



WORKING PAPER

**DANGEROUS GOODS PANEL (DGP)
MEETING OF THE WORKING GROUP OF THE WHOLE**

Montréal, 15 to 19 April 2013

- Agenda Item 2: Development of recommendations for amendments to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284) for incorporation in the 2015-2016 Edition**
2.4 : Part 4 — Packing Instructions

PACKING INSTRUCTION 971 / ASSYMETRIC CAPACITORS

(Presented by the Dangerous Goods Advisory Council (DGAC))

SUMMARY

This paper proposes changes to Packing Instruction 971 to accommodate asymmetric capacitors and introduces an effective date for marking the Wh rating for UN3 499 and UN 3508.

Action by the DGP is in paragraph 2.

1. INTRODUCTION

1.1 Document DGP-WG/13-WP/13 proposes inclusion of new requirements for asymmetric capacitors (UN 3508) in the dangerous goods list (see page 6 of DGP-WG/13-WP/13) and a corresponding Special Provision A196 (see page 14 of DGP-WG/13-WP/13). Packing Instruction 971 currently applicable to UN 3499 is referenced in the proposed table entry. Packing Instruction 971 would be applicable to asymmetric capacitors not excepted by proposed Special Provision A196 (i.e. generally those with a Wh rating of more than 20 Wh).

1.2 Under Packing Instruction 971, as it appears in the 2013-14 Edition of the Technical Instructions, electric double layer capacitors (UN 3499) which are not covered by the exceptions in A186 (i.e. generally those with a Wh rating of more than 10 Wh) are required to be fitted with a metal strap. Application of this requirement to asymmetric capacitors would render them useless as a minimum charge must be maintained for continued viability of these capacitors. For this reason, it was agreed by the UN Subcommittee to require protection against short circuit in the case of asymmetric capacitors in UN special provision 372. This is also reflected in A196 as proposed in DGP-WG/13-WP/13. For consistency with the UN provisions, some changes to Packing Instruction 971 are needed. Note also that although Packing Instruction 971 is not addressed in DGP-WG/13-WP/14, it would also require some

consequential heading and table changes to accommodate UN 3508 and to reflect the proper shipping name change for UN 3499.

1.3 DGAC further notes that, in a paper to the June 2013 UN Subcommittee meeting, the expert from Japan has proposed that the Wh marking requirement for capacitors under UN 3499 and UN 3508 not apply to pre-existing capacitors (see ST/SG/AC.10/C.3/2013/34 at <http://www.unece.org/fileadmin/DAM/trans/doc/2013/dgac10c3/ST-SG-AC10-C3-2013-34e.pdf>). In this respect DGAC recommends that the dates proposed by Japan be included in square brackets in Special Provisions A186 and A196 pending a decision by the UN Subcommittee in June 2013.

2. ACTION BY THE DGP-WG

2.1 DGAC recommends that the text in Special Provisions A186, A196 and Packing Instruction 971 be revised as presented in the appendix to this working paper.

APPENDIX

PROPOSED AMENDMENTS TO THE TECHNICAL INSTRUCTIONS

Chapter 3

SPECIAL PROVISIONS

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Table 3-2. Special provisions

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A186 (361) This entry applies to electric double layer capacitors with an energy storage capacity greater than 0.3 Wh. Capacitors with an energy storage capacity of 0.3 Wh or less are not subject to these Instructions. Energy storage capacity means the energy held by a capacitor, as calculated using the nominal voltage and capacitance. All capacitors to which this entry applies, including capacitors containing an electrolyte that does not meet the classification criteria of any class or division of dangerous goods, must meet the following conditions:

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d) capacitors must be designed and constructed to safely relieve pressure that may build up in use, through a vent or a weak point in the capacitor casing. Any liquid which is released upon venting must be contained by the packaging or by the equipment in which a capacitor is installed; and

e) capacitors must be marked with the energy storage capacity in Wh. [This must not apply to capacitors manufactured before 1 January 2015].

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Revision to new Special Provision A196 proposed in DGP-WG/13-WP/13 is highlighted in yellow below.

A196 (372) This entry applies to asymmetric capacitors with an energy storage capacity greater than 0.3 Wh. Capacitors with an energy storage capacity of 0.3 Wh or less are not subject to these Instructions.

Energy storage capacity means the energy stored in a capacitor, as calculated according to the following equation:

$$Wh = 1/2C_N(U_R^2 - U_L^2) \times (1/3600).$$

using the nominal capacitance (C_N), rated voltage (U_R) and rated lower limit voltage (U_L).

All asymmetric capacitors to which this entry applies must meet the following conditions:

- a) capacitors or modules must be protected against short circuit;
- b) capacitors must be designed and constructed to safely relieve pressure that may build up in use, through a vent or a weak point in the capacitor casing. Any liquid which is released upon venting must be contained by packaging or by equipment in which a capacitor is installed;
- c) capacitors must be marked with the energy storage capacity in Wh. **This must not apply to capacitors manufactured before 1 January 2015**; and
- d) capacitors containing an electrolyte meeting the classification criteria of any class or division of dangerous goods must be designed to withstand a 95 kPa pressure differential;

Capacitors containing an electrolyte not meeting the classification criteria of any class or division of dangerous goods, including when configured in a module or when installed in equipment are not subject to other provisions of these Instructions.

Capacitors containing an electrolyte meeting the classification criteria of any class or division of dangerous goods, with an energy storage capacity of 20 Wh or less, including when configured in a module, are not subject to other provisions of these Instructions when the capacitors are capable of withstanding a 1.2 metre drop test unpackaged on an unyielding surface without loss of contents.

Capacitors containing an electrolyte meeting the classification criteria of any class or division of dangerous goods that are not installed in equipment and with an energy storage capacity of more than 20 Wh are subject to these Instructions.

Capacitors installed in equipment and containing an electrolyte meeting the classification criteria of any class or division of dangerous goods, are not subject to other provisions of these Instructions provided that the equipment is packaged in a strong outer packaging constructed of suitable material, and of adequate strength and design, in relation to the packaging's intended use and in such a manner as to prevent accidental functioning of capacitors during transport. Large robust equipment containing capacitors may be offered for transport unpackaged or on pallets when capacitors are afforded equivalent protection by the equipment in which they are contained.

Note.— Notwithstanding the provisions of this special provision, nickel-carbon asymmetric capacitors containing Class 8 alkaline electrolytes must be transported as UN 2795, **Batteries, wet, filled with alkali, electric storage.**

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Part 4

PACKING INSTRUCTIONS

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Chapter 11

CLASS 9 — MISCELLANEOUS DANGEROUS GOODS

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Packing Instruction 971

Passenger and cargo aircraft for UN 3499 and UN 3508 only (see also Special Provision A186 and A196 respectively)

General requirements

Part 4;1.1.1 and 1.1.8 requirements must be met.

For the purpose of this packaging instruction, a capacitor is considered an inner packaging.

<i>UN number and proper shipping name</i>	<i>Quantity — passenger</i>	<i>Quantity — cargo</i>
“Electric double layer” is now part of the proper shipping name for UN 3499 (now in bold):.	No limit	No limit
UN 3499 Capacitor, electric double layer		
<u>UN 3508</u> Capacitor, asymmetric	No limit	No limit

ADDITIONAL PACKING REQUIREMENTS

- For capacitors under UN 3499, each capacitor must be transported in an uncharged state. The capacitor or, when fitted in a module, the module must be fitted with a metal strap connecting the terminals.
- For capacitors under UN 3508, each capacitor or, when fitted in a module, the module must be protected against short circuit.
- Capacitors must be securely cushioned in the outer packagings.

OUTER PACKAGINGS OF COMBINATION PACKAGINGS (see 6;3.1)

Boxes

Drums

Jerricans

Strong outer packagings

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