

فريق خبراء البضائع الخطرة

الاجتماع التاسع والعشرون

مونتريال، ١٣ إلى ١٧/١١/٢٠٢٣

البند رقم ٤ : إدارة مخاطر السلامة الناجمة عن نقل بطاريات الليثيوم جواً (المرجع: بطاقة الأعمال رقم DGP.003.04)

إعادة النظر في التعديلات المقترحة أثناء المؤتمر الثامن والعشرين لفريق خبراء البضائع الخطرة فيما يخص اشتراطات خفض مستوى شحن بطاريات أيونات الليثيوم

(ورقة عمل مقدّمة من أمين الفريق)

الموجز^١

يُدعى فريق الخبراء في هذه الورقة إلى إعادة النظر في التعديلات المقترحة أثناء المؤتمر الثامن والعشرين لفريق خبراء البضائع الخطرة (DGP/28) فيما يخص اشتراطات خفض مستوى شحن بطاريات أيونات الليثيوم، مع مراعاة نتائج تقييم مخاطر السلامة الذي أجرته مجموعة العمل المعنية بأجهزة التخزين الإلكترونية التابعة لفريق خبراء البضائع الخطرة. وقد وافق فريق الخبراء على إعادة النظر في تلك التعديلات بعد الانتهاء من تقييم المخاطر.

الإجراءات المعروضة على فريق الخبراء: يُرجى من فريق الخبراء القيام بما يلي:

- (أ) اتخاذ قرار بشأن قبول التعديلات المقترحة أثناء المؤتمر الثامن والعشرين لفريق خبراء البضائع الخطرة (DGP/28)، والتي ترد في المرفقين (ب) و(ج) بهذه الورقة، وذلك على ضوء نتائج تقييم مخاطر السلامة الذي أجرته مجموعة العمل المعنية بأجهزة التخزين الإلكترونية التابعة لفريق الخبراء، والتي ترد في ورقة العمل DGP/28-WP/41؛
- (ب) النظر في مدى ضرورة اتخاذ إجراءات احترازية أخرى.

^١ لم يُترجم سوى موجز ورقة العمل.

1- INTRODUCTION

1.1.1 Considerable time was spent discussing proposed amendments related to reduced state of charge requirements for lithium ion batteries at the twenty-eighth meeting of the Dangerous Goods Panel (DGP/28, Montréal, 15 to 19 November 2021) (see Appendix A to this working paper for the report of the discussions). The proposed amendments:

replaced an existing requirement for batteries packed without equipment to be offered for transport at a state of charge not exceeding 30 per cent of their rated capacity with a requirement for them to be offered at the lowest state of charge practical but not exceeding 30 per cent of their rated capacity;

extended the state of charge limit, with the proposed revision described in sub-paragraph a) above, to batteries packed with or contained in equipment (UN 3481) and to battery-powered vehicles and battery-powered equipment (UN 3177); and

amended existing state of charge limits in Packing Instructions 910 and 974 of the Supplement to the Technical Instructions with the proposed revision described in sub-paragraph a) above.

Note.— Packing Instruction 910 applies to low production runs and prototype lithium batteries and cells not meeting the UN 38.3 test criteria shipped under an approval, and Packing Instruction 974 applies to lithium cells or batteries having a mass exceeding 35 kg shipped under an approval.

1.1.2 While there was support for the intent of the proposed amendments, the panel could not agree to them at that time. It could not agree to the revised state of charge requirement as written as it was considered ambiguous and difficult to implement and enforce. It could not reach a consensus on extending the reduced state of charge requirement beyond those packed on their own without first conducting a thorough safety risk assessment. However, this was not possible during DGP/28 due to time constraints. The panel agreed that this should be conducted by the DGP Working Group on Electronic Storage Devices (DGP-WG/Energy Storage Devices) and, given the complexity of the task, agreed that it should be conducted under the guidance of safety management experts through coordination with the Secretariat.

2- SAFETY RISK ASSESSMENT

2.1 A report of the safety risk assessment conducted by DGP-WG/Electronic Storage Devices is contained in DGP/29-WP/41, “Report of the Dangerous Goods Panel Working Group on Energy Storage Devices (DGP-WG/Energy Storage Devices)”. It focuses on lithium ion batteries packed with and contained in equipment. As noted in the report, “Lithium ion batteries packed with and contained in equipment were selected for this analysis because these configurations have similar characteristics and requirements, while lithium ion battery powered vehicles comprise a broad range of products and sizes that may warrant special consideration.”.

3- PROPOSED AMENDMENTS TO THE TECHNICAL INSTRUCTIONS AND ITS SUPPLEMENT PRESENTED TO DGP/28

3.1 The amendments to the Technical Instructions requiring a reduced state of charge for lithium ion batteries proposed at DGP/28 are reproduced in Appendix B and the amendments to the Supplement to the Technical Instructions are reproduced in Appendix C to this working paper. The amendments presented in Appendices B and C are based on the 2023-2024 Edition of the Technical Instructions and the 2023-2024 Edition of the Supplement, respectively (the amendments presented at DGP/28 were based on the 2021-2022 Edition of these documents). The amendments were proposed to the following packing instructions at DGP/28:

- a) Packing Instruction 952 of the Technical Instructions, assigned to UN 3171 — **Battery-powered equipment and Battery-powered vehicle.**
- b) Packing Instructions 965 of the Technical Instructions, assigned to UN 3480 — **Lithium ion batteries;**
- c) Packing Instruction 966 of the Technical Instructions, assigned to UN 3481 — **Lithium ion batteries packed with equipment;**
- d) Packing Instruction 967 of the Technical Instructions, assigned to UN 3481 — **Lithium ion batteries contained in equipment;**
- e) Packing Instructions 910 of the Supplement; and
- f) Packing Instructions 974 of the Supplement.

3.2 The amendment to Packing Instruction 952 proposed at DGP/28 is outdated on account of lithium ion battery-powered vehicles being reassigned to new UN No. 3556 — **Vehicle, lithium ion battery powered** in the 23rd revised edition of the UN Model Regulations (see DGP/29-WP/13 for amendments to Table 3-1 and DGP/29-WP/14 for amendment to Packing Instruction 952 proposed to align with the UN provisions). A reference to vehicles in the text proposed for inclusion in Packing Instruction 952 is therefore struck out in the appendix to this working paper. A requirement for vehicles powered by lithium ion batteries to be discharged is proposed for inclusion in Packing Instruction 952 independently of this working paper (see DGP/29-WP/26).

4- ACTION BY THE DGP

4.1 The DGP is invited to:

- a) decide on whether to accept the amendments proposed at DGP/28 contained in Appendices B and C to this working paper based on the outcome of the safety risk assessment conducted by DGP-WG/Electronic Storage Devices presented in DGP/28-WP/41; and
- b) consider whether any other mitigation measures are necessary.

APPENDIX A

EXTRACT FROM DGP/28 REPORT: DISCUSSIONS ON PROPOSAL TO REQUIRING A REDUCED STATE FOR LITHIUM ION BATTERIES AT DGP28 —

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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)**

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.

The packing instructions for which amendments were proposed were:

- c) Packing Instructions 965 assigned to UN 3480 — **Lithium ion batteries**;
- d) Packing Instruction 966 assigned to UN 3481 — **Lithium ion batteries packed with equipment**;
- e) Packing Instruction 967 assigned to UN 3481 — **Lithium ion batteries contained in equipment**; and
- f) 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.

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.

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

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.

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

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.

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)

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.

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).

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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)

a) 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”.

f) Justification for maintaining the status quo

- g) The language used was not appropriate for regulations.
- h) “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.
- i) It would be difficult to enforce.
- j) 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.
- k) 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)

l) 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.

m) 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.

APPENDIX B

AMENDMENTS TO THE TECHNICAL INSTRUCTIONS PROPOSED AT DGP/28
(INCORPORATED IN THE 2023-2024 EDITION OF EACH DOCUMENT)

Part 4

PACKING INSTRUCTIONS

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Chapter 11

CLASS 9 — MISCELLANEOUS DANGEROUS GOODS

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Packing Instruction 952

Passenger and cargo aircraft for UN 3171 only

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

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ADDITIONAL PACKING REQUIREMENTS

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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:

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3) Lithium ion batteries installed in equipment or vehicles must be offered for transport at the lowest practical state of charge but not exceeding 30 per cent of their rated capacity; and

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

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Packing Instruction 965

Cargo aircraft only for UN 3480

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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~~ [the lowest practical](#) state of charge [but](#) 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.

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IB. SECTION IB

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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~~ [the lowest practical](#) state of charge [but](#) 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.

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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

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I.2 Additional requirements

- Lithium ion cells and batteries must be offered for transport at the lowest practical state of charge but 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.
- 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 and batteries must:
 - be placed in inner packagings that completely enclose the cell or battery, then placed in a 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; 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.
- 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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II. SECTION II

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II.2 Additional requirements

- Lithium ion cells and batteries must be offered for transport at the lowest practical state of charge but 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.
- 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).

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Packing Instruction 967

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

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I. SECTION I

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I.2 Additional requirements

- Lithium ion cells and batteries must be offered for transport at the lowest practical state of charge but 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.
- The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.
- 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.

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II. SECTION II

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II.2 Additional requirements

- Lithium ion cells and batteries must be offered for transport at the lowest practical state of charge but 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.
- The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.

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APPENDIX C

AMENDMENTS TO THE SUPPLEMENT TO THE TECHNICAL INSTRUCTIONS PROPOSED
AT DGP/28 (INCORPORATED IN THE 2023-2024 EDITION)

Part S-4

PACKING INSTRUCTIONS

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Chapter 11

CLASS 9 — MISCELLANEOUS DANGEROUS GOODS

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Packing Instruction 910

Cargo aircraft only

Introduction

This packing instruction applies to UN Nos. 3090, 3091, 3480 and 3481 annual production runs consisting of not more than 100 cells or batteries and to pre-production prototypes of cells or batteries when these prototypes are transported for testing.

General requirements

Part 4, Chapter 1 requirements of the Technical Instructions must be met.

Lithium ion cells and batteries (UN 3480), including when packed with or contained in equipment (UN 3481), must be offered for transport at ~~a~~ the lowest practical state of charge but 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.

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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.

General requirements

Part 4;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~~ the lowest practical state of charge but 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.

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

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— END —