



**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)**

**PACKAGING STANDARD FOR LITHIUM BATTERIES, SECTION IB AND II**

(Presented by D. Brennan)

**SUMMARY**

This working paper proposes that the provisions of Section IB and Section II of the lithium battery packing instructions be revised to incorporate requirements that the packages must be capable of withstanding a 1.2 m drop test and stack test in line with that specified for limited quantity packages.

**Action by the DGP:** The DGP is invited to consider the revisions to Packing Instructions 965 to 970 as shown in the appendix to this working paper.

**1. INTRODUCTION**

1.1 The requirements for packagings for lithium cells and batteries that are prepared in accordance with Section IB and Section II of the lithium battery packing instructions are largely derived from the provisions set out in special provision 188 in the UN Model Regulations.

1.2 Special Provision A188 requires strong outer packagings for packages of cells and batteries and for cells and batteries packed with equipment. For cells and batteries contained in equipment the requirement is for strong outer packagings unless the battery is afforded equivalent protection by the equipment in which it contained.

1.3 Over time the DGP has expanded on the requirements of special provision 188 to require for Section IB and II that the strong outer packagings must be rigid, as this was seen as providing an additional level of protection for the contents, and also that the packages of cells or batteries and cells or batteries packed with equipment must be capable of withstanding a 1.2 m drop test. However, the 1.2 m drop test capability does not apply to cells or batteries contained in equipment, Section II of Packing Instructions 967 and 970.

1.4 A recent event where a consignment of mobile phones caught fire on the ramp in Hong Kong while waiting to be loaded onto an aircraft generated significant discussion, as there was no evidence of non-compliance and the investigation into the cause was inconclusive.

1.5 The mobile phones were in boxes stacked approximately 2 m high on a pallet and there was some question as to the ability of packages to adequately protect the contents from damage and the ability of the packages to withstand the force applied by other packages stacked on top when loaded into a unit load device.

1.6 The packaging and packing requirements for lithium cells and batteries in Section II of Packing Instructions 965 to 970 and for cells and batteries in Section IB of Packing Instructions 965 and 968 can be considered analogous to the provisions for limited quantity. This is particularly the case for Section IB, where all of the provisions of the Technical Instructions other than those in Part 6 apply.

1.7 However, in Section IB and Section II there is no specification on the package being able to withstand a stack test as is specified for limited quantity packages. In addition, the 1.2 m drop test capability in the lithium battery packing instructions does not extend to Section II of Packing Instructions 967 and 970.

1.8 In considering the analogy between the packaging standards for limited quantity packages and those currently in place for Section IB and for Section II, it is believed that the 1.2 m drop capability should be applied to Section II of Packing Instructions 967 and 970. In addition, it is believed that packages of Section IB and Section II should be capable of withstanding a stack test similar to that specified in Part 3;4.4.2 for limited quantity packages.

## 2. ACTION BY THE DGP

2.1 The DGP is invited to consider the revisions to Packing Instructions 965 to 970 as shown in the appendix to this working paper.

-----

APPENDIX

PROPOSED AMENDMENT TO PART 4 OF THE TECHNICAL INSTRUCTIONS

Part 4

PACKING INSTRUCTIONS

...

Chapter 11

CLASS 9 — MISCELLANEOUS DANGEROUS GOODS

...

Packing Instruction 965

Cargo aircraft only for UN 3480

...

IB. SECTION IB

...

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 Division 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.
- 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).

...

II. SECTION II

...

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;

### Packing Instruction 965

Cargo aircraft only for UN 3480

- shifting of the contents so as to allow battery to battery (or cell to cell) contact;
- release of contents.
- 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) 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.

...

...

...

## Packing Instruction 966

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

...

### II. SECTION II

...

#### II.2 Additional requirements

- Lithium ion cells and batteries must:
  - be placed in inner packagings that completely enclose the cell or battery, then placed in a strong rigid outer packaging; or
  - be placed in inner packagings that completely enclose the cell or battery, then placed with the equipment in a strong rigid outer packaging.
- Cells and batteries must be protected so as to prevent 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 batteries that are required to power each piece of equipment.
- Each package of cells or batteries, or the completed 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 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).
  - 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 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), packing instruction numbers and "CAO", when applicable.
- Where a package contains a combination of lithium batteries contained in equipment and lithium batteries packed with equipment that meet the limits for lithium cells or batteries of Section II, the following additional requirements apply:
  - the shipper must ensure that all applicable parts of both packing instructions are met. The total mass of lithium batteries contained in any package must not exceed 5 kg;
  - 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.
- 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.

...

...

...

## Packing Instruction 967

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

...

### II. SECTION II

...

#### 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.
- Each package must be capable of withstanding a 1.2 m drop test in any orientation without:
  - damage to equipment contained therein;
  - release of contents.
- Each package must be capable of withstanding, without damage to the equipment 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). The package must be of such size that there is adequate space to affix the mark on one side without the mark being folded.
  - This requirement does not apply to:
    - packages containing only button cell batteries installed in equipment (including circuit boards); and
    - packages containing no more than four cells or two batteries installed in equipment, where there are not more than two packages in the consignment.
  - Where a consignment includes packages bearing the lithium battery mark, the words "lithium ion batteries, in compliance with Section II of PI967" must be placed on the air waybill, when an air waybill is used. Where packages of Section II lithium batteries from multiple packing instructions are included on one air waybill, the compliance statement for the different lithium battery types and/or packing instructions may be combined into a single statement provided that the statement identifies the applicable lithium battery type(s), packing instruction numbers and "CAO", when applicable.
- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with the functions for which they are responsible.

...

## Packing Instruction 968

Cargo aircraft only for UN 3090

...

### IB. SECTION IB

...

#### 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 Division 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.
- 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).

...

### II. SECTION II

...

#### 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 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) 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.

...

## Packing Instruction 969

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

...

### II. SECTION II

...

#### II.2 Additional requirements

- Lithium metal cells and batteries must:
  - be placed in inner packagings that completely enclose the cell or battery, then placed in a strong rigid outer packaging; or
  - be placed in inner packagings that completely enclose the cell or battery, then placed with the equipment in a strong rigid outer packaging.
- Cells and batteries must be protected so as to prevent 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 batteries that are required to power each piece of equipment.
- Each package of cells or batteries, or the completed 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 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).
  - 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 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), packing instruction numbers and "CAO", when applicable.
- Where a package contains a combination of lithium batteries contained in equipment and lithium batteries packed with equipment that meet the limits for lithium cells or batteries of Section II, the following additional requirements apply:
  - the shipper must ensure that all applicable parts of both packing instructions are met. The total mass of lithium batteries contained in any package must not exceed 5 kg;
  - 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.
- 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.

...



## Packing Instruction 970

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

...

### II. SECTION II

...

#### 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.
- Each package must be capable of withstanding a 1.2 m drop test in any orientation without:
  - damage to equipment contained therein;
  - release of contents.
- Each package must be capable of withstanding, without damage to the equipment 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). The package must be of such size that there is adequate space to affix the mark on one side without the mark being folded.
  - This requirement does not apply to:
    - packages containing only button cell batteries installed in equipment (including circuit boards); and
    - packages containing no more than four cells or two batteries installed in equipment, where there are not more than two packages in the consignment.
- Where a consignment includes packages bearing the lithium battery mark, the words "lithium metal batteries, in compliance with Section II of PI970" must be placed on the air waybill, when an air waybill is used. Where packages of Section II lithium batteries from multiple packing instructions are included on one air waybill, the compliance statement for the different lithium battery types and/or packing instructions may be combined into a single statement provided that the statement identifies the applicable lithium battery type(s), packing instruction numbers and "CAO", when applicable.
- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with the functions for which they are responsible.

...

— END —