



WORKING PAPER

DANGEROUS GOODS PANEL (DGP)

TWENTY-EIGHTH MEETING

Virtual, 15 to 19 November 2021

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

REDUCED STATE OF CHARGE NOT EXCEEDING 30 PER CENT FOR LITHIUM ION WITH MASS EXCEEDING 35 KG THROUGH PACKING INSTRUCTION 974

(Presented by S. Schwartz)

SUMMARY

This working paper proposes to amend Packing Instruction 974 of the Supplement to the Technical Instructions to include UN 3481 — **Lithium ion batteries packed with equipment** and UN 3481 — **Lithium ion batteries contained in equipment** in the maximum state of charge (SOC) requirement and to require that all shipments containing lithium ion batteries (both UN 3480 — **Lithium ion batteries** and UN 3481) with a mass greater than 35 kg be offered for transport at as lowest practical state of charge, but not exceeding 30 per cent without specific state approvals.

Action by the DGP: The DGP-WG is invited to consider amendments as detailed in the appendix to this working paper.

1. INTRODUCTION

1.1 Packing Instruction 974 of the Supplement to the Technical Instructions applies to packages containing lithium cells or batteries, both alone or packed in or with equipment (UN 3480 — **Lithium ion batteries** and UN 3481 — **Lithium ion batteries packed with equipment** and UN 3481 — **Lithium ion batteries contained in equipment**) larger than 35 kg.

1.2 Since these are very large cells and batteries, they may present a significantly greater risk in air transport than those covered by Packing Instruction 965 of the Technical Instructions, and appropriate additional mitigations are warranted.

1.3 One way to limit the energy available in the event of a thermal runaway is to reduce the state of charge (SOC) in transport. Reducing the SOC will reduce the energy available in the event of thermal runaway to cause a fire, cause propagation of thermal runaway to other batteries, and produce explosive gasses.

1.4 When the 30 per cent SOC requirement for UN 3480 was implemented, it was seen as a way to quickly and easily reduce the general risk they pose in air transport. The 30 per cent level was based on tests demonstrating significantly reduced risk from many cells and batteries offered for transport, but it was never accepted as providing a safe level for all cells and batteries. Some cells and batteries pose significant risk if they enter thermal runaway in air transport when shipped at 30 per cent SOC.

1.5 Thermal runaway propagation and explosive gas generation normally decreases as SOC is reduced, and therefore the DGP is invited to consider whether the Technical Instructions should be amended to require UN 3480 and UN 3481 that are offered for transport under Packing Instruction 974 of the Supplement to be at the lowest practical SOC, but no higher than 30 per cent.

2. ACTION BY THE DGP

2.1 The DGP-WG is invited to consider amendments as detailed in the appendix to this working paper.

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APPENDIX

**PROPOSED AMENDMENT TO PART 4 OF THE SUPPLEMENT TO THE TECHNICAL
INSTRUCTIONS**

Part S-4

PACKING INSTRUCTIONS

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Chapter 11

CLASS 9 — MISCELLANEOUS DANGEROUS GOODS

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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 (whether packaged alone as UN 3480 or packed in or with equipment as 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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