



WORKING PAPER

**DANGEROUS GOODS PANEL (DGP)
WORKING GROUP MEETING (DGP-WG/21)**

Virtual Meeting, 24 to 28 May 2021

Agenda Item 1: Harmonizing ICAO dangerous goods provisions with UN Recommendations on the Transport of Dangerous Goods

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

DRAFT AMENDMENTS TO PART 2 OF THE TECHNICAL INSTRUCTIONS TO ALIGN WITH THE UN RECOMMENDATIONS

(Presented by the DGP Working Group on UN Harmonization)

SUMMARY

This working paper contains draft amendments to Part 2 of 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 at its ninth session (Geneva, 11 December 2020).

Action by the DGP-WG: The DGP-WG is invited to agree to the draft amendments in this working paper.

Part 2

CLASSIFICATION OF DANGEROUS GOODS

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Chapter 1

CLASS 1 — EXPLOSIVES

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1.4 COMPATIBILITY GROUPS

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The Secretariat proposes removing reference and edition number because it is included in the definition for Manual of Tests and Criteria in Part 1;3. The Secretariat has recommended in DGP-WG/21-WP/11 the addition of a definition for Model Regulations in Part 1;3 so that the edition number needs only change there each biennium and not throughout the Instructions. References to UN Recommendations throughout the Technical Instructions will be replaced with Manual of Tests and Criteria or Model Regulations, as appropriate, in the DGP/27 working papers on UN harmonization if DGP-WG/21 agrees to this approach):

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.4~~) 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

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4.2.3.2.4 List of currently assigned self-reactive substances in packages

The Secretariat proposes to replace the following reference with “Model Regulations” because a definition for Model Regulations is proposed for Part 1;3 (see DGP-WG/21-WP/11) (references to UN Recommendations throughout the Technical Instructions will be replaced with Manual of Tests and Criteria or Model Regulations, as appropriate, in the DGP/27 working papers on UN harmonization if DGP-WG/21 agrees to this approach) :

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.

DGP-WG/UN Harmonized identified that the list in Technical Instructions Table 2-6 was not identical to the associated table in the UN Model Regulations and concluded that a thorough review of the two tables would need to be carried out. Depending on the outcome of the review, the rationale behind the discrepancies may need to be documented in the “Guidance for the Panel to Aid in Preparation of the Technical Instructions and Supporting Documents”.

In addition to these tables, a DGP-WG/UN Harmonization also identified some inconsistencies in Table 3-1 for certain self-reactive substances. For instance, Self-reactive liquid type B* is forbidden (for air transport) but assigned with UN number UN 3231; however, Self-reactive solid type B is completely forbidden, without an assignment of UN number, which triggered the discussion on whether the classification of these self-reactive substances should be aligned. DGP-WG/UN Harmonization concluded that substances should be listed with the un number even if forbidden.

DGP-WG/UN Harmonization agreed to conduct a thorough review of Table 2-6 against the associated table in the UN Model Regulations.

<i>Self-reactive substance</i>	<i>Concentration (%)</i>	<i>Control temperature (°C)</i>	<i>Emergency temperature (°C)</i>	<i>UN generic entry</i>	<i>Notes</i>
...					
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	
<u>(7-Methoxy-5-methyl-benzothiophen-2-yl) boronic acid</u>	<u>88-100</u>			<u>3230</u>	<u>9</u>

<i>Self-reactive substance</i>	<i>Concentration (%)</i>	<i>Control temperature (°C)</i>	<i>Emergency temperature (°C)</i>	<i>UN generic entry</i>	<i>Notes</i>
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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 DGP-WG/21-WP/11):

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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Chapter 5

CLASS 5 — OXIDIZING SUBSTANCES; ORGANIC PEROXIDES

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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.

DGP-WG/UN Harmonization agreed to conduct a thorough review of Table 2-7 for the same reasons identified when reviewing Table 2-6 (see DGP-WG/UN Harmonization note for Table 2-6 above).

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
<u>Acetyl acetone peroxide</u>	<u>≤35</u>	<u>≥57</u>			<u>≥8</u>			<u>3107</u>	<u>32</u>
tert-Butylperoxy isopropylcarbonate	≤77	≥23						3103	
1-(2-tert-Butylperoxyisopropyl)-3-isopropenylbenzene	≤77	≥23						3105	
<u>tert-Butylperoxy isopropylcarbonate</u>	<u>≤62</u>		<u>≥38</u>					<u>3105</u>	
...									
tert-Hexyl Peroxypivalate	≤72		≥28			+10	+15	3115	
<u>tert-Hexyl peroxypivalate</u>	<u>≤52 as a stable dispersion in water</u>					<u>+15</u>	<u>+20</u>	<u>3117</u>	

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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

Parts of this Chapter are affected by State Variation CA 8

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

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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*

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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 A₂. 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 ~~7.2.3.4.1~~ **7.2.3.4.3**, the activity in the water would not exceed 100 A₂. 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 shall 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.

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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.

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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 cm², does not exceed:
 - i) 400 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters; and
 - ii) 40 Bq/cm² 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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UN Model Regulations, 2.7.2.3.4.3 and 2.7.2.3.4.4 (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 seven 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 seven-day test period the free volume of the unabsorbed and unreacted water remaining shall 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 seven-day immersion of the test sample.

7.2.3.4.4 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.

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Chapter 8

CLASS 8 — CORROSIVE SUBSTANCES

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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:

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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.

— END —