s.*	2006	4.2		III
Polymerizing substance, liquid, temperature controlled, n.o.s.*	3534	4.1		III
Polymerizing substance, solid, temperature controlled, n.o.s.*	3533	4.1		III
n-Propyl chloroformate	2740	6.1	8 3	I
n-Propyl isocyanate	2482	6.1	3	I
Pyrophoric alloy, n.o.s.*	1383	4.2		I
Pyrophoric liquid, inorganic, n.o.s.*	3194	4.2		I
Pyrophoric liquid, organic, n.o.s.* †	2845	4.2		I
Pyrophoric metal, n.o.s.*	1383	4.2		I
Pyrophoric solid, inorganic, n.o.s.*	3200	4.2		I
Pyrophoric solid, organic, n.o.s.*	2846	4.2		I
Rags, oily	1856	4.2		
Seed cake	2217	4.2		III
Seed cake	1386	4.2		III
Self-heating solid, oxidizing, n.o.s.*	3127	4.2	5.1	III
Self-heating solid, oxidizing, n.o.s.*	3127	4.2	5.1	II
Silver picrate, wetted	1347	4.1		I
Straw	1327	4.1		
Sulphur trioxide, stabilized	1829	8		I
Sulphur, molten	2448	4.1		III
Sulphuric acid, fuming	1831	8	6.1	I
Sulphuryl chloride	1834	6.1	8	I
Tear gas substance, liquid, n.o.s.*	1693	6.1		I
Tetranitromethane	1510	6.1	5.1	I
Textile waste, wet	1857	4.2		III
Thionyl chloride	1836	8		I
Thiophosgene	2474	6.1		I

Proper shipping name (1)	*UN No. (2)*	*Class or division (3)*	*Subsidiary Hazard (4)*	*UN packing group (8)*
Titanium powder, dry	2546	4.2		I
Titanium tetrachloride	1838	6.1	8	I
Titanium trichloride mixture, pyrophoric	2441	4.2	8	I
Titanium trichloride, pyrophoric	2441	4.2	8	I
Toxic by inhalation liquid, corrosive, n.o.s.*	3389	6.1	8	I
Toxic by inhalation liquid, corrosive, n.o.s.*	3390	6.1	8	I
Toxic by inhalation liquid, flammable, corrosive, n.o.s.*	3488	6.1	3 8	I
Toxic by inhalation liquid, flammable, corrosive, n.o.s.*	3489	6.1	3 8	I
Toxic by inhalation liquid, flammable, n.o.s.*	3384	6.1	3	I
Toxic by inhalation liquid, flammable, n.o.s.*	3383	6.1	3	I
Toxic by inhalation liquid, n.o.s.*	3381	6.1		I
Toxic by inhalation liquid, n.o.s.*	3382	6.1		I
Toxic by inhalation liquid, oxidizing, n.o.s.*	3387	6.1	5.1	I
Toxic by inhalation liquid, oxidizing, n.o.s.*	3388	6.1	5.1	I
Toxic by inhalation liquid, water-reactive, flammable, n.o.s.*	3491	6.1	3 4.3	I
Toxic by inhalation liquid, water-reactive, flammable, n.o.s.*	3490	6.1	3 4.3	I
Toxic by inhalation liquid, water-reactive, n.o.s.*	3386	6.1	4.3	I
Toxic by inhalation liquid, water-reactive, n.o.s.*	3385	6.1	4.3	I
Tributylphosphane	3254	4.2		I
Trichloroacetyl chloride	2442	8		II
Trichlorosilane	1295	4.3	3 8	I
Trimethylacetyl chloride	2438	6.1	3 8	I
Water-reactive solid, oxidizing, n.o.s.*	3133	4.3	5.1	III
Water-reactive solid, oxidizing, n.o.s.*	3133	4.3	5.1	II
Wool waste, wet	1387	4.2		III
Zirconium powder, dry	2008	4.2		I
Zirconium scrap	1932	4.2		III

Additional amendments to Table 3-1 are presented below. The only column with amended values is Column 9, Excepted quantity, other than for column 8, UN packing group for UN 3094 and UN 3098.

Paragraph 3.2 of this report:

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*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
Adsorbed gas, toxic, n.o.s.*	3512	2.3			AU 1 CA 7 IR 3 NL 1 US 3	A2		~~E0~~	FORBIDDEN		FORBIDDEN	
Adsorbed gas, toxic, corrosive, n.o.s.*	3516	2.3	8		AU 1 CA 7 IR 3 NL 1 US 3	A2		~~E0~~	FORBIDDEN		FORBIDDEN	
Adsorbed gas, toxic, flammable, n.o.s.*	3514	2.3	2.1		AU 1 CA 7 IR 3 NL 1 US 3	A2		~~E0~~	FORBIDDEN		FORBIDDEN	
Adsorbed gas, toxic, flammable, corrosive, n.o.s.*	3517	2.3	2.1 8		AU 1 CA 7 IR 3 NL 1 US 3	A2		~~E0~~	FORBIDDEN		FORBIDDEN	
Adsorbed gas, toxic, oxidizing, n.o.s.*	3515	2.3	5.1		AU 1 CA 7 IR 3 NL 1 US 3	A2		~~E0~~	FORBIDDEN		FORBIDDEN	
Adsorbed gas, toxic, oxidizing, corrosive, n.o.s.*	3518	2.3	5.1 8		AU 1 CA 7 IR 3 NL 1 US 3	A2		~~E0~~	FORBIDDEN		FORBIDDEN	
Aluminium phosphide pesticide	3048	6.1				A128		~~E0~~	FORBIDDEN		FORBIDDEN	
Arsine, adsorbed	3522	2.3	2.1		AU 1 CA 7 IR 3 NL 1 US 3	A2		~~E0~~	FORBIDDEN		FORBIDDEN	
Boron trifluoride, adsorbed	3519	2.3	8		AU 1 CA 7 IR 3 NL 1 US 3	A2		~~E0~~	FORBIDDEN		FORBIDDEN	
Chlorine, adsorbed	3520	2.3	5.1 8		AU 1 CA 7 IR 3 NL 1 US 3	A2		~~E0~~	FORBIDDEN		FORBIDDEN	
Corrosive liquid, water-reactive, n.o.s.	3094	8	4.3	Corrosive & Danger if wet			I II	~~E0~~ E2	FORBIDDEN		FORBIDDEN	

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	5	6	7	8	9	10	11	12	13
Dimethyl disulphide	2381	3	6.1				II	~~E0~~	FORBIDDEN		FORBIDDEN	
Germane, adsorbed	3523	2.3	2.1		AU 1 CA 7 IR 3 NL 1 US 3	A2		~~E0~~	FORBIDDEN		FORBIDDEN	
Hydrogen selenide, adsorbed	3526	2.3	2.1		AU 1 CA 7 IR 3 NL 1 US 3	A2		~~E0~~	FORBIDDEN		FORBIDDEN	
Lithium batteries installed in cargo transport unit lithium ion batteries or lithium metal batteries	3536	9						~~E0~~	FORBIDDEN		FORBIDDEN	
Oxidizing liquid, corrosive, n.o.s. *	3098	5.1	8	Oxidizer & Corrosive		A3	I II III	~~E0~~ E2 E1	FORBIDDEN 550 Y540 551 Y541	 1 L 0.5 L 2.5 L 1 L	FORBIDDEN 554 555	 5 L 30 L
Packagings, discarded, empty, uncleaned	3509	9				A200		~~E0~~	FORBIDDEN		FORBIDDEN	
Phosphorus pentafluoride, adsorbed	3524	2.3	8		AU 1 CA 7 IR 3 NL 1 US 3	A2		~~E0~~	FORBIDDEN		FORBIDDEN	
Phosphine, adsorbed	3525	2.3	2.1		AU 1 CA 7 IR 3 NL 1 US 3	A2		~~E0~~	FORBIDDEN		FORBIDDEN	
Polymerizing substance, liquid, temperature controlled, n.o.s.*	3534	4.1				A209		~~E0~~	FORBIDDEN		FORBIDDEN	
Polymerizing substance, solid, temperature controlled, n.o.s.*	3533	4.1				A209		~~E0~~	FORBIDDEN		FORBIDDEN	
Powder, smokeless †	0509	1.4C		Explosive 1.4				E0	FORBIDDEN		114	75 kg
Propellant, solid	0501	1.4C		Explosive 1.4				E0	FORBIDDEN		114	75 kg
Silicon tetrafluoride, adsorbed	3521	2.3	8		AU 1 CA 7 IR 3 NL 1 US 3	A2		~~E0~~	FORBIDDEN		FORBIDDEN	

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Chapter 3

SPECIAL PROVISIONS

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Table 3-2. Special provisions

TIs	*UN*
Amendments to manage aviation specific risks	
Paragraphs 1.2.1.5 and 8.1 of this report and 3.2.2.14 of DGP/28-WP/3:	
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.
. . .	
Paragraph 2.2.7 of this report:	
A4	Liquids having a vapour inhalation toxicity of Packing Group I are forbidden on both passenger and cargo aircraft. Liquids having a mist inhalation toxicity of Packing Group I are forbidden on a passenger aircraft. They may be carried on cargo aircraft providing they are packed in accordance with the packing instructions for the Packing Group I substance and the maximum net quantity per package does not exceed 5 L, except where the limit specified in column 13 of Table 3-1 is less than 5 L, in which case the limit specified in column 13 applies. Transport in accordance with this special provision must be noted on the dangerous goods transport document.

TIs *UN*

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UN harmonization amendments

Paragraphs 1.2.1.5 and 8.1 of this report and 3.1.2.6.1 b) of DGP/28-WP/3:

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.

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Amendments to manage aviation specific risks

Paragraphs 2.2.1 and 8.1 of this report and 3.2.2.7 of DGP/28-WP/3 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.

TIs	*UN*	
Paragraph 2.2.3 of this report:		
A36		~~The provisions of Special Provision A2 apply to this entry for Packing Group I only and t~~The provisions of Special Provision A1 apply to this entry for Packing Group II only~~, as applicable~~.
. . .		
Introduced into 2021-2022 Edition of the Technical Instructions through a corrigendum Paragraph 3.2.2.5 of DGP/28-WP/2:		
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~~ ~~s~~Sealed packets ~~or~~ 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.
. . .		
UN harmonization amendments		
Paragraph 1.2.1.5 b) of this report:		
A57		~~Packagings must be so constructed that explosion is not possible by reason of increased internal pressure.~~Not used.
. . .		
Amendments to manage aviation specific risks		
Paragraphs 2.2.1 and 8.1 of this report and 3.2.2.7 of DGP/28-WP/2:		
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.
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TIs *UN*

Amendments to lithium battery provisions

Paragraph 4.11 of this report:

A88 Pre-production prototypes of lithium batteries or cells, when these prototypes are transported for testing, or low production runs (i.e. annual production runs consisting of not more than 100 lithium batteries or cells) of lithium batteries or cells that have not been tested to the requirements in Part III, subsection 38.3 of the UN *Manual of Tests and Criteria* may be transported aboard cargo aircraft if approved by the appropriate authority of the State of Origin and the State of the Operator and the requirements in Packing Instruction 910 of the Supplement are met.

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

Irrespective of the limit specified in column 13 of Table 3-1, the ~~battery~~ cell or battery ~~assembly~~ as prepared for transport may have a mass exceeding 35 kg.

Paragraphs 2.2.1, 4.11 and 8.1 of this report and 3.2.2.15 of DGP/28-WP/3:

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~~ cell 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.

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Paragraphs 2.2.1 and 8.1 of this report and 3.2.2.3 of DGP/28-WP/3:

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.

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Paragraphs 2.2.1 and 8.1 of this report and 3.2.2.6 of DGP/28-WP/3:

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~~.

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Paragraph 2.2.9 of this report:

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

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Paragraphs 2.2.1 and 8.1 of this report and 3.2.2.11 of DGP/28-WP/2:

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.

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Paragraph 4.7 of this report:

A206	~~(384)~~	~~The hazard label must conform to the model shown in Figure 5-26.~~Not used.

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		Amendments to lithium battery provisions
		Paragraph 4.1 of this report:
A213	(387)	Lithium batteries in conformity with 2;9.3 f) containing both primary lithium metal cells and rechargeable lithium ion cells must be assigned to UN Nos. 3090 or 3091 as appropriate. When such batteries are transported in accordance with Section IB ~~or II~~ of Packing Instruction 968 or in accordance with Section II of Packing Instruction 969 or 970, the total lithium content of all lithium metal cells contained in the battery must not exceed 1.5 g, and the total capacity of all lithium ion cells contained in the battery must not exceed 10 Wh.
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		UN harmonization amendments
		Paragraphs 1.2.1.5 and 8.1 of this report and 3.1.2.6 of DGP/28-WP/3:
		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.
		Amendments to manage aviation specific risks
		Paragraphs 2.2.1 and 8.1 of this report and 3.2.2.4 of DGP/28-WP/3:
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.

TIs *UN*

Amendments to facilitate transport

Paragraphs 2.2.1, 8.1 and 3.10 of this report and 3.2.2.22 of DGP/28-WP/3:

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) with the exception of lithium cells or batteries that comply with Section II of Packing Instruction 967, as applicable, or Section II of Packing Instruction 970, as applicable, 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.

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Paragraphs 2.2.1, 8.1 and 3.10 of this report and 3.2.2.22 of DGP/28-WP/3:

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) with the exception of lithium cells or batteries that comply with Section II of Packing Instruction 967, as applicable, or Section II of Packing Instruction 970, as applicable, 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.

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Chapter 4

DANGEROUS GOODS IN LIMITED QUANTITIES

Amendments to facilitate transport

Paragraph 3.1 of this report:

4.1 APPLICABILITY

4.1.1 Limited quantities of dangerous goods may only be carried in accordance with the limitations and provisions of this chapter and must meet all the applicable requirements of the Technical Instructions unless otherwise provided for below.

4.1.2 Only dangerous goods which are permitted on passenger aircraft and which meet the criteria of the following classes, divisions and packing groups (if appropriate) may be carried under these provisions for dangerous goods in limited quantities:

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Division 4.1	Packing Groups II and III but excluding UN 2555, UN 2556, UN 2557, UN 2907, polymerizing substances and all self-reactive substances ~~irrespective of packing group~~

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Part 4

PACKING INSTRUCTIONS

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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

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UN harmonization amendments

Paragraphs 1.2.1.6 and 8.1 of this report and 3.1.2.7.1 a) of DGP/28-WP/3:

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.

Paragraphs 1.2.1.6 and 8.1 of this report and 3.1.2.7 of DGP/28-WP/3:

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.

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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.

UN harmonization amendments

Paragraphs 1.2.1.6 and 8.1 of this report and 3.1.2.7 of DGP/28-WP/3:

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.

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Chapter 3

CLASS 1 — EXPLOSIVES

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UN harmonization amendments

Paragraphs 1.2.1.6 and 8.1 of this report and 3.1.2.7 of DGP/28-WP/3:

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

Packing Instruction 137

Inner packagings	*Intermediate packagings*	*Outer packagings*
Bags plastics Boxes fibreboard wood Tubes fibreboard metal plastics Dividing partitions in the outer packagings	Not necessary	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;1.1.13~~ 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.

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Chapter 4

CLASS 2 — GASES

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4.1 SPECIAL PACKING PROVISIONS FOR DANGEROUS GOODS OF CLASS 2

4.1.1 General requirements

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UN harmonization amendments

Paragraphs 1.2.1.6 and 8.1 of this report and 3.1.2.7 of DGP/28-WP/3:

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.

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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.

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Paragraph 1.2.1.6 of this report:

Packing Instruction 203

Passenger and cargo aircraft for UN 1950 and 2037 only

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

For the purposes of this packing instruction, a receptacle is considered to be an inner packaging.

Note.— "Receptacle" has the same meaning as set out in 1;3. Any reference in this packing instruction to receptacle will include "aerosols" of UN 1950 and "receptacles, small, containing gas" and "gas cartridges" of UN 2037.

~~***Metal aerosols (IP.7, IP.7A, IP.7B) and non-refillable receptacles containing gas (gas cartridges)***~~*Aerosols and receptacles, small containing gas (gas cartridges) must meet the requirements of Part 6;5.4.*

The capacity of metal receptacles must not exceed 1 000 mL; plastics receptacles must not exceed 500 mL.

~~Non-refillable metal aerosols and non-refillable receptacles containing gas (gas cartridges) must not exceed 1 000 mL capacity.~~

~~The following conditions must be met:~~

~~a) the pressure in the receptacle must not exceed 1 500 kPa at 55°C and each receptacle must be capable of withstanding without bursting a pressure of at least 1.5 times the equilibrium pressure of the contents at 55°C;~~

~~b) if the pressure in the receptacle exceeds 970 kPa at 55°C but does not exceed 1 105 kPa at 55°C, an IP.7, IP.7A or IP.7B metal receptacle must be used;~~

~~c) if the pressure in the receptacle exceeds 1 105 kPa at 55°C but does not exceed 1 245 kPa at 55°C, an IP.7A or IP.7B metal receptacle must be used;~~

~~d) if the pressure in the receptacle exceeds 1 245 kPa at 55°C, an IP.7B metal receptacle must be used;~~

~~e) IP.7B metal receptacles having a minimum burst pressure of 1 800 kPa may be equipped with an inner capsule charged with a non-flammable, non-toxic compressed gas to provide the propellant function. In this case, the pressures indicated in a), b), c) or d) do not apply to the pressure within the capsule for an aerosol. The quantity of gas contained in the capsule must be so limited such that the minimum burst pressure of the receptacle would not be exceeded if the entire gas content of the capsule were released into the outer metal receptacle;~~

~~f) the liquid content must not completely fill the closed receptacle at 55°C; and~~

~~g) each receptacle exceeding 120 mL capacity must have been heated until the pressure in the receptacle is equivalent to the equilibrium pressure of the contents at 55°C, without evidence of leakage, distortion or other defect. For aerosols, non-flammable (tear gas devices), this heat test applies to all aerosols regardless of their capacity.~~

~~***Plastic aerosols (IP.7C)***~~

~~Non-refillable plastic aerosols must not exceed 120 mL capacity, except when the propellant is a non-flammable, non-toxic gas and the contents are not dangerous goods in accordance with the provisions of these Instructions, in which case the quantity must not exceed 500 mL.~~

~~The following conditions must be met:~~

~~a) the contents must not completely fill the closed receptacle at 55°C;~~

~~b) the pressure in the receptacle may not exceed 970 kPa at 55°C; and~~

~~c) each receptacle must be leak tested in accordance with the provisions of 6;3.2.8.1.6.~~

~~***Non-flammable aerosols containing medical preparations or biological products***~~

~~Aerosols, non-flammable, containing only a non-toxic substance or substances and biological products or a medical preparation which will be deteriorated by a heat test, are acceptable in inner non-refillable receptacles not exceeding 575 mL capacity each, providing all the following conditions are met:~~

~~a) the pressure in the aerosol must not exceed 970 kPa at 55°C;~~

~~b) the liquid contents must not completely fill the closed receptacle at 55°C;~~

~~c) one aerosol out of each lot of 500 or less must be heated until the pressure in the aerosol is equivalent to the equilibrium pressure of the contents at 55°C, without evidence of leakage, distortion or other defect; and~~

~~d) the valves must be protected by a cap or other suitable means during transport.~~

UN number and name		*Net quantity per package*	
		Passenger	*Cargo*
UN 1950	**Aerosols**, flammable	75 kg	150 kg
UN 1950	**Aerosols**, flammable (engine starting fluid)	Forbidden	150 kg
UN 1950	**Aerosols**, non-flammable	75 kg	150 kg
UN 1950	**Aerosols**, non-flammable (tear gas devices)	Forbidden	50 kg
UN 2037	**Gas cartridges**	1 kg	15 kg
UN 2037	**Receptacles, small, containing gas**	1 kg	15 kg

ADDITIONAL PACKING REQUIREMENTS

— Packagings must meet Packing Group II performance requirements.
— Release valves on aerosols must be protected by a cap or other suitable means to prevent inadvertent release of the contents during normal conditions of air transport.
— Receptacles must be packed so as to prevent excessive movement and inadvertent discharge during normal conditions of transport.

~~**UN 1950 Aerosols, non-flammable (tear gas devices) — Cargo Aircraft Only**~~

~~— Only metal receptacles, IP.7, IP.7A, IP.7B are permitted. The aerosols must be individually placed into spiral wound tubes fitted with metal ends or a double-faced fibreboard box with suitable padding before being packed into the outer packaging.~~

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)

Paragraph 1.2.1.6 of this report:

Packing Instruction Y203

Passenger and cargo aircraft for UN 1950 and 2037 only

The requirements of 3;4 must be met.

For the purposes of this packing instruction, a receptacle is considered to be an inner packaging.

Note.— "Receptacle" has the same meaning as set out in 1;3. Any reference in this packing instruction to receptacle will include "aerosols" of UN 1950 and "receptacles, small, containing gas" and "gas cartridges" of UN 2037.

~~***Metal aerosols (IP.7, IP.7A, IP.7B) and non-refillable receptacles containing gas (gas cartridges)***~~*Aerosols and receptacles, small containing gas (gas cartridges) must meet the requirements of Part 6;5.4.*

The capacity of metal receptacles must not exceed 1 000 mL; plastics receptacles must not exceed 500 mL.

Non-refillable ~~metal~~ aerosols and non-refillable receptacles containing gas (gas cartridges) containing toxic substances must not exceed 120 mL capacity.

~~All other non-refillable metal aerosols and non-refillable receptacles containing gas (gas cartridges) must not exceed 1 000 mL capacity.~~

~~The following conditions must be met:~~

~~a) the pressure in the receptacle must not exceed 1 500 kPa at 55°C and each receptacle must be capable of withstanding without bursting a pressure of at least 1.5 times the equilibrium pressure of the contents at 55°C;~~

~~b) if the pressure in the receptacle exceeds 970 kPa at 55°C but does not exceed 1 105 kPa at 55°C, an IP.7, IP.7A or IP.7B metal receptacle must be used;~~

~~c) if the pressure in the receptacle exceeds 1 105 kPa at 55°C, an IP.7A or IP.7B metal receptacle must be used;~~

~~d) if the pressure in the receptacle exceeds 1 245 kPa at 55°C, an IP.7B metal receptacle must be used;~~

~~e) IP.7B metal receptacles having a minimum burst pressure of 1 800 kPa may be equipped with an inner capsule charged with a non-flammable, non-toxic compressed gas to provide the propellant function. In this case, the pressures indicated in a), b), c) or d) do not apply to the pressure within the capsule for an aerosol. The quantity of gas contained in the capsule must be so limited such that the minimum burst pressure of the receptacle would not be exceeded if the entire gas content of the capsule were released into the outer metal receptacle;~~

~~f) the liquid content must not completely fill the closed receptacle at 55°C;~~

~~g) each receptacle exceeding 120 mL capacity must have been heated until the pressure in the receptacle is equivalent to the equilibrium pressure of the contents at 55°C, without evidence of leakage, distortion or other defect.~~

~~***Plastic aerosols** (IP.7C)~~

~~Non-refillable plastic aerosols must not exceed 120 mL capacity, except when the propellant is a non-flammable, non-toxic gas and the contents are not dangerous goods in accordance with the provisions of these Instructions, in which case the quantity must not exceed 500 mL.~~

~~The following conditions must be met:~~

~~a) the contents must not completely fill the closed receptacle at 55°C;~~

~~b) the pressure in the receptacle may not exceed 970 kPa at 55°C; and~~

~~c) each receptacle must be leak tested in accordance with the provisions of 6;3.2.8.1.6.~~

~~***Non-flammable aerosols containing medical preparations or biological products***~~

~~Aerosols, non-flammable, containing only a non-toxic substance or substances and biological products or a medical preparation which will be deteriorated by a heat test, are acceptable in inner non-refillable receptacles not exceeding 575 mL capacity each, providing all the following conditions are met:~~

~~a) the pressure in the aerosol must not exceed 970 kPa at 55°C;~~

~~b) the liquid contents must not completely fill the closed receptacle at 55°C;~~

~~c) one aerosol out of each lot of 500 or less must be heated until the pressure in the aerosol is equivalent to the equilibrium pressure of the contents at 55°C, without evidence of leakage, distortion or other defect; and~~

~~d) the valves must be protected by a cap or other suitable means during transport.~~

UN number and name		*Total gross mass per package*
UN 1950	***Aerosols**, flammable*	30 kg G
UN 1950	***Aerosols**, flammable (engine starting fluid)*	30 kg G
UN 1950	***Aerosols**, non-flammable*	30 kg G
UN 1950	***Aerosols**, non-flammable (tear gas devices)*	30 kg G
UN 2037	***Gas cartridges***	1 kg
UN 2037	***Receptacles, small, containing gas***	1 kg

ADDITIONAL PACKING REQUIREMENTS

— Release valves on aerosols must be protected by a cap or other suitable means to prevent inadvertent release of the contents during normal conditions of air transport.
— Receptacles must be packed so as to prevent excessive movement and inadvertent discharge during normal conditions of transport.

OUTER PACKAGINGS (see 6;3.1)

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

Paragraphs 1.2.1.6 and 8.1 of this report and 3.1.2.7.1 c) of DGP/28-WP/3:

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.

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Paragraphs 1.2.1.6 and 8.1 of this report and 3.1.2.7 of DGP/28-WP/3:

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.

Paragraphs 1.2.1.6 and 8.1 of this report and 3.1.2.7.1 d) of DGP/28-WP/3:

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.

UN number and proper shipping name		*Quantity — passenger*	*Quantity — cargo*
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.

Amendments to lithium battery provisions

Paragraphs 4.8 and 4.12 of this report:

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) ~~i~~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) ~~i~~If lithium batteries are installed~~,~~:

   i) lithium batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport; and

   ii) ~~they~~ lithium batteries 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~~, except that pre-production prototypes of lithium batteries or cells, when these prototypes are transported for testing, or low production runs of lithium batteries or cells that have not been tested to the requirements in Part III, subsection 38.3 of the UN *Manual of Tests and Criteria* may be transported aboard cargo aircraft if approved by the appropriate authority of the State of Origin and the State of the Operator. A copy of the document of approval must accompany the consignment.

3) ~~i~~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.

Amendments to facilitate transport

Paragraphs 2.2.1, 8.1 and 3.10 of this report and 3.2.2.22 of DGP/28-WP/3:

Packing Instruction 222

Passenger 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. In addition to the Division 2.2 gas, the article may also contain lithium cells or batteries that comply with Section II of Packing Instruction 967, as applicable, or Section II of Packing Instruction 970, as applicable.

General requirements

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

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

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

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Chapter 5

CLASS 3 — FLAMMABLE LIQUIDS

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Amendments to facilitate transport

Paragraph 3.7 of this report:

Packing Instruction 370

Passenger and cargo aircraft for UN 3269 (Packing Group II or III) only

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COMBINATION PACKAGINGS						
Packing conditions	*Inner packaging (see 6;3.2)*	*Inner packaging quantity (per receptacle) — for liquid base ~~liquid~~ material*	*Inner packaging quantity (per receptacle) — for liquid activator*	*Inner packaging quantity (per receptacle) — for solid activator*	*Total quantity per package*	**SINGLE PACKAGINGS**

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Packing Instruction Y370

Limited quantities
Passenger and cargo aircraft for UN 3269 (Packing Group II or III) only

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COMBINATION PACKAGINGS						
Packing conditions	*Inner packaging (see 6;3.2)*	*Inner packaging quantity (per receptacle) — for liquid base ~~liquid~~ material*	*Inner packaging quantity (per receptacle) — for liquid activator*	*Inner packaging quantity (per receptacle) — for solid activator*	*Total quantity per package*	**SINGLE PACKAGINGS**

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UN harmonization amendments

Paragraphs 1.2.1.6 and 8.1 of this report and 3.1.2.7.1 d) of DGP/28-WP/3:

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.

UN number and proper shipping name		*Quantity — passenger*	*Quantity — cargo*
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.

Amendments to lithium battery provisions

Paragraphs 4.8 and 4.12 of this report:

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) ~~i~~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) ~~i~~If lithium batteries are installed~~,~~ :

   i) lithium batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport; and

   ii) ~~they~~ lithium batteries 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~~, except that pre-production prototypes of lithium batteries or cells, when these prototypes are transported for testing, or low production runs of lithium batteries or cells that have not been tested to the requirements in Part III, subsection 38.3 of the UN *Manual of Tests and Criteria* may be transported aboard cargo aircraft if approved by the appropriate authority of the State of Origin and the State of the Operator. A copy of the document of approval must accompany the consignment.

3) ~~i~~If sodium batteries are installed they must conform to the requirements of Special Provision A94.

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Chapter 6

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

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Amendments to facilitate transport

Paragraph 3.7 of this report:

Packing Instruction 450

Passenger and cargo aircraft for UN 3527 (Packing Group II or III) only

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COMBINATION PACKAGINGS						
Packing conditions	*Inner packaging (see 6;3.2)*	*Inner packaging quantity (per receptacle) — for solid base ~~liquid~~ material*	*Inner packaging quantity (per receptacle) — for liquid activator*	*Inner packaging quantity (per receptacle) — for solid activator*	*Total quantity per package*	**SINGLE PACKAGINGS**

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Packing Instruction Y450

Limited quantities
Passenger and cargo aircraft for UN 3527 (Packing Group II or III) only

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COMBINATION PACKAGINGS						
Packing conditions	*Inner packaging (see 6;3.2)*	*Inner packaging quantity (per receptacle) — for solid base ~~liquid~~ material*	*Inner packaging quantity (per receptacle) — for liquid activator*	*Inner packaging quantity (per receptacle) — for solid activator*	*Total quantity per package*	**SINGLE PACKAGINGS**

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UN harmonization amendments

Paragraphs 1.2.1.6 and 8.1 of this report and 3.1.2.7.1 e) of DGP/28-WP/3:

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.

UN number and proper shipping name	*Packing conditions*	*Total quantity per package — passenger*	*Total quantity per package — cargo*
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	*Drums*	*Jerricans*
Aluminium (4B)	Aluminium (1B2)	Aluminium (3B2)
Fibreboard (4G)	Fibre (1G)	Plastics (3H2)
Natural wood (4C1, 4C2)	Other metal (1N2)	Steel (3A2)
Other metal (4N)	Plastics (1H2)	
Plastics (4H1, 4H2)	Plywood (1D)	
Plywood (4D)	Steel (1A2)	
Reconstituted wood (4F)		
Steel (4A)		

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Chapter 8

CLASS 6 — TOXIC AND INFECTIOUS SUBSTANCES

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UN harmonization amendments

Paragraphs 1.2.1.6 and 8.1 of this report and 3.1.2.7.1 f) and 3.2.2.12 of DGP/28-WP/3:

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;1~~ 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

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

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Chapter 10

CLASS 8 — CORROSIVE SUBSTANCES

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UN harmonization amendments

Paragraphs 1.2.1.6 and 8.1 of this report and 3.1.2.7.1 e) of DGP/28-WP/3:

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.

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**	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. Amendments to manage aviation specific risks Paragraphs 1.2.1.6 and 8.1 of this report and 3.2.2.11 of DGP/28-WP/3: ~~*Batteries installed in equipment*~~ ~~If batteries are shipped as an integral component of assembled equipment, they must be securely installed and fastened in an upright position and protected against contact with other articles so as to prevent short circuits. Batteries must be removed and packed according to this packing instruction if the assembled equipment is likely to be carried in other than an upright position.~~	30 kg	~~No limit~~400 kg

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

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Chapter 11

CLASS 9 — MISCELLANEOUS DANGEROUS GOODS

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Packing Instruction 950

Passenger and cargo aircraft for UN 3166 only
(See Packing Instruction 220 for flammable gas-powered engines and machinery, Packing Instruction 378 for flammable liquid-powered engines and machinery, 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:

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ADDITIONAL PACKING REQUIREMENTS

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Amendments to lithium battery provisions

Paragraphs 4.8 and 4.12 of this report:

Batteries

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

1) ~~i~~If spillable batteries are installed, and it is possible for the vehicle 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) ~~i~~If lithium batteries are installed~~,~~ :

   i) lithium batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport; and

   ii) ~~they~~ lithium batteries 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 vehicle and must be protected in such a manner so as to prevent damage and short circuits; and~~, except that pre-production prototypes of lithium batteries or cells, when these prototypes are transported for testing, or low production runs of lithium batteries or cells that have not been tested to the requirements in Part III, subsection 38.3 of the UN *Manual of Tests and Criteria* may be transported aboard cargo aircraft if approved by the appropriate authority of the State of Origin and the State of the Operator. A copy of the document of approval must accompany the consignment.

3) ~~i~~If sodium batteries are installed they must conform to the requirements of Special Provision A94.

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Packing Instruction 951

Cargo aircraft only for UN 3166 only
(See Packing Instruction 220 for flammable gas-powered engines and machinery, Packing Instruction 378 for flammable liquid-powered engines and machinery, Packing Instruction 950 for flammable liquid-powered vehicles, Packing Instruction 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:

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ADDITIONAL PACKING REQUIREMENTS

. . .

Amendments to lithium battery provisions

Paragraphs 4.8 and 4.12 of this report:

Batteries

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

1) ~~i~~If spillable batteries are installed, and it is possible for the vehicle 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) ~~i~~If lithium batteries are installed~~,~~ :

   i) lithium batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport; and

   ii) ~~they~~ lithium batteries 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 vehicle and must be protected in such a manner so as to prevent damage and short circuits; and~~, except that pre-production prototypes of lithium batteries or cells, when these prototypes are transported for testing, or low production runs of lithium batteries or cells that have not been tested to the requirements in Part III, subsection 38.3 of the UN *Manual of Tests and Criteria* may be transported aboard cargo aircraft if approved by the appropriate authority of the State of Origin and the State of the Operator. A copy of the document of approval must accompany the consignment.

3) ~~i~~If sodium batteries are installed they must conform to the requirements of Special Provision A94.

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Packing Instruction 952

Passenger and cargo aircraft for UN 3171 only
(See Packing Instruction 220 for flammable gas-powered engines and machinery, Packing Instruction 378 for flammable liquid-powered engines and machinery, Packing Instruction 950 for flammable liquid-powered vehicles, Packing Instruction 951 for flammable gas-powered vehicles or Packing Instruction 972 for engines or machinery containing only environmentally hazardous fuels)

General requirements

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

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ADDITIONAL PACKING REQUIREMENTS

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Amendments to lithium battery provisions

Paragraphs 4.8 and 4.12 of this report:

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

Batteries

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

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

2) ~~i~~If lithium batteries are installed ~~in a vehicle,~~:

   i) lithium batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport; and

   ii) ~~they~~ lithium batteries must meet the provisions of Part 2;9.3, unless otherwise approved by the appropriate authority of the State of Origin, except that pre-production prototypes of lithium batteries or cells, when these prototypes are transported for testing, or low production runs of lithium batteries or cells that have not been tested to the requirements in Part III, subsection 38.3 of the UN *Manual of Tests and Criteria* may be transported aboard cargo aircraft if approved by the appropriate authority of the State of Origin and the State of the Operator. A copy of the document of approval must accompany the consignment.

   iii) Where the lithium battery is removed from the vehicle and is packed separate from the vehicle in the same outer packaging, the package must be consigned as UN 3481— **Lithium ion batteries packed with equipment** or UN 3091 — **Lithium metal batteries packed with equipment** and packed according to Packing Instruction 966 or 969, as applicable~~; and~~.

3) ~~i~~If sodium batteries are installed they must conform to the requirements of Special Provision A94.

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Packing Instruction 955

Passenger and cargo aircraft for UN 2990 and UN 3072 only

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ADDITIONAL PACKING REQUIREMENTS

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

a) Division 2.2 gases, must be contained in cylinders which conform to the requirements of the appropriate national authority of the country in which they are approved and filled. Such cylinders may be connected to the life-saving appliance. These cylinders may include installed actuating cartridges (cartridges, power device of Division 1.4C and 1.4S) provided the aggregate quantity of deflagrating (propellant) explosives does not exceed 3.2 grams per unit. When the cylinders are shipped separately, they must be classified as appropriate for the Division 2.2 gas contained and need not be marked, labelled or described as explosive articles;

b) signal devices (Class 1), which may include smoke and illumination signal flares; signal devices must be packed in plastic or fibreboard inner packagings;

c) small quantities of flammable substances, corrosive solids and organic peroxides (Class 3, Class 8, Division 4.1 and 5.2), which may include a repair kit and not more than 30 strike-anywhere matches. The organic peroxide may only be a component of a repair kit and the kit must be packed in strong inner packaging. The strike-anywhere matches must be packed in a cylindrical metal or composition packaging with a screw-type closure and be cushioned to prevent movement;

d) electric storage batteries (Class 8), which must be disconnected or electrically isolated and protected against short circuits;

Amendments to lithium battery provisions

Paragraph 4.8 of this report:

e) lithium batteries:

1) identified as damaged or defective in accordance with Special Provision A154 are forbidden for transport;

2) must meet the applicable requirements of 2;9.3;

~~2)~~3) must be disconnected or electrically isolated and protected against short circuits; and

~~3)~~4) must be secured against movement within the appliance.

f) first aid kits which may include flammable, corrosive and toxic articles or substances.

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

Amendments to manage aviation specific risks

Paragraphs 2.2.1 and 8.1 of this report and 3.2.2.4 of DGP/28-WP/3:

~~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.

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Amendments to manage aviation specific risks

Paragraph 2.2.2 of this report:

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Packing Instruction Y956

Limited quantities
Passenger and cargo aircraft for UN 3077 and UN 3335 only

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COMBINATION PACKAGINGS						SINGLE PACKAGINGS
UN number and proper shipping name	*Packing group*	*Inner packaging (see 6;3.2)*	*Inner packaging quantity (per receptacle)*	~~*Total quantity per package*~~	*Total gross mass per package*	
UN 3077 **Environmentally hazardous substance, solid, n.o.s.** UN 3335 **Aviation regulated solid, n.o.s.***	III	Glass	5.0 kg	~~30 kg~~	30 kg	No
		Plastics	5.0 kg			
		Metal	5.0 kg			
		Paper bag	5.0 kg			
		Plastic bag	5.0 kg			
		Fibre	5.0 kg			

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Packing Instruction Y958

Limited quantities
Passenger and cargo aircraft

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COMBINATION PACKAGINGS						SINGLE PACKAGINGS
UN number and proper shipping name	*Packing group*	*Inner packaging (see 6;3.2)*	*Inner packaging quantity (per receptacle)*	~~*Total quantity per package*~~	*Total gross mass per package*	
UN 2071 **Ammonium nitrate based fertilizers~~**~~	III	Glass	5.0 kg	~~30 kg G~~	30 kg	No
		Plastics	5.0 kg			
		Metal	5.0 kg			
		Paper bag	5.0 kg			
		Plastic bag	5.0 kg			
		Fibre	5.0 kg			

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Amendments to facilitate transport

Paragraph 3.3 of this report:

Packing Instruction Y960

Limited quantities
Passenger and cargo aircraft for UN 3316 only

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UN number and proper shipping name	*State*	*Inner packaging* (see 6;3.2)*	*Maximum quantity of dangerous goods per kit*	*Maximum quantity of dangerous goods per package*	*Total gross mass per package*	SINGLE PACKAGINGS
UN 3316 **Chemical kit** or **First aid kit**	Liquid	30 mL	1 kg	1 kg	30 kg	No
	Solid	100 g				
*Containing dangerous goods.						

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OUTER PACKAGINGS OF COMBINATION PACKAGINGS (see 6;3.1)

Boxes

Aluminium
Fibreboard
Natural wood
Other metal
Plastics
Plywood
Reconstituted wood
Steel

UN harmonization amendments

Paragraph 1.2.1.6 of this report:

Packing Instruction Y963

Limited quantities
Passenger and cargo aircraft for ID 8000 only

Consumer commodities are materials that are packaged and distributed in a form intended or suitable for retail sale for the purposes of personal care or household use. These include items administered or sold to patients by doctors or medical administrations. Except as otherwise provided below, dangerous goods packed in accordance with this packing instruction do not need to comply with 4;1 or Part 6 of these Instructions; they must, however, comply with all other applicable requirements. Other dangerous goods not classified as ID 8000 must not be packed in the same outer packaging with ID 8000.

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

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h) Class 2 substances must be further limited to aerosol products containing non-toxic compressed or liquefied gas(es) ~~that are necessary to expel liquids, powders or pastes, packed in inner non-refillable non-metal receptacles not exceeding 120 mL capacity each, or in inner non-refillable metal receptacles not exceeding 820 mL capacity each (except that flammable aerosols must not exceed 500 mL capacity each), subject in either case to the following provisions~~. Aerosols must meet the requirements of Part 6;5.4. The valves must be protected by a cap or other suitable means during transport.~~:~~

~~1) the pressure in the aerosol must not exceed 1 500 kPa at 55°C and each receptacle must be capable of withstanding, without bursting, a pressure of at least 1.5 times the equilibrium pressure of the contents at 55°C;~~

~~2) if the pressure in the aerosol exceeds 970 kPa at 55°C but does not exceed 1 105 kPa at 55°C, an inner IP.7, IP.7A or IP.7B metal receptacle must be used;~~

~~3) if the pressure in the aerosol exceeds 1 105 kPa at 55°C but does not exceed 1 245 kPa at 55°C, an IP.7A or IP.7B metal receptacle must be used;~~

~~4) if the pressure in the aerosol exceeds 1 245 kPa at 55°C, an IP.7B metal receptacle must be used;~~

~~5) IP.7B metal receptacles having a minimum burst pressure of 1 800 kPa may be equipped with an inner capsule charged with a non-flammable, non-toxic compressed gas to provide the propellant function. In this case, the pressures indicated in 1), 2), 3) or 4) do not apply to the pressure within the capsule. The quantity of gas contained in the capsule must be so limited such that the minimum burst pressure of the receptacle would not be exceeded if the entire gas content of the capsule were released into an aerosol;~~

~~6) the liquid contents must not completely fill the closed receptacle at 55°C;~~

~~7) each aerosol exceeding 120 mL capacity must have been heated until the pressure in the aerosol is equivalent to the equilibrium pressure of the contents at 55°C, without evidence of leakage, distortion or other defect; and~~

~~8) the valves must be protected by a cap or other suitable means during transport.~~

~~i) For aerosols containing a biological or medical preparation which will be deteriorated by a heat test and which are non-toxic and non-flammable, packed in inner non-refillable receptacles not exceeding 575 mL capacity each, the following provisions are applicable:~~

~~1) the pressure in the aerosol must not exceed 970 kPa at 55°C;~~

~~2) the liquid contents must not completely fill the closed receptacle at 55°C;~~

~~3) one aerosol out of each lot of 500 or less must be heated until the pressure in the aerosol is equivalent to the equilibrium pressure of the contents at 55°C, without evidence of leakage, distortion or other defect; and~~

~~4) the valves must be protected by a cap or other suitable means during transport.~~

~~j)~~i) Except for aerosols, inner packagings must not exceed:

1) 500 mL for liquids; and

2) 500 g for solids.

~~k)~~j) Consumer commodities shipped according to these provisions may be shipped in a unit load device prepared by a single shipper provided they contain no other dangerous goods other than UN 1845 — **Carbon dioxide, solid** (dry ice) used as a refrigerant. When the unit load device contains dry ice, the provisions of these Instructions applicable to dry ice must be met in addition to the provisions set out in this packing instruction. The shipper must provide the operator with written documentation stating the number of packages of consumer commodities contained in each unit load device.

~~l)~~k) The gross mass on the dangerous goods transport document must be shown as:

1) for one package, the actual gross mass of the package;

2) for more than one package, either the actual gross mass of each package or as the average mass of the packages. (For example, if there are 10 packages and the total gross mass of them is 100 kg, the dangerous goods transport document may show this as “average gross mass per package 10 kg”.)

~~m)~~l) Packages prepared in accordance with these provisions must be durably and legibly marked with the mark shown in Figure 3-1.

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Amendments to manage aviation specific risks

Paragraph 2.2.2 of this report:

Packing Instruction Y964

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

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COMBINATION PACKAGINGS					SINGLE PACKAGINGS
UN number and proper shipping name	*Inner packaging (see 6;3.2)*	*Inner packaging quantity (per receptacle)*	*~~Total quantity per package~~*	*Total gross mass per package*	
UN 1941 **Dibromodifluoromethane** UN 1990 **Benzaldehyde** UN 3082 **Environmentally hazardous substance, liquid, n.o.s.** UN 3334 **Aviation regulated liquid, n.o.s.***	Glass	5.0 L	~~30 kg~~	30 kg	No
	Plastics	5.0 L			
	Metal	5.0 L			

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Amendments to lithium battery provisions

Packing Instruction 965

Cargo aircraft only for UN 3480

Paragraph 4.1 of this report:

1. **Introduction**

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

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

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

2. **Lithium batteries forbidden from transport**

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

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

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

IA. **SECTION IA**

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

IA.1 **General requirements**

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

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

Table 965-IA

UN number and proper shipping name		*Net quantity per package*	
		Passenger	*Cargo*
UN 3480	**Lithium ion batteries**	Forbidden	35 kg

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 harmonization amendments

Paragraphs 1.2.1.6 and 8.1 of this report and 3.1.2.7 of DGP/28-WP/3:

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

— A ~~L~~lithium ion 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.
— Batteries manufactured after 31 December 2011 must be marked with the Watt-hour rating on the outside case.

IA.3 **Outer packagings**

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

Amendments to lithium battery provisions

Paragraph 4.1 of this report:

IB. **SECTION IB**

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

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

Lithium ion cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3 a), e) and g) and the following:

1) for lithium ion cells, the Watt-hour rating (see the Glossary of Terms in Attachment 2) is not more than 20 Wh;

2) for lithium ion batteries, the Watt-hour rating is not more than 100 Wh;
   — the Watt-hour rating must be marked on the outside of the battery case except for those batteries manufactured before 1 January 2009;

IB.1 **General requirements**

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

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

Table 965-IB

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

IB.2 **Additional requirements**

— Cells and batteries must be packed in inner packagings that completely enclose the cell or battery then placed in a strong rigid outer packaging.
— Cells and batteries must not be packed in the same outer packaging with substances and articles of Class 1 (explosives) other than Divìsion 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers).
— Cells and batteries must be protected so as to prevent short circuits. This includes protection against contact with electrically conductive material within the same packaging that could lead to a short circuit.
— Each package must be capable of withstanding a 1.2 m drop test in any orientation without:
  — damage to cells or batteries contained therein;
  — shifting of the contents so as to allow battery to battery (or cell to cell) contact;
  — release of contents.

Paragraph 4.2 of this report:

— Each package must be capable of withstanding, without damage to the cells or batteries contained therein and without any reduction of effectiveness, a force applied to the top surface equivalent to the total weight of identical packages stacked to a height of 3 m (including the test sample) for a duration of 24 hours.
— Each package must be marked with the appropriate lithium battery mark (Figure 5-3) in addition to the appropriate Class 9 hazard label (Figure 5-26) and the cargo aircraft only label (Figure 5-28).

IB.3 **Outer packagings**

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

~~II. **SECTION II**~~

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

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

— Part 5;2.4.16 (Shipper's responsibilities — Special marking requirements for lithium batteries);
— Part 7;2.1 (Operator's responsibilities — Loading restrictions on the flight deck and for passenger aircraft);
— Part 7;2.4.1 (Operator's responsibilities — Loading of cargo aircraft);
— Part 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);
— Part 7;4.5 (Operator's responsibilities — Reporting of undeclared and misdeclared dangerous goods);
— Part 8;1.1 (Provisions concerning passengers and crew — Dangerous goods carried by passengers or crew); and
— Paragraphs 1 and 2 of this packing instruction.

Lithium ion cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3 a), e) and g) and the following:

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

II.1 **General requirements**

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

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

Table 965-II

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

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

II.2 **Additional requirements**

— Cells and batteries must be packed in inner packagings that completely enclose the cell or battery then placed in a strong rigid outer packaging.
— Cells and batteries must not be packed in the same outer packaging with other dangerous goods.
— Cells and batteries must be protected so as to prevent short circuits. This includes protection against contact with electrically conductive materialwithin the same packaging that could lead to a short circuit.
— Each package must be capable of withstanding a 1.2 m drop test in any orientation without:
— damage to cells or batteries contained therein;
— shifting of the contents so as to allow battery to battery (or cell to cell) contact;
— release of contents.
— Each package must be marked with the appropriate lithium battery mark (Figure 5-3) and the cargo aircraft only label (Figure 5-28).
— the package must be of such size that there is adequate space to affix the mark on one side without the mark being folded.
— the cargo aircraft only label must be located on the same surface of the package near the lithium battery mark, if the package dimensions are adequate.
— A shipper is not permitted to offer for transport more than one package prepared according to this section in any single consignment.
— The words "lithium ion batteries, in compliance with Section II of PI965" — cargo aircraft only" or "lithium ion batteries, in compliance with Section II of PI965 — CAO" must be placed on the air waybill, when an air waybill is used. 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".~~

- ~~Packages and overpacks of lithium ion batteries prepared in accordance with the provisions of Section II must be offered to the operator separately from cargo which is not subject to these Instructions and must not be loaded into a unit load device before being offered to the operator.~~
- ~~Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with the functions for which they are responsible.~~

II.3 **~~Outer packagings~~**

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

II.4 **~~Overpacks~~**

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

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

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

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

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Packing Instruction 966

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

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I. **SECTION I**

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

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Amendments to lithium battery provisions

Paragraphs 2.2.1 and 8.1 of this report and 3.3.6.1 and 3.3.6.2 of DGP/28-WP/2:

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 a ~~n 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.
- Batteries manufactured after 31 December 2011 must be marked with the Watt-hour rating on the outside case.

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Packing Instruction 966

II. **SECTION II**

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Amendments to lithium battery provisions

Paragraphs 2.2.1 and 8.1 of this report, 3.3.6.1 and 3.3.6.2 of DGP/28-WP/2, and 4.2 and 4.9 of this report:

II.1 **General requirements**

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

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II.2 **Additional requirements**

- Lithium ion cells and batteries must:
  - be placed in inner packagings that completely enclose the cell or battery, then placed in a strong rigid outer packaging that conforms to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1); or
  - be placed in inner packagings that completely enclose the cell or battery, then placed with the equipment in a strong rigid outer packaging that conforms to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).
- 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.

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Paragraph 4.1 of this report:

- The words "lithium ion batteries, in compliance with Section II of PI966" must be placed on the air waybill, when an air waybill is used. Where 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) ~~,~~ and packing instruction numbers ~~and "CAO", when applicable~~.

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Paragraph 4.10 of this report:

II.4 **Overpacks**

When packages are placed in an overpack ~~,~~ :

a) the packages must be secured within the overpack;

b) the intended function of each package must not be impaired by the overpack; and

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

Amendments to lithium battery provisions

Paragraph 2.2.1 and 8.1 of this report and paragraph 3.3.1.1 of DGP/28-WP/3:

Packing Instruction 967

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

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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**

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

II. **SECTION II**

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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 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.

Paragraph 4.1 of this report:

— 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)~~,~~ and 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.

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Paragraph 4.10 of this report:

II.4 **Overpacks**

When packages are placed in an overpack~~,~~ :

a) the packages must be secured within the overpack;

b) the intended function of each package must not be impaired by the overpack; and

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

Amendments to lithium battery provisions

Packing Instruction 968

Cargo aircraft only for UN 3090

Paragraph 4.1 of this report:

1. **Introduction**

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

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

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

2. **Lithium batteries forbidden from transport**

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

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

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

IA. **SECTION IA**

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

IA.1 **General requirements**

Part 4;1 requirements must be met.

Table 968-IA

UN number and proper shipping name	*Net quantity per package*	
	Passenger	*Cargo*
UN 3090 **Lithium metal batteries**	Forbidden	35 kg

IA.2 **Additional requirements**

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

UN harmonization amendments

Paragraph 3.1.2.7 of DGP/28-WP/3:

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

— A ~~L~~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.

IA.3 **Outer packagings**

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

Amendments to lithium battery provisions

Paragraph 4.1 of this report:

IB. **SECTION IB**

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

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

Lithium metal or lithium alloy cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3 a), e), f) (if applicable) and g) and the following:

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

IB.1 **General requirements**

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

Table 968-IB

Contents	*Net quantity per package*	
	Passenger	*Cargo*
Lithium metal cells and batteries	Forbidden	2.5 kg

IB.2 **Additional requirements**

- Cells and batteries must be packed in inner packagings that completely enclose the cell or battery then placed in a strong rigid outer packaging.
- Cells and batteries must not be packed in the same outer packaging with substances and articles of Class 1 (explosives) other than Divìsion 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers).
- Cells and batteries must be protected so as to prevent short circuits. This includes protection against contact with electrically conductive material within the same packaging that could lead to a short circuit.
- Each package must be capable of withstanding a 1.2 m drop test in any orientation without:
  - damage to cells or batteries contained therein;
  - shifting of the contents so as to allow battery to battery (or cell to cell) contact;
  - release of contents.

Paragraph 4.2 of this report:

- Each package must be capable of withstanding, without damage to the cells or batteries contained therein and without any reduction of effectiveness, a force applied to the top surface equivalent to the total weight of identical packages stacked to a height of 3 m (including the test sample) for a duration of 24 hours.
- Each package must be marked with the appropriate lithium battery mark (Figure 5-3) in addition to the appropriate Class 9 hazard label (Figure 5-26) and the cargo aircraft only label (Figure 5-28).

IB.3 **Outer packagings**

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

~~II. **SECTION II**~~

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

- ~~Part 1;2.3 (General — Transport of dangerous goods by post);~~
- ~~Part 5;1.1 g) and j) (Shipper's responsibilities — General requirements);~~
- ~~Part 5;2.4.16 (Shipper's responsibilities — Special marking requirements for lithium batteries);~~
- ~~Part 7;2.1 (Operator's responsibilities — Loading restrictions on the flight deck and for passenger aircraft);~~
- ~~Part 7;2.4.1 (Operator's responsibilities — Loading of cargo aircraft);~~
- ~~Part 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents);~~
- ~~Part 7;4.5 (Operator's responsibilities — Reporting of undeclared and misdeclared dangerous goods);~~
- ~~Part 8;1.1 (Provisions concerning passengers and crew — Dangerous goods carried by passengers or crew); and~~
- ~~Paragraphs 1 and 2 of this packing instruction.~~

Lithium metal or lithium alloy cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3 a), e), f) (if applicable) and g) and the following:

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

II.1 **General requirements**

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

Table 968-II

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

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

II.2 **Additional requirements**

- Cells and batteries must be packed in inner packagings that completely enclose the cell or battery, then placed in a strong rigid outer packaging.
- Cells and batteries must not be packed in the same outer packaging with other dangerous goods.
- Cells and batteries must be protected so as to prevent short circuits. This includes protection against contact with electrically conductive material within the same packaging that could lead to a short circuit.
- Each package must be capable of withstanding a 1.2 m drop test in any orientation without:
  - damage to cells or batteries contained therein;
  - shifting of the contents so as to allow battery to battery (or cell to cell) contact;
  - release of contents.
- Each package must be marked with the appropriate lithium battery mark (Figure 5-3) and the cargo aircraft only label (Figure 5-28).
  - the package must be of such size that there is adequate space to affix the mark on one side without the mark being folded.
  - the cargo aircraft only label must be located on the same surface of the package near the lithium battery mark, if the package dimensions are adequate.
- A shipper is not permitted to offer for transport more than one package prepared according to this section in any single consignment.
- The words “lithium metal batteries, in compliance with Section II of PI968 — cargo aircraft only" or "lithium metal batteries, in compliance with Section II of PI968 — CAO" must be placed on the air waybill, when an air waybill is used. 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”.
- Packages and overpacks of lithium metal batteries prepared in accordance with the provisions of Section II must be offered to the operator separately from cargo which is not subject to these Instructions and must not be loaded into a unit load device before being offered to the operator.
- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with the functions for which they are responsible.

II.3 **Outer packagings**

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

II.4 **Overpacks**

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

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

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

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

Amendments to lithium battery provisions

Paragraphs 2.2.1 and 8.1 of this report and 3.3.6.1 and 3.3.6.2 of DGP/28-WP/2:

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 a ~~n 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.

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II. **SECTION II**

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Amendments to lithium battery provisions

Paragraphs 2.2.1 and 8.1 of this report, 3.3.6.1 and 3.3.6.2 of DGP/28-WP/2, and 4.2 and 4.9 of this report:

II.1 **General requirements**

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

. . .

II.2 **Additional requirements**

— Lithium metal cells and batteries must:
  — be placed in inner packagings that completely enclose the cell or battery, then placed in a strong rigid outer packaging that conforms to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1); or
  — be placed in inner packagings that completely enclose the cell or battery, then placed with the equipment in a strong rigid outer packaging that conforms to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).
— 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~~.

. . .

Paragraph 4.1 of this report:

— The words “lithium metal batteries, in compliance with Section II of PI969” must be placed on the air waybill, when an air waybill is used. Where 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)~~,~~ and packing instruction numbers ~~and “CAO”, when applicable~~.

. . .

Paragraph 4.10 of this report:

II.4 **Overpacks**

When packages are placed in an overpack~~,~~:

a) the packages must be secured within the overpack;

b) the intended function of each package must not be impaired by the overpack; and

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

Amendments to lithium battery provisions

Paragraphs 2.2.1 and 8.1 of this report and 3.3.1.1 of DGP/28-WP/3:

Packing Instruction 970

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

1. **Introduction**

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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.

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II. **SECTION II**

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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 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.

. . .

Paragraph 4.1 of this report:

- 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)~~,~~ and 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.

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Paragraph 4.10 of this report:

II.4 **Overpacks**

When packages are placed in an overpack~~,~~:

a) the packages must be secured within the overpack;

b) the intended function of each package must not be impaired by the overpack; and

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

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Packing Instruction 972

Passenger or cargo aircraft for UN 3530 only
(See Packing Instruction 220 for flammable gas-powered engines and machinery, Packing Instruction 378 for flammable liquid-powered engines and machinery, Packing Instruction 950 for flammable liquid-powered vehicles, Packing Instruction 951 for flammable gas-powered vehicles or Packing Instruction 952 for battery-powered equipment and vehicles)

General requirements

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

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ADDITIONAL PACKING REQUIREMENTS

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Amendments to lithium battery provisions

Paragraphs 4.8 and 4.12 of this report:

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) ~~i~~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) ~~i~~If lithium batteries are installed:~~,~~

   i) lithium batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport; and

   ii) 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~~, except that pre-production prototypes of lithium batteries or cells, when these prototypes are transported for testing, or low production runs of lithium batteries or cells that have not been tested to the requirements in Part III, subsection 38.3 of the UN *Manual of Tests and Criteria* may be transported aboard cargo aircraft if approved by the appropriate authority of the State of Origin and the State of the Operator. A copy of the document of approval must accompany the consignment.

3) ~~i~~If sodium batteries are installed they must conform to the requirements of Special Provision A94.

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Amendments to facilitate transport

Paragraphs 2.2.1 and 8.1 of this report, 3.2.2.22 of DGP/28-WP/3 Report and 3.10 of this 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. In addition to the environmentally hazardous substances, the article may also contain lithium cells or batteries that comply with Section II of Packing Instruction 967, as applicable, or Section II of Packing Instruction 970, as applicable.

General requirements

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

UN number and proper shipping name	*Quantity — passenger*	*Quantity — cargo*
UN 3548 **Articles containing miscellaneous dangerous goods, n.o.s.***	No limit	No limit

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

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Part 5

SHIPPER'S RESPONSIBILITIES

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Chapter 1

GENERAL

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1.2 GENERAL PROVISIONS FOR CLASS 7

1.2.1 Approval of shipments and notification

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UN harmonization amendments

Paragraphs 1.2.1.7 and 8.1 of this report and 3.1.2.8 of DGP/28-WP/3:

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~~ consignments~~, which does~~ that do not satisfy all ~~of~~ the applicable requirements of these Instructions may be transported under special arrangement (see 1;6.4).

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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 harmonization amendments

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.

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Chapter 2

MARKING

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2.4.16 Special marking requirements for lithium batteries

Amendments to lithium battery provisions

Paragraph 4.1 of this report:

2.4.16.1 Packages containing lithium cells or batteries prepared in accordance with Section II of Packing Instructions ~~965~~966, 967, 969 ~~to~~ or 970 and Section IB of Packing Instructions 965 and 968 must be marked as shown in Figure 5-3.

UN harmonization amendments

Paragraphs 1.2.1.7 and 8.1 of this report and 3.1.2.8 of DGP/28-WP/3:

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:

~~1~~a) “UN 3090” for lithium metal cells or batteries;

~~2~~b) “UN 3480” for lithium ion cells or batteries;

~~3~~c) “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.~~

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UN harmonization amendments

Paragraphs 1.2.1.5 and 8.1 of this report and 3.1.2.8.1 a) and 3.1.2.8.3 of DGP/28-WP/3:

Figure 5-3. Lithium battery mark

Paragraph 1.2.1.7 of this report:

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

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Chapter 4

DOCUMENTATION

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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);

UN harmonization amendments

Paragraphs 1.2.1.7 and 8.1 of this report and 3.1.2.8.1 b) of DGP/28-WP/3:

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.

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UN harmonization amendments

Paragraphs 1.2.1.7 and 8.1 of this report and 3.1.2.8 of DGP/28-WP/3:

4.1.5 Information required in addition to the dangerous goods description

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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.

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Amendments to manage aviation specific risks

Paragraphs 2.2.1 and 8.1 of this report and 3.2.2.8 of DGP/28-WP/2:

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;

Paragraph 2.2.1.1 b) of this report:

Note.— When Table 2-13 is used, 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.

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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;

Paragraph 2.2.1.1 a) of this report:

~~*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.**~~

Paragraphs 2.2.1, 2.2.9 and 8.1 of this report and 3.2.2.14 and 3.2.2.15 of DGP/28-WP/3:

b) when applicable, reference to Special Provision A1, A2, A4, A5, A51~~, A78~~, A88, A99, A176, 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~~

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

Paragraphs 2.2.1.1 b) and 8.1 of this report and 3.2.2.8 of DGP/28-WP/2:

g) for individual radionuclides or for mixtures of radionuclides for which relevant data are not available or which are not listed in Table 2-12 and where Table 2-13 was used to determine the maximum allowed activity, the use of Table 2-13 must be referenced as well as the radioactive contents as specified in the first column of Table 2-13. For example: "Table 2-13 used. Only beta- or gamma- emitting nuclides are known to be present".

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UN harmonization amendments

Paragraphs 1.2.1.7 and 8.1 of this report and 3.1.2.8.2 of DGP/28-WP/3:

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

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Chapter 1

APPLICABILITY, NOMENCLATURE AND CODES

1.1 APPLICABILITY

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UN harmonization amendments

Paragraphs 1.2.1.8 and 8.1 of this report and 3.1.2.9 of DGP/28-WP/3:

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.

~~1.1.3~~1.1.4 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.

. . .

Paragraph 1.2.1.8 a) of this report:

Table 6-3. Index of inner packagings

Code	*Kind*	*Paragraph*
	Glass	3.2.1
	Plastic	3.2.2
	Metal cans, tins or tubes	3.2.3
	Paper bags	3.2.4
	Plastic bags	3.2.5
	Fibre cans or boxes	3.2.6
~~IP.7~~	~~Metal receptacles (aerosols), non-refillable~~	~~3.2.7.1~~
~~IP.7A~~	~~Metal receptacles (aerosols), non-refillable~~	~~3.2.7.1~~
~~IP.7B~~	~~Metal receptacles (aerosols), non-refillable~~	~~3.2.7.2~~
~~IP.7C~~	~~Plastic receptacle (aerosols), non-refillable~~	~~3.2.8~~
	Metal or plastic flexible tubes	~~3.2.9~~3.2.7

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Chapter 3

REQUIREMENTS FOR PACKAGINGS

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3.2 REQUIREMENTS FOR INNER PACKAGINGS

. . .

UN harmonization amendments

Paragraph 1.2.1.8 a) of this report:

~~**3.2.7 Metal receptacles (aerosols), non-refillable (IP.7, IP.7A, IP.7B)**~~

~~3.2.7.1 *Receptacles (aerosols) IP.7 and IP.7A*~~

~~3.2.7.1.1 *Materials and construction.* Uniform quality steel plate or non-ferrous metal of uniform drawing quality must be used:~~

~~— IP.7 receptacles must have a minimum wall thickness of 0.18 mm;~~
~~— IP.7A receptacles must have a minimum wall thickness of 0.20 mm.~~

~~The receptacles may be seamless or with seams welded, soldered, brazed, double-seamed or swaged. The ends must be of pressure design. Maximum capacity must not exceed 1 L and the maximum inner diameter must not exceed 76 mm.~~

~~3.2.7.1.2 *Performance test.* One out of each lot of 25 000 or less receptacles successively produced per day must be pressure-tested to destruction:~~

~~— IP.7 receptacles must not burst below 1 650 kPa gauge pressure;~~
~~— IP.7A receptacles must not burst below 1 860 kPa gauge pressure.~~

~~3.2.7.2 *Receptacles (aerosols) IP.7B*~~

~~3.2.7.2.1 *Materials and construction.* Uniform quality steel plate or non-ferrous metal of uniform drawing quality must be used. The receptacles may be seamless or with seams welded, soldered, brazed, double-seamed or swaged. The ends must be of pressure design. Maximum capacity must not exceed 1 000 mL and the maximum inner diameter must not exceed 76 mm. The aerosol, including its valve, must be virtually hermetically sealed under normal conditions of transport and the valve must be suitably protected to prevent actuation during transport.~~

~~3.2.7.2.2 Performance tests required:~~

~~— hydraulic pressure test;~~
~~— bursting test;~~
~~— leakage test.~~

~~3.2.7.2.3 *Hydraulic pressure test.* Number of samples: six receptacles.~~

~~Method of testing and pressure applied: the pressure must be applied slowly. The test pressure must be 50 per cent higher than the internal pressure at 50°C but at least 1 000 kPa. The test pressure must be applied for 25 seconds.~~

~~Criteria for passing the test successfully: the receptacle must not show major distortions, leaks or similar faults, but a slight symmetrical distortion of the base, or one affecting the profile of the top end shall be allowed, provided that the receptacle passes the bursting test.~~

~~3.2.7.2.4 *Bursting test.* Number of samples: six receptacles; these may be the same receptacles used in the hydraulic pressure test.~~

~~Method of testing and pressures applied: a hydraulic pressure at least 20 per cent higher than the test pressure as mentioned in 3.2.7.2.3 must be applied.~~

~~Criteria for passing the test successfully: no receptacle may leak.~~

~~3.2.7.2.5 *Leakage test.* Number of samples: every aerosol.~~

~~Method of testing: each aerosol must be immersed in a bath of water. The temperature of the water and the duration of the test must be such that the internal pressure reaches that which would be reached at 55°C, or 50°C if the liquid phase does not exceed 95 per cent of the capacity of the aerosol at 50°C. When an aerosol is sensitive to heat, the temperature of the bath may be set at between 20°C and 30°C in which case one receptacle in 2 000 must be tested at the higher temperature.~~

~~Equally effective methods of testing may also be used.~~

~~Criteria for passing the test successfully: the aerosol must not show visible permanent distortions or any leakage.~~

~~3.2.8 Plastic receptacles (aerosols) non-refillable (IP.7C)~~

~~3.2.8.1 *Receptacles (aerosols) IP.7C*~~

~~3.2.8.1.1 *Materials and construction.* The receptacle must be of polyethylene terephthalate (PET), polyethylene napthalate (PEN), polyamide (Nylon), or a blend containing some combination of PET, PEN, ethyl vinyl alcohol (EVOH) and Nylon. Thermoplastic processes ensuring uniformity of the completed container shall be applied. No used material other than production residues or re-grind from the same manufacturing process may be used. The packaging shall be adequately resistant to aging and to degradation caused either by the substance contained or by ultraviolet radiation. Maximum capacity must not exceed 500 mL.~~

~~3.2.8.1.2 Performance tests required:~~

~~— drop test;~~
~~— hydraulic pressure test;~~
~~— bursting test;~~
~~— leakage test.~~

~~3.2.8.1.3 *Drop test.* Method of testing: to ensure that creep does not affect the ability of the receptacle type to retain the contents the receptacles shall be dropped as follows: three groups of twenty-five filled receptacles shall be dropped from 1.8 m on to a rigid, non-resilient, flat and horizontal surface. One group must be conditioned at 38°C for 26 weeks, the second group for 100 hours at 50°C and the third group for 18 hours at 55°C, prior to the drop test.~~

~~Criteria for passing the test successfully: the receptacle must not break or leak.~~

~~3.2.8.1.4 *Hydraulic pressure test.* Number of samples: six receptacles.~~

~~Method of testing: receptacles must resist a test pressure equal to at least 1 200 kPa.~~

~~Criteria for passing the test successfully: the receptacle must not show major distortions, leaks or similar faults, but a slight symmetrical distortion of the base, or one affecting the profile of the top end, shall be allowed, provided that the receptacle passes the bursting test.~~

~~3.2.8.1.5 *Bursting test.* Number of samples: six. These may be the same receptacles used in the hydraulic pressure test.~~

~~Method of testing and pressures applied: a hydraulic pressure at least 20 per cent higher than the test pressure as mentioned in 3.2.8.1.4 must be applied.~~

~~Criteria for passing the test successfully: the receptacle must not leak.~~

~~3.2.8.1.6 *Leakage test.* Every aerosol. A leakage test in accordance with 6;5.4.1.2 or 6;5.4.3 approved by the competent authority must be used.~~

3.2.~~9~~.7 Metal or plastic flexible tubes

The materials of construction of flexible tubes and their closures must, where in contact with the organic peroxide, not affect the thermal stability.

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Chapter 5

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

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5.1 GENERAL REQUIREMENTS

5.1.1 Design and construction

UN harmonization amendments

Paragraphs 1.2.1.8 and 8.1 of this report and 3.1.2.9 of DGP/28-WP/3:

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 cylinder~~s~~ 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.

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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

Cylinder~~s~~ 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 cylinder~~s~~ 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.

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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 cylinder~~s~~ 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 cylinder~~s~~ shells:

g) a hydraulic pressure test. Cylinder~~s~~ 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 cylinder~~s~~ shells unserviceable. In the case of welded cylinder~~s~~ shells, particular attention must be paid to the quality of the welds;

i) an inspection of the marks on the cylinder~~s~~ shells;

j) in addition, cylinder~~s~~ 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 c~~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 technical code;

e) inspection of welds by radiographic, ultrasonic or other suitable non-destructive test method according to the applicable design and construction standard or technical 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 technical 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 cylinder~~s~~ 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~~ cylinder~~s~~ 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.

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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.

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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 cylinder~~s~~ 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. *Note.— The note concerning the F factor in section 7.3 of this standard must not be applied for UN cylinders.*	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. *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.*	Until 31 December 2020
ISO 7866: 2012+ Cor 1:2014	Gas cylinders — Refillable seamless aluminium alloy gas cylinders — Design, construction and testing *Note.— Aluminium alloy 6351A or equivalent must not be used.*	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

Reference	*Title*	*Applicable for manufacture*
~~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
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. *Note.— This standard must not be used for linerless cylinders manufactured from two parts joined together.*	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. *Note.— This standard must not be used for linerless cylinders manufactured from two parts joined together.*	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 cylinder~~s~~ shells must be designed for a design life of not less than fifteen years.

Note 2.— Composite cylinder~~s~~ 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 cylinder~~s~~ 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.	Until 31 December 2018

	Note.— The note concerning the F factor in section 7.3 of this standard must not be applied for UN cylinders.	
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 9809-3:2000	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 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 *Note.— Aluminium alloy 6351A or equivalent must not be used*	Until further notice

For the acetylene cylinder including the porous mass in the cylinder:

Reference	*Title*	*Applicable for manufacture*
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:

Reference	*Title*	*Applicable for manufacture*
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:

Reference	*Title*	*Applicable for manufacture*
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.

Reference	*Title*	*Applicable for manufacture*
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~~ 31 December 2026
ISO 11513:2019	Gas cylinders — Refillable welded steel cylinders containing materials for sub-atmospheric gas packaging (excluding acetylene) — Design, construction, testing, use and periodic inspection.	Until further notice
ISO 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

5.2.1.8 Not used.

UN Model Regulations, 6.2.2.1.9 (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.

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

Reference	*Title*	*Applicable for manufacture*
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:

Reference	*Title*	*Applicable for manufacture*
ISO 11117:1998	Gas cylinders — Valve protection caps and valve guards for industrial and medical gas cylinders — Design, construction and tests.	Until 31 December 2014
ISO 11117:2008+ Cor 1:2009	Gas cylinders — Valve protection caps and valve guards — Design, construction and tests.	Until ~~further notice~~ 31 December 2026
ISO 11117:2019	Gas cylinders — Valve protection caps and guards — Design, construction and tests.	Until further notice
ISO 10297:1999	Gas cylinders – Refillable gas cylinder valves – Specification and type testing.	Until 31 December 2008
ISO 10297:2006	Gas cylinders — Refillable gas cylinder valves — Specification and type testing.	Until 31 December 2020
ISO 10297:2014	Gas cylinders — Cylinder valves — Specification and type testing	Until 31 December 2022
ISO 10297:2014 + A1:2017	Gas cylinders — Cylinder valves — Specification and type testing	Until further notice
~~ISO 13340:2001~~	~~Transportable gas cylinders — Cylinder valves for non-refillable cylinders — Specification and prototype testing.~~	~~Until 31 December 2020~~
ISO 14246:2014	Gas cylinders — Cylinder valves — Manufacturing tests and examination	Until 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 *Note.— This standard must not be used for flammable gases.*	Until ~~further notice~~ 31 December 2026
Paragraph 3.1.2.9.2 of DGP/28-WP/3:		
ISO 17871:2020	Gas cylinders — Quick-release cylinder valves — Specification and type testing.	Until further notice
ISO 17879:2017	Gas cylinders — Self-closing cylinder valves — Specification and type testing *Note.— This standard must not be applied to self-closing valves in acetylene cylinders.*	Until further notice

Paragraph 3.1.2.9 of DGP/28-WP/3:

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

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~~ 31 December 2024
ISO 18119:2018	Gas cylinders — Seamless steel and seamless aluminium-alloy gas cylinders and tubes — Periodic inspection and testing.	Until further notice
ISO 10460:2005	Gas cylinders – Welded carbon-steel gas cylinders – Periodic inspection and testing. *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.*	Until ~~further notice~~ 31 December 2024
ISO 10460:2018	Gas cylinders — Welded aluminium-alloy, carbon and stainless steel gas cylinders — Periodic inspection and testing.	Until further notice
ISO 10461:2005/A1:2006	Seamless aluminium-alloy gas cylinders — Periodic inspection and testing.	Until ~~further notice~~ 31 December 2024
ISO 10462:2013	Gas cylinders — Acetylene cylinders — Periodic inspection and maintenance.	Until ~~further notice~~ 31 December 2024
ISO 10462:2013 + Amd1:2019	Gas cylinders — Acetylene cylinders — Periodic inspection and maintenance.	Until further notice
ISO 11513:2011	Gas cylinders — Refillable welded steel cylinders containing materials for sub-atmospheric gas packaging (excluding acetylene) — Design, construction, testing, use and periodic inspection.	Until ~~further notice~~ 31 December 2024
ISO 11513:2019	Gas cylinders — Refillable welded steel cylinders containing materials for sub-atmospheric gas packaging (excluding acetylene) — Design, construction, testing, use and periodic inspection.	Until further notice
~~ISO 11623:2002~~	~~Transportable gas cylinders — Periodic inspection and testing of composite gas cylinders.~~	~~Until 31 December 2020~~
ISO 11623:2015	Gas cylinders — Composite construction — Periodic inspection and testing	Until further notice
ISO 22434:2006	Transportable gas cylinders — Inspection and maintenance of cylinder valves *Note.— These requirements may be met at times other than at the periodic inspection and test of UN cylinders.*	Until further notice
ISO 20475:2018	Gas cylinders — Cylinder bundles — Periodic inspection and testing	Until further notice
ISO 23088:2020	Gas cylinders — Periodic inspection and testing of welded steel pressure drums — Capacities up to 1 000 L.	Until further notice

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~~ 31 December 2024
ISO 16111:2018	Transportable gas storage devices — Hydrogen absorbed in reversible metal hydride.	Until further notice

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

Paragraphs 1.2.1.8 and 8.1 of this report and 3.1.2.9.1 c) of DGP/28-WP/3:

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.

Paragraphs 1.2.1.8 b), c) and 8.1 of this report and 3.1.2.9.1 a) of DGP/28-WP/3:

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 5.1.4.4 gives details of which parts of cylinders and closed cryogenic receptacles 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;

Paragraphs 1.2.1.8 d) and 8.1 of this report and 3.1.2.9.1 b) of DGP/28-WP/3:

b) Not used; and

Paragraphs 1.2.1.8 and 8.1 of this report and 3.1.2.9 of DGP/28-WP/3:

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.

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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;

Paragraphs 1.2.1.8 and 8.1 of this report and 3.1.2.9.1 a) of DGP/28-WP/3:

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.

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5.2.7 Marking of UN refillable cylinders and closed cryogenic receptacles

Paragraphs 1.2.1.8 and 8.1 of this report and 3.1.2.9 of DGP/28-WP/3:

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~~s~~ 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 (u n)

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;

Paragraphs 1.2.1.8 and 8.1 of this report and 3.1.2.9 d) of DGP/28-WP/3:

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~~ 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. "/").

Paragraphs 1.2.1.8 and 8.1 of this report and 3.1.2.9 of DGP/28-WP/3:

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.

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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 (u / n)

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 1SO 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) and paragraph 1.2.1.8 c) of this report:

5.2.11 Marking of closures for refillable UN cylinders and closed cryogenic receptacles

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.

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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) and paragraph 1.2.1.8 a) of this report:

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 For aerosol dispensers, the liquid content must not completely fill the closed receptacle at 55°C.

5.4.3 The capacity of metal receptacles must not exceed 1 000 mL; plastics receptacles must not exceed 500 mL

5.4.4 Each model of receptacles (aerosol dispensers or cartridges) must, before being put into service, satisfy a hydraulic pressure test:

5.4.4.1 The internal pressure to be applied (test pressure) must be 1.5 times the internal pressure at 50°C, with a minimum pressure of 1 MPa (10 bar).

5.4.4.2 The hydraulic pressure tests must be carried out on at least five empty receptacles of each model:

a) until the prescribed test pressure is reached, by which time no leakage or visible permanent deformation must have occurred; and

b) until leakage or bursting occurs; the dished end, if any, must yield first and the receptacle must not leak or burst until a pressure 1.2 times the test pressure has been reached or passed.

5.4.5 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 5.4.5.1 or an approved water bath alternative in accordance with 5.4.5.2.

5.4.5.1 HOT WATER BATH TEST

5.4.5.1.1 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.

5.4.5.1.2. 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.

5.4.5.2 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 5.4.2.5.1 and, as appropriate, 5.4.2.~~2~~5.2 or 5.4.2.5.3 are met.

5.4.5.2.1 *Quality system*

5.4.5.2.1.1 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.

5.4.5.2.1.1.1 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.

5.4.5.2.1.1.2 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.

5.4.5.2.2 *Aerosol dispensers*

5.4.5.2.2.1 *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.

5.4.5.2.2.2 *Testing of the aerosol dispensers after filling*

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

5.4.5.2.2.2.2 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.

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

5.4.5.2.3 *Gas cartridges and fuel cell cartridges*

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

5.4.5.2.3.1.1 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.

5.4.5.2.3.2 *Leak testing gas cartridges and fuel cell cartridges*

5.4.5.2.3.2.1 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.

5.4.5.2.3.2.2 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.

5.4.5.2.3.2.3 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.

5.4.5.3 With the approval of the appropriate national authority, aerosols and receptacles, small, are not subject to 5.4.2.1 and 5.4.5.2 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.

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

Chapter 6

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

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UN harmonization amendments

Paragraphs 1.2.1.8 and 8.1 of this report and 3.1.2.9 of DGP/28-WP/3:

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.

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.

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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.

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Chapter 7

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

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UN harmonization amendments

7.11 TEST PROCEDURES AND DEMONSTRATION OF COMPLIANCE

Paragraphs 1.2.1.8 and 8.1 of this report and 3.1.2.9 of DGP/28-WP/3:

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.

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Part 7

OPERATOR'S RESPONSIBILITIES

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Chapter 2

STORAGE AND LOADING

Amendments to manage aviation specific risks

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Paragraph 2.2.1 and 8.1 of this report and 3.2.2.16 of DGP/28-WP/3:

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.

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Amendments to facilitate transport

Paragraphs 2.2.1, 3.8 and 8.1 of this report and 3.2.2.21 of DGP/28-WP/3:

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~~ battery(ies). The mobility aid, the ~~batteries~~ battery(ies), 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(ies) 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(ies) 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

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~~ battery(ies), removed ~~batteries~~ battery(ies) and spare ~~batteries~~ battery(ies).

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~~ battery(ies). The mobility aid, the ~~batteries~~ battery(ies), 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(ies) is fitted, where feasible, with spill resistant-vent caps; and

c) the battery(ies) 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(ies), the operator must remove the ~~batteries~~ battery(ies) 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~~ battery(ies) 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~~ battery(ies) and removed ~~batteries~~ battery(ies).

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~~ battery(ies). The mobility aid, the ~~batteries~~ battery(ies), 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~~ battery(ies) 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~~ each 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~~. A maximum of one spare battery not exceeding 300 Wh or two spare batteries with each not exceeding 160 Wh may be carried.

2.13.3.3 An operator must ensure that any battery(ies) removed from the mobility aid and any spare ~~batteries~~ battery(ies) 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~~ battery(ies), removed ~~batteries~~ battery(ies) and spare ~~batteries~~ battery(ies).

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Chapter 4

PROVISION OF INFORMATION

4.1 INFORMATION TO THE PILOT-IN-COMMAND

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Table 7-9. Dangerous goods not required to appear in the information to the pilot-in-command

UN Number	*Item*	*Reference*
. . .		
Amendments to lithium battery provisions		
Paragraph 4.1 of this report:		
~~UN 3090~~	~~**Lithium metal batteries** (including lithium alloy batteries) when meeting the requirements of Packing Instruction 968, Section II~~	~~Packing Instruction 968, Section II~~
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
Amendments to manage aviation specific risks		
Paragraphs 2.2.1 and 8.1 of this report and 3.2.2.17 of DGP/28-WP/3:		
UN 3164	**Articles, pressurized, hydraulic** containing non-flammable gas when meeting the requirements of Packing Instruction 208 a)	Packing Instruction 208, a)
UN 3164	**Articles, pressurized, pneumatic** containing non-flammable gas when meeting the requirements of Packing Instruction 208 a)	Packing Instruction 208, a)
UN 3245	**Genetically modified micro-organisms**	Packing Instruction 959
. . .		

UN Number	*Item*	*Reference*
Amendments to lithium battery provisions		
Paragraph 4.1 of this report:		
~~UN 3480~~	~~**Lithium ion batteries** (including lithium ion polymer batteries) when meeting the requirements of Packing Instruction 965, Section II~~	~~Packing Instruction 965, Section II~~
UN 3481	**Lithium ion batteries contained in equipment** (including lithium ion polymer batteries) when meeting the requirements of Packing Instruction 967, Section II	Packing Instruction 967, Section II
UN 3481	**Lithium ion batteries packed with equipment** (including lithium ion polymer batteries) when meeting the requirements of Packing Instruction 966, Section II	Packing Instruction 966, Section II

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Part 8

PROVISIONS CONCERNING PASSENGERS AND CREW

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Chapter 1

PROVISIONS FOR DANGEROUS GOODS CARRIED BY PASSENGERS OR CREW

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Amendments to facilitate transport

Table 8-1. Provisions for dangerous goods carried by passengers or crew

Dangerous Goods	*Location*		*Approval of the operator(s) is required*	*Restrictions*
	Checked baggage	*Carry-on baggage*		
Batteries				
. . .				

Paragraphs 2.2.1, 3.8 and 8.1 of this report and 3.2.2.21 of DGP/28-WP/3 Report:

4) Mobility aids (e.g. wheelchairs) powered by: – spillable batteries; – non-spillable wet batteries; – dry batteries; – nickel-metal hydride batteries; or – lithium ion batteries	Yes	(see e~~)~~i))	Yes	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); 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); c) the battery(ies) is either: i) 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 ii) removed from the mobility aid, following the manufacturer's instructions; d) the battery terminals must be protected from short circuits (e.g. by being enclosed in a battery container); e) all removed and spare battery(ies) must be protected from damage (e.g. by placing each battery in a strong, rigid packaging);

Dangerous Goods	*Location*		*Approval of the operator(s) is required*	*Restrictions*
	Checked baggage	*Carry-on baggage*		
				f) 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; ~~e~~g) in the case of a dry battery or nickel-metal hydride battery, each battery must comply with Special Provision A123 or A199, respectively; ~~d~~h) in the case of a non-spillable wet battery: i) each battery must comply with Special Provision A67; and ii) a maximum of one spare battery may be carried per passenger; ~~e~~i) in the case of a lithium ion battery: i) each battery must be of a type which meets the requirements of each test in the *UN Manual of Tests and Criteria*, Part III, subsection 38.3; ii) ~~when the mobility aid does not provide adequate protection to the battery:~~ ~~— 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(ies) is removed: — each battery must not exceed 300 Wh; and — the battery(ies) 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~~ battery(ies) must be carried in the cabin.

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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.

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Chapter 2

LIST OF N.O.S. AND GENERIC PROPER SHIPPING NAMES

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THE MOST SPECIFIC APPLICABLE NAME MUST ALWAYS BE USED

UN harmonization amendments

Paragraphs 1.2.1.10 and 8.1 of this report and 3.1.2.10 of DGP/28-WP/3:

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

Class or Division	*Subsidiary hazard*	*UN No.*	*Proper shipping name*
. . .			
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, SCO-II** or **SCO-~~II~~III),** non-fissile or fissile excepted
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Amendments to facilitate transport

Paragraph 3.4 of this report:

Attachment 2

GLOSSARY OF TERMS

Glossary of terms

Term and explanation	*UN Number(s), when relevant*
AIRCRAFT ENGINES. Generic term for engines powering flying craft fuelled by flammable liquid (jet-fuel, petrol, kerosene, etc.) which applies to piston designs, turbine designs and includes auxiliary power units (APU).	~~3166~~3528
. . .	
FUEL CELL ENGINE. See Part 1;3.1.	~~3166~~3528, 3529
. . .	
GAS TURBINE ENGINES. Generic term used for turbine engines fuelled by flammable liquid, flammable gas or other combustible fuels. They may power fixed wing aircraft, rotorcraft, hover craft (cushion craft), marine vessels, land vehicles, pumps and power-generating plants.	~~3166~~3528, 3529
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APPENDIX B TO THE REPORT

CONSOLIDATED AMENDMENTS TO THE SUPPLEMENT TO THE TECHNICAL INSTRUCTIONS RECOMMENDED UNDER AGENDA ITEMS 1, 2, 3 AND 4

Part S-3

DANGEROUS GOODS LIST, SPECIAL PROVISIONS AND QUANTITY LIMITATIONS

Chapter 1

GENERAL

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1.2 QUANTITY LIMITATIONS AND PACKING REQUIREMENTS

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Amendments to manage aviation specific risks

Paragraphs 2.3.1 and 8.1 of this report and paragraph 3.2.3.1 of DGP/28-WP/3:

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.

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Chapter 2

SUPPLEMENTARY DANGEROUS GOODS LIST

UN harmonization amendments

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	5	6	7	8	9	10	11	12	13
Paragraphs 2.3.1 and 8.1 of this report and paragraph 3.1.3.1.1 a) DGP/28-WP/3:												
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	Gas non-flammable		A2 A333 A335			FORBIDDEN		221	~~150 kg~~No limit
Paragraph 2.2.3 of this report:												
Metal catalyst, dry*	2881	4.2		Spontaneous combustion		A1 A3 A36	I II	E0	FORBIDDEN 473	(15 kg)	FORBIDDEN 473	50 kg

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Chapter 6

SPECIAL PROVISIONS

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UN harmonization amendments

Table S-3-4. Special Provisions

Supplementary special provisions

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Paragraphs 2.3.1 and 8.1 of this report and paragraph 3.1.3.1 of DGP/28-WP/3:

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.

Paragraphs 2.3.1 and 8.1 of this report and paragraph 3.1.3.1.1 b) of DGP/28-WP/3:

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.

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Part S-4

PACKING INSTRUCTIONS

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Chapter 4

CLASS 2 — GASES

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UN harmonization amendments

Paragraphs 2.3.1 and 8.1 of this report, paragraph 3.1.3.1.1 c) DGP/28-WP/3 and paragraph 1.3.1.1 a) of this 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.

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Paragraph 1.3.1.1 b) of this report:

Packing Instruction 203

Passenger and cargo aircraft for UN 1950 and 2037 only

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

For the purposes of this packing instruction, a receptacle is considered to be an inner packaging.

Note.— "Receptacle" has the same meaning as set out in 1;3. Any reference in this packing instruction to receptacle will include "aerosols" of UN 1950 and "receptacles, small, containing gas" and "gas cartridges" of UN 2037.

~~***Metal aerosols (IP.7, IP.7A, IP.7B) and non-refillable receptacles containing gas (gas cartridges)***~~Aerosols and receptacles, small containing gas (gas cartridges) must meet the requirements of Part 6;5.4 of the Technical Instructions.

The capacity of metal receptacles must not exceed 1 000 mL; plastics receptacles must not exceed 500 mL.

~~Non-refillable metal aerosols and non-refillable receptacles containing gas (gas cartridges) must not exceed 1 000 mL capacity.~~

~~The following conditions must be met:~~

~~a) the pressure in the receptacle must not exceed 1 500 kPa at 55°C and each receptacle must be capable of withstanding without bursting a pressure of at least 1.5 times the equilibrium pressure of the contents at 55°C;~~

~~b) if the pressure in the receptacle exceeds 970 kPa at 55°C but does not exceed 1 105 kPa at 55°C, an IP.7, IP.7A or IP.7B metal receptacle must be used;~~

~~c) if the pressure in the receptacle exceeds 1 105 kPa at 55°C but does not exceed 1 245 kPa at 55°C, an IP.7A or IP.7B metal receptacle must be used;~~

~~d) if the pressure in the receptacle exceeds 1 245 kPa at 55°C, an IP.7B metal receptacle must be used;~~

~~e) IP.7B metal receptacles having a minimum burst pressure of 1 800 kPa may be equipped with an inner capsule charged with a non-flammable, non-toxic compressed gas to provide the propellant function. In this case, the pressures indicated in a), b), c) or d) do not apply to the pressure within the capsule for an aerosol. The quantity of gas contained in the capsule must be so limited such that the minimum burst pressure of the receptacle would not be exceeded if the entire gas content of the capsule were released into the outer metal receptacle;~~

~~f) the liquid content must not completely fill the closed receptacle at 55°C;~~

~~g) each receptacle exceeding 120 mL capacity must have been heated until the pressure in the receptacle is equivalent to the equilibrium pressure of the contents at 55°C, without evidence of leakage, distortion or other defect.~~

~~***Plastic aerosols (IP.7C)***~~

~~Non-refillable plastic aerosols must not exceed 120 mL capacity, except when the propellant is a non-flammable, non-toxic gas and the contents are not dangerous goods in accordance with the provisions of the Technical Instructions, in which case the quantity must not exceed 500 mL.~~

~~The following conditions must be met:~~

~~a) the contents must not completely fill the closed receptacle at 55°C;~~

~~b) the pressure in the receptacle may not exceed 970 kPa at 55°C; and~~

~~c) each receptacle must be leak tested in accordance with the provisions of 6;3.2.8.1.6 of the Technical Instructions.~~

~~***Non-flammable aerosols containing medical preparations or biological products***~~

~~Aerosols, non-flammable, containing only a non-toxic substance or substances and biological products or a medical preparation which will be deteriorated by a heat test, are acceptable in inner non-refillable receptacles not exceeding 575 mL capacity each, providing all the following conditions are met:~~

~~a) the pressure in the aerosol must not exceed 970 kPa at 55°C;~~

~~b) the liquid contents must not completely fill the closed receptacle at 55°C;~~

~~c) one aerosol out of each lot of 500 or less must be heated until the pressure in the aerosol is equivalent to the equilibrium pressure of the contents at 55°C, without evidence of leakage, distortion or other defect;~~

~~d) the valves must be protected by a cap or other suitable means during transport.~~

UN number and name	*Net quantity per package*	
	Passenger	*Cargo*
UN 1950 **Aerosols**, flammable	75 kg	150 kg
UN 1950 **Aerosols**, flammable (engine starting fluid)	(75 kg)	150 kg
UN 1950 **Aerosols**, non-flammable	75 kg	150 kg
UN 1950 **Aerosols**, non-flammable (tear gas devices)	(25 kg)	50 kg
UN 2037 **Gas cartridges**	1 kg	15 kg
UN 2037 **Receptacles, small, containing gas**	1 kg	15 kg

ADDITIONAL PACKING REQUIREMENTS

— Packagings must meet Packing Group II performance requirements.
— Release valves on aerosols must be protected by a cap or other suitable means to prevent inadvertent release of the contents during normal conditions of air transport.
— Receptacles must be tightly packed, so as to prevent movement.

~~**UN 1950 Aerosols, non-flammable (tear gas devices) — Cargo Aircraft Only**~~

~~— Only metal receptacles, IP.7, IP.7A, IP.7B are permitted. The aerosols must be individually placed into spiral wound tubes fitted with metal ends or a double-faced fibreboard box with suitable padding before being packed into the outer packaging.~~

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)

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UN harmonization amendments

Paragraphs 2.3.1 and 8.1 of this report and paragraph 3.1.3.1 of DGP/28-WP/3:

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.

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Chapter 8

CLASS 6 — TOXIC AND INFECTIOUS SUBSTANCES

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UN harmonization amendments

Paragraphs 2.3.1 and 8.1 of this report and paragraph 3.1.3.1 of DGP/28-WP/3:

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

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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.

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Chapter 11

CLASS 9 — MISCELLANEOUS DANGEROUS GOODS

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.

Amendments to lithium battery provisions

Paragraphs 2.3.1 and 8.1 of this report and paragraph 3.2.3.3 of DGP/28-WP/3:

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.

UN harmonization amendments

Paragraphs 2.3.1 and 8.1 of this report and paragraph 3.1.2.7.1 b) of DGP/28-WP/3:

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).

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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.

Amendments to lithium battery provisions

Paragraph 4.4 of this report:

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 State of Origin and the State of the Operator.

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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 harmonization amendments

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).

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Amendments to manage aviation specific risks

Paragraphs 2.3.1 and 8.1 of this report and paragraph 3.2.3.2 of DGP/28-WP/3:

Part S-7

STATE'S RESPONSIBILITIES WITH RESPECT TO OPERATORS

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Chapter 2

STORAGE AND LOADING

. . .

Chapter 2

STORAGE AND LOADING

. . .

2.2 LOADING ON PASSENGER AIRCRAFT

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2.2.2 The dangerous goods may only be in the following classes or divisions:

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Class 9 (except UN 1931, UN 1941, UN 1990, UN 2211, UN 2590, UN 3268, UN 3314, UN 3316, UN 3363, ~~UN~~ ID 8000)

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APPENDIX C TO THE REPORT

AMENDMENTS TO THE *EMERGENCY RESPONSE GUIDANCE FOR AIRCRAFT INCIDENTS INVOLVING DANGEROUS GOODS* RECOMMENDED UNDER AGENDA ITEM 2

Amendments to manage aviation specific risks

Paragraphs 2.4.1 and 8.1 of this report and paragraph 3.2.4.1 of DGP/28-WP/3:

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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.

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Paragraph 2.4.1 of this report.

Alignment of UN No. and proper shipping names with UN Model Regulations, Chapter 3.2, dangerous goods list (see ST/SG/AC.10/48/Add.1):

Amend Tables 4-2 and 4-3 as indicated:

UN No.	*Drill Code*	*Proper shipping name*
3550	6L	Cobalt dihydroxide powder
1891	~~6L~~3P	Ethyl bromide
~~1169~~	~~3L~~	~~Extracts, aromatic, liquid~~
1197	3L	Extracts~~, flavouring~~, liquid
2913	7L	Radioactive material, surface contaminated objects (SCO-I ~~or~~, SCO-II or SCO-III)

— END —