International Civil Aviation Organization

DGP/27-WP/12
11/6/19

WORKING PAPER

DANGEROUS GOODS PANEL (DGP)

TWENTY-SEVENTH MEETING

Montréal, 16 to 20 September 2019

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 2021-2022 Edition

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

(Presented by the Secretary)

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, 7 December 2018).

The DGP is invited to agree to the draft amendments in this working paper.

Part 2

CLASSIFICATION OF DANGEROUS GOODS

INTRODUCTORY CHAPTER

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6. CLASSIFICATION OF ARTICLES AS ARTICLES CONTAINING DANGEROUS GOODS N.O.S.

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6.3 This section does not apply to articles for which a more specific proper shipping name already exists in Table 3-1.

UN Model Regulations, 2.0.5.4 (see ST/SG/AC.10/46/Add.1)

6.4 This section does not apply to dangerous goods of Class 1, Division 6.2, Class 7 or radioactive material contained in articles. However, this section applies to articles containing explosives which are excluded from Class 1 in accordance with 2;1.5.2.4.

6.5 Articles containing dangerous goods must be assigned to the appropriate class or division determined by the hazards present using, where applicable, Table 2-1 for each of the dangerous goods contained in the article. If dangerous goods classified as Class 9 are contained within the article, all other dangerous goods present in the article must be considered to present a higher hazard.

6.6 Subsidiary hazards must be representative of the primary hazard posed by the other dangerous goods contained within the article. When only one item of dangerous goods is present in the article, the subsidiary hazard(s), if any, is the subsidiary hazard(s) identified in column 4 of Table 3-1. If the article contains more than one item of dangerous goods and these could react dangerously with one another during transport, each of the dangerous goods must be enclosed separately (see 4;1.1.8).

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Chapter 1

CLASS 1 — EXPLOSIVES

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1.5.2 Exclusion from Class 1

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1.5.2.4 An article may be excluded from Class 1 when three unpackaged articles, each individually activated by its own means of initiation or ignition or external means to function in the designed mode, meet the following test criteria:

a) no external surface has a temperature of more than 65ºC. A momentary spike in temperature up to 200ºC is acceptable;

b) no rupture or fragmentation of the external casing or movement of the article or detached parts thereof of more than one metre in any direction;

UN Model Regulations, 2.1.3.6.4 (b) (see ST/SG/AC.10/46/Add.1)

Note.— Where the integrity of the article may be affected in the event of an external fire, these criteria must be examined by a fire *test~~, such as described in ISO 12097-3~~*. *One such method is described in ISO 14451-2 using a heating rate of 80 K/min.*

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Chapter 2

CLASS 2 — GASES

2.1 DEFINITIONS AND GENERAL PROVISIONS

2.1.1 A gas is a substance which:

a) at 50°C has a vapour pressure greater than 300 kPa; or

b) is completely gaseous at 20°C at a standard pressure of 101.3 kPa.

2.1.2 The transport condition of a gas is described according to its physical state as:

a) compressed gas — a gas which when packaged under pressure for transport is entirely gaseous at –50°C; this category includes all gases with a critical temperature less than or equal to –50°C;

b) liquefied gas — a gas which when packaged under pressure for transport is partially liquid at temperatures above –50°C. A distinction is made between:

High pressure liquefied gas: a gas with a critical temperature between –50°C and +65°C, and

Low pressure liquefied gas: a gas with a critical temperature above +65°C;

c) refrigerated liquefied gas — a gas which when packaged for transport is made partially liquid because of its low temperature;

d) dissolved gas — a gas which when packaged under pressure for transport is dissolved in a liquid phase solvent; or

e) adsorbed gas — a gas which when packaged for transport is adsorbed onto a solid porous material resulting in an internal receptacle pressure of less than 101.3 kPa at 20°C and less than 300 kPa at 50°C.

UN Model Regulations, 2.2.1.3 (see ST/SG/AC.10/46/Add.1)

2.1.3 This class comprises compressed gases; liquefied gases; dissolved gases; refrigerated liquefied gases; mixtures of one or more gases with one or more vapours of substances of other classes; articles charged with a gas~~; and~~, aerosols and chemicals under pressure. (For aerosols, see 1;3.1.)

Note.—"Cryogenic liquid" means the same as "refrigerated liquefied gas".

2.1.4 Pressures of all kinds relating to receptacles (such as test pressure, internal pressure, safety-valve opening pressure) are always indicated in gauge pressure (pressure in excess of atmospheric pressure); however, the vapour pressure of substances is always expressed in absolute pressure.

2.2 DIVISIONS

2.2.1 Substances of Class 2 are assigned to one of three divisions based on the primary hazard of the gas during transport.

*Note.— UN 1950 — **Aerosols,** UN 2037 — **Receptacles, small, containing gas** and UN 2037 — **Gas cartridges** must be regarded as being in Division 2.1 when the criteria in 2.5.1 a) are met. For chemicals under pressure of UN Nos. 3500 to 3505, see Special Provision A187.*

a) Division 2.1 — Flammable gases.

Gases which at 20°C and a standard pressure of 101.3 kPa:

i) are ignitable when in a mixture of 13 per cent or less by volume with air; or

UN Model Regulations, 2.2.2.1 a) ii) (see ST/SG/AC.10/46/Add.1)

ii) have a flammable range with air of at least 12 percentage points regardless of the lower flammable limit. Flammability must be determined by tests or by calculation in accordance with methods adopted by ISO (see ISO 10156:~~2010~~2017). Where insufficient data are available to use these methods, tests by a comparable method recognized by the appropriate national authority must be used.

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b) Division 2.2 — Non-flammable, non-toxic gases.

Gases which:

i) are asphyxiant — gases which dilute or replace the oxygen normally in the atmosphere; or

ii) are oxidizing — gases which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does; or

iii) do not come under the other divisions.

UN Model Regulations, 2.2.2.1 b) iii) (see ST/SG/AC.10/46/Add.1)

Note.— In 2.2.1 b) ii), "gases which cause or contribute to the combustion of other material more than air does" means pure gases or gas mixtures with an oxidizing power greater than 23.5 per cent as determined by a method specified in ISO 10156:~~2010~~2017.

c) Division 2.3 — Toxic gases.

Gases which:

i) are known to be so toxic or corrosive to humans as to pose a hazard to health; or

ii) are presumed to be toxic or corrosive to humans because they have an LC_{50} value equal to or less than 5 000 mL/m^3 (ppm) when tested in accordance with 6.2.1.3.

≠ *Note.— Gases meeting the above criteria owing to their corrosivity are to be classified as toxic with a subsidiary corrosive hazard.*

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2.4 MIXTURES OF GASES

For the classification of gas mixtures into one of the three divisions (including vapours of substance from other classes), the following principles must be used:

UN Model Regulations, 2.2.3 a) (see ST/SG/AC.10/46/Add.1)

a) Flammability must be determined by tests or by calculation in accordance with methods adopted by ISO (see ISO 10156:~~2010~~2017). Where insufficient data are available to use these methods, tests by a comparable method recognized by the appropriate national authority may be used.

b) The level of toxicity is determined by either tests in accordance with 6.2.1.3 or a calculation method using the following formula:

$$LC_{50}\text{Toxic (mixture)} = \frac{1}{\sum_{i=1}^{n} \frac{f_i}{T_i}}$$

where f_i = mole fraction of the i^{th} component substance of the mixture, and

where T_i = toxicity index of the i^{th} component substance of the mixture (the T_i equals the LC_{50} value when available).

When LC_{50} values are unknown, the toxicity index is determined by using the lowest LC_{50} value of substances of similar physiological and chemical effects, or through testing if this is the only practical possibility.

≠ c) A gas mixture has a subsidiary hazard of corrosivity when the mixture is known by human experience to be destructive to the skin, eyes or mucous membranes or when the LC_{50} value of the mixture's corrosive components is equal to or less than 5 000 mL/m^3 (ppm) when the LC_{50} value is calculated by the formula:

$$LC_{50}\text{Corrosive (mixture)} = \frac{1}{\sum_{i=1}^{n} \frac{f_{ci}}{T_{ci}}}$$

where f_{ci} = mole fraction of the i^{th} corrosive component substance of the mixture, and

where T_{ci} = Toxicity index of the i^{th} corrosive component substance of the mixture (the T_{ci} equals the LC_{50} value when available).

UN Model Regulations, 2.2.3 d) (see ST/SG/AC.10/46/Add.1)

d) Oxidizing ability is determined either by tests or by calculation methods adopted by the International Standards Organization (see the Note in 2.2.1 b) and ISO 10156:~~2010~~2017).

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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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4.3 SUBSTANCES LIABLE TO SPONTANEOUS COMBUSTION (DIVISION 4.2)

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4.3.2.3 *Self-heating substances*

4.3.2.3.1 A substance must be classified as a self-heating substance of Division 4.2 if, in tests performed in accordance with the test method given in the current edition of the UN *Manual of Tests and Criteria*, Part III, subsection 33.3.1.6:

a) a positive result is obtained using a 25 mm sample cube at 140°C;

b) a positive result is obtained in a test using a 100 mm sample cube at 140°C and a negative result is obtained in a test using a 100 mm sample cube at 120°C and the substance is to be transported in packages with a volume of more than 3 m^3;

c) a positive result is obtained in a test using a 100 mm sample cube at 140°C and a negative result is obtained in a test using a 100 mm sample cube at 100°C and the substance is to be transported in packages with a volume of more than 450 L;

d) a positive result is obtained in a test using a 100 mm sample cube at 140°C and a positive result is obtained using a 100 mm sample cube at 100°C.

UN Model Regulations, 2.4.3.2.3.1 (see ST/SG/AC.10/46/Add.1)

Self-reactive substances~~, except for type G,~~ which also give a positive result according to this test method must not be classified in Division 4.2 but in Division 4.1 (see 4.2.3.1.1).

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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.

	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*
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UN Model Regulations, 2.5.3.2.4 (see ST/SG/AC.10/46/Add.1)

	Dibenzoyl peroxide	≤35			≥65			Exempt	29
	Di-(4-tert-butylcyclohexyl) peroxydicarbonate	≤100				+30	+35	3114	
+	Di-(4-tert-butylcyclohexyl) peroxydicarbonate	≤42 as a paste				+35	+40	~~3116~~3118	
	Di-(4-tert-butylcyclohexyl) peroxydicarbonate	≤42 as a stable dispersion in water				+30	+35	3119	

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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

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.

6.1 DEFINITIONS

Class 6 is divided into two divisions as follows:

a) Division 6.1 — Toxic substances.

Substances liable either to cause death or injury or to harm human health if swallowed, if inhaled or by skin contact.

Note.— In these Instructions "poisonous" has the same meaning as "toxic".

b) Division 6.2 — Infectious substances.

UN Model Regulations, 2.6.1 b) (see ST/SG/AC.10/46/Add.1)

Substances known to contain, or reasonably expected to contain, pathogens. Pathogens are defined as micro-organisms (including bacteria, viruses~~, rickettsiae~~, parasites, fungi) and other agents such as prions, which can cause disease in humans or animals.

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6.3 DIVISION 6.2 — INFECTIOUS SUBSTANCES

6.3.1 Definitions

For the purposes of these Instructions:

UN Model Regulations, 2.6.3.1.1 (see ST/SG/AC.10/46/Add.1)

6.3.1.1 *Infectious substances* are substances which are known to contain, or are reasonably expected to contain, pathogens. Pathogens are defined as micro-organisms (including bacteria, viruses~~, rickettsiae~~, parasites, fungi) and other agents such as prions, which can cause disease in humans or animals.

6.3.1.2 *Biological products* are those products derived from living organisms which are manufactured and distributed in accordance with the requirements of appropriate national authorities, which may have special licensing requirements, and are used either for prevention, treatment or diagnosis of disease in humans or animals, or for development, experimental or investigational purposes related thereto. They include, but are not limited to, finished or unfinished products such as vaccines.

6.3.1.3 *Cultures* are the result of a process by which pathogens are intentionally propagated. This definition does not include patient specimens as defined in 6.3.1.4.

6.3.1.4 *Patient specimens* are those collected directly from humans or animals, including, but not limited to, excreta, secreta, blood and its components, tissue and tissue fluid swabs, and body parts being transported for purposes such as research, diagnosis, investigational activities, and disease treatment and prevention.

UN Model Regulations, 2.6.3.1.6 (see ST/SG/AC.10/46/Add.1)

6.3.1.5 *Medical or clinical wastes* are wastes derived from the veterinary treatment of animals, the medical treatment of ~~animals or~~ humans or from bio-research.

6.3.2 Classification of infectious substances

UN Model Regulations, 2.6.3.2.1 (see ST/SG/AC.10/46/Add.1)

6.3.2.1 Infectious substances must be classified in Division 6.2 and assigned to UN 2814, UN 2900, UN 3291~~ or~~, UN 3373 or UN 3549 as appropriate.

6.3.2.2 Infectious substances are divided into the following categories:

6.3.2.2.1 *Category A:* An infectious substance which is transported in a form that, when exposure to it occurs, is capable of causing permanent disability, life-threatening or fatal disease in otherwise healthy humans or animals. Indicative examples of substances that meet these criteria are given in Table 2-10.

Note. — An exposure occurs when an infectious substance is released outside of the protective packaging resulting in physical contact with humans or animals.

a) Infectious substances meeting these criteria which cause disease in humans or in both humans and animals must be assigned to UN 2814. Infectious substances which cause disease only in animals must be assigned to UN 2900.

b) Assignments to UN 2814 or UN 2900 must be based on the known medical history and symptoms of the source human or animal, endemic local conditions, or professional judgement concerning individual circumstances of the source human or animal.

Note 1.— The proper shipping name for UN 2814 is ***Infectious substance, affecting humans****. The proper shipping name for UN 2900 is* ***Infectious substance, affecting animals*** *only*.

Note 2.— Table 2-10 is not exhaustive. Infectious substances, including new or emerging pathogens, which do not appear in Table 2-10 but which meet the same criteria must be assigned to Category A. In addition, if there is doubt as to whether or not a substance meets the criteria it must be included in Category A.

UN Model Regulations, 2.6.3.2.2.1 (see ST/SG/AC.10/46/Add.1)

Note 3.— In Table 2-10, the micro-organisms written in italics are bacteria~~, mycoplasma, rickettsiae~~ or fungi.

6.3.2.2.2 *Category B:* An infectious substance which does not meet the criteria for inclusion in Category A. Infectious substances in Category B must be assigned to UN 3373.

Note.— The proper shipping name of UN 3373 is ***Biological substances, Category B****.*

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6.3.2.3 *Exceptions*

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6.3.2.3.9 Except for:

UN Model Regulations, 2.6.3.2.3.9 (see ST/SG/AC.10/46/Add.1)

a) medical waste (UN 3291 and UN 3549);

b) medical devices or equipment contaminated with or containing infectious substances in Category A (UN 2814 or UN 2900); and

c) medical devices or equipment contaminated with or containing other dangerous goods that meet the definition of another hazard class,

medical devices or equipment potentially contaminated with or containing infectious substances which are being transported for disinfection, cleaning, sterilization, repair, or equipment evaluation are not subject to the provisions of these Instructions if packed in packagings designed and constructed in such a way that, under normal conditions of transport, they cannot break, be punctured or leak their contents. Packagings must be designed to meet the construction requirements listed in 6;3.

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6.3.5 Medical or clinical wastes

UN Model Regulations, 2.6.3.5.1 (see ST/SG/AC.10/46/Add.1)

6.3.5.1 Medical or clinical wastes containing~~:~~

a) Category A infectious substances must be assigned to UN 2814 ~~or~~, UN 2900 or UN 3549 as appropriate. Solid medical waste containing Category A infectious substances generated from the medical treatment of humans or veterinary treatment of animals may be assigned to UN 3549. The UN 3549 entry must not be used for waste from bio-research or liquid waste

b) ~~Medical or clinical wastes containing infectious substances in~~ Category B infectious substances must be assigned to UN 3291.

6.3.5.2 Medical or clinical wastes that are reasonably believed to have a low probability of containing infectious substances must be assigned to UN 3291. For the assignment, international, regional or national waste catalogues may be taken into account.

Note.— The proper shipping name for UN 3291 is ***Clinical waste, unspecified, n.o.s.*** *or* ***Biomedical waste, n.o.s.*** *or* ***Medical waste, n.o.s.*** *or* ***Regulated medical waste, n.o.s.***

6.3.5.3 Decontaminated medical or clinical wastes that previously contained infectious substances are not subject to these Instructions unless they meet the criteria for inclusion in another class.

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Chapter 7

CLASS 7 — RADIOACTIVE MATERIAL

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7.1.3 Definitions of specific terms

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UN Model Regulations, 1.1.1.2 (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.4.1 b) of the DGP-WG/19 report:

Transport index (TI) assigned to a package, overpack or freight container, or to unpackaged LSA-I ~~or~~, SCO-I or SCO-III. A number which is used to provide control over radiation exposure.

Note.— Unpackaged LSA-I, SCO-I or SCO-III material are not permitted for transport by air.

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7.2 CLASSIFICATION

7.2.1 General provisions

UN Model Regulations, 2.7.2.1.1 (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.4.1 c) of the DGP-WG/19 report:

7.2.1.1 Radioactive material must be assigned to one of the UN numbers specified in Table 2-11 in accordance with ~~7.2.4.2~~ 7.2.4 to 7.2.~~4~~.5, taking into account the material characteristics determined in 7.2.3.

Table 2-11. Assignment of UN numbers

UN number	*Proper shipping name and description*[a]
. . .	
Surface contaminated objects (7.2.3.2)	
UN Model Regulations, Table 2.7.2.1.1 (see ST/SG/AC.10/46/Add.1)	
UN 2913	**Radioactive material, surface contaminated objects (SCO-I ~~or~~, SCO-II or SCO-III)**, non-fissile or fissile excepted[b]
UN 3326	**Radioactive material, surface contaminated objects (SCO-I** or **SCO-II), fissile**
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7.2.2 Determination of basic radionuclide values

7.2.2.1 The following basic values for individual radionuclides are given in Table 2-12:

a) A_1 and A_2 in TBq;

b) activity concentration limits for exempt material in Bq/g; and

c) activity limits for exempt consignments in Bq.

7.2.2.2 For individual radionuclides:

UN Model Regulations, 2.7.2.2.2 a) and b) (see ST/SG/AC.10/46/Add.1)

a) which are not listed in Table 2-12, determination of the basic radionuclide values referred to in 7.2.2.1 requires multilateral approval. For these radionuclides, activity concentration limits for exempt material and activity limits for exempt consignments must be calculated in accordance with the principles established in the Radiation Protection and Safety of Radiation Sources: *International Basic Safety Standards ~~for Protection against Ionizing Radiation and for the Safety of Radiation Sources~~*, IAEA Safety Standards Series No.~~115~~ GSR Part 3, IAEA, Vienna (~~1996~~2014). It is permissible to use the A_2 value calculated using a dose coefficient for the appropriate lung absorption type as recommended by the International Commission on Radiological Protection, if the chemical forms of each radionuclide under both normal and accident conditions of transport are taken into consideration. Alternatively, the radionuclide values in Table 2-13 may be used without obtaining competent authority approval.

b) in instruments or articles in which the radioactive material is enclosed or is included as a component part of the instrument or other manufactured article and which meet 7.2.4.1.1.3 c), alternative basic radionuclide values to those in Table 2-12 for the activity limit for an exempt consignment are permitted and require multilateral approval. Such alternative activity limits for an exempt consignment must be calculated in accordance with the principles set out in ~~the *International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources*, Safety Series No.115, IAEA, Vienna (1996)~~ GSR Part 3.

UN Model Regulations, 2.7.2.2.3 (see ST/SG/AC.10/46/Add.1)

7.2.2.3 In the calculations of A_1 and A_2 for a radionuclide not in Table 2-12, a single radioactive decay chain in which the radionuclides are present in their naturally occurring proportions, and in which no ~~daughter~~ progeny nuclide has a half-life either longer than 10 days or longer than that of the parent nuclide, must be considered as a single radionuclide; and the activity to be taken into account and the A_1 or A_2 value to be applied must be that corresponding to the parent nuclide of that chain. In the case of radioactive decay chains in which any ~~daughter~~ progeny nuclide has a half-life either longer than 10 days or greater than that of the parent nuclide, the parent and such ~~daughter~~ progeny nuclides must be considered as mixtures of different nuclides.

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Table 2-12. Basic radionuclides values for individual radionuclides

UN Model Regulations, Table 2.7.2.2.1 (see ST/SG/AC.10/46/Add.1)

Radionuclide (atomic number)	*Special form A_1 (TBq)*	*Other form A_2 (TBq)*	*Activity concentration limit for exempt material (Bq/g)*	*Activity limit for an exempt consignment (Bq)*
. . .				
Barium (56)				
Ba-131 (a)	2×10^0	2×10^0	1×10^2	1×10^6
Ba-133	3×10^0	3×10^0	1×10^2	1×10^6
Ba-133m	2×10^1	6×10^{-1}	1×10^2	1×10^6
Ba-135m	2×10^1	6×10^{-1}	1×10^2	1×10^6
Ba-140 (a)	5×10^{-1}	3×10^{-1}	1×10^1 (b)	1×10^5 (b)
. . .				
Germanium (32)				
Ge-68 (a)	5×10^{-1}	5×10^{-1}	1×10^1	1×10^5
Ge-69	1×10^0	1×10^0	1×10^1	1×10^6
. . .				
Iridium (77)				

Radionuclide (atomic number)	*Special form A_1 (TBq)*	*Other form A_2 (TBq)*	*Activity concentration limit for exempt material (Bq/g)*	*Activity limit for an exempt consignment (Bq)*
Ir-189 (a)	1×10^{1}	1×10^{1}	1×10^{2}	1×10^{7}
Ir-190	7×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{6}
Ir-192	1×10^{0}(c)	6×10^{-1}	1×10^{1}	1×10^{4}
Ir-193m	4×10^{1}	4×10^{0}	1×10^{4}	1×10^{7}
Ir-194	3×10^{-1}	3×10^{-1}	1×10^{2}	1×10^{5}
. . .				
Nickel (28)				
Ni-57	6×10^{-1}	6×10^{-1}	1×10^{1}	1×10^{6}
Ni-59	Unlimited	Unlimited	1×10^{4}	1×10^{8}
Ni-63	4×10^{1}	3×10^{1}	1×10^{5}	1×10^{8}
Ni-65	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{6}
. . .				
Strontium (38)				
Sr-82 (a)	2×10^{-1}	2×10^{-1}	1×10^{1}	1×10^{5}
Sr-83	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Sr-85	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Sr-85m	5×10^{0}	5×10^{0}	1×10^{2}	1×10^{7}
Sr-87m	3×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Sr-89	6×10^{-1}	6×10^{-1}	1×10^{3}	1×10^{6}
Sr-90 (a)	3×10^{-1}	3×10^{-1}	1×10^{2} (b)	1×10^{4} (b)
Sr-91 (a)	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
Sr-92 (a)	1×10^{0}	3×10^{-1}	1×10^{1}	1×10^{6}
. . .				
Terbium (65)				
Tb-149	8×10^{-1}	8×10^{-1}	1×10^{1}	1×10^{6}
Tb-157	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{7}
Tb-158	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Tb-160	1×10^{0}	6×10^{-1}	1×10^{1}	1×10^{6}
Tb-161	3×10^{1}	7×10^{-1}	1×10^{3}	1×10^{6}
. . .				

Radionuclide (atomic number)	*Special form A_1 (TBq)*	*Other form A_2 (TBq)*	*Activity concentration limit for exempt material (Bq/g)*	*Activity limit for an exempt consignment (Bq)*

UN Model Regulations, Table 2.7.2.2.1, note (b) (see ST/SG/AC.10/46/Add.1)

(b) Parent nuclides and their progeny included in secular equilibrium are listed in the following (the activity to be taken into account is that of the parent nuclide only):

Sr-90	Y-90
Zr-93	Nb-93m
Zr-97	Nb-97
Ru-106	Rh-106
Ag-108m	Ag-108
Cs-137	Ba-137m
Ce-144	Pr-144
Ba-140	La-140
Bi-212	Tl-208 (0.36), Po-212 (0.64)
Pb-210	Bi-210, Po-210
Pb-212	Bi-212, Tl-208 (0.36), Po-212 (0.64)
Rn-222	Po-218, Pb-214, Bi-214, Po-214
Ra-223	Rn-219, Po-215, Pb-211, Bi-211, Tl-207
Ra-224	Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Ra-226	Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
Ra-228	Ac-228
Th-228	Ra-224, Rn-220, Po-216, Pb212, Bi-212, Tl208 (0.36), Po-212 (0.64)
Th-229	Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213, Pb-209

UN Model Regulations, Table 2.7.2.2.1, note (b) (see ST/SG/AC.10/46/Add.1)

Th-nat[1]	Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Th-234	Pa-234m
U-230	Th-226, Ra-222, Rn-218, Po-214
U-232	Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
U-235	Th-231
U-238	Th-234, Pa-234m

UN Model Regulations, Table 2.7.2.2.1, note (b) (see ST/SG/AC.10/46/Add.1)

U-nat[1]	Th-234, Pa-234m, U-234, Th-230, Ra-226, Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
Np-237	Pa-233
Am-242m	Am-242
Am-243	Np-239

(c) The quantity may be determined from a measurement of the rate of decay or a measurement of the radiation level at a prescribed distance from the source.

(d) These values apply only to compounds of uranium that take the chemical form of UF_6, UO_2F_2 and $UO_2(NO_3)_2$ in both normal and accident conditions of transport.

(e) These values apply only to compounds of uranium that take the chemical form of UO_3, UF_4, UCl_4 and hexavalent compounds in both normal and accident conditions of transport.

(f) These values apply to all compounds of uranium other than those specified in (d) and (e) above.

(g) These values apply to unirradiated uranium only.

UN Model Regulations, Table 2.7.2.2.1, note (b) (see ST/SG/AC.10/46/Add.1)

In the case of Th-natural, the parent nuclide is Th-232, in the case of U-natural the parent nuclide is U-238.

. . .

7.2.3 Determination of other material characteristics

7.2.3.1 *Low specific activity (LSA) material*

7.2.3.1.1 (Reserved)

7.2.3.1.2 LSA material must be in one of three groups:

a) LSA-I

i) uranium and thorium ores and concentrates of such ores, and other ores containing naturally occurring radionuclides;

ii) natural uranium, depleted uranium, natural thorium, or their compounds or mixtures, that are unirradiated and in solid or liquid form;

iii) radioactive material for which the A_2 value is unlimited. Fissile material may be included only if excepted under 7.2.3.5; or

iv) other radioactive material in which the activity is distributed throughout and the estimated average specific activity does not exceed 30 times the values for activity concentration specified in 7.2.2.1 to 7.2.2.6. Fissile material may be included only if excepted under 7.2.3.5.

b) LSA-II

i) water with tritium concentration up to 0.8 TBq/L;

ii) other material in which the activity is distributed throughout and the estimated average specific activity does not exceed 10^{-4} A_2/g for solids and gases, and 10^{-5} A_2/g for liquids.

UN Model Regulations, 2.7.2.3.1.2 c) (see ST/SG/AC.10/46/Add.1)

c) LSA-III — solids (e.g. consolidated wastes, activated materials), excluding powders ~~that meet the requirements of 7.2.3.1.3~~, in which:

i) the radioactive material is distributed throughout a solid or a collection of solid objects, or is essentially uniformly distributed in a solid compact binding agent (such as concrete, bitumen and ceramic); and

ii) ~~the radioactive material is relatively insoluble, or it is intrinsically contained in a relatively insoluble matrix, so that, even under loss of packaging, the loss of radioactive material per package by leaching when placed in water for seven days would not exceed 0.1 A_2; and~~

~~iii)~~ the estimated average specific activity of the solid, excluding any shielding material, does not exceed 2×10^{-3} A_2/g.

UN Model Regulations, 2.7.2.3.1.3 (see ST/SG/AC.10/46/Add.1)

7.2.3.1.3 ~~LSA-III material must be a solid of such a nature that if the entire contents of a package were subjected to the test specified in 7.2.3.1.4, the activity in the water would not exceed 0.1 A_2.~~ *Deleted*

. . .

7.2.3.2 *Surface contaminated object (SCO)*

UN Model Regulations, 2.7.2.3.2 (see ST/SG/AC.10/46/Add.1)

7.2.3.2.1 SCO is classified in one of ~~two~~ three groups:

a) SCO-I: A solid object on which:

i) the non-fixed contamination on the accessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 4 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 0.4 Bq/cm^2 for all other alpha emitters;

ii) the fixed contamination on the accessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 4×10^4 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 4×10^3 Bq/cm^2 for all other alpha emitters; or

iii) the non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 4×10^4 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 4×10^3 Bq/cm^2 for all other alpha emitters;

b) SCO-II: A solid object on which either the fixed or non-fixed contamination on the surface exceeds the applicable limits specified for SCO-I in a) above and on which:

i) the non-fixed contamination on the accessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 400 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 40 Bq/cm^2 for all other alpha emitters;

ii) the fixed contamination on the accessible surface, averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 8×10^5 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 8×10^4 Bq/cm^2 for all other alpha emitters; or

iii) the non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 8×10^5 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 8×10^4 Bq/cm^2 for all other alpha emitters~~.~~;

UN Model Regulations, 2.7.2.3.2 (c) (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.4.1 d) of the DGP-WG/19 report:

c) SCO-III: A large solid object which, because of its size, cannot be transported in a type of package described in these Instructions.

Note.— SCO-III material is forbidden for transport by air.

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7.2.3.3 *Special form radioactive material*

. . .

7.2.3.3.5 The relevant test methods are:

a) Impact test: The specimen must drop onto the target from a height of 9 m. The target must be as defined in 6;7.13;

UN Model Regulations, 2.7.2.3.3.5 (b) (see ST/SG/AC.10/46/Add.1)

b) Percussion test: The specimen must be placed on a sheet of lead which is supported by a smooth, solid surface and struck by the flat face of a mild steel bar so as to cause an impact equivalent to that resulting from a free drop of 1.4 kg ~~through~~ from a height of 1 m. The lower part of the bar must be 25 mm in diameter with the edges rounded off to a radius of (3.0 ± 0.3) mm. The lead, of hardness number 3.5 to 4.5 on the Vickers scale and not more than 25 mm thick, must cover an area greater than that covered by the specimen. A fresh surface of lead must be used for each impact. The bar must strike the specimen so as to cause maximum damage.

UN Model Regulations, 2.7.2.3.3.5 (c) (see ST/SG/AC.10/46/Add.1)

c) Bending test: The test must apply only to long, slender sources with both a minimum length of 10 cm and a length to minimum width ratio of not less than 10. The specimen must be rigidly clamped in a horizontal position so that one-half of its length protrudes from the face of the clamp. The orientation of the specimen must be such that the specimen will suffer maximum damage when its free end is struck by the flat face of a steel bar. The bar must strike the specimen so as to cause an impact equivalent to that resulting from a free vertical drop of 1.4 kg ~~through~~ from a height of 1 m. The lower part of the bar must be 25 mm in diameter with the edges rounded off to a radius of (3.0 ± 0.3) mm.

d) Heat test: The specimen must be heated in air to a temperature of 800°C and held at that temperature for a period of 10 minutes and must then be allowed to cool.

. . .

7.2.3.3.7 For specimens which comprise or simulate indispersible solid material, a leaching assessment must be performed as follows:

a) The specimen 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;

UN Model Regulations, 2.7.2.3.3.7 (b) (see ST/SG/AC.10/46/Add.1)

b) The water ~~with~~ and the specimen must then be heated to a temperature of (50 ± 5)°C and maintained at this temperature for 4 hours;

c) The activity of the water must then be determined;

d) The specimen must then be kept for at least 7 days in still air at not less than 30°C and relative humidity not less than 90 per cent;

UN Model Regulations, 2.7.2.3.3.7 (e) (see ST/SG/AC.10/46/Add.1)

e) The specimen must then be immersed in water of the same specification as in a) above and the water ~~with~~ and the specimen heated to (50 ± 5)°C and maintained at this temperature for 4 hours;

f) The activity of the water must then be determined.

7.2.3.3.8 For specimens which comprise or simulate radioactive material enclosed in a sealed capsule, either a leaching assessment or a volumetric leakage assessment must be performed as follows:

a) The leaching assessment must consist of the following steps:

i) the specimen must be immersed in water at ambient temperature. The water must have an initial pH of 6-8 with a maximum conductivity of 1 mS/m at 20°C;

UN Model Regulations, 2.7.2.3.3.8 (a)(ii) (see ST/SG/AC.10/46/Add.1)

ii) the water and specimen must then be heated to a temperature of (50 ± 5)°C and maintained at this temperature for 4 hours;

iii) the activity of the water must then be determined;

iv) the specimen must then be kept for at least 7 days in still air at not less than 30°C and relative humidity of not less than 90 per cent;

v) the process in i), ii) and iii) must be repeated;

b) The alternative volumetric leakage assessment must comprise any of the tests prescribed in ISO 9978:1992 “Radiation protection — Sealed radioactive sources — Leakage test methods”, provided that they are acceptable to the competent authority.

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:

UN Model Regulations, 2.7.2.3.4.1 (a) (see ST/SG/AC.10/46/Add.1)

a) The ~~radiation level~~ 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 A_2. A separate specimen may be used for each test; and

c) If subjected to the test specified in 7.2.3.1.4, the activity in the water would not exceed 100 A_2. 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.

7.2.3.4.3 Demonstration of compliance with the performance standards in 7.2.3.4.1 and 7.2.3.4.2 must be in accordance with 6;7.11.1 and 6;7.11.2.

7.2.3.5 *Fissile material*

7.2.3.5.1 Fissile material and packages containing fissile material must be classified under the relevant entry as fissile in accordance with Table 2-11 unless excepted by one of the provisions of sub-paragraphs a) to f) below and transported subject to the requirements of 7;2.9.4.3. All provisions apply only to material in packages that meets the requirements of 6;7.6.2.

a) Uranium enriched in uranium-235 to a maximum of 1 per cent by mass, and with a total plutonium and uranium-233 content not exceeding 1 per cent of the mass of uranium-235, provided that the fissile nuclides are distributed essentially homogeneously throughout the material. In addition, if uranium-235 is present in metallic, oxide or carbide forms, it must not form a lattice arrangement;

b) Liquid solutions of uranyl nitrate enriched in uranium-235 to a maximum of 2 per cent by mass, with a total plutonium and uranium-233 content not exceeding 0.002 per cent of the mass of uranium, and with a minimum nitrogen to uranium atomic ratio (N/U) of 2;

c) Uranium with a maximum uranium enrichment of 5 per cent by mass uranium-235 provided:

i) there is no more than 3.5 g of uranium-235 per package;

ii) the total plutonium and uranium-233 content does not exceed 1 per cent of the mass of uranium-235 per package;

iii) transport of the package is subject to the consignment limit provided in 7;2.9.4.3 c);

d) Fissile nuclides with a total mass not greater than 2 g per package provided the package is transported subject to the consignment limit provided in 7;2.9.4.3 d);

UN Model Regulations, 2.7.2.3.5 (e) (see ST/SG/AC.10/46/Add.1)

e) Fissile nuclides with a total mass not greater than 45 g subject to ~~limits provided in~~ the requirements of 7;2.9.4.3 e);

f) A fissile material that meets the requirements of 7;2.9.4.3 b), 7.2.3.6 and 5;1.2.2.1.

UN Model Regulations, 2.7.2.3.6 (see ST/SG/AC.10/46/Add.1)

7.2.3.6 ~~A f~~Fissile material excepted from classification as fissile under 7.2.3.5.1 f) must be subcritical without the need for accumulation control under the following conditions:

a) the conditions of 6;7.10.1 a);

b) the conditions consistent with the assessment provisions stated in 6;7.10.12 b) and 6;7.10.13 b) for packages; and

c) the conditions specified in 6;7.10.11 a).

7.2.4 Classification of packages

7.2.4.1 The quantity of radioactive material in a package must not exceed the relevant limits for the package type as specified below.

7.2.4.1.1 Classification as excepted packages

7.2.4.1.1.1 A package may be classified as excepted packages if it meets one of the following conditions:

a) it is an empty packaging having contained radioactive material;

b) it contains instruments or articles not exceeding the activity limits specified in columns 2 and 3 of Table 2-14;

c) it contains articles manufactured of natural uranium, depleted uranium or natural thorium; or

d) it contains radioactive material not exceeding the activity limits specified in column 4 of Table 2-14; or

e) it contains less than 0.1 kg of uranium hexafluoride not exceeding the activity limits specified in column 4 of Table 2-14.

7.2.4.1.1.2 A package containing radioactive material may be classified as an excepted package provided that the radiation level at any point on its external surface does not exceed 5 μSv/h.

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 radiation level 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;

UN Model Regulations, 2.7.2.4.1.3 (c), (d), (e) and (f) (see ST/SG/AC.10/46/Add.1)

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); ~~and~~

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

f) if the package contains fissile material, one of the provisions of 7.2.3.5.1 a) to f) must apply.

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:

UN Model Regulations, 2.7.2.4.1.4 (a), (b) (ii), (c) (see ST/SG/AC.10/46/Add.1)

a) the package retains its radioactive contents under routine conditions of transport; ~~and~~

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

c) if the package contains fissile material, one of the provisions of 7.2.3.5.1 a) to f) must apply.

7.2.4.1.1.5 Uranium hexafluoride not exceeding the limits specified in column 4 of Table 2-14 may be classified under UN 3507 — **Uranium hexafluoride, radioactive material, excepted package**, less than 0.1 kg per package, non-fissile or fissile-excepted provided that:

a) the mass of uranium hexafluoride in the package is less than 0.1 kg; and

b) the conditions of 7.2.4.5.2 and 7.2.4.1.1.4 a) and b) are met.

7.2.4.1.1.6 Articles manufactured of natural uranium, depleted uranium or natural thorium and articles in which the sole radioactive material is unirradiated natural uranium, unirradiated depleted uranium or unirradiated natural thorium may be classified under UN 2909, **Radioactive material, excepted package — articles manufactured from natural uranium** or **depleted uranium** or **natural thorium** provided that the outer surface of the uranium or thorium is enclosed in an inactive sheath made of metal or some other substantial material.

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;

UN Model Regulations, 2.7.2.4.1.7 (c) (ii), (d) and (e) (see ST/SG/AC.10/46/Add.1) and paragraph 3.1.2.4.1 e) and f) of the DGP-WG/19 report:

c) the level of internal non-fixed contamination, when averaged over any 300 cm^2, does not exceed:

i) 400 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters; and

ii) 40 Bq/cm^2 for all other alpha emitters; ~~and~~

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 7.1.3 must apply.

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Chapter 8

CLASS 8 — CORROSIVE SUBSTANCES

8.1 DEFINITION AND GENERAL PROVISIONS

For French version: There may be a need for amendment to the following for the sake of alignment with 2.8.1.1 of the UN Model Regulations, (see ST/SG/AC.10/46/Add.1), i.e.:

2.8.1.1 Remplacer « engins de transport » par « matériels de transport ».

8.1.1 Corrosive substances are substances which, by chemical action, will cause irreversible damage to the skin or, in the case of leakage, will materially damage, or even destroy, other goods or the means of transport.

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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.10/46/Add.1) and paragraph 3.1.2.4.1 g) of the DGP-WG/19 report:

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, ~~the grouping~~ 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 ~~or~~ 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, ~~*In Vitro Skin Corrosion: Transcutaneous Electrical Resistance Test (TER),* 2015 or No. 431, *In Vitro Skin Corrosion: Human Skin Model Test,* 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.

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Chapter 9

CLASS 9 — MISCELLANEOUS DANGEROUS SUBSTANCES AND ARTICLES, INCLUDING ENVIRONMENTALLY HAZARDOUS SUBSTANCES

DGP-WG/19 (see paragraph 3.1.2.4.1 h) of the DGP-WG/19 report:

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9.2 ASSIGNMENT TO CLASS 9

~~Class 9 includes, inter alia:~~The substances and articles of Class 9 are subdivided as shown in Table 2-16.

Insert the following new table (the text in existing 9.2 has been incorporated in the "notes" column of the table):

Table 2-16. Substances and articles of Class 9

UN number	*Name*	*Notes*
Substances which, on inhalation as fine dust, may endanger health		
2212	**Asbestos, amphibole** (amosite, tremolite, actinolite, anthophyllite, crocidolite)	
2590	**Asbestos, chrysotile**	
Substances evolving flammable vapour		
2211	**Polymeric beads, expandable**, evolving flammable vapour	
3314	**Plastics moulding compound** in dough, sheet or extruded rope form evolving flammable vapour	
Lithium batteries		
3090	**Lithium metal batteries** (including lithium alloy batteries)	See 2;9.3
3091	**Lithium metal batteries contained in equipment** (including lithium alloy batteries)	
3091	**Lithium metal batteries packed with equipment** (including lithium alloy batteries)	
3480	**Lithium ion batteries** (including lithium ion polymer batteries)	
3481	**Lithium ion batteries contained in equipment** (including lithium ion polymer batteries)	
3481	**Lithium ion batteries packed with equipment** (including lithium ion polymer batteries)	
3536	**Lithium batteries installed in cargo transport unit**	
Capacitors		
3499	**Capacitor, electric double layer** (with an energy storage capacity greater than 0.3 Wh)	
3508	**Capacitor, asymmetric** (with an energy storage capacity greater than 0.3 Wh)	

UN number	*Name*	*Notes*
Live-saving appliances		
2990	**Life-saving appliances, self-inflating**	
3072	**Life-saving appliances, not self-inflating** containing dangerous goods as equipment	
3268	**Safety devices**, electrically initiated	
Substances and articles which, in the event of fire, may form dioxins		
2315	**Polychlorinated biphenyls, liquid**	Examples of articles are transformers, condensers and apparatus containing those substances.
3432	**Polychlorinated biphenyls, solid**	
3151	**Polyhalogenated biphenyls, liquid**	
3151	**Halogenated monomethyldiphenylmethanes, liquid**	
3151	**Polyhalogenated terphenyls, liquid**	
3152	**Polyhalogenated biphenyls, solid**	
3152	**Halogenated monomethyldiphenylmethanes, solid**	
3152	**Polyhalogenated terphenyls, solid**	
Substances transported or offered for transport at elevated temperatures		
3257	**Elevated temperature liquid, n.o.s.**, at or above 100°C and below its flash point (including molten metals, molten salts, etc.)	Elevated temperature substances (i.e. substances that are transported or offered for transport at temperatures equal to or exceeding 100°C in a liquid state or at temperatures equal to or exceeding 240°C in a solid state (these substances may only be carried under 1;1.1)).
3258	**Elevated temperature solid, n.o.s.**, at or above 240°C	
Environmentally hazardous substances		
3077	**Environmentally hazardous substance, solid, n.o.s.**	Environmentally hazardous substances (aquatic environment) are those that meet the criteria in 2.9.3 of the UN Model Regulations or that meet criteria in international regulations or national regulations established by the appropriate national authority in the State of Origin, transit or destination of the consignment. Substances or mixtures dangerous to the aquatic environment not otherwise classified under these Instructions must be assigned to Packing Group III and assigned to UN 3077 or UN 3082.
3082	**Environmentally hazardous substance, liquid, n.o.s.**	
Genetically modified micro-organisms (GMMOs) and genetically modified organisms (GMOs)		
3245	**Genetically modified micro-organisms**	GMMOs or GMOs which do not meet the definition of toxic substances (see 6.2) or infectious substances (see 6.3) must be assigned to UN 3245. GMMOs or GMOs are not subject to these Instructions when authorized for use by the appropriate national authorities of the States of Origin, transit and destination. Genetically modified live animals must be transported under terms and conditions of the appropriate national authorities of the States of Origin and destination.
3245	**Genetically modified organisms**	
Ammonium nitrate based fertilizers		
2071	**Ammonium nitrate based fertilizer**	Solid ammonium nitrate based fertilizers must be classified in accordance with the procedure as set out in the *Manual of Tests and Criteria*, Part III, Section 39.

UN number	*Name*	*Notes*
Other substances or articles presenting a danger during transport, but not meeting the definitions of another class		
1841	**Acetaldehyde ammonia**	
1845	**Dry ice**	
1845	**Carbon dioxide, solid**	
1931	**Zinc dithionite**	
1931	**Zinc hydrosulphite**	
1941	**Dibromodifluoromethane**	
1990	**Benzaldehyde**	
2216	**Fish meal, stabilized**	
2216	**Fish scrap, stabilized**	
2807	**Magnetized material**	Magnetized material is any material which, when packed for air transport, has a maximum magnetic field strength sufficient to cause a compass deflection of more than 2 degrees at a distance of 2.1 m from any point on the surface of the assembled package. The magnetic field strength at the compass producing a 2 degree deflection is taken to be 0.418 A/m (0.00525 Gauss). The magnetic field strength must be measured with a magnetic compass sensitive enough to read a 2 degree variation, preferably in 1 degree increments or finer, or using a Gauss meter having a sensitivity sufficient to measure magnetic fields greater than 0.0005 Gauss within a tolerance of plus or minus 5 per cent, or by an equivalent means. Compass measurements must be taken in an area free from magnetic interference other than the Earth's magnetic field. When using a compass, the material and the compass must be aligned in an east-west direction. Gauss meter measurements must be in accordance with the manufacturer's instructions. Measurements are taken while the packaged material is rotated through 360 degrees in its horizontal plane while maintaining a constant distance (2.1 m or 4.6 m as referred to in Packing Instruction 953) between the measuring device and any point on the outside surface of the package. Shielding may be used to reduce the package's magnetic strength. *Note.— Masses of ferro-magnetic metals such as automobiles, automobile parts, metal fencing, piping and metal construction material, even if not meeting the definition of magnetized material may affect aircraft compasses, as may packages or items which individually do not meet the definition of magnetized material but cumulatively may have a magnetic field strength of a magnetized material.*
2969	**Castor beans**	
2969	**Castor meal**	
2969	**Castor pomace**	
2969	**Castor flake**	
3166	**Vehicle, flammable gas powered**	
3166	**Vehicle, flammable liquid powered**	
3166	**Vehicle, fuel cell, flammable gas powered †**	

UN number	*Name*	*Notes*
3166	**Vehicle, fuel cell, flammable liquid powered †**	
3171	**Battery-powered vehicle**	
3171	**Battery-powered equipment**	
3316	**Chemical kit**	
3316	**First aid kit**	
3334	**Aviation regulated liquid, n.o.s.**	Aviation regulated liquid is any material which has narcotic, noxious or other properties such that, in the event of spillage or leakage on an aircraft, extreme annoyance or discomfort could be caused to crew members so as to prevent the correct performance of assigned duties.
3335	**Aviation regulated solid, n.o.s.**	Aviation regulated solid is any material which has narcotic, noxious or other properties such that, in the event of spillage or leakage on an aircraft, extreme annoyance or discomfort could be caused to crew members so as to prevent the correct performance of assigned duties.
3359	**Fumigated cargo transport unit**	
3363	**Dangerous goods in machinery**	
3363	**Dangerous goods in apparatus**	
3363	**Dangerous goods in articles**	
3509	**Packagings, discarded, empty, uncleaned**	
3530	**Engine, internal combustion**	
3530	**Machinery, internal combustion**	
3548	**Articles containing miscellaneous dangerous goods, n.o.s.**	

~~Some examples of articles in Class 9 are:~~

~~— Engines, internal combustion;~~

~~— Life-saving appliances, self-inflating;~~

~~— Battery-powered equipment or vehicle.~~

~~Some examples of substances in Class 9 are:~~

~~— Asbestos, amphibole (amosite, tremolite, actinolite, anthophyllite, crocidolite)~~

~~— Asbestos, chrysotile~~

~~— Carbon dioxide, solid (dry ice);~~

~~— Zinc dithionite.~~

— END —