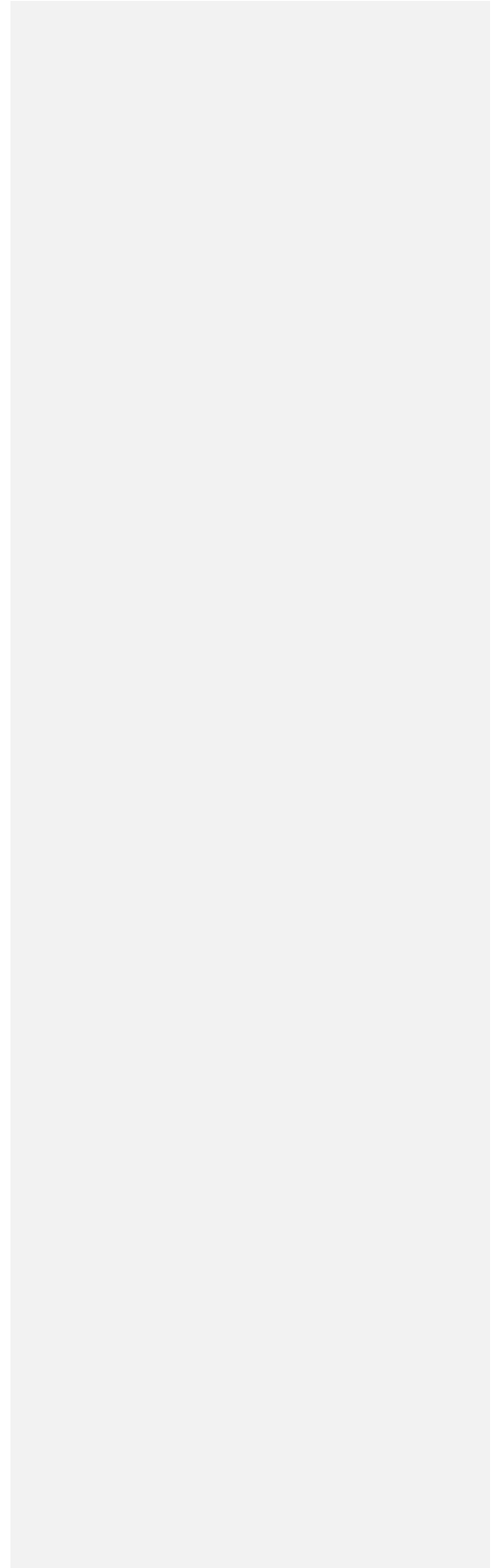


PART 2
Classification



CHAPTER 2.1

GENERAL PROVISIONS

2.1.1 Introduction

2.1.1.1 The classes of dangerous goods according to ADR are the following:

Class 1	Explosive substances and articles
Class 2	Gases
Class 3	Flammable liquids
Class 4.1	Flammable solids, self-reactive substances, polymerizing substances and solid desensitized explosives
Class 4.2	Substances liable to spontaneous combustion
Class 4.3	Substances which, in contact with water, emit flammable gases
Class 5.1	Oxidizing substances
Class 5.2	Organic peroxides
Class 6.1	Toxic substances
Class 6.2	Infectious substances
Class 7	Radioactive material
Class 8	Corrosive substances
Class 9	Miscellaneous dangerous substances and articles

2.1.1.2 Each entry in the different classes has been assigned a UN number. The following types of entries are used:

A. Single entries for well defined substances or articles including entries for substances covering several isomers, e.g.:

UN No. 1090 ACETONE
UN No. 1104 AMYL ACETATES
UN No. 1194 ETHYL NITRITE SOLUTION

B. Generic entries for a well defined group of substances or articles, which are not n.o.s. entries, e.g.:

UN No. 1133 ADHESIVES
UN No. 1266 PERFUMERY PRODUCTS
UN No. 2757 CARBAMATE PESTICIDE, SOLID, TOXIC
UN No. 3101 ORGANIC PEROXIDE TYPE B, LIQUID

C. Specific n.o.s. entries covering a group of substances or articles of a particular chemical or technical nature, not otherwise specified, e.g.:

UN No. 1477 NITRATES, INORGANIC, N.O.S.
UN No. 1987 ALCOHOLS, N.O.S.

D. General n.o.s. entries covering a group of substances or articles having one or more dangerous properties, not otherwise specified, e.g.:

UN No. 1325 FLAMMABLE SOLID, ORGANIC, N.O.S.
UN No. 1993 FLAMMABLE LIQUID, N.O.S.

The entries defined under B., C. and D. are defined as collective entries.

2.1.1.3 For packing purposes, substances other than those of Classes 1, 2, 5.2, 6.2 and 7, and other than self-reactive substances of Class 4.1 are assigned to packing groups in accordance with the degree of danger they present:

Packing group I: Substances presenting high danger;
Packing group II: Substances presenting medium danger;
Packing group III: Substances presenting low danger.

The packing group(s) to which a substance is assigned is (are) indicated in Table A of Chapter 3.2.

Articles are not assigned to packing groups. For packing purposes any requirement for a specific packaging performance level is set out in the applicable packing instruction.

2.1.2 Principles of classification

- 2.1.2.1 The dangerous goods covered by the heading of a class are defined on the basis of their properties according to sub-section 2.2.x.1 of the relevant class. Assignment of dangerous goods to a class and a packing group is made according to the criteria mentioned in the same sub-section 2.2.x.1. Assignment of one or several subsidiary **riskhazard**(s) to a dangerous substance or article is made according to the criteria of the class or classes corresponding to those **riskhazards**, as mentioned in the appropriate sub-section(s) 2.2.x.1.
- 2.1.2.2 All dangerous goods entries are listed in Table A of Chapter 3.2 in the numerical order of their UN Number. This table contains relevant information on the goods listed, such as name, class, packing group(s), label(s) to be affixed, packing and carriage **provisions¹**. The substances listed by name in column (2) of Table A of Chapter 3.2 shall be carried according to their classification in Table A or under the conditions specified in 2.1.2.8.
- 2.1.2.3 A substance may contain technical impurities (for example those deriving from the production process) or additives for stability or other purposes that do not affect their classification. However, a substance mentioned by name, i.e. listed as a single entry in Table A of Chapter 3.2, containing technical impurities or additives for stability or other purposes affecting its classification shall be considered a solution or mixture (see 2.1.3.3).
- 2.1.2.4 Dangerous goods which are listed or defined in sub-section 2.2.x.2 of each class are not to be accepted for carriage.
- 2.1.2.5 Goods not mentioned by name, i.e. goods not listed as single entries in Table A of Chapter 3.2 and not listed or defined in one of the above-mentioned sub-sections 2.2.x.2 shall be assigned to the relevant class in accordance with the procedure of section 2.1.3. In addition, the subsidiary **riskhazard** (if any) and the packing group (if any) shall be determined. Once the class, subsidiary **riskhazard** (if any) and packing group (if any) have been established the relevant UN number shall be determined. The decision trees in sub-sections 2.2.x.3 (list of collective entries) at the end of each class indicate the relevant parameters for selecting the relevant collective entry (UN number). In all cases the most specific collective entry covering the properties of the substance or article shall be selected, according to the hierarchy indicated in 2.1.1.2 by the letters B, C and D respectively. If the substance or article cannot be classified under entries of type B or C according to 2.1.1.2, then, and only then shall it be classified under an entry of type D.
- 2.1.2.6 On the basis of the test procedures of Chapter 2.3 and the criteria set out in sub-sections 2.2.x.1 of classes when it is so specified, it may be determined that a substance, solution or mixture of a certain class, mentioned by name in Table A of Chapter 3.2, does not meet the criteria of that class. In such a case, the substance, solution or mixture is deemed not to belong to that class.
- 2.1.2.7 For the purposes of classification, substances with a melting point or initial melting point of 20 °C or lower at a pressure of 101.3 kPa shall be considered to be liquids. A viscous substance for which a specific melting point cannot be determined shall be subjected to the ASTM D 4359-90 test or to the test for determining fluidity (penetrometer test) prescribed in 2.3.4.
- 2.1.2.8 A consignor who has identified, on the basis of test data, that a substance listed by name in column 2 of Table A of Chapter 3.2 meets classification criteria for a class that is not identified in column 3a or 5 of Table A of Chapter 3.2, may, with the approval of the competent authority, consign the substance:
- Under the most appropriate collective entry listed in sub-sections 2.2.x.3 reflecting all hazards;
 - or

¹ *Note by the Secretariat: An alphabetic list of these entries has been prepared by the secretariat and is*

reproduced in Table B of Chapter 3.2. This table is not an official part of the ADR.

- Under the same UN number and name but with additional hazard communication information as appropriate to reflect the additional subsidiary **riskhazard**(s) (documentation, label, placard) provided that the class remains unchanged and that any other carriage conditions (e.g. limited quantity, packaging and tank provisions) that would normally apply to substances possessing such a combination of hazards are the same as those applicable to the substance listed.

NOTE 1: *The competent authority granting the approval may be the competent authority of any ADR Contracting Party who may also recognize an approval granted by the competent authority of a country which is not an ADR Contracting Party provided that this approval has been granted in accordance with the procedures applicable according to RID, ADR, ADN, the IMDG Code or the ICAO Technical Instructions.*

NOTE 2: *When a competent authority grants such approvals, it should inform the United Nations Sub-Committee of Experts on the Transport of Dangerous Goods accordingly and submit a relevant proposal of amendment to the Dangerous Goods List of the UN Model Regulations. Should the proposed amendment be rejected, the competent authority should withdraw its approval.*

NOTE 3: *For carriage in accordance with 2.1.2.8, see also 5.4.1.1.20.*

2.1.3 Classification of substances, including solutions and mixtures (such as preparations and wastes), not mentioned by name

2.1.3.1 Substances including solutions and mixtures not mentioned by name shall be classified according to their degree of danger on the basis of the criteria mentioned in sub-section 2.2.x.1 of the various classes. The danger(s) presented by a substance shall be determined on the basis of its physical and chemical characteristics and physiological properties. Such characteristics and properties shall also be taken into account when such experience leads to a more stringent assignment.

2.1.3.2 A substance not mentioned by name in Table A of Chapter 3.2 presenting a single hazard shall be classified in the relevant class under a collective entry listed in sub-section 2.2.x.3 of that class.

2.1.3.3 A solution or mixture meeting the classification criteria of ADR composed of a single predominant substance mentioned by name in Table A of Chapter 3.2 and one or more substances not subject to ADR or traces of one or more substances mentioned by name in Table A of Chapter 3.2, shall be assigned the UN number and proper shipping name of the predominant substance mentioned by name in Table A of Chapter 3.2 unless:

- (a) The solution or mixture is mentioned by name in Table A of Chapter 3.2;
- (b) The name and description of the substance mentioned by name in Table A of Chapter 3.2 specifically indicate that they apply only to the pure substance;
- (c) The class, classification code, packing group, or physical state of the solution or mixture is different from that of the substance mentioned by name in Table A of Chapter 3.2; or
- (d) The hazard characteristics and properties of the solution or mixture necessitate emergency response measures that are different from those required for the substance mentioned by name in Table A of Chapter 3.2.

In those other cases, except the one described in (a), the solution or mixture shall be classified as a substance not mentioned by name in the relevant class under a collective entry listed in sub-section 2.2.x.3 of that class taking account of the subsidiary **riskshazards** presented by that solution or mixture, if any, unless the solution or mixture does not meet the criteria of any class, in which case it is not subject to ADR.

2.1.3.4 Solutions and mixtures containing substances belonging to one of the entries mentioned in 2.1.3.4.1 or 2.1.3.4.2 shall be classified in accordance with the provisions of these paragraphs.

2.1.3.4.1 Solutions and mixtures containing one of the following substances mentioned by name shall always be classified under the same entry as the substance they contain, provided they do not have the hazard characteristics as indicated in 2.1.3.5.3:

- Class 3

UN No. 1921 PROPYLENEIMINE, STABILIZED; UN No. 3064 NITROGLYCERIN SOLUTION IN ALCOHOL with more than 1% but not more than 5% nitroglycerin;

- Class 6.1

UN No. 1051 HYDROGEN CYANIDE, STABILIZED, containing less than 3% water; UN No. 1185 ETHYLENEIMINE, STABILIZED; UN No. 1259 NICKEL CARBONYL; UN No. 1613 HYDROCYANIC ACID, AQUEOUS SOLUTION (HYDROGEN CYANIDE, AQUEOUS SOLUTION), with not more than 20% hydrogen cyanide; UN No. 1614 HYDROGEN CYANIDE, STABILIZED, containing not more than 3% water and absorbed in a porous inert material; UN No. 1994 IRON PENTACARBONYL; UN No. 2480 METHYL ISOCYANATE; UN No. 2481 ETHYL ISOCYANATE; UN No. 3294 HYDROGEN CYANIDE, SOLUTION IN ALCOHOL, with not more than 45% hydrogen cyanide;

- Class 8

UN No. 1052 HYDROGEN FLUORIDE, ANHYDROUS; UN No. 1744 BROMINE or UN No. 1744 BROMINE SOLUTION; UN No. 1790 HYDROFLUORIC ACID with more than 85% hydrogen fluoride; UN No. 2576 PHOSPHORUS OXYBROMIDE, MOLTEN;

2.1.3.4.2 Solutions and mixtures containing a substance belonging to one of the following entries of Class 9:

UN No. 2315 POLYCHLORINATED BIPHENYLS, LIQUID;
UN No. 3151 POLYHALOGENATED BIPHENYLS, LIQUID;
UN No. 3151 HALOGENATED MONOMETHYLDIPHENYLMETHANES, LIQUID;
UN No. 3151 POLYHALOGENATED TERPHENYLS, LIQUID;
UN No. 3152 POLYHALOGENATED BIPHENYLS, SOLID;
UN No. 3152 HALOGENATED MONOMETHYLDIPHENYLMETHANES, SOLID;
UN No. 3152 POLYHALOGENATED TERPHENYLS, SOLID; or
UN No. 3432 POLYCHLORINATED BIPHENYLS, SOLID

shall always be classified under the same entry of Class 9 provided that:

- they do not contain any additional dangerous component other than components of packing group III of classes 3, 4.1, 4.2, 4.3, 5.1, 6.1 or 8; and
- they do not have the hazard characteristics as indicated in 2.1.3.5.3.

2.1.3.5 Substances not mentioned by name in Table A of Chapter 3.2, having more than one hazard characteristic and solutions or mixtures meeting the classification criteria of ADR containing several dangerous substances shall be classified under a collective entry (see 2.1.2.5) and packing group of the appropriate class in accordance with their hazard characteristics. Such classification according to the hazard characteristics shall be carried out as follows:

2.1.3.5.1 The physical and chemical characteristics and physiological properties shall be determined by measurement or calculation and the substance, solution or mixture shall be classified according to the criteria mentioned in sub-section 2.2.x.1 of the various classes.

2.1.3.5.2 If this determination is not possible without disproportionate cost or effort (as for some kinds of wastes), the substance, solution or mixture shall be classified in the class of the component presenting the major hazard.

2.1.3.5.3 If the hazard characteristics of the substance, solution or mixture fall within more than one class or group of substances listed below then the substance, solution or mixture shall be classified in the class or group of substances corresponding to the major hazard on the basis of the following order of precedence:

- (a) Material of Class 7 (apart from radioactive material in excepted packages for which, except for UN 3507 URANIUM HEXAFLUORIDE, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE, special provision 290 of Chapter 3.3 applies, where the other hazardous properties take precedence);

- (b) Substances of Class 1;
- (c) Substances of Class 2;
- (d) Liquid desensitized explosives of Class 3;
- (e) Self-reactive substances and solid desensitized explosives of Class 4.1;
- (f) Pyrophoric substances of Class 4.2;
- (g) Substances of Class 5.2;
- (h) Substances of Class 6.1 meeting the inhalation toxicity criteria of packing group I (Substances meeting the classification criteria of Class 8 and having an inhalation toxicity of dust and mist (LC₅₀) in the range of Packing group I and a toxicity through oral ingestion or dermal contact only in the range of Packing group III or less, shall be allocated to Class 8);
- (i) Infectious substances of Class 6.2.

2.1.3.5.4 If the hazard characteristics of the substance fall within more than one class or group of substances not listed in 2.1.3.5.3 above, the substance shall be classified in accordance with the same procedure but the relevant class shall be selected according to the precedence of hazards table in 2.1.3.10.

2.1.3.5.5 If the substance to be carried is a waste, with a composition that is not precisely known, its assignment to a UN number and packing group in accordance with 2.1.3.5.2 may be based on the consignor's knowledge of the waste, including all available technical and safety data as requested by safety and environmental legislation in ~~force²~~force².

In case of doubt, the highest danger level shall be taken.

If however, on the basis of the knowledge of the composition of the waste and the physical and chemical properties of the identified components, it is possible to demonstrate that the properties of the waste do not correspond to the properties of the packing group I level, the waste may be classified by default in the most appropriate n.o.s. entry of packing group II. However, if it is known that the waste possesses only environmentally hazardous properties, it may be assigned to packing group III under UN Nos. 3077 or 3082.

This procedure may not be used for wastes containing substances mentioned in 2.1.3.5.3, substances of Class 4.3, substances of the case mentioned in 2.1.3.7 or substances which are not accepted for carriage in accordance with 2.2.x.2.

2.1.3.6 The most specific applicable collective entry (see 2.1.2.5) shall always be used, i.e. a general n.o.s. entry shall only be used if a generic entry or a specific n.o.s. entry cannot be used.

2.1.3.7 Solutions and mixtures of oxidizing substances or substances with an oxidizing subsidiary ~~risk~~hazard may have explosive properties. In such a case they are not to be accepted for carriage unless they meet the requirements for Class 1. For solid ammonium nitrate based fertilizers, see also 2.2.51.2.2, thirteenth and fourteenth indent and Manual of Tests and Criteria, Part III, Section 39.

2.1.3.8 Substances of classes 1 to 6.2, 8 and 9, other than those assigned to UN Nos. 3077 and 3082, meeting the criteria of 2.2.9.1.10 are additionally to their hazards of classes 1 to 6.2, 8 and 9 considered to be environmentally hazardous substances. Other substances meeting the criteria of no other class, but those of 2.2.9.1.10 are to be assigned to UN Nos. 3077 and 3082 as appropriate.

2.1.3.9 Wastes that do not meet the criteria for classification in classes 1 to 9 but are covered by the *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal* may be carried under UN Nos. 3077 or 3082.

² Such legislation is for instance the Commission Decision 2000/532/EC of 3 May 2000 replacing Decision 94/3/EC establishing a list of wastes pursuant to Article 1(a) of Council Directive 75/442/EEC on waste and Council Decision 94/904/EC establishing a list of hazardous wastes pursuant to Article 1(4) of Council Directive 91/689/EEC on hazardous

wastes (Official Journal of the European Communities No. L 226 of 6 September 2000, page 3~~+~~), as amended; and Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (Official Journal of the European Union No. L312 of 22 November 2008, pages 3-30~~+~~), as amended.

2.1.3.10 Table of precedence of hazards

Class and packing group	4.1, II	4.1, III	4.2, II				4.2, III	4.3, I	4.3, II	4.3, III	5.1, I	5.1, II	5.1, III	6.1, DERM	
3, I	SOL LIQ 4.1 3, I	SOL LIQ 4.1 3, I	SOL LIQ 4.2 3, I	LIQ 3, I		SOL LIQ 4.2 3, I	Deleted Cells								
3, II	SOL LIQ 4.1 3, II	SOL LIQ 4.1 3, II	SOL LIQ 4.2 3, II	LIQ 3, II		SOL LIQ 4.2 3, II	Deleted Cells								
3, III	SOL LIQ 4.1 3, III	SOL LIQ 4.1 3, III	SOL LIQ 4.2 3, II	LIQ 3, II		SOL LIQ 4.2 3, III	Deleted Cells								
4.1, II			4.2, II				4.2, II	4.3, I	4.3, II	4.3, II	5.1, I	4.1, II	4.1, II	6.1, DERM	
4.1, III			4.2, II				4.2, III	Deleted Cells							
4.2, II								4.3, I	4.3, II	4.3, II	5.1, I	4.2, II	4.2, II	6.1, DERM	
4.2, III								4.3, I	4.3, II	4.3, III	5.1, I	5.1, II	4.2, III	6.1, DERM	
4.3, I											5.1, I	4.3, I	4.3, I	6.1, DERM	
4.3, II								Deleted Cells							
4.3, III								Deleted Cells							
5.1, I								Deleted Cells							
5.1, II								Deleted Cells							
5.1, III								Deleted Cells							
6.1, I DERMAL								Deleted Cells							
6.1, I ORAL								Deleted Cells							
6.1, II INHAL								Deleted Cells							
6.1, II DERMAL								Deleted Cells							
6.1, II ORAL			SOL = LIQ = DERMAL = ORAL = INHAL = *Class 6.1 for pesticides	SOL = LIQ = DERMAL = ORAL = INHAL = *Class 6.1 for pesticides	= Solid substances and mixtures = Liquid substances, mixtures and solutions = Dermal toxicity = Oral toxicity = Inhalation toxicity		Split Cells								
6.1, III								Deleted Cells							
8, I								Deleted Cells							
8, II								Deleted Cells							
8, III								Deleted Cells							

NOTE 1: Examples to explain the use of the table

Classification of a single substance

Description of the substance to be classified:

An amine not mentioned by name meeting the criteria for Class 3, packing group II as well as those for Class 8, packing group I.

Procedure:

The intersection of line 3 II with column 8 I gives 8 I.

This amine has therefore to be classified in Class 8 under:

UN No. 2734 AMINES LIQUID, CORROSIVE, FLAMMABLE, N.O.S. or UN No. 2734 POLYAMINES, LIQUID, CORROSIVE, FLAMMABLE, N.O.S.

packing group I

Classification of a mixture

Description of the mixture to be classified:

Mixture consisting of a flammable liquid classified in Class 3, packing group III, a toxic substance in Class 6.1, packing group II and a corrosive substance in Class 8, packing group I.

Procedure:

The intersection of line 3 III with column 6.1 II gives 6.1 II.

The intersection of line 6.1 II with column 8 I gives 8 I LIQ.

This mixture not further defined has therefore to be classified in Class 8 under:

UN No. 2922 CORROSIVE LIQUID, TOXIC, N.O.S. packing group I.

NOTE 2: Examples for the classification of mixtures and solutions under a class and a packing group:

A phenol solution of Class 6.1, (II), in benzene of Class 3, (II) is to be classified in Class 3, (II); this solution is to be classified under UN No. 1992 FLAMMABLE LIQUID, TOXIC, N.O.S., Class 3, (II), by virtue of the toxicity of the phenol.

A solid mixture of sodium arsenate of Class 6.1, (II) and sodium hydroxide of Class 8, (II) is to be classified under UN No. 3290 TOXIC SOLID, CORROSIVE, INORGANIC, N.O.S., in Class 6.1 (II).

A solution of crude or refined naphthalene of Class 4.1, (III) in petrol of Class 3, (II), is to be classified under UN No. 3295 HYDROCARBONS, LIQUID, N.O.S. in Class 3, (II).

A mixture of hydrocarbons of Class 3, (III), and of polychlorinated biphenyls (PCB) of Class 9, (II), is to be classified under UN No. 2315 POLYCHLORINATED BIPHENYLS LIQUID or UN No. 3432 POLYCHLORINATED BIPHENYLS SOLID in Class 9, (II).

A mixture of propyleneimine of Class 3, and polychlorinated biphenyls (PCB) of Class 9, (II), is to be classified under UN No. 1921 PROPYLENEIMINE, INHIBITED in Class 3.

2.1.4 Classification of samples

2.1.4.1 When the class of a substance is uncertain and it is being carried for further testing, a tentative class, proper shipping name and UN number shall be assigned on the basis of the consignor's knowledge of the substance and application of:

- (a) the classification criteria of Chapter 2.2; and

- (b) the requirements of this Chapter.

The most severe packing group possible for the proper shipping name chosen shall be used.

Where this provision is used the proper shipping name shall be supplemented with the word "SAMPLE" (e.g., "FLAMMABLE LIQUID, N.O.S., SAMPLE"). In certain instances, where a specific proper shipping name is provided for a sample of a substance considered to meet certain classification criteria (e.g., GAS SAMPLE, NON-PRESSURIZED, FLAMMABLE, UN No. 3167) that proper shipping name shall be used. When an N.O.S. entry is used to carry the sample, the proper shipping name need not be supplemented with the technical name as required by special provision 274 of Chapter 3.3.

2.1.4.2 Samples of the substance shall be carried in accordance with the requirements applicable to the tentative assigned proper shipping name provided:

- (a) The substance is not considered to be a substance not accepted for carriage by sub-sections 2.2.x.2 of Chapter 2.2 or by Chapter 3.2;
- (b) The substance is not considered to meet the criteria for Class 1 or considered to be an infectious substance or a radioactive material;
- (c) The substance is in compliance with 2.2.41.1.15 or 2.2.52.1.9 if it is a self-reactive substance or an organic peroxide, respectively;
- (d) The sample is carried in a combination packaging with a net mass per package not exceeding 2.5 kg; and
- (e) The sample is not packed together with other goods.

2.1.4.3 Samples of energetic materials for testing purposes

2.1.4.3.1 Samples of organic substances carrying functional groups listed in tables A6.1 and/or A6.3 in Appendix 6 (Screening Procedures) of the Manual of Tests and Criteria may be carried under UN No. 3224 (self-reactive solid type C) or UN No. 3223 (self-reactive liquid type C), as applicable, of Class 4.1 provided that:

- (a) The samples do not contain any:

- Known explosives;
- Substances showing explosive effects in testing;
- Compounds designed with the view of producing a practical explosive or pyrotechnic effect; or
- Components consisting of synthetic precursors of intentional explosives;

- (b) For mixtures, complexes or salts of inorganic oxidizing substances of Class 5.1 with organic material(s), the concentration of the inorganic oxidizing substance is:

- Less than 15%, by mass, if assigned to packing group I (high hazard) or II (medium hazard); or
- Less than 30%, by mass, if assigned to packing group III (low hazard);

- (c) Available data do not allow a more precise classification;

- (d) The sample is not packed together with other goods; and

- (e) The sample is packed in accordance with packing instruction P520 and special packing provisions PP94 or PP95 of 4.1.4.1, as applicable.

2.1.5 Classification of articles as articles containing dangerous goods, n.o.s.

NOTE: For articles which do not have a proper shipping name, other than UN Nos. 3537 to 3548, and which contain only dangerous goods within the permitted limited quantity amounts specified in Column (7a) of Table A of Chapter 3.2, see UN No. 3363 and special provisions 301 and 672 of Chapter 3.3.

2.1.5.1 Articles containing dangerous goods may be classified as otherwise provided by ADR under the proper shipping name for the dangerous goods they contain or in accordance with this section.

For the purposes of this section “article” means machinery, apparatus or other devices containing one or more dangerous goods (or residues thereof) that are an integral element of the article, necessary for its functioning and that cannot be removed for the purpose of carriage.

An inner packaging shall not be an article.

2.1.5.2 Such articles may in addition contain batteries. Lithium batteries that are integral to the article shall be of a type proven to meet the testing requirements of the Manual of Tests and Criteria, part III, sub-section 38.3, except when otherwise specified by ADR (e.g. for pre-production prototype articles containing lithium batteries or for a small production run, consisting of not more than 100 such articles).

2.1.5.3 This section does not apply to articles for which a more specific proper shipping name already exists in Table A of Chapter 3.2.

2.1.5.4 This section does not apply to dangerous goods of Class 1, Class 6.2, Class 7 or radioactive material contained in articles.

2.1.5.5 Articles containing dangerous goods shall be assigned to the appropriate Class determined by the hazards present using, where applicable, the table of precedence of hazard in 2.1.3.10 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 shall be considered to present a higher hazard.

2.1.5.6 Subsidiary hazards shall be representative of the primary hazards 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, shall be the subsidiary hazard(s) identified by the subsidiary hazard label(s) in column (5) of Table A of Chapter 3.2. If the article contains more than one item of dangerous goods and these could react dangerously with one another during carriage, each of the dangerous goods shall be enclosed separately (see 4.1.1.6).

2.1.5.2.1.6 Classification of packagings, discarded, empty, uncleaned

Empty uncleaned packagings, large packagings or IBCs, or parts thereof, carried for disposal, recycling or recovery of their material, other than reconditioning, repair, routine maintenance, remanufacturing or reuse, may be assigned to UN 3509 if they meet the requirements for this entry.

CHAPTER 2.2

CLASS SPECIFIC PROVISIONS

2.2.1 Class 1 Explosive substances and articles

2.2.1.1 Criteria

2.2.1.1.1 The heading of Class 1 covers:

- (a) Explosive substances: solid or liquid substances (or mixtures of substances) capable by chemical reaction of producing gases at such a temperature and pressure and at such a speed as to cause damage to the surroundings.

Pyrotechnic substances: substances or mixtures of substances designed to produce an effect by heat, light, sound, gas or smoke or a combination of these as the result of non-detonating self-sustaining exothermic chemical reactions;

NOTE 1: Substances which are not themselves explosive but which may form an explosive mixture of gas, vapour or dust are not substances of Class 1.

NOTE 2: Also excluded from Class 1 are: water- or alcohol-wetted explosives of which the water or alcohol content exceeds the limits specified and those containing plasticizers - these explosives are assigned to Class 3 or Class 4.1 - and those explosives which, on the basis of their predominant hazard, are assigned to Class 5.2.

- (b) Explosive articles: articles containing one or more explosive or pyrotechnic substances;

NOTE: Devices containing explosive or pyrotechnic substances in such small quantity or of such a character that their inadvertent or accidental ignition or initiation during carriage would not cause any manifestation external to the device by projection, fire, smoke, heat or loud noise are not subject to the requirements of Class 1.

- (c) Substances and articles not mentioned above which are manufactured with a view to producing a practical ~~effect by explosion~~explosive or a pyrotechnic effect.

For the purposes of Class 1, the following definition applies:

Phlegmatized means that a substance (or "phlegmatizer") has been added to an explosive to enhance its safety in handling and carriage. The phlegmatizer renders the explosive insensitive, or less sensitive, to the following actions: heat, shock, impact, percussion or friction. Typical phlegmatizing agents include, but are not limited to: wax, paper, water, polymers (such as chlorofluoropolymers), alcohol and oils (such as petroleum jelly and paraffin).

2.2.1.1.2 Any substance or article having or suspected of having explosive properties shall be considered for assignment to Class 1 in accordance with the tests, procedures and criteria prescribed in Part I, Manual of Tests and Criteria.

A substance or article assigned to Class 1 can only be accepted for carriage when it has been assigned to a name or n.o.s. entry listed in Table A of Chapter 3.2 and meets the criteria of the Manual of Tests and Criteria.

2.2.1.1.3 The substances and articles of Class 1 shall be assigned to a UN Number and a name or n.o.s. entry listed in Table A of Chapter 3.2. Interpretation of the names of substances and articles in Table A of Chapter 3.2 shall be based upon the glossary in 2.2.1.4.

Samples of new or existing explosive substances or articles carried for purposes including: testing, classification, research and development quality control, or as a commercial sample, other than initiating explosive, may be assigned to UN No. 0190 SAMPLES, EXPLOSIVE.

The assignment of explosive substances and articles not mentioned by name as such in Table A of Chapter 3.2 to an n.o.s. entry of Class 1 or UN No. 0190 SAMPLES, EXPLOSIVE as well as the assignment of certain substances the carriage of which is subject to a specific authorization by the

competent authority according to the special provisions referred to in Column (6) of Table A of Chapter 3.2 shall be made by the competent authority of the country of origin. This competent authority shall also approve in writing the conditions of carriage of these substances and articles. If the country of origin is not a Contracting Party to ADR, the classification and the conditions of carriage shall be recognized by the competent authority of the first country Contracting Party to ADR reached by the consignment.

2.2.1.1.4 Substances and articles of Class 1 shall have been assigned to a division in accordance with 2.2.1.1.5 and to a compatibility group in accordance with 2.2.1.1.6. The division shall be based on the results of the tests described in 2.3.0 and 2.3.1 applying the definitions in 2.2.1.1.5. The compatibility group shall be determined in accordance with the definitions in 2.2.1.1.6. The classification code shall consist of the division number and the compatibility group letter.

2.2.1.1.5 *Definition of divisions*

Division 1.1 Substances and articles which have a mass explosion hazard (a mass explosion is an explosion which affects almost the entire load virtually instantaneously).

Division 1.2 Substances and articles which have a projection hazard but not a mass explosion hazard.

Division 1.3 Substances and articles which have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard:

- (a) combustion of which gives rise to considerable radiant heat; or
- (b) which burn one after another, producing minor blast or projection effects or both.

Division 1.4 Substances and articles which present only a slight ~~risk~~ hazard of explosion in the event of ignition or initiation during carriage. The effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected. An external fire shall not cause virtually instantaneous explosion of almost the entire contents of the package.

Division 1.5 Very insensitive substances having a mass explosion hazard which are so insensitive that there is very little probability of initiation or of transition from burning to detonation under normal conditions of carriage. As a minimum requirement they must not explode in the external fire test.

Division 1.6 Extremely insensitive articles which do not have a mass explosion hazard. The articles predominantly contain extremely insensitive substances and demonstrate a negligible probability of accidental initiation or propagation.

NOTE: The ~~risk~~ hazard from articles of Division 1.6 is limited to the explosion of a single article.

2.2.1.1.6 *Definition of compatibility groups of substances and articles*

A Primary explosive substance.

B Article containing a primary explosive substance and not having two or more effective protective features. Some articles, such as detonators for blasting, detonator assemblies for blasting and primers, cap-type, are included, even though they do not contain primary explosives.

C Propellant explosive substance or other deflagrating explosive substance or article containing such explosive substance.

D Secondary detonating explosive substance or black powder or article containing a secondary detonating explosive substance, in each case without means of initiation and without a propelling charge, or article containing a primary explosive substance and having two or more effective protective features.

- E Article containing a secondary detonating explosive substance, without means of initiation, with a propelling charge (other than one containing a flammable liquid or gel or hypergolic liquids).
- F Article containing a secondary detonating explosive substance with its own means of initiation, with a propelling charge (other than one containing a flammable liquid or gel or hypergolic liquids) or without a propelling charge.
- G Pyrotechnic substance, or article containing a pyrotechnic substance, or article containing both an explosive substance and an illuminating, incendiary, tear- or smoke-producing substance (other than a water-activated article or one which contains white phosphorus, phosphides, a pyrophoric substance, a flammable liquid or gel or hypergolic liquids).
- H Article containing both an explosive substance and white phosphorus.
- J Article containing both an explosive substance and a flammable liquid or gel.
- K Article containing both an explosive substance and a toxic chemical agent.
- L Explosive substance or article containing an explosive substance and presenting a special **risk hazard** (e.g. due to water activation or the presence of hypergolic liquids, phosphides or a pyrophoric substance) necessitating isolation of each type.
- N Articles predominantly containing extremely insensitive substances.
- S Substance or article so packed or designed that any hazardous effects arising from accidental functioning are confined within the package unless the package has been degraded by fire, in which case all blast or projection effects are limited to the extent that they do not significantly hinder or prevent fire-fighting or other emergency response efforts in the immediate vicinity of the package.

NOTE 1: Each substance or article, packed in a specified packaging, may be assigned to one compatibility group only. Since the criterion of compatibility group S is empirical, assignment to this group is necessarily linked to the tests for assignment of a classification code.

NOTE 2: Articles of compatibility groups D and E may be fitted or packed together with their own means of initiation provided that such means have at least two effective protective features designed to prevent an explosion in the event of accidental functioning of the means of initiation. Such articles and packages shall be assigned to compatibility groups D or E.

NOTE 3: Articles of compatibility groups D and E may be packed together with their own means of initiation, which do not have two effective protective features (i.e. means of initiation assigned to compatibility group B), provided that they comply with mixed packing provision MP21 of Section 4.1.10. Such packages shall be assigned to compatibility groups D or E.

NOTE 4: Articles may be fitted or packed together with their own means of ignition provided that the means of ignition cannot function during normal conditions of carriage.

NOTE 5: Articles of compatibility groups C, D and E may be packed together. Such packages shall be assigned to compatibility group E.

2.2.1.1.7 *Assignment of fireworks to divisions*

2.2.1.1.7.1 Fireworks shall normally be assigned to divisions 1.1, 1.2, 1.3, and 1.4 on the basis of test data derived from Test Series 6 of the Manual of Tests and Criteria.

However:

- (a) waterfalls ~~giving a positive result when tested in the HSL-containing~~ flash composition ~~test in Appendix 7 (see Note 2 of the Manual of Tests and Criteria 2.2.1.1.7.5)~~ shall be classified as 1.1G regardless of the results of Test Series 6;
- (b) since the range of such articles is very extensive and the availability of test facilities may be limited, assignment to divisions may also be made in accordance with the procedure in 2.2.1.1.7.2.

2.2.1.1.7.2 Assignment of fireworks to UN Nos. 0333, 0334, 0335 and 0336 may be made on the basis of analogy, without the need for Test Series 6 testing, in accordance with the default fireworks classification table in 2.2.1.1.7.5. Such assignment shall be made with the agreement of the competent authority. Items not specified in the table shall be classified on the basis of test data derived from Test Series 6.

NOTE 1: The addition of other types of fireworks to column 1 of the table in 2.2.1.1.7.5 shall only be made on the basis of full test data submitted to the UN Sub-Committee of Experts on the Transport of Dangerous Goods for consideration.

NOTE 2: Test data derived by competent authorities which validates, or contradicts the assignment of fireworks specified in column 4 of the table in 2.2.1.1.7.5 to divisions in column 5 should be submitted to the UN Sub-Committee of Experts on the Transport of Dangerous Goods for information.

2.2.1.1.7.3 Where fireworks of more than one division are packed in the same package, they shall be classified on the basis of the most dangerous division unless test data derived from Test Series 6 indicate otherwise.

2.2.1.1.7.4 The classification shown in the table in 2.2.1.1.7.5 applies only for articles packed in fibreboard boxes (4G).

2.2.1.1.7.5 Default fireworks classification ~~table~~^{table 1}

NOTE 1: References to percentages in the table, unless otherwise stated, are to the mass of all pyrotechnic substances (e.g. rocket motors, lifting charge, bursting charge and effect charge).

NOTE 2: "Flash composition" in this table refers to pyrotechnic substances in powder form or as pyrotechnic units as presented in the ~~firework~~ fireworks that are used in waterfalls, or to produce an aural effect or used as a bursting charge, or propellant charge unless:

(a) ~~The time taken for the pressure rise in the HSL Flash Composition Test in Appendix 7 of the Manual of Tests and Criteria is demonstrated to be more than 6 ms for 0.5 g of pyrotechnic substance in the HSL; or~~

(~~a~~) (b) The pyrotechnic substance gives a negative "-" result in the US Flash Composition Test in Appendix 7 of the Manual of Tests and Criteria.

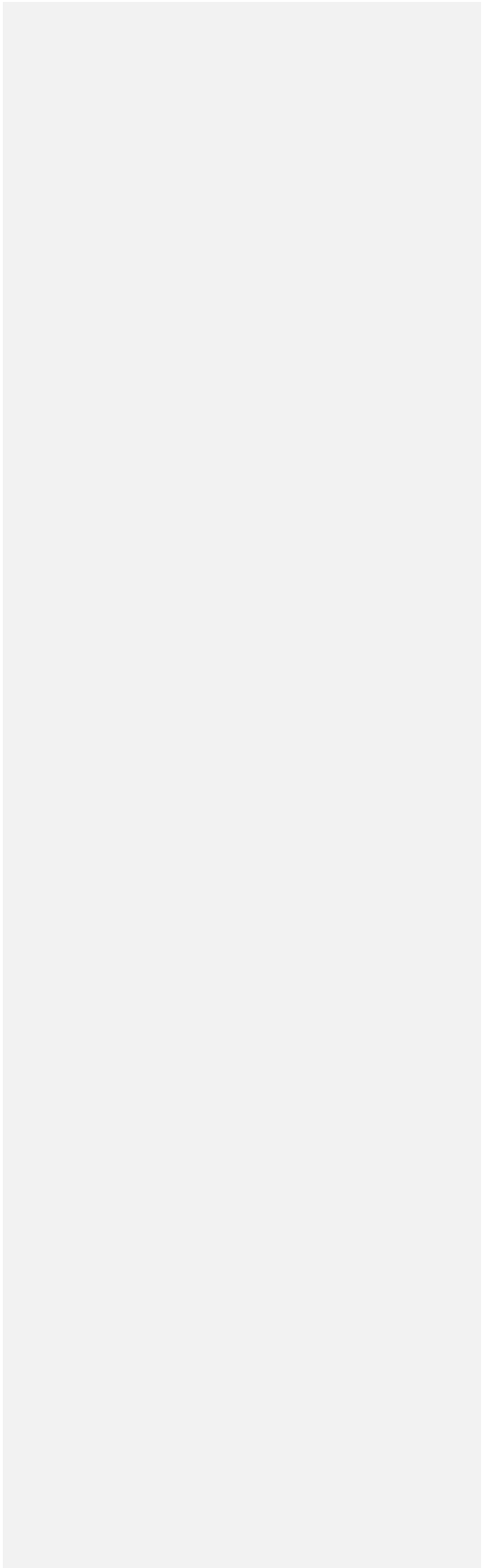
NOTE 3: Dimensions in mm refer to:

- *for spherical and peanut shells the diameter of the sphere of the shell;*
- *for cylinder shells the length of the shell;*
- *for a shell in mortar, Roman candle, shot tube firework or mine the inside diameter of the tube comprising or containing the firework;*
- *for a bag mine or cylinder mine, the inside diameter of the mortar intended to contain the mine.*

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¹ *This table contains a list of firework classifications which may be used in the absence of Test Series 6 data (see 2.2.1.1.7.2).*



Type	Includes: / Synonym:	Definition	Specification	Classification
Shell, spherical or cylindrical	Spherical display shell: aerial shell, colour shell, dye shell, multi-break shell, multi-effect shell, nautical shell, parachute shell, smoke shell, star shell; report shell: maroon, salute, sound shell, thunderclap, aerial shell kit	Device with or without propellant charge, with delay fuse and bursting charge, pyrotechnic unit(s) or loose pyrotechnic substance and designed to be projected from a mortar	All report shells	1.1G
			Colour shell: ≥ 180 mm	1.1G
			Colour shell: < 180 mm with $> 25\%$ flash composition, as loose powder and/or report effects	1.1G
			Colour shell: < 180 mm with $\leq 25\%$ flash composition, as loose powder and/or report effects	1.3G
			Colour shell: ≤ 50 mm, or ≤ 60 g pyrotechnic substance, with $\leq 2\%$ flash composition as loose powder and/or report effects	1.4G
	Peanut shell	Device with two or more spherical aerial shells in a common wrapper propelled by the same propellant charge with separate external delay fuses	The most hazardous spherical aerial shell determines the classification	
	Preloaded mortar, shell in mortar	Assembly comprising a spherical or cylindrical shell inside a mortar from which the shell is designed to be projected	All report shells	1.1G
			Colour shell: ≥ 180 mm	1.1G
			Colour shell: $> 25\%$ flash composition as loose powder and/or report effects	1.1G
			Colour shell: > 50 mm and < 180 mm	1.2G
			Colour shell: ≤ 50 mm, or ≤ 60 g pyrotechnic substance, with $\leq 25\%$ flash composition as loose powder and/or report effects	1.3G

Type	Includes: / Synonym:	Definition	Specification	Classification
Shell, spherical or cylindrical (cont'd)	Shell of shells (spherical) <i>(Reference to percentages for shell of shells are to the gross mass of the fireworks article)</i>	Device without propellant charge, with delay fuse and bursting charge, containing report shells and inert materials and designed to be projected from a mortar	> 120 mm	1.1G
		Device without propellant charge, with delay fuse and bursting charge, containing report shells ≤ 25g flash composition per report unit, with ≤ 33% flash composition and ≥ 60% inert materials and designed to be projected from a mortar	≤ 120 mm	1.3G
		Device without propellant charge, with delay fuse and bursting charge, containing colour shells and/or pyrotechnic units and designed to be projected from a mortar	> 300 mm	1.1G
		Device without propellant charge, with delay fuse and bursting charge, containing colour shells ≤ 70mm and/or pyrotechnic units, with ≤ 25% flash composition and ≤ 60% pyrotechnic substance and designed to be projected from a mortar	> 200 mm and ≤ 300 mm	1.3G
		Device with propellant charge, with delay fuse and bursting charge, containing colour shells ≤ 70 mm and/or pyrotechnic units, with ≤ 25% flash composition and ≤ 60% pyrotechnic substance and designed to be projected from a mortar	≤ 200 mm	1.3G
Battery/ combination	Barrage, bombardos, cakes, finale box, flowerbed, hybrid, multiple tubes, shell cakes, banger batteries, flash banger batteries	Assembly including several elements either containing the same type or several types each corresponding to one of the types of fireworks listed in this table, with one or two points of ignition	The most hazardous firework type determines the classification	

Type	Includes: / Synonym:	Definition	Specification	Classification
Roman candle	Exhibition candle, candle, bombettes	Tube containing a series of pyrotechnic units consisting of alternate pyrotechnic substance, propellant charge, and transmitting fuse	≥ 50 mm inner diameter, containing flash composition, or < 50 mm with > 25% flash composition	1.1G
			≥ 50 mm inner diameter, containing no flash composition	1.2G
			< 50 mm inner diameter and ≤ 25% flash composition	1.3G
			≤ 30 mm inner diameter, each pyrotechnic unit ≤ 25 g and ≤ 5% flash composition	1.4G
Shot tube	Single shot Roman candle, small preloaded mortar	Tube containing a pyrotechnic unit consisting of pyrotechnic substance, propellant charge with or without transmitting fuse	≤ 30 mm inner diameter and pyrotechnic unit > 25 g, or > 5% and ≤ 25% flash composition	1.3G
			≤ 30 mm inner diameter, pyrotechnic unit ≤ 25 g and ≤ 5% flash composition	1.4G
Rocket	Avalanche rocket, signal rocket, whistling rocket, bottle rocket, sky rocket, missile type rocket, table rocket	Tube containing pyrotechnic substance and/or pyrotechnic units, equipped with stick(s) or other means for stabilization of flight, and designed to be propelled into the air	Flash composition effects only	1.1G
			Flash composition > 25% of the pyrotechnic substance	1.1G
			> 20 g pyrotechnic substance and flash composition ≤ 25%	1.3G
			≤ 20 g pyrotechnic substance, black powder bursting charge and ≤ 0.13 g flash composition per report and ≤ 1 g in total	1.4G

Type	Includes: / Synonym:	Definition	Specification	Classification
Mine	Pot-a-feu, ground mine, bag mine, cylinder mine	<p>Tube containing propellant charge and pyrotechnic units and designed to be placed on the ground or to be fixed in the ground. The principal effect is ejection of all the pyrotechnic units in a single burst producing a widely dispersed visual and/or aural effect in the air or:</p> <p>Cloth or paper bag or cloth or paper cylinder containing propellant charge and pyrotechnic units, designed to be placed in a mortar and to function as a mine</p>	> 25% flash composition, as loose powder and/ or report effects	1.1G
			≥ 180 mm and ≤ 25% flash composition, as loose powder and/ or report effects	1.1G
			< 180 mm and ≤ 25% flash composition, as loose powder and/ or report effects	1.3G
			≤ 150 g pyrotechnic substance, containing ≤ 5% flash composition as loose powder and/ or report effects. Each pyrotechnic unit ≤ 25 g, each report effect < 2g; each whistle, if any, ≤ 3 g	1.4G
Fountain	Volcanos, gerbs, lances, Bengal fire, flitter sparkle, cylindrical fountains, cone fountains, illuminating torch	<p>Non-metallic case containing pressed or consolidated pyrotechnic substance producing sparks and flame</p> <p>NOTE: <i>Fountains intended to produce a vertical cascade or curtain of sparks are considered to be waterfalls (see row below).</i></p>	≥ 1 kg pyrotechnic substance	1.3G
			< 1 kg pyrotechnic substance	1.4G

Type	Includes: / Synonym:	Definition	Specification	Classification
Waterfall	Cascades, showers	Pyrotechnic fountain intended to produce a vertical cascade or curtain of sparks	Containing a pyrotechnic substance which gives a positive result when tested in the HSL flash composition test in Appendix 7 of the Manual of Tests and Criteria regardless of the results of Test Series 6 (see 2.2.1.1.7.1 (a))	1.1G
			Containing a pyrotechnic substance which gives a negative result when tested in the HSL Flash composition test in Appendix 7 of the Manual of Tests and Criteria <u>Not containing flash composition</u>	1.3G
Sparkler	Handheld sparklers, non-handheld sparklers, wire sparklers	Rigid wire partially coated (along one end) with slow burning pyrotechnic substance with or without an ignition tip	Perchlorate based sparklers: > 5 g per item or > 10 items per pack	1.3G
			Perchlorate based sparklers: ≤ 5 g per item and ≤ 10 items per pack; Nitrate based sparklers: ≤ 30 g per item	1.4G

<u>Type</u>	<u>Includes: / Synonym:</u>	<u>Definition</u>	<u>Specification</u>	<u>Classification</u>
Bengal stick	Dipped stick	Non-metallic stick partially coated (along one end) with slow-burning pyrotechnic substance and designed to be held in the hand	Perchlorate based items: > 5 g per item or > 10 items per pack	1.3 G
			Perchlorate based items: ≤ 5 g per item and ≤ 10 items per pack; nitrate based items: ≤ 30 g per item	1.4G

<u>Low hazard fireworks and novelties</u>	<u>Table bombs, throwdowns, crackling granules, smokes, fog, snakes, glow worm, serpents, snaps, party poppers</u>	<u>Device designed to produce very limited visible and/ or audible effect which contains small amounts of pyrotechnic and/or explosive composition.</u>	<u>Throwdowns and snaps may contain up to 1.6 mg of silver fulminate; snaps and party poppers may contain up to 16 mg of potassium chlorate/red phosphorous mixture; other articles may contain up to 5 g of pyrotechnic substance, but no flash composition</u>	<u>1.4G</u>
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Type	Includes: / Synonym:	Definition	Specification	Classification
Low hazard fireworks and novelties	Table bombs, throwdowns, crackling granules, smokes, fog, snakes, glow worm, serpents, snaps, party poppers	Device designed to produce very limited visible and/ or audible effect which contains small amounts of pyrotechnic and/or explosive composition.	Throwdowns and snaps may contain up to 1.6 mg of silver fulminate; snaps and party poppers may contain up to 16 mg of potassium chlorate/red phosphorous mixture; other articles may contain up to 5 g of pyrotechnic substance, but no flash composition	1.4G
Spinner	Aerial spinner, helicopter, chaser, ground spinner	Non-metallic tube or tubes containing gas- or spark-producing pyrotechnic substance, with or without noise producing composition, with or without aerofoils attached	Pyrotechnic substance per item > 20 g, containing ≤ 3% flash composition as report effects, or whistle composition ≤ 5 g	1.3G
			Pyrotechnic substance per item ≤ 20 g, containing ≤ 3% flash composition as report effects, or whistle composition ≤ 5 g	1.4G
Wheels	Catherine wheels, Saxon	Assembly including drivers containing pyrotechnic substance and provided with a means of attaching it to a support so that it can rotate	≥ 1 kg total pyrotechnic substance, no report effect, each whistle (if any) ≤ 25 g and ≤ 50 g whistle composition per wheel	1.3G
			< 1 kg total pyrotechnic substance, no report effect, each whistle (if any) ≤ 5 g and ≤ 10 g whistle composition per wheel	1.4G

Type	Includes: / Synonym:	Definition	Specification	Classification
Aerial wheel	Flying Saxon, UFO's, rising crown	Tubes containing propellant charges and sparks-flame- and/or noise producing pyrotechnic substances, the tubes being fixed to a supporting ring	> 200 g total pyrotechnic substance or > 60 g pyrotechnic substance per driver, ≤ 3% flash composition as report effects, each whistle (if any) ≤ 25 g and ≤ 50 g whistle composition per wheel	1.3G
			≤ 200 g total pyrotechnic substance and ≤ 60 g pyrotechnic substance per driver, ≤ 3% flash composition as report effects, each whistle (if any) ≤ 5 g and ≤ 10 g whistle composition per wheel	1.4G
Selection pack	Display selection box, display selection pack, garden selection box, indoor selection box; assortment	A pack of more than one type each corresponding to one of the types of fireworks listed in this table	The most hazardous firework type determines the classification	
Firecracker	Celebration cracker, celebration roll, string cracker	Assembly of tubes (paper or cardboard) linked by a pyrotechnic fuse, each tube intended to produce an aural effect	Each tube ≤ 140 mg of flash composition or ≤ 1 g black powder	1.4G
Banger	Salute, flash banger, lady cracker	Non-metallic tube containing report composition intended to produce an aural effect	> 2 g flash composition per item	1.1G
			≤ 2 g flash composition per item and ≤ 10 g per inner packaging	1.3G
			≤ 1 g flash composition per item and ≤ 10 g per inner packaging or ≤ 10 g black powder per item	1.4G

2.2.1.1.8 *Exclusion from Class 1*

2.2.1.1.8.1 An article or a substance may be excluded from Class 1 by virtue of test results and the Class 1 definition with the approval of the competent authority of any ADR Contracting Party who may also recognize an approval granted by the competent authority of a country which is not an ADR Contracting Party provided that this approval has been granted in accordance with the procedures applicable according to RID, ADR, ADN, the IMDG Code or the ICAO Technical Instructions.

2.2.1.1.8.2 With the approval of the competent authority in accordance with 2.2.1.1.8.1, 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 shall have a temperature of more than 65 °C. A momentary spike in temperature up to 200 °C 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;

NOTE: Where the integrity of the article may be affected in the event of an external fire these criteria shall be examined by a fire test, such as described in ISO 12097-3.

- (c) No audible report exceeding 135 dB(C) peak at a distance of one metre;
- (d) No flash or flame capable of igniting a material such as a sheet of 80 ± 10 g/m² paper in contact with the article; and
- (e) No production of smoke, fumes or dust in such quantities that the visibility in a one cubic metre chamber equipped with appropriately sized blow out panels is reduced more than 50% as measured by a calibrated light (lux) meter or radiometer located one metre from a constant light source located at the midpoint on opposite walls. The general guidance on Optical Density Testing in ISO 5659-1 and the general guidance on the Photometric System described in Section 7.5 in ISO 5659-2 may be used or similar optical density measurement methods designed to accomplish the same purpose may also be employed. A suitable hood cover surrounding the back and sides of the light meter shall be used to minimize effects of scattered or leaking light not emitted directly from the source.

NOTE 1: If during the tests addressing criteria (a), (b), (c) and (d) no or very little smoke is observed the test described in (e) may be waived.

NOTE 2: The competent authority referred to in 2.2.1.1.8.1 may require testing in packaged form if it is determined that, as packaged for carriage, the article may pose a greater ~~risk~~ hazard.

2.2.1.1.9 *Classification documentation*

2.2.1.1.9.1 A competent authority assigning an article or substance to Class 1 shall confirm that classification with the applicant in writing.

2.2.1.1.9.2 A competent authority classification document may be in any form and may consist of more than one page, provided pages are numbered consecutively. The document shall have a unique reference.

2.2.1.1.9.3 The information provided shall be easy to identify, legible and durable.

2.2.1.1.9.4 Examples of the information that may be provided in the classification documents are as follows:

- (a) The name of the competent authority and the provisions in national legislation under which it is granted its authority;
- (b) The modal or national regulations for which the classification document is applicable;
- (c) Confirmation that the classification has been approved, made or agreed in accordance with the UN Model Regulations or the relevant modal regulations;

- (d) The name and address of the person in law to which the classification has been assigned and any company registration which uniquely identifies a company or other body corporate under national legislation;
- (e) The name under which the explosives will be placed onto the market or otherwise supplied for carriage;
- (f) The proper shipping name, UN number, class, division and corresponding compatibility group of the explosives;
- (g) Where appropriate, the maximum net explosive mass of the package or article;
- (h) The name, signature, stamp, seal or other identification of the person authorised by the competent authority to issue the classification document is clearly visible;
- (i) Where safety in carriage or the division is assessed as being dependent upon the packaging, the packaging mark or a description of the permitted:
 - Inner packagings
 - Intermediate packagings
 - Outer packagings
- (j) The classification document states the part number, stock number or other identifying reference under which the explosives will be placed onto the market or otherwise supplied for carriage;
- (k) The name and address of the person in law who manufactured the explosives and any company registration which uniquely identifies a company or other body corporate under national legislation;
- (l) Any additional information regarding the applicable packing instruction and special packing provisions where appropriate;
- (m) The basis for assigning the classification, i.e. whether on the basis of test results, default for fireworks, analogy with classified explosive, by definition from Table A of Chapter 3.2 etc.;
- (n) Any special conditions or limitations that the competent authority has identified as relevant to the safety for carriage of the explosives, the communication of the hazard and international carriage;
- (o) The expiry date of the classification document is given where the competent authority considers one to be appropriate.

2.2.1.2 Substances and articles not accepted for carriage

- 2.2.1.2.1 Explosive substances which are unduly sensitive according to the criteria of the Manual of Tests and Criteria, Part I, or are liable to spontaneous reaction, as well as explosive substances and articles which cannot be assigned to a name or n.o.s. entry listed in Table A of Chapter 3.2, shall not be accepted for carriage.
- 2.2.1.2.2 Articles of compatibility group K shall not be accepted for carriage (1.2K, UN No. 0020 and 1.3K, UN No. 0021).

2.2.1.3 List of collective entries

Classification code (see 2.2.1.1.4)	UN No.	Name of the substance or article
1.1A	0473	SUBSTANCES, EXPLOSIVE, N.O.S.
1.1B	0461	COMPONENTS, EXPLOSIVE TRAIN, N.O.S.
1.1C	0474	SUBSTANCES, EXPLOSIVE, N.O.S.
	0497	PROPELLANT, LIQUID
	0498	PROPELLANT, SOLID
1.1D	0462	ARTICLES, EXPLOSIVE, N.O.S.
	0475	SUBSTANCES, EXPLOSIVE, N.O.S.
	0463	ARTICLES, EXPLOSIVE, N.O.S.
1.1E	0464	ARTICLES, EXPLOSIVE, N.O.S.
1.1F	0465	ARTICLES, EXPLOSIVE, N.O.S.
1.1G	0476	SUBSTANCES, EXPLOSIVE, N.O.S.
1.1L	0357	SUBSTANCES, EXPLOSIVE, N.O.S.
	0354	ARTICLES, EXPLOSIVE, N.O.S.
1.2B	0382	COMPONENTS, EXPLOSIVE TRAIN, N.O.S.
1.2C	0466	ARTICLES, EXPLOSIVE, N.O.S.
1.2D	0467	ARTICLES, EXPLOSIVE, N.O.S.
1.2E	0468	ARTICLES, EXPLOSIVE, N.O.S.
1.2F	0469	ARTICLES, EXPLOSIVE, N.O.S.
1.2L	0358	SUBSTANCES, EXPLOSIVE, N.O.S.
	0248	CONTRIVANCES, WATER-ACTIVATED with burster, expelling charge or <i>propelling charge</i> <i>propelling charge</i>
	0355	ARTICLES, EXPLOSIVE, N.O.S.
1.3C	0132	DEFLAGRATING METAL SALTS OF AROMATIC NITRO-DERIVATIVES, N.O.S.
	0477	SUBSTANCES, EXPLOSIVE, N.O.S.
	0495	PROPELLANT, LIQUID
	0499	PROPELLANT, SOLID
	0470	ARTICLES, EXPLOSIVE, N.O.S.
1.3G	0478	SUBSTANCES, EXPLOSIVE, N.O.S.
1.3L	0359	SUBSTANCES, EXPLOSIVE, N.O.S.
	0249	CONTRIVANCES, WATER-ACTIVATED with burster, expelling charge or <i>propelling charge</i> <i>propelling charge</i>
	0356	ARTICLES, EXPLOSIVE, N.O.S.
1.4B	0350	ARTICLES, EXPLOSIVE, N.O.S.
	0383	COMPONENTS, EXPLOSIVE TRAIN, N.O.S.
1.4C	0479	SUBSTANCES, EXPLOSIVE, N.O.S.
	0501	PROPELLANT, SOLID
	0351	ARTICLES, EXPLOSIVE, N.O.S.
1.4D	0480	SUBSTANCES, EXPLOSIVE, N.O.S.
	0352	ARTICLES, EXPLOSIVE, N.O.S.
1.4E	0471	ARTICLES, EXPLOSIVE, N.O.S.
1.4F	0472	ARTICLES, EXPLOSIVE, N.O.S.

Merged Cells

Merged Cells

Merged Cells

Merged Cells

Merged Cells

Merged Cells

Classification code (see 2.2.1.1.4)	UN No.	Name of the substance or article
1.4G	04850 353	SUBSTANCES, EXPLOSIVE, N.O.S. ARTICLES, EXPLOSIVE, N.O.S.
	0353	ARTICLES, EXPLOSIVE, N.O.S.
1.4S	0481	SUBSTANCES, EXPLOSIVE, N.O.S.
	0349	ARTICLES, EXPLOSIVE, N.O.S.
1.4S	0481 03490 384	SUBSTANCES, EXPLOSIVE, N.O.S. ARTICLES, EXPLOSIVE, N.O.S. COMPONENTS, EXPLOSIVE TRAIN, N.O.S.
1.5D	0482	SUBSTANCES, EXPLOSIVE, VERY INSENSITIVE (SUBSTANCES, EVD) N.O.S.
1.6N	0486	ARTICLES, EXPLOSIVE, EXTREMELY INSENSITIVE (ARTICLES, EEI)
	0190	SAMPLES, EXPLOSIVE other than initiating explosive
	0190	SAMPLES, EXPLOSIVE other than initiating explosive <i>NOTE: Division and Compatibility Group shall be defined as directed by the competent authority and according to the principles in 2.2.1.1.4.</i>

Merged Cells

Merged Cells

Merged Cells

2.2.1.4

Glossary of names

NOTE 1: The descriptions in the glossary are not intended to replace the test procedures, nor to determine the hazard classification of a substance or article of Class 1. Assignment to the correct division and a decision on whether Compatibility Group S is appropriate shall be based on testing of the product in accordance with the Manual of Tests and Criteria, Part I or by analogy with similar products which have already been tested and assigned in accordance with the procedures of the Manual of Tests and Criteria.

NOTE 2: The figures given after the names refer to the relevant UN numbers (Column 1 of Table A of Chapter 3.2). For the classification code, see 2.2.1.1.4.

AMMUNITION, ILLUMINATING, with or without burster, expelling charge or propelling charge: UN Nos. 0171, 0254, 0297

Ammunition designed to produce a single source of intense light for lighting up an area. The term includes illuminating cartridges, grenades and projectiles; and illuminating and target identification bombs.

NOTE: The following articles: CARTRIDGES, SIGNAL; SIGNAL DEVICES HAND; SIGNALS, DISTRESS; FLARES, AERIAL; FLARES, SURFACE are not included in this definition. They are listed separately.

AMMUNITION, INCENDIARY, liquid or gel, with burster, expelling charge or propelling charge: UN No. 0247

Ammunition containing liquid or gelatinous incendiary substance. Except when the incendiary substance is an explosive per se, it also contains one or more of the following: a propelling charge with primer and igniter charge; a fuze with burster or expelling charge.

AMMUNITION, INCENDIARY, WHITE PHOSPHORUS with burster, expelling charge or propelling charge: UN Nos. 0243, 0244

Ammunition containing white phosphorus as incendiary substance. It also contains one or more of the following: a propelling charge with primer and igniter charge; a fuze with burster or expelling charge.

AMMUNITION, INCENDIARY with or without burster, expelling charge or propelling charge: UN Nos. 0009, 0010, 0300

Ammunition containing incendiary composition. Except when the composition is an explosive per se, it also contains one or more of the following: a propelling charge with primer and igniter charge; a fuze with burster or expelling charge.

AMMUNITION, PRACTICE: UN Nos. 0362, 0488

Ammunition without a main bursting charge, containing a burster or expelling charge. Normally it also contains a fuze and a propelling charge.

NOTE: GRENADES, PRACTICE are not included in this definition. They are listed separately.

AMMUNITION, PROOF: UN No. 0363

Ammunition containing pyrotechnic substances, used to test the performance or strength of new ammunition, weapon components or assemblies.

AMMUNITION, SMOKE, WHITE PHOSPHORUS, with burster, expelling charge or propelling charge: UN Nos. 0245, 0246

Ammunition containing white phosphorus as a smoke-producing substance. It also contains one or more of the following: a propelling charge with primer and igniter charge; a fuze with burster or expelling charge. The term includes grenades, smoke.

AMMUNITION, SMOKE with or without burster, expelling charge or propelling charge: UN Nos. 0015, 0016, 0303

Ammunition containing a smoke-producing substance such as chlorosulphonic acid mixture or titanium tetrachloride; or a smoke-producing pyrotechnic composition based on hexachloroethane or red phosphorus. Except when the substance is an explosive *per se*, the ammunition also contains one or more of the following: a propelling charge with primer and igniter charge; a fuze with burster or expelling charge. The term includes grenades, smoke.

NOTE: SIGNALS, SMOKE are not included in this definition. They are listed separately.

AMMUNITION, TEAR-PRODUCING, with burster, expelling charge or propelling charge: UN Nos. 0018, 0019, 0301

Ammunition containing a tear-producing substance. It also contains one or more of the following: a pyrotechnic substance; a propelling charge with primer and igniter charge; a fuze with burster or expelling charge.

ARTICLES, EXPLOSIVE, EXTREMELY INSENSITIVE (ARTICLES EEI): UN No. 0486

Articles containing only extremely insensitive substances which demonstrate a negligible probability of accidental initiation or propagation under normal conditions of transport, and which have passed Test Series 7.

ARTICLES, PYROPHORIC: UN No. 0380

Articles which contain a pyrophoric substance (capable of spontaneous ignition when exposed to air) and an explosive substance or component. The term excludes articles containing white phosphorus.

ARTICLES, PYROTECHNIC, for technical purposes: UN Nos. 0428, 0429, 0430, 0431, 0432

Articles which contain pyrotechnic substances and are used for technical purposes such as heat generation, gas generation, theatrical effects, etc.

NOTE: The following articles: all ammunition; CARTRIDGES, SIGNAL; CUTTERS, CABLE, EXPLOSIVE; FIREWORKS; FLARES, AERIAL; FLARES, SURFACE; RELEASE DEVICES, EXPLOSIVE; RIVETS, EXPLOSIVE; SIGNAL DEVICES, HAND; SIGNALS, DISTRESS; SIGNALS, RAILWAY TRACK, EXPLOSIVES; SIGNALS, SMOKE are not included in this definition. They are listed separately.

BLACK POWDER (GUNPOWDER), COMPRESSED or BLACK POWDER (GUNPOWDER), IN PELLETS: UN No. 0028

Substance consisting of a pelletized form of black powder.

BLACK POWDER (GUNPOWDER), granular or as meal: UN No. 0027

Substance consisting of an intimate mixture of charcoal or other carbon and either potassium nitrate or sodium nitrate, with or without sulphur.

BOMBS, WITH FLAMMABLE LIQUID, with bursting charge: UN Nos. 0399, 0400

Articles which are dropped from aircraft, consisting of a tank filled with inflammable liquid and bursting charge.

BOMBS, PHOTO-FLASH: UN No. 0038

Explosive articles which are dropped from aircraft to provide brief, intense illumination for photography. They contain a charge of detonating explosive without means of initiation or with means of initiation containing two or more effective protective features.

BOMBS, PHOTO-FLASH: UN No. 0037

Explosive articles which are dropped from aircraft to provide brief, intense illumination for photography. They contain a charge of detonating explosive with means of initiation not containing two or more effective protective features.

BOMBS, PHOTO-FLASH: UN Nos. 0039, 0299

Explosive articles which are dropped from aircraft to provide brief, intense illumination for photography. They contain a photo-flash composition.

BOMBS with bursting charge: UN Nos. 0034; 0035

Explosive articles which are dropped from aircraft, without means of initiation or with means of initiation containing two or more effective protective features.

BOMBS with bursting charge: UN Nos. 0033, 0291

Explosive articles which are dropped from aircraft, with means of initiation not containing two or more effective protective features.

BOOSTERS WITH DETONATOR: UN Nos. 0225, 0268

Articles consisting of a charge of detonating explosive with means of initiation. They are used to increase the initiating power of detonators or detonating cord.

BOOSTERS without detonator: UN Nos. 0042, 0283

Articles consisting of a charge of detonating explosive without means of initiation. They are used to increase the initiating power of detonators or detonating cord.

BURSTERS, explosive: UN No. 0043

Articles consisting of a small charge of explosive used to open projectiles or other ammunition in order to disperse their contents.

CARTRIDGES, FLASH: UN Nos. 0049, 0050

Articles consisting of a casing, a primer and flash powder, all assembled in one piece ready for firing.

CARTRIDGES FOR TOOLS, BLANK: UN No. 0014

Article, used in tools, consisting of a closed cartridge case with a centre or rim fire primer with or without a charge of smokeless or black powder but with no projectile.

CARTRIDGES FOR WEAPONS, BLANK: UN Nos. 0326, 0413, 0327, 0338, 0014

Ammunition consisting of a closed cartridge case with a centre or rim fire primer and a charge of smokeless or black powder but no projectile. It produces a loud noise and is used for training, saluting, propelling charge, starter pistols, etc. The term includes ammunition, blank.

CARTRIDGES FOR WEAPONS, INERT PROJECTILE: UN Nos. 0328, 0417, 0339, 0012

Ammunition consisting of a projectile without bursting charge but with a propelling charge with or without a primer. The articles may include a tracer, provided that the predominant hazard is that of the propelling charge.

CARTRIDGES FOR WEAPONS with bursting charge: UN Nos. 0006, 0321, 0412

Ammunition consisting of a projectile with a bursting charge without means of initiation or with means of initiation containing two or more effective protective features; and a propelling charge with or without a primer. The term includes fixed (assembled) ammunition, semi-fixed (partially assembled) ammunition and separate loading ammunition when the components are packed together.

CARTRIDGES FOR WEAPONS with bursting charge: UN Nos. 0005, 0007, 0348

Ammunition consisting of a projectile with a bursting charge with means of initiation not containing two or more effective protective features; and a propelling charge with or without a primer. The term includes fixed (assembled) ammunition, semi-fixed (partially assembled) ammunition and separate loading ammunition when the components are packed together.

CARTRIDGES, OIL WELL: UN Nos. 0277, 0278

Articles consisting of a thin casing of fibreboard, metal or other material containing only propellant powder which projects a hardened projectile to perforate an oil well casing.

NOTE: CHARGES, SHAPED are not included in this definition. They are listed separately.

CARTRIDGES, POWER DEVICE: UN Nos. 0275, 0276, 0323, 0381

Articles designed to accomplish mechanical actions. They consist of a casing with a charge of deflagrating explosive and a means of ignition. The gaseous products of the deflagration produce inflation, linear or rotary motion or activate diaphragms, valves or switches or project fastening devices or extinguishing agents.

CARTRIDGES, SIGNAL: UN Nos. 0054, 0312, 0405

Articles designed to fire coloured flares or other signals from signal pistols, etc.

CARTRIDGES, SMALL ARMS: UN Nos. 0417, 0339, 0012

Ammunition consisting of a cartridge case fitted with a centre or rim fire primer and containing both a propelling charge and solid projectile. They are designed to be fired in weapons of calibre not larger than 19.1 mm. Shot-gun cartridges of any calibre are included in this description.

NOTE: CARTRIDGES, SMALL ARMS, BLANK, are not included in this definition. They are listed separately. Some military small arms cartridges are not included in this definition. They are listed under CARTRIDGES FOR WEAPONS, INERT PROJECTILE.

CARTRIDGES, SMALL ARMS, BLANK: UN Nos. 0014, 0327, 0338

Ammunition consisting of a closed cartridge case with a centre or rim fire primer and a charge of smokeless or black powder. The cartridge cases contain no projectiles. The cartridges are designed to be fired from weapons with a calibre of at most 19.1 mm and serve to produce a loud noise and are used for training, saluting, propelling charge, starter pistols, etc.

CASES, CARTRIDGE, EMPTY, WITH PRIMER: UN Nos. 0379; 0055

Articles consisting of a cartridge case made from metal, plastics or other non-inflammable material, in which the only explosive component is the primer.

CASES, COMBUSTIBLE, EMPTY, WITHOUT PRIMER: UN Nos. 0447, 0446

Articles consisting of a cartridge case made partly or entirely from nitrocellulose.

CHARGES, BURSTING, PLASTICS BONDED: UN Nos. 0457, 0458, 0459, 0460

Articles consisting of a charge of detonating explosive, plastics bonded, manufactured in a specific form without a casing and without means of initiation. They are designed as components of ammunition such as warheads.

CHARGES, DEMOLITION: UN No. 0048

Articles containing a charge of a detonating explosive in a casing of fibreboard, plastics, metal or other material. The articles are without means of initiation or with means of initiation containing two or more effective protective features.

NOTE: The following articles: BOMBS; MINES; PROJECTILES are not included in this definition. They are listed separately.

CHARGES, DEPTH: UN No. 0056

Articles consisting of a charge of detonating explosive contained in a drum or projectile without means of initiation or with means of initiation containing two or more effective protective features. They are designed to detonate under water.

CHARGES, EXPLOSIVE, COMMERCIAL without detonator: UN Nos. 0442, 0443, 0444, 0445

Articles consisting of a charge of detonating explosive without means of initiation, used for explosive welding, jointing, forming and other metallurgical processes.

CHARGES, PROPELLING, FOR CANNON: UN Nos. 0242, 0279, 0414

Charges of propellant in any physical form for separate-loading ammunition for cannon.

CHARGES, PROPELLING: UN Nos. 0271, 0272, 0415, 0491

Articles consisting of a charge of a propellant charge in any physical form, with or without a casing, as a component of rocket motors or for reducing the drag of projectiles.

CHARGES, SHAPED, without detonator: UN Nos. 0059, 0439, 0440, 0441

Articles consisting of a casing containing a charge of detonating explosive with a cavity lined with rigid material, without means of initiation. They are designed to produce a powerful, penetrating jet effect.

CHARGES, SHAPED, FLEXIBLE, LINEAR: UN Nos. 0237, 0288

Articles consisting of a V-shaped core of a detonating explosive clad by a flexible sheath.

CHARGES, SUPPLEMENTARY, EXPLOSIVE: UN No. 0060

Articles consisting of a small removable booster placed in the cavity of a projectile between the fuze and the bursting charge.

COMPONENTS, EXPLOSIVE TRAIN, N.O.S.: UN Nos. 0382, 0383, 0384, 0461

Articles containing an explosive designed to transmit detonation or deflagration within an explosive train.

CONTRIVANCES, WATER-ACTIVATED with burster, expelling charge or propelling charge: UN Nos. 0248, 0249

Articles whose functioning depends upon physico-chemical reaction of their contents with water.

CORD, DETONATING, flexible: UN Nos. 0065, 0289

Article consisting of a core of detonating explosive enclosed in spun fabric and a plastics or other covering. The covering is not necessary if the spun fabric is sift-proof.

CORD (FUSE) DETONATING, metal clad: UN Nos. 0102, 0290

Article consisting of a core of detonating explosive clad by a soft metal tube with or without protective covering.

CORD (FUSE) DETONATING, MILD EFFECT, metal clad: UN No. 0104

Article consisting of a core of detonating explosive clad by a soft metal tube with or without a protective covering. The quantity of explosive substance is so small that only a mild effect is manifested outside the cord.

CORD, IGNITER: UN No. 0066

Article consisting of textile yarns covered with black powder or another fast burning pyrotechnic composition and of a flexible protective covering; or it consists of a core of black powder surrounded by a flexible woven fabric. It burns progressively along its length with an external flame and is used to transmit ignition from a device to a charge or primer.

CUTTERS, CABLE, EXPLOSIVE: UN No. 0070

Articles consisting of a knife-edged device which is driven by a small charge of deflagrating explosive into an anvil.

DETONATOR ASSEMBLIES, NON-ELECTRIC for blasting: UN Nos. 0360, 0361, 0500

Non-electric detonators assembled with and activated by such means as safety fuse, shock tube, flash tube or detonating cord. They may be of instantaneous design or incorporate delay elements. Detonating relays incorporating detonating cord are included.

DETONATORS, ELECTRIC for blasting: UN Nos. 0030, 0255, 0456

Articles specially designed for the initiation of blasting explosives. These detonators may be constructed to detonate instantaneously or may contain a delay element. Electric detonators are activated by an electric current.

DETONATORS FOR AMMUNITION: UN Nos. 0073, 0364, 0365, 0366

Articles consisting of a small metal or plastics tube containing explosives such as lead azide, PETN or combinations of explosives. They are designed to start a detonation train.

DETONATORS, NON-ELECTRIC for blasting: UN Nos. 0029, 0267, 0455

Articles specially designed for the initiation of blasting explosives. These detonators may be constructed to detonate instantaneously or may contain a delay element. Non-electric detonators are activated by such means as shock tube, flash tube, safety fuse, other igniferous device or flexible detonating cord. Detonating relays without detonating cord are included.

EXPLOSIVE, BLASTING, TYPE A: UN No. 0081

Substances consisting of liquid organic nitrates such as nitroglycerine or a mixture of such ingredients with one or more of the following: nitrocellulose; ammonium nitrate or other inorganic nitrates; aromatic nitro-derivatives, or combustible materials, such as wood-meal and aluminium powder. They may contain inert components such as kieselguhr, and additives such as colouring agents and stabilizers. Such explosives shall be in powdery, gelatinous or elastic form. The term includes dynamite; gelatine, blasting and gelatine dynamites.

EXPLOSIVE, BLASTING, TYPE B: UN Nos. 0082, 0331

Substances consisting of

- (a) a mixture of ammonium nitrate or other inorganic nitrates with an explosive such as trinitrotoluene, with or without other substances such as wood-meal and aluminium powder; or
- (b) a mixture of ammonium nitrate or other inorganic nitrates with other combustible substances which are not explosive ingredients. In both cases they may contain inert components such as kieselguhr, and additives such as colouring agents and stabilizers. Such explosives must not contain nitroglycerine, similar liquid organic nitrates or chlorates.

EXPLOSIVE, BLASTING, TYPE C: UN No. 0083

Substances consisting of a mixture of either potassium or sodium chlorate or potassium, sodium or ammonium perchlorate with organic nitro-derivatives or combustible materials such as wood-meal or aluminium powder or a hydrocarbon. They may contain inert components such as kieselguhr and additives such as colouring agents and stabilizers. Such explosives must not contain nitroglycerine or similar liquid organic nitrates.

EXPLOSIVE, BLASTING, TYPE D: UN No. 0084

Substances consisting of a mixture of organic nitrated compounds and combustible materials such as hydrocarbons and aluminium powder. They may contain inert components such as kieselguhr and additives such as colouring agents and stabilizers. Such explosives must not contain nitroglycerine, similar liquid organic nitrates, chlorates and ammonium nitrate. The term generally includes plastic explosives.

EXPLOSIVES, BLASTING, TYPE E: UN Nos. 0241, 0332

Substances consisting of water as an essential ingredient and high proportions of ammonium nitrate or other oxidizers, some or all of which are in solution. The other constituents may include nitro-derivatives such as trinitrotoluene, hydrocarbons or aluminium powder. They may contain inert components such as kieselguhr and additives such as colouring agents and stabilizers. The term includes explosives, emulsion, explosives, slurry and explosives, wattergel.

FIREWORKS: UN Nos. 0333, 0334, 0335, 0336, 0337

Pyrotechnic articles designed for entertainment.

FLARES, AERIAL: UN Nos. 0093, 0403, 0404, 0420, 0421

Articles containing pyrotechnic substances which are designed to be dropped from an aircraft to illuminate, identify, signal or warn.

FLARES, SURFACE: UN Nos. 0092, 0418, 0419

Articles containing pyrotechnic substances which are designed for use on the surface to illuminate, identify, signal or warn.

FLASH POWDER: UN Nos. 0094, 0305

Pyrotechnic substance which, when ignited, produces an intense light.

FRACTURING DEVICES, EXPLOSIVE without detonator, for oil wells: UN No. 0099

Articles consisting of a charge of detonating explosive contained in a casing without means of initiation. They are used to fracture the rock around a drill shaft to assist the flow of crude oil from the rock.

FUSE, IGNITER, tubular, metal clad: UN No. 0103

Article consisting of a metal tube with a core of deflagrating explosive.

FUSE, NON-DETONATING: UN No. 0101

Article consisting of cotton yarns impregnated with fine black powder (quickmatch). It burns with an external flame and is used in ignition trains for fireworks, etc.

FUSE, SAFETY: UN No. 0105

Article consisting of a core of fine grained black powder surrounded by a flexible woven fabric with one or more protective outer coverings. When ignited, it burns at a predetermined rate without any external explosive effect.

FUZES, DETONATING: UN Nos. 0106, 0107, 0257, 0367

Articles with explosive components designed to produce a detonation in ammunition. They incorporate mechanical, electrical, chemical or hydrostatic components to initiate the detonation. They generally incorporate protective features.

FUZES, DETONATING with protective features: UN Nos. 0408, 0409, 0410

Articles with explosive components designed to produce a detonation in ammunition. They incorporate mechanical, electrical, chemical or hydrostatic components to initiate the detonation. The detonating fuze must incorporate two or more effective protective features.

FUZES, IGNITING: UN Nos. 0316, 0317, 0368

Articles with primary explosive components designed to produce a deflagration in ammunition. They incorporate mechanical, electrical, chemical or hydrostatic components to start the deflagration. They generally incorporate protective features.

GRENADES, hand or rifle, with bursting charge: UN Nos. 0284, 0285

Articles which are designed to be thrown by hand or to be projected by a rifle. They are without means of initiation or with means of initiation containing two or more effective protective features.

GRENADES, hand or rifle, with bursting charge: UN Nos. 0292, 0293

Articles which are designed to be thrown by hand or to be projected by a rifle. They are with means of initiation not containing two or more effective protective features.

GRENADES, PRACTICE, hand or rifle: UN Nos. 0110, 0372, 0318, 0452

Articles without a main bursting charge which are designed to be thrown by hand or to be projected by a rifle. They contain the priming device and may contain a spotting charge.

HEXOTONAL: UN No. 0393

Substance consisting of an intimate mixture of cyclotrimethylene-trinitramine (RDX), trinitrotoluene (TNT) and aluminium.

HEXOLITE (HEXOTOL), dry or wetted with less than 15% water, by mass: UN No. 0118

Substance consisting of an intimate mixture of cyclotrimethylene-trinitramine (RDX) and trinitrotoluene (TNT). The term includes "Composition B".

IGNITERS: UN Nos. 0121, 0314, 0315, 0325, 0454

Articles containing one or more explosive substances designed to produce a deflagration in an explosive train. They may be actuated chemically, electrically or mechanically.

NOTE: The following articles: CORD, IGNITER; FUSE, IGNITER; FUSE, NON-DETONATING; FUZES, IGNITING; LIGHTERS, FUSE; PRIMERS, CAP TYPE; PRIMERS, TUBULAR are not included in this definition. They are listed separately.

JET PERFORATING GUNS, CHARGED, oil well, without detonator: UN Nos. 0124, 0494

Articles consisting of a steel tube or metallic strip, into which are inserted shaped charges connected by detonating cord, without means of initiation.

LIGHTERS, FUSE: UN No. 0131

Articles of various design actuated by friction, percussion or electricity and used to ignite a safety fuse.

MINES with bursting charge: UN Nos. 0137, 0138

Articles consisting normally of metal or composition receptacles filled with a detonating explosive, without means of initiation or with means of initiation containing two or more effective protective features. They are designed to be operated by the passage of ships, vehicles or personnel. The term includes "Bangalore torpedoes".

MINES with bursting charge: UN Nos. 0136, 0294

Articles consisting normally of metal or composition receptacles filled with a detonating explosive, with means of initiation not containing two or more effective protective features. They are designed to be operated by the passage of ships, vehicles or personnel. The term includes "Bangalore torpedoes".

OCTOLITE (OCTOL), dry or wetted with less than 15% water, by mass: UN No. 0266

Substance consisting of an intimate mixture of cyclotetramethylene-tetranitramine (HMX) and trinitrotoluene (TNT).

OCTONAL: UN No. 0496

Substance consisting of an intimate mixture of cyclotetramethylenetetranitramine (HMX), trinitrotoluene (TNT) and aluminium.

PENTOLITE, dry or wetted with less than 15% water, by mass: UN No. 0151

Substance consisting of an intimate mixture of pentaerythrite tetranitrate (PETN) and trinitrotoluene (TNT).

POWDER CAKE (POWDER PASTE), WETTED with not less than 17% alcohol, by mass; POWDER CAKE (POWDER PASTE), WETTED with not less than 25% water, by mass: UN Nos. 0433, 0159

Substance consisting of nitrocellulose impregnated with not more than 60% of nitroglycerine or other liquid organic nitrates or a mixture of these.

POWDER, SMOKELESS: UN Nos. 0160, 0161, 0509

Substance based on nitrocellulose used as propellant. The term includes propellants with a single base (nitrocellulose (NC) alone), those with a double base (such as NC and nitroglycerine/(NG)) and those with a triple base (such as NC/NG/nitroguanidine).

NOTE: Cast, pressed or bag-charges of smokeless powder are listed under CHARGES, PROPELLING or CHARGES, PROPELLING, FOR CANON.

PRIMERS, CAP TYPE: UN Nos. 0044, 0377, 0378

Articles consisting of a metal or plastics cap containing a small amount of primary explosive mixture that is readily ignited by impact. They serve as igniting elements in small arms cartridges and in percussion primers for propelling charges.

PRIMERS, TUBULAR: UN Nos. 0319, 0320, 0376

Articles consisting of a primer for ignition and an auxiliary charge of deflagrating explosive such as black powder used to ignite the propelling charge in a cartridge case for cannon, etc.

PROJECTILES, inert with tracer: UN Nos. 0345, 0424, 0425

Articles such as a shell or bullet, which are projected from a cannon or other gun, rifle or other small arm.

PROJECTILES with burster or expelling charge: UN Nos. 0346, 0347

Articles such as a shell or bullet, which are projected from a cannon or other gun. They are without means of initiation or with means of initiation containing two or more effective protective features. They are used to scatter dyes for spotting or other inert materials.

PROJECTILES with burster or expelling charge: UN Nos. 0426, 0427

Articles such as a shell or bullet, which are projected from a cannon or other gun. They are with means of initiation not containing two or more effective protective features. They are used to scatter dyes for spotting or other inert materials.

PROJECTILES with burster or expelling charge: UN Nos. 0434, 0435

Articles such as a shell or bullet, which are projected from a cannon or other gun, rifle or other small arm. They are used to scatter dyes for spotting or other inert materials.

PROJECTILES with bursting charge: UN Nos. 0168, 0169, 0344

Articles such as a shell or bullet, which are projected from a cannon or other gun. They are without means of initiation or with means of initiation containing two or more effective protective features.

PROJECTILES with bursting charge: UN Nos. 0167, 0324

Articles such as a shell or bullet, which are projected from a cannon or other gun. They are with means of initiation not containing two or more effective protective features.

PROPELLANT, LIQUID: UN Nos. 0495, 0497

Substance consisting of a deflagrating liquid explosive, used for propulsion.

PROPELLANT, SOLID: UN Nos. 0498, 0499, 0501

Substance consisting of a deflagrating solid explosive, used for propulsion.

RELEASE DEVICES, EXPLOSIVE: UN No. 0173

Articles consisting of a small charge of explosive with means of initiation and rods or links. They sever the rods or links to release equipment quickly.

RIVETS, EXPLOSIVE: UN No. 0174

Articles consisting of a small charge of explosive inside a metallic rivet.

ROCKET MOTORS: UN Nos. 0186, 0280, 0281, 0510

Articles consisting of a charge of explosive, generally a solid propellant, contained in a cylinder fitted with one or more nozzles. They are designed to propel a rocket or a guided missile.

ROCKET MOTORS, LIQUID FUELLED: UN Nos. 0395, 0396

Articles consisting of a liquid fuel within a cylinder fitted with one or more nozzles. They are designed to propel a rocket or a guided missile.

ROCKET MOTORS WITH HYPERGOLIC LIQUIDS with or without expelling charge: UN Nos. 0322, 0250

Articles consisting of a hypergolic fuel contained in a cylinder fitted with one or more nozzles. They are designed to propel a rocket or a guided missile.

ROCKETS, LINE THROWING: UN Nos. 0238, 0240, 0453

Articles consisting of a rocket motor which is designed to extend a line.

ROCKETS, LIQUID FUELLED with bursting charge: UN Nos. 0397, 0398

Articles consisting of a liquid fuel within a cylinder fitted with one or more nozzles and fitted with a warhead. The term includes guided missiles.

ROCKETS with bursting charge: UN Nos. 0181, 0182

Articles consisting of a rocket motor and a warhead without means of initiation or with means of initiation containing two or more effective protective features. The term includes guided missiles.

ROCKETS with bursting charge: UN Nos. 0180, 0295

Articles consisting of a rocket motor and a warhead with means of initiation not containing two or more effective protective features. The term includes guided missiles.

ROCKETS with expelling charge: UN Nos. 0436, 0437, 0438

Articles consisting of a rocket motor and a charge to expel the payload from a rocket head. The term includes guided missiles.

ROCKETS with inert head: UN Nos. 0183, 0502

Articles consisting of a rocket motor and an inert head. The term includes guided missiles.

SAFETY DEVICES, PYROTECHNIC: UN No. 0503

Articles which contain pyrotechnic substances or dangerous goods of other classes and are used in vehicles, vessels or aircraft to enhance safety to persons. Examples are: air bag inflators, air bag

modules, seat-belt pretensioners and pyromechanical devices. These pyromechanical devices are assembled components for tasks such as but not limited to separation, locking, or occupant restraint.

SAMPLES, EXPLOSIVE, other than initiating explosive UN No. 0190

New or existing explosive substances or articles, not yet assigned to a name in Table A of Chapter 3.2 and carried in conformity with the instructions of the competent authority and generally in small quantities, *inter alia*, for the purposes of testing, classification, research and development, or quality control, or as commercial samples.

NOTE: Explosive substances or articles already assigned to another name in Table A of Chapter 3.2 are not included in this definition.

SIGNAL DEVICES, HAND: UN Nos. 0191, 0373

Portable articles containing pyrotechnic substances which produce visual signals or warnings. The term includes small surface flares such as highway or railway flares and small distress flares.

SIGNALS, DISTRESS, ship: UN Nos. 0194, 0195, 0505, 0506

Articles containing pyrotechnic substances designed to produce signals by means of sound, flame or smoke or any combination thereof.

SIGNALS, RAILWAY TRACK, EXPLOSIVE: UN Nos. 0192, 0193, 0492, 0493

Articles containing a pyrotechnic substance which explodes with a loud report when the article is crushed. They are designed to be placed on a rail.

SIGNALS, SMOKE: UN Nos. 0196, 0197, 0313, 0487, 0507

Articles containing pyrotechnic substances which emit smoke. In addition they may contain devices for emitting audible signals.

SOUNDING DEVICES, EXPLOSIVE: UN Nos. 0374, 0375

Articles consisting of a charge of detonating explosive, without means of initiation or with means of initiation containing two or more effective protective features. They are dropped from ships and function when they reach a predetermined depth or the sea bed.

SOUNDING DEVICES, EXPLOSIVE: UN Nos. 0204, 0296

Articles consisting of a charge of detonating explosive with means of initiation not containing two or more effective protective features. They are dropped from ships and function when they reach a predetermined depth or the sea bed.

SUBSTANCES, EXPLOSIVE, VERY INSENSITIVE (Substances, EVI), N.O.S.: UN No. 0482

Substances presenting a mass explosion hazard but which are so insensitive that there is very little probability of initiation or of transition from burning to detonation under normal conditions of transport, and which have passed Test Series 5.

TORPEDOES, LIQUID FUELLED with inert head: UN No. 0450

Articles consisting of a liquid explosive system to propel the torpedo through the water, with an inert head.

TORPEDOES, LIQUID FUELLED with or without bursting charge: UN No. 0449

Articles consisting of either a liquid explosive system to propel the torpedo through the water, with or without a warhead; or a liquid non-explosive system to propel the torpedo through the water, with a warhead.

TORPEDOES with bursting charge: UN No. 0451

Articles consisting of a non-explosive system to propel the torpedo through the water, and a warhead without means of initiation or with means of initiation containing two or more effective protective features.

TORPEDOES with bursting charge: UN No. 0329

Articles consisting of an explosive system to propel the torpedo through the water, and a warhead without means of initiation or with means of initiation containing two or more effective protective features.

TORPEDOES with bursting charge: UN No. 0330

Articles consisting of an explosive or non-explosive system to propel the torpedo through the water, and a warhead with means of initiation not containing two or more effective protective features.

TRACERS FOR AMMUNITION: UN Nos. 0212, 0306

Sealed articles containing pyrotechnic substances, designed to reveal the trajectory of a projectile.

TRITONAL: UN No. 0390

Substance consisting of trinitrotoluene (TNT) mixed with aluminium.

WARHEADS, ROCKET with burster or expelling charge: UN No. 0370

Articles consisting of an inert payload and a small charge of detonating or deflagrating explosive, without means of initiation or with means of initiation containing two or more effective protective features. They are designed to be fitted to a rocket motor to scatter inert material. The term includes warheads for guided missiles.

WARHEADS, ROCKET with burster or expelling charge: UN No. 0371

Articles consisting of an inert payload and a small charge of detonating or deflagrating explosive, with means of initiation not containing two or more effective protective features. They are designed to be fitted to a rocket motor to scatter inert material. The term includes warheads for guided missiles.

WARHEADS, ROCKET with bursting charge: UN Nos. 0286, 0287

Articles consisting of a detonating explosive, without means of initiation or with means of initiation containing two or more effective protective features. They are designed to be fitted to a rocket. The term includes warheads for guided missiles.

WARHEADS, ROCKET with bursting charge: UN No. 0369

Articles consisting of a detonating explosive, with means of initiation not containing two or more effective protective features. They are designed to be fitted to a rocket. The term includes warheads for guided missiles.

WARHEADS, TORPEDO with bursting charge: UN No. 0221

Articles consisting of a detonating explosive, without means of initiation or with means of initiation containing two or more effective protective features. They are designed to be fitted to a torpedo.

2.2.2 Class 2 Gases

2.2.2.1 Criteria

2.2.2.1.1 The heading of Class 2 covers pure gases, mixtures of gases, mixtures of one or more gases with one or more other substances and articles containing such substances.

A gas is a substance which:

- (a) at 50 °C has a vapour pressure greater than 300 kPa (3 bar); or
- (b) is completely gaseous at 20 °C at the standard pressure of 101.3 kPa.

NOTE 1: UN No. 1052 HYDROGEN FLUORIDE, ANHYDROUS is nevertheless classified in Class 8.

NOTE 2: A pure gas may contain other components deriving from its production process or added to preserve the stability of the product, provided that the level of these components does not change its classification or its conditions of carriage, such as filling ratio, filling pressure, test pressure.

NOTE 3: N.O.S. entries in 2.2.2.3 may cover pure gases as well as mixtures.

2.2.2.1.2 The substances and articles of Class 2 are subdivided as follows:

1. *Compressed gas:* a gas which when packaged under pressure for carriage is entirely gaseous at -50 °C; this category includes all gases with a critical temperature less than or equal to -50 °C;
2. *Liquefied gas:* a gas which when packaged under pressure for carriage is partially liquid at temperatures above -50 °C. A distinction is made between:
 - High pressure liquefied gas:* a gas with a critical temperature above -50 °C and equal to or below +65 °C; and
 - Low pressure liquefied gas:* a gas with a critical temperature above +65 °C;
3. *Refrigerated liquefied gas:* a gas which when packaged for carriage is made partially liquid because of its low temperature;
4. *Dissolved gas:* a gas which when packaged under pressure for carriage is dissolved in a liquid phase solvent;
5. Aerosol dispensers and receptacles, small, containing gas (gas cartridges);
6. Other articles containing gas under pressure;
7. Non-pressurized gases subject to special requirements (gas samples);
8. Chemicals under pressure: liquids, pastes or powders, pressurized with a propellant that meets the definition of a compressed or liquefied gas and mixtures thereof.
9. *Adsorbed gas:* a gas which when packaged for carriage 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.

2.2.2.1.3 Substances and articles (except aerosols and chemicals under pressure) of Class 2 are assigned to one of the following groups according to their hazardous properties, as follows:

- A asphyxiant;
- O oxidizing;
- F flammable;
- T toxic;
- TF toxic, flammable;

TC toxic, corrosive;

TO toxic, oxidizing;

~~TO toxic, oxidizing;~~

TFC toxic, flammable, corrosive;

TOC toxic, oxidizing, corrosive.

For gases and gas mixtures presenting hazardous properties associated with more than one group according to the criteria, the groups designated by letter T take precedence over all other groups. The groups designated by letter F take precedence over the groups designated by letters A or O.

NOTE 1: In the UN Model Regulations, the IMDG Code and the ICAO Technical Instructions, gases are assigned to one of the following three divisions, based on the primary hazard:

Division 2.1: flammable gases (corresponding to the groups designated by the capital letter F);

Division 2.2: non-flammable, non-toxic gases (corresponding to the groups designated by the capital letters A or O);

Division 2.3: toxic gases (corresponding to the groups designated by the capital letter T i.e. T, TF, TC, TO, TFC and TOC).

NOTE 2: Receptacles, small containing gas (UN No. 2037) shall be assigned to the groups A to TOC according to the hazard of the contents. For aerosols (UN No. 1950), see 2.2.2.1.6. For chemicals under pressure (UN Nos. 3500 to 3505), see 2.2.2.1.7.

NOTE 3: Corrosive gases are considered to be toxic, and are therefore assigned to the group TC, TFC or TOC.

2.2.2.1.4 If a mixture of Class 2 mentioned by name in Table A of Chapter 3.2 meets different criteria as mentioned in 2.2.2.1.2 and 2.2.2.1.5, this mixture shall be classified according to the criteria and assigned to an appropriate N.O.S. entry.

2.2.2.1.5 Substances and articles (except aerosols and chemicals under pressure) of Class 2 which are not mentioned by name in Table A of Chapter 3.2 shall be classified under a collective entry listed in 2.2.2.3 in accordance with 2.2.2.1.2 and 2.2.2.1.3. The following criteria shall apply:

Asphyxiant gases

Gases which are non-oxidizing, non-flammable and non-toxic and which dilute or replace oxygen normally in the atmosphere.

Flammable gases

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

- (a) are ignitable when in a mixture of 13% or less by volume with air; or
- (b) have a flammable range with air of at least 12 percentage points regardless of the lower flammable limit.

Flammability shall be determined by tests or by calculation, in accordance with methods adopted by ISO (see ISO 10156:2010).

Where insufficient data are available to use these methods, tests by a comparable method recognized by the competent authority of the country of origin may be used.

If the country of origin is not a Contracting Party to ADR these methods shall be recognized by the competent authority of the first country Contracting Party to ADR reached by the consignment.

Oxidizing gases

Gases, which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does. These are pure gases or gas mixtures with an oxidizing power greater than 23.5% as determined by a method specified in ISO 10156:2010.

Toxic gases

NOTE: Gases meeting the criteria for toxicity in part or completely owing to their corrosivity are to be classified as toxic. See also the criteria under the heading "Corrosive gases" for a possible subsidiary corrosivity **riskhazard**.

Gases which:

- (a) are known to be so toxic or corrosive to humans as to pose a hazard to health; or
- (b) are presumed to be toxic or corrosive to humans because they have a LC₅₀ value for acute toxicity equal to or less than 5 000 ml/m³ (ppm) when tested in accordance with 2.2.61.1.

In the case of gas mixtures (including vapours of substances from other classes) the following formula may be used:

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

where f_i = mole fraction of the i^{th} component substance of the mixture;
 T_i = toxicity index of the i^{th} component substance of the mixture.

The T_i equals the LC₅₀ value as found in packing instruction P200 of 4.1.4.1.

When no LC₅₀ value is listed in packing instruction P200 of 4.1.4.1, a LC₅₀ value available in scientific literature shall be used.

When the LC₅₀ value is unknown, the toxicity index is determined by using the lowest LC₅₀ value of substances of similar physiological and chemical effects, or through testing if this is the only practical possibility.

Corrosive gases

Gases or gas mixtures meeting the criteria for toxicity completely owing to their corrosivity are to be classified as toxic with a subsidiary corrosivity **riskhazard**.

A gas mixture that is considered to be toxic due to the combined effects of corrosivity and toxicity has a subsidiary **riskhazard** of corrosivity when the mixture is known by human experience to be destructive to the skin, eyes or mucous membranes or when the LC₅₀ value of the corrosive components of the mixture is equal to or less than 5 000 ml/m³ (ppm) when the LC₅₀ 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;
 T_{ci} = toxicity index of the i^{th} corrosive component substance of the mixture.

The T_{ci} equals the LC₅₀ value as found in packing instruction P200 of 4.1.4.1.

When no LC₅₀ value is listed in packing instruction P200 of 4.1.4.1, a LC₅₀ value available in scientific literature shall be used.

When the LC₅₀ value is unknown the toxicity index is determined by using the lowest LC₅₀ value of substances of similar physiological and chemical effects, or through testing if this is the only practical possibility.

2.2.2.1.6 Aerosols

Aerosols (UN No. 1950) are assigned to one of the following groups according to their hazardous properties, as follows:

A	asphyxiant;
O	oxidizing;
F	flammable;
T	toxic;
C	corrosive;
CO	corrosive, oxidizing;
FC	flammable, corrosive;
TF	toxic, flammable;
TC	toxic, corrosive;
TO	toxic, oxidizing;
TFC	toxic, flammable, corrosive;
TOC	toxic, oxidizing, corrosive.

The classification depends on the nature of the contents of the aerosol dispenser.

NOTE: Gases, which meet the definition of toxic gases according to 2.2.2.1.5 and gases identified as "Considered as pyrophoric" by table note c of Table 2 of packing instruction P200 in 4.1.4.1, shall not be used as a propellant in an aerosol dispenser. Aerosols with contents meeting the criteria for packing group I for toxicity or corrosivity shall not be accepted for carriage (see also 2.2.2.2.2).

The following criteria shall apply:

- Assignment to group A shall apply when the contents do not meet the criteria for any other group according to sub-paragraphs (b) to (f) below;
- Assignment to group O shall apply when the aerosol contains an oxidizing gas according to 2.2.2.1.5;
- Assignment to group F shall apply if the contents include 85% by mass or more flammable components and the chemical heat of combustion is 30 kJ/g or more.

It shall not apply if the contents contain 1% by mass or less flammable components and the heat of combustion is less than 20 kJ/g.

Otherwise the aerosol shall be tested for flammability in accordance with the tests described in the *Manual of Tests and Criteria*, Part III, section 31. Extremely flammable and flammable aerosols shall be assigned to group F;

NOTE: Flammable components are flammable liquids, flammable solids or flammable gases and gas mixtures as defined in Notes 1 to 3 of sub-section 31.1.3 of Part III of the *Manual of Tests and Criteria*. This designation does not cover pyrophoric, self-heating or water-reactive substances. The chemical heat of combustion shall be determined by one of the following methods: ASTM D 240, ISO/FDIS 13943:1999 (E/F) 86.1 to 86.3 or NFPA 30B.

- (d) Assignment to group T shall apply when the contents, other than the propellant of aerosol dispensers to be ejected, are classified as Class 6.1, packing groups II or III;
- (e) Assignment to group C shall apply when the contents, other than the propellant of aerosol dispensers to be ejected, meet the criteria for Class 8, packing groups II or III;
- (f) When the criteria for more than one group amongst groups O, F, T, and C are met, assignment to groups CO, FC, TF, TC TO, TFC or TOC shall apply, as relevant.

2.2.2.1.7

Chemicals under pressure

Chemicals under pressure (UN Nos. 3500 to 3505) are assigned to one of the following groups according to their hazardous properties, as follows:

A	asphyxiant;
F	flammable;
T	toxic;
C	corrosive;
FC	flammable, corrosive;
TF	toxic, flammable.

The classification depends on the hazard characteristics of the components in the different states:

The propellant;

The liquid; or

The solid.

NOTE 1: Gases, which meet the definition of toxic gases or of oxidizing gases according to 2.2.2.1.5 or gases identified as "Considered as pyrophoric" by table note c of Table 2 of packing instruction P200 in 4.1.4.1, shall not be used as a propellant in chemicals under pressure.

NOTE 2: Chemicals under pressure with contents meeting the criteria for packing group I for toxicity or corrosivity or with contents meeting both the criteria for packing group II or III for toxicity and for packing group II or III for corrosivity shall not be accepted for carriage under these UN numbers.

NOTE 3: Chemicals under pressure with components meeting the properties of Class 1; liquid desensitized explosives of Class 3; self-reactive substances and solid desensitized explosives of Class 4.1; Class 4.2; Class 4.3; Class 5.1; Class 5.2; Class 6.2; or Class 7, shall not be used for carriage under these UN numbers.

NOTE 4: A chemical under pressure in an aerosol dispenser shall be carried under UN No. 1950.

The following criteria shall apply:

- (a) Assignment to group A shall apply when the contents do not meet the criteria for any other group according to sub-paragraphs (b) to (e) below;

- (b) Assignment to group F shall apply if one of the components, which can be a pure substance or a mixture, needs to be classified as flammable. Flammable components are flammable liquids and liquid mixtures, flammable solids and solid mixtures or flammable gases and gas mixtures meeting the following criteria:
- (i) A flammable liquid is a liquid having a flashpoint of not more than 93 °C;
 - (ii) A flammable solid is a solid which meets the criteria in 2.2.41.1;
 - (iii) A flammable gas is a gas which meets the criteria in 2.2.2.1.5;
- (c) Assignment to group T shall apply when the contents, other than the propellant, are classified as dangerous goods of Class 6.1, packing groups II or III;
- (d) Assignment to group C shall apply when the contents, other than the propellant, are classified as dangerous goods of Class 8, packing groups II or III;
- (e) When the criteria for two groups amongst groups F, T, and C are met, assignment to groups FC or TF shall apply, as relevant.

2.2.2.2 Gases not accepted for carriage

2.2.2.2.1 Chemically unstable gases of Class 2 shall not be accepted for carriage unless the necessary precautions have been taken to prevent the possibility of a dangerous decomposition or polymerization under normal conditions of carriage or unless carried in accordance with special packing provision (r) of packing instruction P200 (10) of 4.1.4.1, as applicable. For the precautions necessary to prevent polymerization, see special provision 386 of Chapter 3.3. To this end particular care shall be taken to ensure that receptacles and tanks do not contain any substances liable to promote these reactions.

2.2.2.2.2 The following substances and mixtures shall not be accepted for carriage:

- UN No. 2186 HYDROGEN CHLORIDE, REFRIGERATED LIQUID;
- UN No. 2421 NITROGEN TRIOXIDE;
- UN No. 2455 METHYL NITRITE;
- Refrigerated liquefied gases which cannot be assigned to classification codes 3A, 3O or 3F;
- Dissolved gases which cannot be classified under UN Nos. 1001, 2073 or 3318;
- Aerosols where gases which are toxic according to 2.2.2.1.5 or pyrophoric according to packing instruction P200 in 4.1.4.1 are used as propellants;
- Aerosols with contents meeting the criteria for packing group I for toxicity or corrosivity (see 2.2.61 and 2.2.8);
- Receptacles, small, containing gases which are very toxic (LC₅₀ lower than 200 ppm) or pyrophoric according to packing instruction P200 in 4.1.4.1.

2.2.2.3 List of collective entries

Compressed gases		
Classification code	UN No.	UN — Name of the substance or article
1A	1956	1956 COMPRESSED GAS, N.O.S.
1O	3156	3156 COMPRESSED GAS, OXIDIZING, N.O.S.
1F	1964	1964 HYDROCARBON GAS MIXTURE, COMPRESSED, N.O.S. 1954 COMPRESSED GAS, FLAMMABLE, N.O.S.
	1954	COMPRESSED GAS, FLAMMABLE, N.O.S.
1T	1955	1955 COMPRESSED GAS, TOXIC, N.O.S.
1TF	1953	1953 COMPRESSED GAS, TOXIC, FLAMMABLE, N.O.S.
1TC	3304	3304 COMPRESSED GAS, TOXIC, CORROSIVE, N.O.S.
1TO	3303	3303 COMPRESSED GAS, TOXIC, OXIDIZING, N.O.S.
1TFC	3305	3305 COMPRESSED GAS, TOXIC, FLAMMABLE, CORROSIVE, N.O.S.
1TOC	3306	3306 COMPRESSED GAS, TOXIC, OXIDIZING, CORROSIVE, N.O.S.

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Liquefied gases

Liquefied gases		
Classification code	UN No.	Name of the substance or article
2A	1058	LIQUEFIED GASES, non-flammable, charged with nitrogen, carbon dioxide or air
	1078	REFRIGERANT GAS, N.O.S. such as mixtures of gases, indicated by the letter R..., which as: Mixture F1, have a vapour pressure at 70 °C not exceeding 1.3 MPa (13 bar) and a density at 50 °C not lower than that of dichlorodifluoromethane (1.30 kg/l); density at 50 °C not lower than that of dichlorodifluoromethane (1.30 kg/l); Mixture F2, have a vapour pressure at 70 °C not exceeding 1.9 MPa (19 bar) and a density at 50 °C not lower than that of dichlorodifluoromethane (1.21 kg/l); density at 50 °C not lower than that of dichlorodifluoromethane (1.21 kg/l); Mixture F3, have a vapour pressure at 70 °C not exceeding 3 MPa (30 bar) and a density at 50 °C not lower than that of chlorodifluoromethane (1.09 kg/l); at 50 °C not lower than that of chlorodifluoromethane (1.09 kg/l); <i>NOTE: Trichlorofluoromethane (Refrigerant R 11), 1,1,2-trichloro-1,2,2-trifluoroethane (Refrigerant R 113), 1,1,1-trichloro-2,2,2-trifluoroethane (Refrigerant R 113a), 1-chloro-1,2,2-trifluoroethane (Refrigerant R 133) and 1-chloro-1,1,2-trifluoroethane (Refrigerant R 133b) are not substances of Class 2. They may, however, enter into the composition of mixtures F1 to F3.</i> <i>NOTE: Trichlorofluoromethane (Refrigerant R 11), 1,1,2-trichloro-1,2,2-trifluoroethane (Refrigerant R 113), 1-chloro-1,2,2-trifluoroethane (Refrigerant R 133) and 1-chloro-1,1,2-trifluoroethane (Refrigerant R 133b) are not substances of Class 2. They may, however, enter into the composition of mixtures F1 to F3.</i>
	1968	INSECTICIDE GAS, N.O.S.
	3163	LIQUEFIED GAS, N.O.S.
2O	3157	LIQUEFIED GAS, OXIDIZING, N.O.S.
2F	1010	BUTADIENES AND HYDROCARBON MIXTURE, STABILIZED, having a vapour pressure at 70 °C not exceeding 1.1 MPa (11 bar) and a density at 50 °C not lower than 0.525 kg/l. <i>NOTE: Butadienes, stabilized are also classified under UN No. 1010, see Table A of Chapter 3.2.</i>
	1060	METHYLACETYLENE AND PROPADIENE MIXTURE, STABILIZED such as mixtures of methylacetylene and propadiene with hydrocarbons, which as:

Merged Cells

Merged Cells

Merged Cells

Merged Cells

Merged Cells

Mixture P1, contain not more than 63% methylacetylene and propadiene by volume and not more than 24% propane and propylene by volume, the percentage of C₄- saturated hydrocarbons being not less than 14% by volume; and as

Mixture P2, contain not more than 48% methylacetylene and propadiene by volume and not more than 50% propane and propylene by volume, the percentage of C₄- saturated hydrocarbons being not less than 5% by volume,
as well as mixtures of propadiene with 1 to 4% methylacetylene.

Liquefied gases (cont'd)		(cont'd)	Deleted Cells
Classification code	UN No.	Name of the substance or article	
	2F	1965	Merged Cells such as mixtures, which as: such as mixtures, which as:
(cont'd)			Merged Cells density at 50 °C not lower than 0.525 kg/l; Mixture A01, have a vapour pressure at 70 °C not exceeding 200 kPa; relative density at 50 °C not lower than 0.516 kg/l; Mixture A02, have a vapour pressure at 70 °C not exceeding 200 kPa; relative density at 50 °C not lower than 0.505 kg/l; Mixture A0, have a vapour pressure at 70 °C not exceeding 200 kPa; density at 50 °C not lower than 0.495 kg/l; Mixture A1, have a vapour pressure at 70 °C not exceeding 200 kPa; density at 50 °C not lower than 0.485 kg/l; Mixture B1 have a vapour pressure at 70 °C not exceeding 200 kPa; relative density at 50 °C not lower than 0.474 kg/l; Mixture B2 have a vapour pressure at 70 °C not exceeding 200 kPa; relative density at 50 °C not lower than 0.463 kg/l; Mixture B, have a vapour pressure at 70 °C not exceeding 200 kPa; density at 50 °C not lower than 0.450 kg/l; Mixture C, have a vapour pressure at 70 °C not exceeding 200 kPa; relative density at 50 °C not lower than 0.440 kg/l; NOTE 1: In the case of the foregoing mixtures, the use of the term "MIXTURE" in the trade is permitted for describing these substances: for mixture A: PROPANE; for mixture B: BUTANE; for mixture C: PROPANE. NOTE 2: UN No. 1075 PETROLEUM GASES, LIQUEFIED, N.O.S. is an alternative entry for UN No. 1965 HYDROCARBON GASES, LIQUEFIED, N.O.S. for carriage prior to or following maritime or air carriage.
		3354	INSECTICIDE GAS, FLAMMABLE, N.O.S.
	2T	3161	LIQUEFIED GAS, FLAMMABLE, N.O.S.
		1967	INSECTICIDE GAS, TOXIC, N.O.S.
		3162	LIQUEFIED GAS, TOXIC, N.O.S.
	2TF	3355	INSECTICIDE GAS, TOXIC, FLAMMABLE, N.O.S.
		3160	LIQUEFIED GAS, TOXIC, FLAMMABLE, N.O.S.
2TC		3308	LIQUEFIED GAS, TOXIC, CORROSIVE, N.O.S.
2TO		3307	LIQUEFIED GAS, TOXIC, OXIDIZING, N.O.S.
2TFC		3309	LIQUEFIED GAS, TOXIC, FLAMMABLE, CORROSIVE, N.O.S.
2TOC		3310	LIQUEFIED GAS, TOXIC, OXIDIZING, CORROSIVE, N.O.S.

Refrigerated liquefied gases		
Classification code	UN No.	Name of the substance or article
3A	3158	GAS, REFRIGERATED LIQUID, N.O.S.
3O	3311	GAS, REFRIGERATED LIQUID, OXIDIZING, N.O.S.
3F	3312	GAS, REFRIGERATED LIQUID, FLAMMABLE, N.O.S.

Dissolved gases		
Classification code	UN No.	Inserted Cells
4		Only substances listed in Table A of Chapter 3.2 are to be a

Aerosols and receptacles, small, containing gas		
Classification code	UN No.	UN — Name of the substance or article No.
<u>5</u>	1950	AEROSOLS
<u>5</u>	2037	1950 AEROSOLS 2037 RECEPTACLES, SMALL CONTAINING GAS (GAS CARTRIDGES) without a release device, non-refillable

Inserted Cells

Merged Cells

Inserted Cells

Other articles containing gas under pressure		
Classification code	UN No.	UN — Name of the substance or article
<u>6A</u>	2857	2857 REFRIGERATING MACHINES containing non-flammable, non-toxic gases or ammonia solutions (UN 2672) 3164 ARTICLES, PRESSURIZED, PNEUMATIC (containing non-flammable gas) or 3164 ARTICLES, PRESSURIZED, HYDRAULIC (containing non-flammable gas)
	3164	ARTICLES, PRESSURIZED, PNEUMATIC (containing non-flammable gas) or
	3164	ARTICLES, PRESSURIZED, HYDRAULIC (containing non-flammable gas)
	3538	ARTICLES CONTAINING NON-FLAMMABLE, NON TOXIC GAS, N.O.S.
<u>6F</u>	3150	DEVICES, SMALL, HYDROCARBON GAS POWERED or
	3150	HYDROCARBON GAS REFILLS FOR SMALL DEVICES, with release device
	3478	FUEL CELL CARTRIDGES, containing liquefied flammable gas or
	3478	FUEL CELL CARTRIDGES CONTAINED IN EQUIPMENT, containing liquefied flammable gas or
	3478	FUEL CELL CARTRIDGES PACKED WITH EQUIPMENT, containing liquefied flammable gas
	3479	FUEL CELL CARTRIDGES, containing hydrogen in metal hydride or
<u>6F</u>	3479	3150 DEVICES, SMALL, HYDROCARBON GAS POWERED or 3150 HYDROCARBON GAS REFILLS FOR SMALL DEVICES, with release device 3478 FUEL CELL CARTRIDGES, containing liquefied flammable gas or 3478 FUEL CELL CARTRIDGES CONTAINED IN EQUIPMENT, containing liquefied flammable gas or 3478 FUEL CELL CARTRIDGES PACKED WITH EQUIPMENT, containing liquefied flammable gas 3479 FUEL CELL CARTRIDGES, containing hydrogen in metal hydride or 3479 FUEL CELL CARTRIDGES CONTAINED IN EQUIPMENT, containing hydrogen in metal hydride or 3479 FUEL CELL CARTRIDGES PACKED WITH EQUIPMENT, containing hydrogen in metal hydride 3529 ENGINE, INTERNAL COMBUSTION, FLAMMABLE GAS POWERED or 3529 ENGINE, FUEL CELL, FLAMMABLE GAS POWERED or 3529 MACHINERY, INTERNAL COMBUSTION, FLAMMABLE GAS POWERED or 3529 MACHINERY, FUEL CELL, FLAMMABLE GAS POWERED
	3479	FUEL CELL CARTRIDGES PACKED WITH EQUIPMENT, containing hydrogen in metal hydride
	3529	ENGINE, INTERNAL COMBUSTION, FLAMMABLE GAS POWERED or
	3529	ENGINE, FUEL CELL, FLAMMABLE GAS POWERED or
	3529	MACHINERY, INTERNAL COMBUSTION, FLAMMABLE GAS POWERED or
	3529	MACHINERY, FUEL CELL, FLAMMABLE GAS POWERED
	3537	ARTICLES CONTAINING FLAMMABLE GAS, N.O.S.
<u>6T</u>	3539	ARTICLES CONTAINING TOXIC GAS, N.O.S.

Inserted Cells

Merged Cells

Merged Cells

Inserted Cells

Gas samples		
Classification code	UN No.	Name of the substance or article
<u>7F</u>	3167	GAS SAMPLE, NON-PRESSURIZED, FLAMMABLE, N.O.S., not refrigerated liquid

7T	3169	GAS SAMPLE, NON-PRESSURIZED, TOXIC, N.O.S., not refrigerated liquid
7TF	3168	GAS SAMPLE, NON-PRESSURIZED, TOXIC, FLAMMABLE, N.O.S., not refrigerated liquid

Chemicals under pressure		
Classification code	<u>UN No.</u>	UN No. Name of the substance or article
8A	<u>3500</u>	3500 CHEMICAL UNDER PRESSURE, N.O.S.
8F	<u>3501</u>	3501 CHEMICAL UNDER PRESSURE, FLAMMABLE, N.O.S.
8T	<u>3502</u>	3502 CHEMICAL UNDER PRESSURE, TOXIC, N.O.S.
8C	<u>3503</u>	3503 CHEMICAL UNDER PRESSURE, CORROSIVE, N.O.S.
8TF	<u>3504</u>	3504 CHEMICAL UNDER PRESSURE, FLAMMABLE, TOXIC, N.O.S.
8FC	<u>3505</u>	3505 CHEMICAL UNDER PRESSURE, FLAMMABLE, CORROSIVE, N.O.S.

Inserted Cells

Adsorbed gases		
Classification code	<u>UN No.</u>	UN No. Name of the substance or article
9A	<u>3511</u>	3511 ADSORBED GAS, N.O.S.
9O	<u>3513</u>	3513 ADSORBED GAS, OXIDIZING, N.O.S.
9F	<u>3510</u>	3510 ADSORBED GAS, FLAMMABLE, N.O.S.
9T	<u>3512</u>	3512 ADSORBED GAS, TOXIC, N.O.S.
9TF	<u>3514</u>	3514 ADSORBED GAS, TOXIC, FLAMMABLE, N.O.S.
9TC	<u>3516</u>	3516 ADSORBED GAS, TOXIC, CORROSIVE, N.O.S.
9TO	<u>3515</u>	3515 ADSORBED GAS, TOXIC, OXIDIZING, N.O.S.
9TFC	<u>3517</u>	3517 ADSORBED GAS, TOXIC, FLAMMABLE, CORROSIVE, N.O.S.
9TOC	<u>3518</u>	3518 ADSORBED GAS, TOXIC, OXIDIZING, CORROSIVE, N.O.S.

Inserted Cells

2.2.3 Class 3 Flammable liquids

2.2.3.1 Criteria

2.2.3.1.1 The heading of Class 3 covers substances and articles containing substances of this Class which:

- are liquids according to subparagraph (a) of the definition for "liquid" in 1.2.1;
- have at 50 °C a vapour pressure of not more than 300 kPa (3 bar) and are not completely gaseous at 20 °C and at standard pressure of 101.3 kPa; and
- have a flash-point of not more than 60 °C (see 2.3.3.1 for the relevant test).

The heading of Class 3 also covers liquid substances and molten solid substances with a flash-point of more than 60°C and which are carried or handed over for carriage whilst heated at temperatures equal to or higher than their flash-point. These substances are assigned to UN No. 3256.

The heading of Class 3 also covers liquid desensitized explosives. Liquid desensitized explosives are explosive substances which are dissolved or suspended in water or other liquid substances, to form an homogeneous liquid mixture to suppress their explosive properties. Such entries in Table A of Chapter 3.2 are UN Nos. 1204, 2059, 3064, 3343, 3357 and 3379.

NOTE 1: Substances having a flash-point above 35 °C, which do not sustain combustion according to the criteria of sub-section 32.2.5 of Part III of the Manual of Tests and Criteria, are not substances of Class 3; if, however, these substances are handed over for carriage and carried whilst heated at temperatures equal to or higher than their flash-point, they are substances of Class 3.

NOTE 2: By derogation from paragraph 2.2.3.1.1 above, diesel fuel, gasoil, heating oil (light) including synthetically manufactured products having a flash-point above 60 °C and not more than 100 °C shall be deemed substances of Class 3, UN No. 1202.

NOTE 3: Flammable liquids which are highly toxic by inhalation, as defined in 2.2.61.1.4 to 2.2.61.1.9, and toxic substances having a flash-point of 23 °C or above are substances of Class 6.1 (see 2.2.61.1). Liquids which are highly toxic by inhalation are indicated as "toxic by inhalation" in their proper shipping name in Column (2) or by special provision 354 in Column (6) of Table A of Chapter 3.2.

NOTE 4: Flammable liquid substances and preparations used as pesticides, which are highly toxic, toxic or slightly toxic and have a flash-point of 23 °C or above are substances of Class 6.1 (see 2.2.61.1).

2.2.3.1.2 The substances and articles of Class 3 are subdivided as follows:

- F Flammable liquids, without subsidiary ~~riskhazard~~ and articles containing such substances: F1 Flammable liquids having a flash-point of or below 60 °C;
- F2 Flammable liquids having a flash-point above 60 °C which are carried or handed over for carriage at or above their flash-point (elevated temperature substances);
- F3 Articles containing flammable liquids;
- FT Flammable liquids, toxic:
 - FT1 Flammable liquids, toxic;
 - FT2 Pesticides;
- FC Flammable liquids, corrosive;
- FTC Flammable liquids, toxic, corrosive;
- D Liquid desensitized explosives.

2.2.3.1.3 Substances and articles classified in Class 3 are listed in Table A of Chapter 3.2. Substances not mentioned by name in Table A of Chapter 3.2 shall be assigned to the relevant entry of 2.2.3.3 and the relevant packing group in accordance with the provisions of this section. Flammable liquids shall be assigned to one of the following packing groups according to the degree of danger they present for carriage:

Packing group	Flash point (closed cup)	Initial boiling point
I	--	≤ 35°C
II ^a	< 23°C	> 35°C
III ^a	≥ 23°C ≤ 60°C	> 35°C

^a See also 2.2.3.1.4.

For a liquid with (a) subsidiary ~~risk~~hazard(s), the packing group determined in accordance with the table above and the packing group based on the severity of the subsidiary ~~risk~~hazard(s) shall be considered; the classification and packing group shall then be determined in accordance with the table of precedence of hazards in 2.1.3.10.

2.2.3.1.4 Viscous flammable liquids such as paints, enamels, lacquers, varnishes, adhesives and polishes having a flash-point of less than 23 °C may be assigned to packing group III in conformity with the procedures prescribed in the Manual of Tests and Criteria, Part III, sub-section 32.3, provided that:

(a) ~~the viscosity~~²~~the viscosity~~² and flash-point are in accordance with the following table:

Kinematic viscosity (extrapolated) v (at near-zero shear rate) mm ² /s at 23°C	Flow-time t in seconds	Jet diameter (mm)	Flash-point, closed-cup (°C)
20 < v ≤ 80	20 < t ≤ 60	4	above 17
80 < v ≤ 135	60 < t ≤ 100	4	above 10
135 < v ≤ 220	20 < t ≤ 32	6	above 5
220 < v ≤ 300	32 < t ≤ 44	6	above -1
300 < v ≤ 700	44 < t ≤ 100	6	above -5
700 < v	100 < t	6	no limit

- (b) Less than 3% of the clear solvent layer separates in the solvent separation test;
- (c) The mixture or any separated solvent does not meet the criteria for Class 6.1 or Class 8;
- (d) The substances are packed in receptacles of not more than 450 litre capacity.

NOTE: These provisions also apply to mixtures containing no more than 20% nitrocellulose with a nitrogen content not exceeding 12.6% by dry mass. Mixtures containing more than 20% but not more than 55% nitrocellulose with a nitrogen content not exceeding 12.6% by dry mass are substances assigned to UN No. 2059.

Mixtures having a flash-point below 23 °C and containing:

- more than 55% nitrocellulose, whatever their nitrogen content; or
 - not more than 55% nitrocellulose with a nitrogen content above 12.6% by dry mass,
- are substances of Class 1 (UN Nos. 0340 or 0342) or of Class 4.1 (UN Nos. 2555, 2556 or 2557).

² **Viscosity determination:** Where the substance concerned is non-Newtonian, or where a flow cup method of viscosity determination is otherwise unsuitable, a variable shear-rate viscometer shall be used to determine the dynamic viscosity coefficient of the substance, at 23 °C, at a number of shear rates. The values obtained are plotted against shear rate and

then extrapolated to zero shear rate. The dynamic viscosity thus obtained, divided by the density, gives the apparent kinematic viscosity at near-zero shear rate.

2.2.3.1.5 *Viscous liquids*

2.2.3.1.5.1 Except as provided for in 2.2.3.1.5.2, viscous liquids which:

- have a flash-point of 23 °C or above and less than or equal to 60 °C;
- are not toxic, corrosive or environmentally hazardous;
- contain not more than 20% nitrocellulose provided the nitrocellulose contains not more than 12.6% nitrogen by dry mass; and
- are packed in receptacles of not more than 450 litre capacity;

are not subject to ADR, if:

- (a) in the solvent separation test (see *Manual of Tests and Criteria*, Part III, sub-section 32.5.1), the height of the separated layer of solvent is less than 3% of the total height; and
- (b) the flowtime in the viscosity test (see *Manual of Tests and Criteria*, Part III, sub-section 32.4.3), with a jet diameter of 6 mm is equal to or greater than:
 - (i) 60 seconds; or
 - (ii) 40 seconds if the viscous liquid contains not more than 60% of Class 3 substances.

2.2.3.1.5.2 Viscous liquids which are also environmentally hazardous, but meet all other criteria in 2.2.3.1.5.1, are not subject to any other provisions of ADR when they are carried in single or combination packagings containing a net quantity per single or inner packaging of 5 litres or less, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8.

2.2.3.1.6 If substances of Class 3, as a result of admixtures, come into categories of **riskhazard** different from those to which the substances mentioned by name in Table A of Chapter 3.2 belong, these mixtures or solutions shall be assigned to the entries to which they belong on the basis of their actual degree of danger.

NOTE: For the classification of solutions and mixtures (such as preparations and wastes) see also 2.1.3.

2.2.3.1.7 On the basis of the test procedures in accordance with 2.3.3.1 and 2.3.4, and the criteria set out in 2.2.3.1.1, it may also be determined whether the nature of a solution or a mixture mentioned by name or containing a substance mentioned by name is such that the solution or mixture is not subject to the provisions for this Class (see also 2.1.3).

2.2.3.2 Substances not accepted for carriage

2.2.3.2.1 Substances of Class 3 which are liable to form peroxides easily (as happens with ethers or with certain heterocyclic oxygenated substances) shall not be accepted for carriage if their peroxide content, calculated as hydrogen peroxide (H₂O₂), exceeds 0.3%. The peroxide content shall be determined as indicated in 2.3.3.3.

2.2.3.2.2 Chemically unstable substances of Class 3 shall not be accepted for carriage unless the necessary precautions have been taken to prevent the possibility of a dangerous decomposition or polymerization under normal conditions of carriage. For the precautions necessary to prevent polymerization, see special provision 386 of Chapter 3.3. To this end particular care shall be taken to ensure that receptacles and tanks do not contain any substances liable to promote these reactions.

2.2.3.2.3 Liquid desensitized explosives other than those listed in Table A of Chapter 3.2 shall not be accepted for carriage as substances of Class 3.

2.2.3.3

List of collective entries

<p>Flammable liquids and articles containing such substances</p>	<p>F1</p>	<p>1133-ADHESIVES-containing flammable liquid- 1136 COAL TAR DISTILLATES, FLAMMABLE 1139 COATING SOLUTION (includes surface treatments or coatings used for industrial or other purposes such as vehicle undercoating, drum or barrel lining) 1169-EXTRACTS, AROMATIC, LIQUID 1197-EXTRACTS, FLAVOURING, LIQUID 1210-PRINTING INK, flammable or 1210-PRINTING INK RELATED MATERIAL (including printing ink thinning or reducing compound), flammable 1263 PAINT (including paint, lacquer, enamel, stain, shellac, varnish, polish, liquid filler and liquid-lacquer base) or 1263 PAINT RELATED MATERIAL (including paint thinning or reducing compound)- 1266 PERFUMERY PRODUCTS with flammable solvents 1293 TINCTURES, MEDICINAL 1306 WOOD PRESERVATIVES, LIQUID 1866 RESIN SOLUTION, flammable 1999 TARS, LIQUID, including road oils, and cutback bitumens- 3065 ALCOHOLIC BEVERAGES 1224 KETONES, LIQUID, N.O.S. 1268 PETROLEUM DISTILLATES, N.O.S. or 1268 PETROLEUM PRODUCTS, N.O.S. 1987 ALCOHOLS, N.O.S. 1989 ALDEHYDES, N.O.S. 2319 TERPENE HYDROCARBONS, N.O.S. 3271-ETHERS, N.O.S. 3272-ESTERS, N.O.S. 3295 HYDROCARBONS, LIQUID, N.O.S. 3336 MERCAPTANS, LIQUID, FLAMMABLE, N.O.S. or 3336 MERCAPTANS MIXTURE, LIQUID, FLAMMABLE, N.O.S. 1993 FLAMMABLE LIQUID, N.O.S.</p>	
		<p>F2</p>	<p>3256 ELEVATED TEMPERATURE LIQUID, FLAMMABLE, N.O.S., with flash point above 60 °C, at or above its flash point</p>
		<p>F3</p>	<p>3269 POLYESTER RESIN KIT, liquid base material 3473 FUEL CELL CARTRIDGES or 3473 FUEL CELL CARTRIDGES CONTAINED IN EQUIPMENT or 3473 FUEL CELL CARTRIDGES PACKED WITH EQUIPMENT 3528 ENGINE, INTERNAL COMBUSTION, FLAMMABLE LIQUID POWERED or 3528 ENGINE, FUEL CELL, FLAMMABLE LIQUID POWERED or 3528 MACHINERY, INTERNAL COMBUSTION, FLAMMABLE LIQUID POWERED or 3528 MACHINERY, FUEL CELL, FLAMMABLE LIQUID POWERED</p>

Without subsidiary risk

F

F2 elevated temperature

F3 articles

(cont'd on next page)

Flammable liquids and articles containing such substances		<p>1133 ADHESIVES containing flammable liquid</p> <p>2285 MERCAPTANS LIQUIDS, FLAMMABLE, TOXIC, N.O.S. or</p> <p>2289 MERCAPTAN SOLUTIONS, LIQUID, FLAMMABLE, TOXIC, N.O.S. for industrial or other</p> <p>1986 ALCOHOLS, FLAMMABLE LIQUID, N.O.S. or barrel lining)</p> <p>0869 ETHERS, PROMPTING LIQUID, N.O.S.</p> <p>4705 ETHERS, LIQUID, PROMPTING LIQUID, N.O.S. or</p> <p>4714 PRINTING INK SOLUTIONS, FLAMMABLE, TOXIC, N.O.S.</p> <p>4241 PRINTING INK REDUCING FLAMMABLE LIQUID, N.O.S. or printing ink thinning or reducing</p> <p>3273 NITROGEN FLAMMABLE, TOXIC, N.O.S.</p> <p>0267 PAINTABLE LIQUID, TOXIC, N.O.S., stain, shellac, varnish, polish, liquid filler and liquid lacquer base) or</p>
Toxic	F1	<p>1263 PAINT RELATED MATERIAL (including paint thinning or reducing compound)</p> <p>1266 PERFUMERY PRODUCTS with flammable solvents</p> <p>1293 TINCTURES, MEDICINAL</p> <p>1306 WOOD PRESERVATIVES, LIQUID</p> <p>1866 RESIN SOLUTION, flammable</p> <p>1999 TARS, LIQUID, including road oils, and cutback bitumens</p> <p>3065 ALCOHOLIC BEVERAGES</p> <p>1224 KETONES, LIQUID, N.O.S.</p> <p>1268 PETROLEUM DISTILLATES, N.O.S. or</p> <p>1268 PETROLEUM PRODUCTS, N.O.S.</p> <p>1987 ALCOHOLS, N.O.S.</p> <p>1989 ALDEHYDES, N.O.S.</p> <p>2319 TERPENE HYDROCARBONS, N.O.S.</p> <p>3271 ETHERS, N.O.S.</p> <p>3272 ESTERS, N.O.S.</p> <p>3295 HYDROCARBONS, LIQUID, N.O.S.</p> <p>3336 MERCAPTANS, LIQUID, FLAMMABLE, N.O.S. or</p> <p>3336 MERCAPTANS MIXTURE, LIQUID, FLAMMABLE, N.O.S.</p> <p>1993 FLAMMABLE LIQUID, N.O.S.</p>
Without pest subsidiary p-hazard	F	
Corrosive elevated temperature	F2	<p>3256 ELEVATED TEMPERATURE LIQUID, FLAMMABLE, N.O.S., with flash-point above 60 °C, at or above its flash-point</p>
Toxic, corrosive	F3	<p>3269 POLYESTER RESIN KIT, liquid base material</p> <p>3473 FUEL CELL CARTRIDGES or</p> <p>3473 FUEL CELL CARTRIDGES CONTAINED IN EQUIPMENT or</p> <p>3473 FUEL CELL CARTRIDGES PACKED WITH EQUIPMENT</p> <p>3528 ENGINE, INTERNAL COMBUSTION, FLAMMABLE LIQUID POWERED or</p> <p>3528 ENGINE, FUEL CELL, FLAMMABLE LIQUID POWERED or</p> <p>3528 MACHINERY, INTERNAL COMBUSTION, FLAMMABLE LIQUID POWERED or</p> <p>3528 MACHINERY, FUEL CELL, FLAMMABLE LIQUID POWERED</p> <p>3540 ARTICLES CONTAINING FLAMMABLE LIQUID, N.O.S.</p>
Liquid (transferred on next page)		

2.2.3.3

List of collective entries (cont'd)

	FT1	<p>1228 MERCAPTANS, LIQUID, FLAMMABLE, TOXIC, N.O.S. or 1228 MERCAPTAN MIXTURE, LIQUID, FLAMMABLE, TOXIC, N.O.S. 1986 ALCOHOLS, FLAMMABLE, TOXIC, N.O.S. 1988 ALDEHYDES, FLAMMABLE, TOXIC, N.O.S. 2478 ISOCYANATES, FLAMMABLE, TOXIC, N.O.S. or 2478 ISOCYANATE SOLUTION, FLAMMABLE, TOXIC, N.O.S. 3248 MEDICINE, LIQUID, FLAMMABLE, TOXIC, N.O.S. 3273 NITRILES, FLAMMABLE, TOXIC, N.O.S. 1992 FLAMMABLE LIQUID, TOXIC, N.O.S.</p>
<u>Toxic</u> <u>FT</u>	FT2 pesticide (f.p. < 23 °C)	<p>2758 CARBAMATE PESTICIDE, LIQUID, FLAMMABLE, TOXIC 2760 ARSENICAL PESTICIDE, LIQUID, FLAMMABLE, TOXIC 2762 ORGANOCHLORINE PESTICIDE, LIQUID, FLAMMABLE, TOXIC 2764 TRIAZINE PESTICIDE, LIQUID, FLAMMABLE, TOXIC 2772 THIOCARBAMATE PESTICIDE, LIQUID, FLAMMABLE, TOXIC 2776 COPPER BASED PESTICIDE, LIQUID, FLAMMABLE, TOXIC 2778 MERCURY BASED PESTICIDE, LIQUID, FLAMMABLE, TOXIC 2780 SUBSTITUTED NITROPHENOL PESTICIDE, LIQUID, FLAMMABLE, TOXIC 2782 BIPYRIDILUM PESTICIDE, LIQUID, FLAMMABLE, TOXIC 2784 ORGANOPHOSPHORUS PESTICIDE, LIQUID, FLAMMABLE, TOXIC 2787 ORGANOTIN PESTICIDE, LIQUID, FLAMMABLE, TOXIC 3024 COUMARIN DERIVATIVE PESTICIDE, LIQUID, FLAMMABLE, TOXIC 3346 PHENOXYACETIC ACID DERIVATIVE PESTICIDE, LIQUID, FLAMMABLE, TOXIC 3350 PYRETHROID PESTICIDE, LIQUID, FLAMMABLE TOXIC 3021 PESTICIDE, LIQUID, FLAMMABLE, TOXIC, N.O.S. NOTE: The classification of a pesticide under an entry shall be effected on the basis of the active ingredient, of the physical state of the pesticide and any subsidiary hazard characteristics.</p>
<u>Corrosive</u>	FC	<p>3469 PAINT, FLAMMABLE, CORROSIVE (including paint, lacquer, enamel, stain, shellac, varnish, polish, liquid filler and liquid lacquer base) or 3469 PAINT RELATED MATERIAL, FLAMMABLE, CORROSIVE (including paint thinning or reducing compound) 2733 AMINES, FLAMMABLE, CORROSIVE, N.O.S. or 2733 POLYAMINES, FLAMMABLE, CORROSIVE, N.O.S. 2985 CHLOROSILANES, FLAMMABLE, CORROSIVE, N.O.S. 3274 ALCOHOLATES SOLUTION, N.O.S., in alcohol 2924 FLAMMABLE LIQUID, CORROSIVE, N.O.S.</p>
<u>Toxic</u> , <u>corrosive</u>	FTC	<p>3286 FLAMMABLE LIQUID, TOXIC, CORROSIVE, N.O.S.</p>
<u>Liquid</u> desensitised explosive	D	<p>3343 NITROGLYCERIN MIXTURE, DESENSITIZED, LIQUID, FLAMMABLE, N.O.S. with not more than 30% nitroglycerin by mass 3357 NITROGLYCERIN MIXTURE, DESENSITIZED, LIQUID, N.O.S. with not more than 30% nitroglycerin by mass 3379 DESENSITIZED EXPLOSIVE, LIQUID, N.O.S.</p>

2.2.41 Class 4.1 Flammable solids, self-reactive substances, polymerizing substances and solid desensitized explosives

2.2.41.1 Criteria

2.2.41.1.1 The heading of Class 4.1 covers flammable substances and articles, desensitized explosives which are solids according to subparagraph (a) of the definition "solid" in 1.2.1, self-reactive liquids or solids and polymerizing substances..

The following are assigned to Class 4.1:

- readily flammable solid substances and articles (see paragraphs 2.2.41.1.3 to 2.2.41.1.8);
- self-reactive solids or liquids (see paragraphs 2.2.41.1.9 to 2.2.41.1.17);
- solid desensitized explosives (see 2.2.41.1.18);
- substances related to self-reactive substances (see 2.2.41.1.19);
- polymerizing substances (see 2.2.41.1.20 and 2.2.41.1.21).

2.2.41.1.2 The substances and articles of Class 4.1 are subdivided as follows:

F Flammable solids, without subsidiary ~~risk~~hazard:

- F1 Organic;
- F2 Organic, molten;
- F3 Inorganic;
- F4 Articles;

FO Flammable solids, oxidizing;

FT Flammable solids, toxic:

- FT1 Organic, toxic;
- ~~FT2 Inorganic, toxic;~~
- ~~FT2 — Inorganic, toxic;~~

FC Flammable solids, corrosive:

- FC1 Organic, corrosive;
- FC2 Inorganic, corrosive;

D Solid desensitized explosives without subsidiary ~~risk~~hazard; DTSolid desensitized explosives, toxic;

SR Self-reactive substances:

- SR1 Not requiring temperature control;
- SR2 Requiring temperature control.

PM Polymerizing substances

- PM1 Not requiring temperature control;
- PM2 Requiring temperature control.

Flammable solids

Definition and properties

2.2.41.1.3 *Flammable solids* are readily combustible solids and solids which may cause fire through friction.

Readily combustible solids are powdered, granular, or pasty substances which are dangerous if they can be easily ignited by brief contact with an ignition source, such as a burning match, and if the flame spreads rapidly. The danger may come not only from the fire but also from toxic combustion products. Metal powders are especially dangerous because of the difficulty of extinguishing a fire since normal extinguishing agents such as carbon dioxide or water can increase the hazard.

Classification

2.2.41.1.4 Substances and articles classified as flammable solids of Class 4.1 are listed in Table A of Chapter 3.2. The assignment of organic substances and articles not mentioned by name in Table A of Chapter 3.2 to the relevant entry of sub-section 2.2.41.3 in accordance with the provisions of Chapter 2.1 can be based on experience or on the results of the test procedures in accordance with Part III, sub-section 33.2.1 of the Manual of Tests and Criteria. The assignment of inorganic substances not mentioned by name shall be based on the results of the test procedures in accordance with Part III, sub-section 33.2.1 of the Manual of Tests and Criteria; experience shall also be taken into account when it leads to a more stringent assignment.

2.2.41.1.5 When substances not mentioned by name are assigned to one of the entries listed in 2.2.41.3 on the basis of the test procedures in accordance with the Manual of Tests and Criteria, Part III, sub-section 33.2.1, the following criteria apply:

- (a) With the exception of metal powders or powders of metal alloys, powdery, granular or pasty substances shall be classified as readily flammable substances of Class 4.1 if they can be easily ignited by brief contact with an ignition source (e.g. a burning match), or if, in the event of ignition, the flame spreads rapidly, the burning time is less than 45 seconds for a measured distance of 100 mm or the rate of burning is greater than 2.2 mm/s;
- (b) Metal powders or powders of metal alloys shall be assigned to Class 4.1 if they can be ignited by a flame and the reaction spreads over the whole length of the sample in 10 minutes or less.

Solids which may cause fire through friction shall be classified in Class 4.1 by analogy with existing entries (e.g. matches) or in accordance with any appropriate special provision.

2.2.41.1.6 On the basis of the test procedure in accordance with the Manual of Tests and Criteria, Part III, Section 33.2.1 and the criteria set out in 2.2.41.1.4 and 2.2.41.1.5, it may also be determined whether the nature of a substance mentioned by name is such that the substance is not subject to the provisions for this Class.

2.2.41.1.7 If substances of Class 4.1, as a result of admixtures, come into different categories of **risk/hazard** from those to which the substances mentioned by name in Table A of Chapter 3.2 belong, these mixtures shall be assigned to the entries to which they belong on the basis of their actual degree of danger.

NOTE: For the classification of solutions and mixtures (such as preparations and wastes), see also 2.1.3.

Assignment of packing groups

2.2.41.1.8 Flammable solids classified under the various entries in Table A of Chapter 3.2 shall be assigned to packing groups II or III on the basis of test procedures of the Manual of Tests and Criteria, Part III, sub-section 33.2.1, in accordance with the following criteria:

- (a) Readily flammable solids which, when tested, have a burning time of less than 45 seconds over a measured distance of 100 mm shall be assigned to:

Packing group II: if the flame passes the wetted zone;

Packing group III: if the wetted zone stops the flame for at least four minutes;
- (b) Metal powders or powders of metal alloys shall be assigned to:

Packing group II: if, when tested, the reaction spreads over the whole length of the sample in five minutes or less;

Packing group III: if, when tested, the reaction spreads over the whole length of the sample in more than five minutes.

For solids which may cause fire through friction, the packing group shall be assigned by analogy with existing entries or in accordance with any special provision.

Self-reactive substances

Definitions

2.2.41.1.9 For the purposes of ADR, *self-reactive substances* are thermally unstable substances liable to undergo a strongly exothermic decomposition even without participation of oxygen (air). Substances are not considered to be self-reactive substances of Class 4.1, if:

- (a) they are explosives according to the criteria of Class 1;
- (b) they are oxidizing substances according to the classification procedure for Class 5.1 (see 2.2.51.1) except that mixtures of oxidizing substances which contain 5% or more of combustible organic substances shall be subjected to the classification procedure defined in Note 2;
- (c) they are organic peroxides according to the criteria of Class 5.2 (see 2.2.52.1);
- (d) their heat of decomposition is less than 300 J/g; or
- (e) their self-accelerating decomposition temperature (SADT) (see Note 3 below) is greater than 75 °C for a 50 kg package.

NOTE 1: *The heat of decomposition can be determined using any internationally recognised method e.g. differential scanning calorimetry and adiabatic calorimetry.*

NOTE 2: *Mixtures of oxidizing substances meeting the criteria of Class 5.1 which contain 5% or more of combustible organic substances, which do not meet the criteria mentioned in (a), (c), (d) or (e) above, shall be subjected to the self-reactive substance classification procedure.*

A mixture showing the properties of a self-reactive substance, type B to F, shall be classified as a self-reactive substance of Class 4.1.

A mixture showing the properties of a self-reactive substance, type G, according to the principle given in section 20.4.3 (g) of Part II of the Manual of Tests and Criteria shall be considered for classification as a substance of Class 5.1 (see 2.2.51.1).

NOTE 3: *The self-accelerating decomposition temperature (SADT) is the lowest temperature at which self-accelerating decomposition may occur with a substance in the packaging as used during carriage. Requirements for the determination of the SADT are given in the Manual of Tests and Criteria, Part II, Chapter 20 and section 28.4.*

NOTE 4: *Any substance which shows the properties of a self-reactive substance shall be classified as such, even if this substance gives a positive test result according to 2.2.42.1.5 for inclusion in Class 4.2.*

Properties

2.2.41.1.10 The decomposition of self-reactive substances can be initiated by heat, contact with catalytic impurities (e.g. acids, heavy-metal compounds, bases), friction or impact. The rate of decomposition increases with temperature and varies with the substance. Decomposition, particularly if no ignition occurs, may result in the evolution of toxic gases or vapours. For certain self-reactive substances, the temperature shall be controlled. Some self-reactive substances may decompose explosively, particularly if confined. This characteristic may be modified by the addition of diluents or by the use of appropriate packagings. Certain self-reactive substances burn vigorously. Self-reactive substances are, for example, some compounds of the types listed below:

aliphatic azo compounds (-C-N=N-C-);
organic azides (-C-N₃);
diazonium salts (-C-N₂-CN₂⁺Z);
N-nitroso compounds (-N-N=O); and
aromatic sulphohydrazides (-SO₂-NH-NH₂).

This list is not exhaustive and substances with other reactive groups and some mixtures of substances may have similar properties.

Classification

2.2.41.1.11 Self-reactive substances are classified into seven types according to the degree of danger they present. The types of self-reactive substances range from type A, which is not accepted for carriage in the packaging in which it is tested, to type G, which is not subject to the provisions for self-reactive substances of Class 4.1. The classification of types B to F is directly related to the maximum quantity allowed in one packaging. The principles to be applied for classification as well as the applicable classification procedures, test methods and criteria and an example of a suitable test report are given in Part II of the Manual of Tests and Criteria.

2.2.41.1.12 Self-reactive substances which have already been classified and are already permitted for carriage in packagings are listed in 2.2.41.4, those already permitted for carriage in IBCs are listed in 4.1.4.2, packing instruction IBC520 and those already permitted for carriage in tanks according to Chapter 4.2 are listed in 4.2.5.2, portable tank instruction T23. Each permitted substance listed is assigned to a generic entry of Table A of Chapter 3.2 (UN Nos. 3221 to 3240), and appropriate subsidiary [risks](#) and remarks providing relevant transport information are given.

The collective entries specify:

- self-reactive substances types B to F, see 2.2.41.1.11 above;
- physical state (liquid/solid); and
- temperature control (when required), see 2.2.41.1.17 below.

The classification of the self-reactive substances listed in 2.2.41.4 is based on the technically pure substance (except where a concentration of less than 100% is specified).

2.2.41.1.13 Classification of self-reactive substances not listed in 2.2.41.4, 4.1.4.2, packing instruction IBC520 or 4.2.5.2, portable tank instruction T23 and assignment to a collective entry shall be made by the competent authority of the country of origin on the basis of a test report. The statement of approval shall contain the classification and the relevant conditions of carriage. If the country of origin is not a Contracting Party to ADR, the classification and the conditions of carriage shall be recognized by the competent authority of the first country Contracting Party to ADR reached by the consignment.

2.2.41.1.14 Activators, such as zinc compounds, may be added to some self-reactive substances to change their reactivity. Depending on both the type and the concentration of the activator, this may result in a decrease in thermal stability and a change in explosive properties. If either of these properties is altered, the new formulation shall be assessed in accordance with the classification procedure.

2.2.41.1.15 Samples of self-reactive substances or formulations of self-reactive substances not listed in 2.2.41.4, for which a complete set of test results is not available and which are to be carried for further testing or evaluation, shall be assigned to one of the appropriate entries for self-reactive substances type C provided the following conditions are met:

- the available data indicate that the sample would be no more dangerous than self-reactive substances type B;
- the sample is packaged in accordance with packing method OP2 and the quantity per transport unit is limited to 10 kg;
- the available data indicate that the control temperature, if any, is sufficiently low to prevent any dangerous decomposition and sufficiently high to prevent any dangerous phase separation.

Desensitization

2.2.41.1.16 In order to ensure safety during carriage, self-reactive substances are in many cases desensitized by use of a diluent. Where a percentage of a substance is stipulated, this refers to the percentage by mass, rounded to the nearest whole number. If a diluent is used, the self-reactive substance shall be tested with the diluent present in the concentration and form used in carriage. Diluents which may allow a self-reactive substance to concentrate to a dangerous extent in the event of leakage from a packaging shall not be used. Any diluent shall be compatible with the self-reactive substance. In this regard, compatible diluents are those solids or liquids which have no detrimental influence on the thermal stability and hazard type of the self-reactive substance. Liquid diluents in formulations requiring temperature control (see 2.2.41.1.14) shall have a boiling point of at least 60 °C and a flash-point not less than 5 °C. The boiling point of the liquid shall be at least 50 °C higher than the control temperature of the self-reactive substance.

Temperature control requirements

~~2.2.41.1.1 Certain self reactive substances may only be carried under temperature controlled conditions. The control temperature is the maximum temperature at which the self reactive substance can be safely carried. It is assumed that the temperature of the immediate surroundings of a package only exceeds 55 °C during carriage for a relatively short time in a 24 hour period. In the event of loss of temperature control, it may be necessary to implement emergency procedures. The emergency temperature is the temperature at which such procedures shall be implemented.~~

~~The control and emergency temperatures are derived from the SADT (see table 1). The SADT shall be determined in order to decide whether a substance shall be subjected to temperature control during carriage. Provisions for the determination of the SADT are given in the Manual of Tests and Criteria, Part II, Chapter 20 and Section 28.4.~~

Table 1: Derivation of control and emergency temperatures

Type of receptacle	SADT ^a	Control temperature	Emergency temperature
Single packagings and IBCs	20 °C or less	20 °C below SADT	10 °C below SADT
	over 20 °C to 35 °C	15 °C below SADT	10 °C below SADT
	over 35 °C	10 °C below SADT	5 °C below SADT
Tanks	not greater than 50 °C	10 °C below SADT	5 °C below SADT

^a SADT of the substance as packaged for carriage.

~~Self-reactive substances with an SADT not greater than 55 °C shall be subject to temperature control during carriage. Where applicable, control and emergency temperatures are listed in 2.2.41.4. The actual temperature during carriage may be lower than the control temperature but shall be selected so as to avoid dangerous separation of phases.~~

~~2.2.41.1.17 See 7.1.7.~~

Solid desensitized explosives

~~2.2.41.1.17, 2.2.41.1.18~~ Solid desensitized explosives are substances which are wetted with water or alcohols or are diluted with other substances to suppress their explosive properties. Such entries in Table A of Chapter 3.2 are: UN Nos. 1310, 1320, 1321, 1322, 1336, 1337, 1344, 1347, 1348, 1349, 1354, 1355, 1356, 1357, 1517, 1571, 2555, 2556, 2557, 2852, 2907, 3317, 3319, 3344, 3364, 3365, 3366, 3367, 3368, 3369, 3370, 3376, 3380 and 3474.

Substances related to self-reactive substances

~~2.2.41.1.18, 2.2.41.1.19~~ Substances that:

- have been provisionally accepted into Class 1 according to Test Series 1 and 2 but exempted from Class 1 by Test Series 6;
- are not self-reactive substances of Class 4.1; and
- are not substances of Classes 5.1 or 5.2;

are also assigned to Class 4.1. UN Nos. 2956, 3241, 3242 and 3251 are such entries.

Polymerizing substances

Definitions and properties

2.2.41.1.1922.41.1.20 Polymerizing substances are substances which, without stabilization, are liable to undergo a strongly exothermic reaction resulting in the formation of larger molecules or resulting in the formation of polymers under conditions normally encountered in carriage. Such substances are considered to be polymerizing substances of Class 4.1 when:

- (a) their self-accelerating polymerization temperature (SAPT) is 75 °C or less under the conditions (with or without chemical stabilization as offered for carriage) and in the packaging, IBC or tank in which the substance or mixture is to be carried;
- (b) they exhibit a heat of reaction of more than 300 J/g; and
- (c) they do not meet any other criteria for inclusion in classes 1 to 8.

A mixture meeting the criteria of a polymerizing substance shall be classified as a polymerizing substance of Class 4.1.

Temperature control requirements

2.2.41.1.2022.41.1.21 Polymerizing substances are subject to temperature control in carriage if their self-accelerating polymerization temperature (SAPT) is:

- (a) when offered for carriage in a packaging or IBC, 50 °C or less in the packaging or IBC in which the substance is to be carried; or

- (b) When offered for carriage in a tank, 45 °C or less in the tank in which the substance is to be carried.

See 7.1.7.

NOTE: Substances meeting the criteria of polymerizing substances and also for inclusion in Classes 1 to 8 are subject to the requirements of special provision 386 of Chapter 3.3.

2.2.41.2 Substances not accepted for carriage

2.2.41.2.1 The chemically unstable substances of Class 4.1 shall not be accepted for carriage unless the necessary steps have been taken to prevent their dangerous decomposition or polymerization during carriage. To this end, it shall in particular be ensured that receptacles and tanks do not contain any substance liable to promote these reactions.

2.2.41.2.2 Flammable solids, oxidizing, assigned to UN No. 3097 shall not be accepted for carriage unless they meet the requirements for Class 1 (see also 2.1.3.7).

2.2.41.2.3 The following substances shall not be accepted for carriage:

- Self-reactive substances of type A (see Manual of Tests and Criteria, Part II, paragraph 20.4.2 (a));
- Phosphorus sulphides which are not free from yellow and whitephosphorus;
- Solid densitized explosives other than those listed in Table A of Chapter 3.2;
- Inorganic flammable substances in the molten form other than UN No. 2448 SULPHUR, MOLTEN.

2.2.41.3

List of collective entries

Flammable solids	without subsidiary risk	organic	F1	3175 SOLIDS CONTAINING FLAMMABLE LIQUID, N.O.S.
				1353 FIBRES IMPREGNATED WITH WEAKLY NITRATED NITROCELLULOSE, N.O.S. or 1353 FABRICS IMPREGNATED WITH WEAKLY NITRATED NITROCELLULOSE, N.O.S. 1325 FLAMMABLE SOLID, ORGANIC, N.O.S.
Flammable solids	without subsidiary hazard	organic	F2	3176 FLAMMABLE SOLID, ORGANIC, MOLTEN, N.O.S.
				3176 FLAMMABLE SOLID, ORGANIC, MOLTEN, N.O.S.
Solid desensitized explosives	without subsidiary risk	inorganic	F3	3089 METAL POWDER, FLAMMABLE, N.O.S. ^{a,b}
				3089 METAL POWDER, FLAMMABLE, N.O.S. ^{a,b} 3181 METAL SALTS OF ORGANIC COMPOUNDS, FLAMMABLE, N.O.S. 3182 METAL HYDRIDES, FLAMMABLE, N.O.S. ^c 3178 FLAMMABLE SOLID, INORGANIC, N.O.S.
Self reactive substances	without subsidiary hazard	organic	F4	3527 POLYESTER RESIN KIT, solid base material 3541 ARTICLES CONTAINING FLAMMABLE SOLID, N.O.S.
				3527 POLYESTER RESIN KIT, solid base material 3541 ARTICLES CONTAINING FLAMMABLE SOLID, N.O.S.
Solid desensitized explosives	without subsidiary hazard	inorganic	D	3319 NITROGLYCERIN MIXTURE, DESENSITIZED, SOLID, N.O.S. with more than 2% but not more than 10% nitroglycerin by mass 3344 PENTAERYTHRITOL TETRANITRATE (PENTAERYTHRITOL TETRANITRATE, PETN) MIXTURE, DESENSITIZED, SOLID, N.O.S. with more than 10% but not more than 20% PETN by mass 3380 DESENSITIZED EXPLOSIVE, SOLID, N.O.S.
				3319 NITROGLYCERIN MIXTURE, DESENSITIZED, SOLID, N.O.S. with more than 2% but not more than 10% nitroglycerin by mass 3344 PENTAERYTHRITOL TETRANITRATE (PENTAERYTHRITOL TETRANITRATE, PETN) MIXTURE, DESENSITIZED, SOLID, N.O.S. with more than 10% but not more than 20% PETN by mass 3380 DESENSITIZED EXPLOSIVE, SOLID, N.O.S.
Self reactive substances	requiring temperature control	toxic	DT	Only substances listed in Table A of Chapter 3.2 are to be accepted for carriage as substances of Class 4.1
				Only substances listed in Table A of Chapter 3.2 are to be accepted for carriage as substances of Class 4.1

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Self-reactive substances
SR

Not requiring temperature control **SR1**

SELF-REACTIVE LIQUID TYPE A	Not accepted for carriage, see 2.2.41.2.3
SELF-REACTIVE SOLID TYPE A	
3221 SELF-REACTIVE LIQUID TYPE B	
3222 SELF-REACTIVE SOLID TYPE B	
3223 SELF-REACTIVE LIQUID TYPE C	
3224 SELF-REACTIVE SOLID TYPE C	
3225 SELF-REACTIVE LIQUID TYPE D	
3226 SELF-REACTIVE SOLID TYPE D	
3227 SELF-REACTIVE LIQUID TYPE E	
3228 SELF-REACTIVE SOLID TYPE E	
3229 SELF-REACTIVE LIQUID TYPE F	
3230 SELF-REACTIVE SOLID TYPE F	
SELF-REACTIVE LIQUID TYPE G	Not subject to the provisions applicable to Class 4.1, see 2.2.41.1.11
SELF-REACTIVE SOLID TYPE G	

Requiring temperature control **SR2**

3231 SELF-REACTIVE LIQUID TYPE B, TEMPERATURE CONTROLLED
3232 SELF-REACTIVE SOLID TYPE B, TEMPERATURE CONTROLLED
3233 SELF-REACTIVE LIQUID TYPE C, TEMPERATURE CONTROLLED
3234 SELF-REACTIVE SOLID TYPE C, TEMPERATURE CONTROLLED
3235 SELF-REACTIVE LIQUID TYPE D, TEMPERATURE CONTROLLED
3236 SELF-REACTIVE SOLID TYPE D, TEMPERATURE CONTROLLED
3237 SELF-REACTIVE LIQUID TYPE E, TEMPERATURE CONTROLLED
3238 SELF-REACTIVE SOLID TYPE E, TEMPERATURE CONTROLLED
3239 SELF-REACTIVE LIQUID TYPE F, TEMPERATURE CONTROLLED
3240 SELF-REACTIVE SOLID TYPE F, TEMPERATURE CONTROLLED

FT1 ~~2926 — FLAMMABLE SOLID, TOXIC, ORGANIC, N.O.S.~~

FT2 ~~3179 — FLAMMABLE SOLID, TOXIC, INORGANIC, N.O.S.~~

FC1 ~~2925 — FLAMMABLE SOLID, TOXIC, INORGANIC, N.O.S.~~

FC2 ~~3180 — FLAMMABLE SOLID, CORROSIVE, INORGANIC, N.O.S.~~

D
~~3319 — NITROGLYCERIN MIXTURE, DESENSITIZED, SOLID, N.O.S. with more than 2% but not more than 10% nitroglycerin by mass~~
~~3344 — PENTAERYTHRITOL TETRANITRATE (PENTAERYTHRITOL TETRANITRATE, PETN) MIXTURE, DESENSITIZED, SOLID, N.O.S. with more than 10% but not more than 20% PETN by mass~~
~~3380 — DESENSITIZED EXPLOSIVE, SOLID, N.O.S.~~

DF ~~Only substances listed in Table A of Chapter 3.2 are to be accepted for carriage as substances of Class 4.1~~

(cont'd on next page)

~~SELF-REACTIVE LIQUID TYPE A~~
~~SELF-REACTIVE SOLID TYPE A~~
~~3221 SELF-REACTIVE LIQUID TYPE B~~
~~3222 SELF-REACTIVE SOLID TYPE B~~
~~3223 SELF-REACTIVE LIQUID TYPE C~~
~~3224 SELF-REACTIVE SOLID TYPE C~~
~~3225 SELF-REACTIVE LIQUID TYPE D~~
SR1 ~~3226 SELF-REACTIVE SOLID TYPE D~~
~~3227 SELF-REACTIVE LIQUID TYPE E~~

3228 SELF-REACTIVE SOLID TYPE E	}
3229 SELF-REACTIVE LIQUID TYPE F	

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~~E F SELF REACTIVE LIQUID~~
~~TYPE G SELF REACTIVE SOLID~~
~~TYPE G~~

~~Not accepted for carriage-~~
~~see 2.2.41.2.3~~

~~Not subject to the provisions applicable~~
~~to Class 4.1, see 2.2.41.1.1.1~~

SR2

3231	SELF REACTIVE LIQUID TYPE B, TEMPERATURE CONTROLLED
3232	SELF REACTIVE SOLID TYPE B, TEMPERATURE CONTROLLED
3233	SELF REACTIVE LIQUID TYPE C, TEMPERATURE CONTROLLED
3234	SELF REACTIVE SOLID TYPE C, TEMPERATURE CONTROLLED
3235	SELF REACTIVE LIQUID TYPE D, TEMPERATURE CONTROLLED
3236	SELF REACTIVE SOLID TYPE D, TEMPERATURE CONTROLLED
3237	SELF REACTIVE LIQUID TYPE E, TEMPERATURE CONTROLLED
3238	SELF REACTIVE SOLID TYPE E, TEMPERATURE CONTROLLED
3239	SELF REACTIVE LIQUID TYPE F, TEMPERATURE CONTROLLED
3240	SELF REACTIVE SOLID TYPE F, TEMPERATURE CONTROLLED

^a Metals and metal alloys in powdered or other flammable form, liable to spontaneous combustion, are substances of Class 4.2.

^b Metals and metal alloys in powdered or other flammable form, which in contact with water, emit flammable gases, are substances of Class 4.3.

^c Metals hydrides which, in contact with water, emit flammable gases, are substances of Class 4.3. Aluminium borohydride or aluminium borohydride in devices are substances of Class 4.2, UN No. 2870.

2.2.41.3 List of collective entries (cont'd)

Polymerizing substances PM	not requiring temperature control	PM1	3531 POLYMERIZING SUBSTANCE, SOLID, STABILIZED, N.O.S. 3532 POLYMERIZING SUBSTANCE, LIQUID, STABILIZED, N.O.S.
	requiring temperature control	PM2	3533 POLYMERIZING SUBSTANCE, SOLID, TEMPERATURE CONTROLLED, N.O.S. 3534 POLYMERIZING SUBSTANCE, LIQUID, TEMPERATURE CONTROLLED, N.O.S.

2.2.41.3 List of currently assigned self-reactive substances in packagings

In the column "Packing Method" codes "OP1" to "OP8" refer to packing methods in 4.1.4.1, packing instruction P520 (see also 4.1.7.1). Self-reactive substances to be carried shall fulfil the classification and the control and emergency temperatures (derived from the SADT) as listed. For substances permitted in IBCs, see 4.1.4.2, packing instruction IBC520 and, for those permitted in tanks according to Chapter 4.2, see 4.2.5.2, portable tank instruction T23.

NOTE: The classification given in this table is based on the technically pure substance (except where a concentration of less than 100% is specified). For other concentrations, the substance may be classified differently following the procedures given in Part II of the Manual of Tests and Criteria and in 2.2.41.1.17.

Polymerizing substances PM	not requiring temperature control	PM1	3531 POLYMERIZING SUBSTANCE, SOLID, STABILIZED, N.O.S. 3532 POLYMERIZING SUBSTANCE, LIQUID, STABILIZED, N.O.S.
	requiring temperature control	PM2	3533 POLYMERIZING SUBSTANCE, SOLID, TEMPERATURE CONTROLLED, N.O.S. 3534 POLYMERIZING SUBSTANCE, LIQUID, TEMPERATURE CONTROLLED, N.O.S.

2.2.41.4 List of currently assigned self-reactive substances in packagings

In the column "Packing Method" codes "OP1" to "OP8" refer to packing methods in 4.1.4.1, packing instruction P520 (see also 4.1.7.1). Self-reactive substances to be carried shall fulfil the classification and the control and emergency temperatures (derived from the SADT) as listed. For substances permitted in IBCs, see 4.1.4.2, packing instruction IBC520 and, for those permitted in tanks according to Chapter 4.2, see 4.2.5.2.6, portable tank instruction T23. The formulations listed in packing instruction IBC520 of 4.1.4.2 and in portable tank instruction T23 of 4.2.5.2.6 may also be carried packed in accordance with packing method OP8 of packing instruction P520 of 4.1.4.1, with the same control and emergency temperatures, if applicable.

NOTE: The classification given in this table is based on the technically pure substance (except where a concentration of less than 100% is specified). For other concentrations, the substance may be classified differently following the procedures given in Part II of the Manual of Tests and Criteria and in 2.2.41.1.17.

SELF-REACTIVE SUBSTANCE	Concentration (%)	Packing method	Control temperature (°C)	Emergency temperature (°C)	UN generic entry	Remarks
ACETONE-PYROGALLOL COPOLYMER 2-DIAZO-1-NAPHTHOL-5-SULPHONATE	100	OP8			3228	
AZODICARBONAMIDE FORMULATION TYPE B, TEMPERATURE CONTROLLED	< 100	OP5			3232	(1) (2)
AZODICARBONAMIDE FORMULATION TYPE C	< 100	OP6			3224	(3)
AZODICARBONAMIDE FORMULATION TYPE C, TEMPERATURE CONTROLLED	< 100	OP6			3234	(4)
AZODICARBONAMIDE FORMULATION TYPE D	< 100	OP7			3226	(5)
AZODICARBONAMIDE FORMULATION TYPE D, TEMPERATURE CONTROLLED	< 100	OP7			3236	(6)
2,2'-AZODI(2,4-DIMETHYL- 4-METHOXY- VALERONITRILE)	100	OP7	-5	+5	3236	

2,2'-AZODI(2,4-DIMETHYL- VALERONITRILE)	100	OP7	+10	+15	3236	
2,2'-AZODI(ETHYL- 2-METHYL-PROPIONATE)	100	OP7	+20	+25	3235	
1,1-AZODI(HEXAHYDROBENZONITRILE)	100	OP7			3226	
2,2'-AZODI(ISOBUTYRONITRILE)	100	OP6	+40	+45	3234	
2,2'-AZODI(ISOBUTYRONITRILE) as a water based paste	≤ 50%	OP6			3224	
2,2'-AZODI(2-METHYLBUTYRONITRILE)	100	OP7	+35	+40	3236	
BENZENE-1,3-DISULPHONYL HYDRAZIDE, as a paste	52	OP7			3226	
BENZENE SULPHONYL HYDRAZIDE	100	OP7			3226	
4-(BENZYL(ETHYL)AMINO)-3-ETHOXY-BENZENEDIAZONIUM ZINC CHLORIDE	100	OP7			3226	
4-(BENZYL(METHYL)AMINO)-3-ETHOXY-BENZENEDIAZONIUM ZINC CHLORIDE	100	OP7	+40	+45	3236	
3-CHLORO-4-DIETHYLAMINOBENZENE-DIAZONIUM ZINC CHLORIDE	100	OP7			3226	

<u>SELF-REACTIVE SUBSTANCE</u>	<u>Concentration (%)</u>	<u>Packing method</u>	<u>Control temperature (°C)</u>	<u>Emergency temperature (°C)</u>	<u>UN generic entry</u>	<u>Remarks</u>
2-DIAZO-1-NAPHTHOL-4-SULPHONYL CHLORIDE	100	OP5			3222	(2)
2-DIAZO-1-NAPHTHOL-5-SULPHONYL CHLORIDE	100	OP5			3222	(2)

SELF-REACTIVE SUBSTANCE	Concentration (%)	Packing method	Control temperature (°C)	Emergency temperature (°C)	UN generic entry	Remarks
2-DIAZO-1-NAPHTHOL SULPHONIC ACID ESTER MIXTURE, TYPE D	< 100	OP7			3226	(9)
2,5-DIBUTOXY-4-(4-MORPHOLINYL)-BENZENEDIAZONIUM, TETRACHLOROZINCATE (2:1)	100	OP8			3228	
2,5-DIETHOXY-4-MORPHOLINO-BENZENEDIAZONIUM ZINC CHLORIDE	67-100	OP7	+35	+40	3236	
2,5-DIETHOXY-4-MORPHOLINO-BENZENEDIAZONIUM ZINC CHLORIDE	66	OP7	+40	+45	3236	
2,5-DIETHOXY-4-MORPHOLINO-BENZENEDIAZONIUM TETRAFLUOROBORATE	100	OP7	+30	+35	3236	
2,5-DIETHOXY-4-(4-MORPHOLINYL)-BENZENEDIAZONIUM SULPHATE	100	OP7			3226	
2,5-DIETHOXY-4-(PHENYLSULPHONYL)-BENZENEDIAZONIUM ZINC CHLORIDE	67	OP7	+40	+45	3236	
DIETHYLENEGLYCOL BIS (ALLYL CARBONATE) + DI- ISOPROPYL-PEROXYDICARBONATE	≥ 88+≤ 12	OP8	-10	0	3237	
2,5-DIMETHOXY-4-(4-METHYL-PHENYLSULPHONYL)BENZENE- DIAZONIUM ZINC CHLORIDE	79	OP7	+40	+45	3236	
4-(DIMETHYLAMINO)-BENZENE-DIAZONIUM TRICHLOROZINCATE (-1)	100	OP8			3228	
4-DIMETHYLAMINO-6-(2-DIMETHYL-AMINOETHOXY) TOLUENE- 2-DIAZONIUM ZINC CHLORIDE	100	OP7	+40	+45	3236	
N,N'-DINITROSO-N,N'- DIMETHYL TEREPHTHALAMIDE, as a paste	72	OP6			3224	
N,N'-DINITROSO-PENTAMETHYLENE-TETRAMINE	82	OP6			3224	(7)
DIPHENYLOXIDE-4,4'-DISULPHONYL HYDRAZIDE	100	OP7			3226	
4-DIPROPYLAMINO-BENZENE- DIAZONIUM ZINC CHLORIDE	100	OP7			3226	
2-(N,N-ETHOXYCARBONYL-PHENYLAMINO)-3-METHOXY-4-(N-METHYL-N-CYCLOHEXYLAMINO) BENZENEDIAZONIUM ZINC CHLORIDE	63-92	OP7	+ 40	+ 45	3236	
2-(N,N-ETHOXYCARBONYL-PHENYLAMINO)-3-METHOXY-4-(N-METHYL-N-CYCLOHEXYLAMINO) BENZENEDIAZONIUM ZINC CHLORIDE	62	OP7	+ 35	+ 40	3236	
N-FORMYL-2-(NITROMETHYLENE)-1,3-PERHYDROTHIAZINE	100	OP7	+45	+50	3236	
2-(2-HYDROXYETHOXY)-1-(PYRROLIDIN-1-YL)BENZENE-4- DIAZONIUM ZINC CHLORIDE	100	OP7	+ 45	+ 50	3236	
3-(2-HYDROXYETHOXY)-4-(PYRROLIDIN-1-YL) BENZENE DIAZONIUM ZINC CHLORIDE	100	OP7	+40	+45	3236	
2-(N,N-METHYLAMINOETHYL-CARBONYL)-4-(3,4-DIMETHYLPHENYLSULPHONYL) BENZENEDIAZONIUM HYDROGEN SULPHATE	96	OP7	+45	+50	3236	
4-METHYLBENZENESULPHONYLHYDRAZIDE	100	OP7			3226	

<u>SELF-REACTIVE SUBSTANCE</u>	<u>Concen- tration (%)</u>	<u>Packing method</u>	<u>Control tempera- ture (°C)</u>	<u>Emergency tempera- ture (°C)</u>	<u>UN generic entry</u>	<u>Remarks</u>
3-METHYL-4-(PYRROLIDIN-1-YL) BENZENEDIAZONIUM TETRAFLUOROBORATE	95	OP6	+45	+50	3234	
4-NITROSOPHENOL	100	OP7	+35	+40	3236	
<u>PHOSPHOROTHIOIC ACID, O-[(CYANOPHENYL METHYLENE) AZANYL] O,O-DIETHYL ESTER</u>	<u>82-91 (Z isomer)</u>	<u>OP8</u>			<u>3227</u>	<u>(10)</u>

SELF-REACTIVE SUBSTANCE	Concentration (%)	Packing method	Control temperature (°C)	Emergency temperature (°C)	UN generic entry	Remarks
SELF-REACTIVE LIQUID, SAMPLE		OP2			3223	(8)
SELF-REACTIVE LIQUID, SAMPLE, TEMPERATURE CONTROLLED		OP2			3233	(8)
SELF-REACTIVE SOLID, SAMPLE		OP2			3224	(8)
SELF-REACTIVE SOLID, SAMPLE, TEMPERATURE CONTROLLED		OP2			3234	(8)
SODIUM 2-DIAZO-1-NAPHTHOL- 4-SULPHONATE	100	OP7			3226	
SODIUM 2-DIAZO-1-NAPHTHOL- 5-SULPHONATE	100	OP7			3226	
TETRAMINE PALLADIUM (II) NITRATE	100	OP6	+30	+35	3234	

Remarks

- (1) Azodicarbonamide formulations which fulfil the criteria of paragraph 20.4.2 (b) of the Manual of Tests and Criteria. The control and emergency temperatures shall be determined by the procedure given in [2.2.41.1.477.3.1 to 7.1.7.3.6](#).
- (2) "EXPLOSIVE" subsidiary ~~risk~~hazard label required (Model No. 1, see 5.2.2.2.2).
- (3) Azodicarbonamide formulations which fulfil the criteria of paragraph 20.4.2 (c) of the Manual of Tests and Criteria.
- (4) Azodicarbonamide formulations which fulfil the criteria of paragraph 20.4.2 (c) of the Manual of Tests and Criteria. The control and emergency temperatures shall be determined by the procedure given in [2.2.41.1.477.3.1 to 7.1.7.3.6](#).
- (5) Azodicarbonamide formulations which fulfil the criteria of paragraph 20.4.2 (d) of the Manual of Tests and Criteria.
- (6) Azodicarbonamide formulations which fulfil the criteria of paragraph 20.4.2 (d) of the Manual of Tests and Criteria. The control and emergency temperatures shall be determined by the procedure given in [2.2.41.1.477.3.1 to 7.1.7.3.6](#).
- (7) With a compatible diluent having a boiling point of not less than 150 °C.
- (8) See 2.2.41.1.15.
- (9) ~~(9)~~ This entry applies to mixtures of esters of 2-diazo-1-naphthol-4-sulphonic acid and 2-diazo-1-naphthol-5-sulphonic acid which fulfil the criteria of paragraph 20.4.2 (d) of the Manual of Test and Criteria.
- (10) [This entry applies to the technical mixture in n-butanol within the specified concentration limits of the \(Z\) isomer.](#)

2.2.42 Class 4.2 Substances liable to spontaneous combustion

2.2.42.1 Criteria

2.2.42.1.1 The heading of Class 4.2 covers:

- *Pyrophoric substances* which are substances, including mixtures and solutions (liquid or solid), which even in small quantities ignite on contact with air within five minutes. These are the Class 4.2 substances the most liable to spontaneous combustion; and
- *Self-heating substances and articles* which are substances and articles, including mixtures and solutions, which, on contact with air, without energy supply, are liable to self-heating. These substances will ignite only in large amounts (kilograms) and after long periods of time (hours or days).

2.2.42.1.2 The substances and articles of Class 4.2 are subdivided as follows:

S Substances liable to spontaneous combustion, without subsidiary

~~risk~~hazard: S1 Organic, liquid;

S2 Organic, solid;

S3 Inorganic, liquid;

S4 Inorganic, solid;

S5 Organometallic;

S6 Articles

SW Substances liable to spontaneous combustion, which, in contact with water, emit flammable gases;

SO Substances liable to spontaneous combustion, oxidizing;

ST Substances liable to spontaneous combustion, toxic:

ST1 Organic, toxic, liquid;

ST2 Organic, toxic, solid;

ST3 Inorganic, toxic, liquid;

ST4 Inorganic, toxic, solid;

SC Substances liable to spontaneous combustion, corrosive:

SC1 Organic, corrosive, liquid;

SC2 Organic, corrosive, solid;

SC3 Inorganic, corrosive, liquid;

SC4 Inorganic, corrosive, solid.

Properties

2.2.42.1.3 Self-heating of a substance is a process where the gradual reaction of that substance with oxygen (in air) generates heat. If the rate of heat production exceeds the rate of heat loss, then the temperature of the substance will rise which, after an induction time, may lead to self-ignition and combustion.

Classification

2.2.42.1.4 Substances and articles classified in Class 4.2 are listed in Table A of Chapter 3.2. The assignment of substances and articles not mentioned by name in Table A of Chapter 3.2 to the relevant specific N.O.S. entry of 2.2.42.3 in accordance with the provisions of Chapter 2.1 can be based on experience or the results of the test procedures in accordance with the Manual of Tests and Criteria, Part III, Section 33.3. Assignment to general N.O.S. entries of Class 4.2 shall be based on the results of the test procedures in accordance with the Manual of Tests and Criteria, Part III, section 33.3; experience shall also be taken into account when it leads to a more stringent assignment.

2.2.42.1.5 When substances or articles not mentioned by name are assigned to one of the entries listed in 2.2.42.3 on the basis of the test procedures in accordance with the Manual of Tests and Criteria, Part III, section 33.3, the following criteria shall apply:

- (a) Solids liable to spontaneous combustion (pyrophoric) shall be assigned to Class 4.2 when they ignite on falling from a height of 1 m or within five minutes;
- (b) Liquids liable to spontaneous combustion (pyrophoric) shall be assigned to Class 4.2 when:
 - (i) on being poured on an inert carrier, they ignite within five minutes, or
 - (ii) in the event of a negative result of the test according to (i), when poured on a dry, indented filter paper (Whatman No. 3 filter), they ignite or carbonize it within five minutes;
- (c) Substances in which, in a 10 cm sample cube, at 140 °C test temperature, spontaneous combustion or a rise in temperature to over 200 °C is observed within 24 hours shall be assigned to Class 4.2. This criterion is based on the temperature of the spontaneous combustion of charcoal, which is at 50 °C for a sample cube of 27 m³. Substances with a temperature of spontaneous combustion higher than 50 °C for a volume of 27 m³ are not to be assigned to Class 4.2.

NOTE 1: Substances carried in packages with a volume of not more than 3 m³ are exempted from Class 4.2 if, tested with a 10 cm sample cube at 120 °C, no spontaneous combustion nor a rise in temperature to over 180 °C is observed within 24 hours.

NOTE 2: Substances carried in packages with a volume of not more than 450 litres are exempted from Class 4.2 if, tested with a 10 cm sample cube at 100 °C, no spontaneous combustion nor a rise in temperature to over 160 °C is observed within 24 hours.

NOTE 3: Since organometallic substances can be classified in Class 4.2 or 4.3 with additional subsidiary **risks/hazards**, depending on their properties, a specific classification flow chart for these substances is given in 2.3.5.

2.2.42.1.6 If substances of Class 4.2, as a result of admixtures, come into different categories of **risks/hazard** from those to which the substances mentioned by name in Table A of Chapter 3.2 belong, these mixtures shall be assigned to the entries to which they belong on the basis of their actual degree of danger.

NOTE: For the classification of solutions and mixtures (such as preparations and wastes), see also 2.1.3.

2.2.42.1.7 On the basis of the test procedure in the Manual of Tests and Criteria, Part III, section 33.3 and the criteria set out in 2.2.42.1.5, it may also be determined whether the nature of a substance mentioned by name is such that the substance is not subject to the provisions for this Class.

Assignment of packing groups

2.2.42.1.8 Substances and articles classified under the various entries in Table A of Chapter 3.2 shall be assigned to packing groups I, II or III on the basis of test procedures of the Manual of Tests and Criteria, Part III, section 33.3, in accordance with the following criteria:

- (a) Substances liable to spontaneous combustion (pyrophoric) shall be assigned to packing group I;
- (b) Self-heating substances and articles in which, in a 2.5 cm sample cube, at 140 °C test temperature, spontaneous combustion or a rise in temperature to over 200 °C is observed within 24 hours, shall be assigned to packing group II;

Substances with a temperature of spontaneous combustion higher than 50 °C for a volume of 450 litres are not to be assigned to packing group II;

- (c) Slightly self-heating substances in which, in a 2.5 cm sample cube, the phenomena referred to under (b) are not observed, in the given conditions, but in which in a 10 cm sample cube at 140 °C test temperature spontaneous combustion or a rise in temperature to over 200 °C is observed within 24 hours, shall be assigned to packing group III.

2.2.42.2

Substances not accepted for carriage

The following substances shall not be accepted for carriage:

- UN No. 3255 tert-BUTYL HYPOCHLORITE; and
- Self-heating solids, oxidizing, assigned to UN No. 3127 unless they meet the requirements for Class 1 (see 2.1.3.7).

2.2.42.3 List of collective entries

Substances liable to spontaneous combustion	organic	liquid S1	2845 PYR 3183 SEL	Merged Cells
Without subsidiary hazard				Deleted Cells Deleted Cells Merged Cells Merged Cells
		S2		
Without subsidiary risk		solid S2	1373 FIB 1373 VEGETABLE or SYNTHETIC, N.O.S. with oil 2006 PLASTICS, NITROCELLULOSE-BASED, SELF-HEATING, N.O.S. 3313 ORGANIC PIGMENTS, SELF HEATING 2846 PYR 3088 SEL	Merged Cells Deleted Cells Deleted Cells Merged Cells
S		liquid S3	3194 PYR	Deleted Cells Deleted Cells Deleted Cells
	inorganic		3186 SEL	Merged Cells
	inorganic	S4	1383 PYR	Deleted Cells Deleted Cells Merged Cells
		3393 ORGANOMETALLIC SUBSTANCE, SOLID, PYROPHORIC, WATER-REACTIVE		
		solid S4	1383 PYROPHORIC ALLOY, N.O.S. 1378 METAL CATALYST, WETTED with a visible excess of liquid 2881 METAL CATALYST, DRY 3189* METAL CATALYST, DRY 2881 3189* 3205 AL	Deleted Cells Deleted Cells Deleted Cells Deleted Cells Deleted Cells
	organometallic		3200 PYROPHORIC SOLID, INORGANIC, N.O.S. 3190 SELF-HEATING SOLID, INORGANIC, N.O.S.	
organometallic		S5	3392 OR 3391 OR 3400 OR	Deleted Cells Merged Cells Inserted Cells
	articles	S6	3542	ARTICLES CONTAINING A SUBSTANCE LIABLE TO SPONTANEOUS COMBUSTION, N.O.S.
Water-reactive				
Water-reactive		SW	3394 RE 3393 OR RE	Merged Cells Inserted Cells Merged Cells
Oxidizing		SO	3127	SELF-HEATING SOLID, OXIDIZING, N.O.S. (not allowed, see 2.2)

2.2.43 Class 4.3 Substances which, in contact with water, emit flammable gases

2.2.43.1 Criteria

2.2.43.1.1 The heading of Class 4.3 covers substances which react with water to emit flammable gases liable to form explosive mixtures with air, and articles containing such substances.

2.2.43.1.2 Substances and articles of Class 4.3 are subdivided as follows:

W Substances which, in contact with water, emit flammable gases, without subsidiary ~~risk~~ hazard, and articles containing such substances:

W1 Liquid;

W2 Solid;

W3 Articles;

WF1 Substances which, in contact with water, emit flammable gases, liquid, flammable;

WF2 Substances which, in contact with water, emit flammable gases, solid, flammable;

WS Substances which, in contact with water, emit flammable gases, solid, self-heating;

WO Substances which, in contact with water, emit flammable gases, oxidizing, solid;

WT Substances which, in contact with water, emit flammable gases, toxic:

WT1 Liquid;

WT2 Solid;

WC Substances which, in contact with water, emit flammable gases, corrosive:

WC1 Liquid;

WC2 Solid;

WFC Substances which, in contact with water, emit flammable gases, flammable, corrosive.

Properties

2.2.43.1.3 Certain substances in contact with water may emit flammable gases that can form explosive mixtures with air. Such mixtures are easily ignited by all ordinary sources of ignition, for example naked lights, sparking handtools or unprotected lamps. The resulting blast wave and flames may endanger people and the environment. The test method referred to in 2.2.43.1.4 below is used to determine whether the reaction of a substance with water leads to the development of a dangerous amount of gases which may be flammable. This test method shall not be applied to pyrophoric substances.

Classification

2.2.43.1.4 Substances and articles classified in Class 4.3 are listed in Table A of Chapter 3.2. The assignment of substances and articles not mentioned by name in Table A of Chapter 3.2 to the relevant entry of 2.2.43.3 in accordance with the provisions of Chapter 2.1 shall be based on the results of the test procedure in accordance with the Manual of Tests and Criteria, Part III, Section 33.4; experience shall also be taken into account when it leads to a more stringent assignment.

2.2.43.1.5 When substances not mentioned by name are assigned to one of the entries listed in 2.2.43.3 on the basis of the test procedure in accordance with the Manual of Tests and Criteria, Part III, Section 33.4, the following criteria shall apply:

A substance shall be assigned to Class 4.3 if:

- (a) spontaneous ignition of the gas emitted takes place in any step of the test procedure; or
- (b) there is an evolution of flammable gas at a rate greater than 1 litre per kilogram of the substance to be tested per hour.

NOTE: Since organometallic substances can be classified in Class 4.2 or 4.3 with additional subsidiary ~~risk~~hazards, depending on their properties, a specific classification flow chart for these substances is given in 2.3.5.

2.2.43.1.6 If substances of Class 4.3, as a result of admixtures, come into different categories of ~~risk~~hazard from those to which the substances mentioned by name in Table A of Chapter 3.2 belong, these mixtures shall be assigned to the entries to which they belong on the basis of their actual degree of danger.

NOTE: For the classification of solutions and mixtures (such as preparations and wastes) see also 2.1.3.

2.2.43.1.7 On the basis of the test procedures in accordance with the Manual of Tests and Criteria, Part III, Section 33.4, and the criteria set out in paragraph 2.2.43.1.5, it may also be determined whether the nature of a substance mentioned by name is such that the substance is not subject to the provisions for this Class.

Assignment of packing groups

2.2.43.1.8 Substances and articles classified under the various entries in Table A of Chapter 3.2 shall be assigned to packing groups I, II or III on the basis of test procedures of the Manual of Tests and Criteria, Part III, section 33.4, in accordance with the following criteria:

- (a) Packing group I shall be assigned to any substance which reacts vigorously with water at ambient temperature and generally demonstrates a tendency for the gas produced to ignite spontaneously, or one which reacts readily with water at ambient temperatures such that the rate of evolution of flammable gas is equal to or greater than 10 litres per kilogram of substance over any one minute period;
- (b) Packing group II shall be assigned to any substance which reacts readily with water at ambient temperature such that the maximum rate of evolution of flammable gas is equal to or greater than 20 litres per kilogram of substance per hour, and which does not meet the criteria of packing group I;
- (c) Packing group III shall be assigned to any substance which reacts slowly with water at ambient temperature such that the maximum rate of evolution of flammable gas is greater than 1 litre per kilogram of substance per hour, and which does not meet the criteria of packing groups I or II.

2.2.43.2 Substances not accepted for carriage

Water-reactive solids, oxidizing, assigned to UN No. 3133 shall not be accepted for carriage unless they meet the requirements for Class 1 (see also 2.1.3.7).

2.2.43.3 List of collective entries

Substances which, in contact with water, emit flammable gases			<p>1389 ALKALI METAL-AMALGAM, LIQUID 1391 ALKALI METAL-DISPERSION or 1391 ALKALINE EARTH METAL-DISPERSION 1392 ALKALINE EARTH METAL-AMALGAM, LIQUID 1420 POTASSIUM METAL-ALLOYS, LIQUID 1421 ALKALI METAL-ALLOY, LIQUID, N.O.S. 1422 POTASSIUM SODIUM ALLOYS, LIQUID 3398 ORGANOMETALLIC SUBSTANCE, LIQUID, WATER-REACTIVE 3148 WATER-REACTIVE LIQUID, N.O.S.</p>
Without subsidiary hazard	liquid	W1	
W	solid	W2 ^a	<p>1390 ALKALI METAL AMIDES 3401 ALKALI METAL-AMALGAM, SOLID 3402 ALKALINE EARTH METAL-AMALGAM, SOLID 3170 ALUMINIUM-SMELTING-BY-PRODUCTS or 3170 ALUMINIUM-REMELTING-BY-PRODUCTS 3403 POTASSIUM METAL-ALLOYS, SOLID 3404 POTASSIUM SODIUM ALLOYS, SOLID 1393 ALKALINE EARTH METAL-ALLOY, N.O.S. 1409 METAL HYDRIDES, WATER-REACTIVE, N.O.S. 3208 METALLIC SUBSTANCE, WATER-REACTIVE, N.O.S. 3395 ORGANOMETALLIC SUBSTANCE, SOLID, WATER-REACTIVE 2813 WATER-REACTIVE SOLID, N.O.S.</p>
	metals	W2 ^a	<p>1390 ALKALI METAL AMIDES 3401 ALKALI METAL-AMALGAM, SOLID or 3402 ALKALI METAL-AMALGAM, SOLID 3170 ALUMINIUM-SMELTING-BY-PRODUCTS or 3170 ALUMINIUM-REMELTING-BY-PRODUCTS 3403 POTASSIUM METAL-ALLOYS, SOLID 3404 POTASSIUM SODIUM ALLOYS, SOLID 1393 ALKALINE EARTH METAL-ALLOY, N.O.S. 1409 METAL HYDRIDES, WATER-REACTIVE, N.O.S. 3208 METALLIC SUBSTANCE, WATER-REACTIVE, N.O.S. 3395 ORGANOMETALLIC SUBSTANCE, SOLID, WATER-REACTIVE 2813 WATER-REACTIVE SOLID, N.O.S.</p>
Liquid, flammable			
Liquid, flammable			
Solid, flammable			
Solid, flammable			
Solid, self-heating		W3	<p>3292 BATTERIES, CONTAINING SODIUM or 3292 CELLS, CONTAINING SODIUM 3543 ARTICLES CONTAINING A SUBSTANCE WHICH IN CONTACT WITH WATER EMITS FLAMMABLE GASES, N.O.S.</p>
Solid, self-heating			
Solid, oxidizing		WF1	<p>3482 ALKALI METAL-DISPERSION, FLAMMABLE or 3482 ALKALINE EARTH METAL-DISPERSION, FLAMMABLE 3399 ORGANOMETALLIC SUBSTANCE, LIQUID, WATER-REACTIVE, FLAMMABLE</p>
Solid, oxidizing	liquid		
Toxic	liquid		
WT	solid	WF2	<p>3396 ORGANOMETALLIC SUBSTANCE, SOLID, WATER-REACTIVE, FLAMMABLE 3132 WATER-REACTIVE SOLID, FLAMMABLE, N.O.S.</p>
Toxic	solid		
WT	solid		
Corrosive		WS ^b	<p>3397 ORGANOMETALLIC SUBSTANCE, SOLID, WATER-REACTIVE, SELF-HEATING 3209 METALLIC SUBSTANCE, WATER-REACTIVE, SELF-HEATING, N.O.S. 3135 WATER-REACTIVE SOLID, SELF-HEATING, N.O.S.</p>
WC	liquid		
Corrosive	solid		
WC	solid		
Flammable, corrosive		WS ^b	<p>3207 ORGANOMETALLIC SUBSTANCE, SOLID, WATER-REACTIVE 3133 WATER-REACTIVE SOLID, OXIDIZING, N.O.S. (not allowed, see 2.2.43.2) SELF-HEATING 3209 METALLIC SUBSTANCE, WATER-REACTIVE, SELF-HEATING, N.O.S. 3135 WATER-REACTIVE SOLID, SELF-HEATING, N.O.S.</p>
Flammable, corrosive			
		WO	<p>3133 WATER-REACTIVE SOLID, OXIDIZING, N.O.S. (not allowed, see 2.2.43.2)</p>
		WT1	<p>3130 WATER-REACTIVE LIQUID, TOXIC, N.O.S.</p>
		WT2	<p>3134 WATER-REACTIVE SOLID, TOXIC, N.O.S.</p>
		WC1	<p>3129 WATER-REACTIVE LIQUID, CORROSIVE, N.O.S.</p>
		WC2	<p>3121 WATER-REACTIVE SOLID, CORROSIVE, N.O.S.</p>
		WFC	<p>2988 CHLOROSILANES, WATER-REACTIVE, FLAMMABLE, CORROSIVE, N.O.S. (No other collective entry with this classification code available, if need be, classification under a collective entry with a classification code to be determined according to the table of precedence of hazard in 2.1.2.10.)</p>

^a *Metals and metal alloys which, in contact with water, do not emit flammable gases and are not pyrophoric or self-heating, but which are readily flammable, are substances of Class 4.1. Alkaline-earth metals and alkaline-earth metal alloys in pyrophoric form are substances of Class 4.2. Dust and powders of metals in pyrophoric form are substances of Class 4.2. Metals and metal alloys in pyrophoric form are substances of Class 4.2. Compounds of phosphorus with heavy metals such as iron, copper, etc. are not subject to the provisions of ADR.*

^b *Metals and metal alloys in pyrophoric form are substances of Class 4.2.*

^c *Chlorosilanes, having a flash-point of less than 23 °C and which, in contact with water, do not emit flammable gases, are substances of Class 3. Chlorosilanes, having a flash-point equal to or greater than 23 °C and which, in contact with water, do not emit flammable gases, are substances of Class 8.*

2.2.51 Class 5.1 Oxidizing substances

2.2.51.1 Criteria

2.2.51.1.1 The heading of Class 5.1 covers substances which, while in themselves not necessarily combustible, may, generally by yielding oxygen, cause or contribute to the combustion of other material, and articles containing such substances.

2.2.51.1.2 The substances of Class 5.1 and articles containing such substances are subdivided as follows:

O Oxidizing substances without subsidiary ~~risk~~hazard or articles containing such substances:

O1 Liquid;

O2 Solid;

O3 Articles;

OF Oxidizing substances, solid, flammable;

OS Oxidizing substances, solid, self-heating;

OW Oxidizing substances, solid which, in contact with water, emit flammable gases;

OT Oxidizing substances, toxic:

OT1 Liquid;

OT2 Solid;

OC Oxidizing substances, corrosive:

OC1 Liquid;

OC2 Solid;

OTC Oxidizing substances, toxic, corrosive.

2.2.51.1.3 Substances and articles classified in Class 5.1 are listed in Table A of Chapter 3.2. The assignment of substances and articles not mentioned by name in Table A of Chapter 3.2 to the relevant entry of 2.2.51.3 in accordance with the provisions of Chapter 2.1 can be based on the tests, methods and criteria in paragraphs 2.2.51.1.6-2.2.51.1.9~~10~~ below and the Manual of Tests and Criteria, Part III, Section 34.4 or, for solid ammonium nitrate based fertilizers, Section 39 subject to the restrictions of 2.2.51.2.2, thirteenth and fourteenth indents. In the event of divergence between test results and known experience, judgement based on known experience shall take precedence over test results.

2.2.51.1.4 If substances of Class 5.1, as a result of admixtures, come into different categories of ~~risk~~hazard from those to which the substances mentioned by name in Table A of Chapter 3.2 belong, these mixtures or solutions shall be assigned to the entries to which they belong on the basis of their actual degree of danger.

NOTE: For the classification of solutions and mixtures (such as preparations and wastes), see also Section 2.1.3.

2.2.51.1.5 On the basis of the test procedures in the Manual of Tests and Criteria, Part III, Section 34.4 and the criteria set out in 2.2.51.1.6 to 2.2.51.1.9 it may also be determined whether the nature of a substance mentioned by name in Table A of Chapter 3.2 is such that the substance is not subject to the provisions for this class.

Oxidizing solids

Classification

2.2.51.1.6 When oxidizing solid substances not mentioned by name in Table A of Chapter 3.2 are assigned to one of the entries listed in 2.2.51.3 on the basis of the test procedure in accordance with the Manual of Tests and Criteria, Part III, sub-section 34.4.1 (test O.1) or alternatively, sub section 34.4.3 (test O.3), the following criteria shall apply:

- (a) In the test O.1, a solid substance shall be assigned to Class 5.1 if, in the 4:1 or the 1:1 sample-to-cellulose ratio (by mass) tested, it ignites or burns or exhibits mean burning times equal to or less than that of a 3:7 mixture (by mass) of potassium bromate and cellulose; or
- (b) In the test O.3, a solid substance shall be assigned to Class 5.1 if, in the 4:1 or the 1:1 sample-to-cellulose ratio (by mass) tested, it exhibits a mean burning rate equal to or greater than the mean burning rate of a 1:2 mixture (by mass) of calcium peroxide and cellulose.

2.2.51.1.7 By exception, solid ammonium nitrate based fertilizers shall be classified in accordance with the procedure as set out in the Manual of Tests and Criteria, Part III, Section 39.

Assignment of packing groups

2.2.51.1.72.2.51.1.8 Oxidizing solids classified under the various entries in Table A of Chapter 3.2 shall be assigned to packing groups I, II or III on the basis of test procedures of the Manual of Tests and Criteria, Part III, sub-section 34.4.1 (test O.1) or sub-section 34.4.3 (test O.3), in accordance with the following criteria:

- (a) Test O.1:
 - (i) Packing group I: any substance which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning time less than the mean burning time of a 3:2 mixture, by mass, of potassium bromate and cellulose;
 - (ii) Packing group II: any substance which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning time equal to or less than the mean burning time of a 2:3 mixture (by mass) of potassium bromate and cellulose and the criteria for packing group I are not met;
 - (iii) Packing group III: any substance which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning time equal to or less than the mean burning time of a 3:7 mixture (by mass) of potassium bromate and cellulose and the criteria for packing groups I and II are not met;
- (b) Test O.3:
 - (i) Packing group I: any substance which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning rate greater than the mean burning rate of a 3:1 mixture (by mass) of calcium peroxide and cellulose;
 - (ii) Packing group II: any substance which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning rate equal to or greater than the mean burning rate of a 1:1 mixture (by mass) of calcium peroxide and cellulose, and the criteria for packing group I are not met;
 - (iii) Packing group III: any substance which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning rate equal to or greater than the mean burning rate of a 1:2 mixture (by mass) of calcium peroxide and cellulose, and the criteria for packing groups I and II are not met.

Oxidizing liquids

Classification

2.2.51.1.82.2.51.1.9 When oxidizing liquid substances not mentioned by name in Table A of Chapter 3.2 are assigned to one of the entries listed in sub-section 2.2.51.3 on the basis of the test procedure in accordance with the Manual of Tests and Criteria, Part III, sub-section 34.4.2, the following criteria shall apply:

A liquid substance shall be assigned to Class 5.1 if, in the 1:1 mixture, by mass, of substance and cellulose tested, it exhibits a pressure rise of 2070 kPa gauge or more and a mean pressure rise time equal to or less than the mean pressure rise time of a 1:1 mixture, by mass, of 65% aqueous nitric acid and cellulose.

Assignment of packing groups

2.2.51.1.92.2.51.1.10 Oxidizing liquids classified under the various entries in Table A of Chapter 3.2 shall be assigned to packing groups I, II or III on the basis of test procedures of the Manual of Tests and Criteria, Part III, section 34.4.2, in accordance with the following criteria:

- (a) Packing group I: any substance which, in the 1:1 mixture, by mass, of substance and cellulose tested, spontaneously ignites; or the mean pressure rise time of a 1:1 mixture, by mass, of substance and cellulose is less than that of a 1:1 mixture, by mass, of 50% perchloric acid and cellulose;
- (b) Packing group II: any substance which, in the 1:1 mixture, by mass, of substance and cellulose tested, exhibits a mean pressure rise time less than or equal to the mean pressure rise time of a 1:1 mixture, by mass, of 40% aqueous sodium chlorate solution and cellulose; and the criteria for packing group I are not met;
- (c) Packing group III: any substance which, in the 1:1 mixture, by mass, of substance and cellulose tested, exhibits a mean pressure rise time less than or equal to the mean pressure rise time of a 1:1 mixture, by mass, of 65% aqueous nitric acid and cellulose; and the criteria for packing groups I and II are not met.

2.2.51.2 *Substances not accepted for carriage*

2.2.51.2.1 The chemically unstable substances of Class 5.1 shall not be accepted for carriage unless the necessary steps have been taken to prevent their dangerous decomposition or polymerization during carriage. To this end it shall in particular be ensured that receptacles and tanks do not contain any material liable to promote these reactions.

2.2.51.2.2 The following substances and mixtures shall not be accepted for carriage:

- oxidizing solids, self-heating, assigned to UN No. 3100, oxidizing solids, water-reactive, assigned to UN No. 3121 and oxidizing solids, flammable, assigned to UN No. 3137, unless they meet the requirements for Class 1 (see also 2.1.3.7);
- hydrogen peroxide, not stabilized or hydrogen peroxide, aqueous solutions, not stabilized containing more than 60% hydrogen peroxide;
- tetranitromethane not free from combustible impurities;
- perchloric acid solutions containing more than 72% (mass) acid, or mixtures of perchloric acid with any liquid other than water;
- chloric acid solution containing more than 10% chloric acid or mixtures of chloric acid with any liquid other than water;
- halogenated fluor compounds other than UN Nos. 1745 BROMINE PENTAFLUORIDE; 1746 BROMINE TRIFLUORIDE and 2495 IODINE PENTAFLUORIDE of Class 5.1 as well as UN Nos. 1749 CHLORINE TRIFLUORIDE and 2548 CHLORINE PENTAFLUORIDE of Class 2;
- ammonium chlorate and its aqueous solutions and mixtures of a chlorate with an ammonium salt;
- ammonium chlorite and its aqueous solutions and mixtures of a chlorite with an ammonium salt;
- mixtures of a hypochlorite with an ammonium salt;
- ammonium bromate and its aqueous solutions and mixtures of a bromate with an ammonium salt;
- ammonium permanganate and its aqueous solutions and mixtures of a permanganate with an ammonium salt;

- ammonium nitrate containing more than 0.2% combustible substances (including any organic substance calculated as carbon) unless it is a constituent of a substance or article of Class 1;
- ~~fertilizers having an ammonium nitrate content (in determining based fertilizers with compositions that lead to exit boxes 4, 6, 8, 15, 31, or 33 of the flowchart of paragraph 39.5.1 of the Manual of Tests and Criteria, Part III, Section 39, unless they have been assigned a suitable UN number in Class 1;~~
- ~~ammonium nitrate content, all nitrate ions for which a molecular equivalent of ammonium ions is present in the mixture shall be calculated as ammonium nitrate) or a content in combustible substances exceeding based fertilizers with compositions that lead to exit boxes 20, 23 or 39 of the values specified in special provision 307 except under flowchart of paragraph 39.5.1 of the Manual of Tests and Criteria, Part III, Section 39, unless they have been assigned a suitable UN number in Class 1 or, provided that the suitability for carriage has been demonstrated and that this has been approved by the competent authority, in Class 5.1 other than UN No. 2067;~~

***NOTE:** The term "competent authority" means the competent authority of the country of origin. If the country of origin is not a Contracting Party to ADR, the classification and conditions applicable to Class 1 of carriage shall be recognized by the competent authority of the first country Contracting Party to ADR reached by the consignment.*
- ammonium nitrite and its aqueous solutions and mixtures of an inorganic nitrite with an ammonium salt;
- mixtures of potassium nitrate, sodium nitrite and an ammonium salt.

Oxidizing substances and articles containing such substances	liquid	
Without subsidiary risk	solid	
Ø		
	articles	
Solid, flammable		
Solid, self-heating		
Solid, water reactive		
Toxic	liquid	
OT	solid	
Corrosive	liquid	
OC	solid	
Toxic, corrosive		

2.2.51.3 List of collective entries

<u>Oxidizing substances and articles containing such substances</u>	<u>liquid</u>	O1	3210 CHLORATES, INORGANIC, AQUEOUS SOLUTION, N.O.S. 3211 PERCHLORATES, INORGANIC, AQUEOUS SOLUTION, N.O.S. 3213 BROMATES, INORGANIC, AQUEOUS SOLUTION, N.O.S. 3214 PERMANGANATES, INORGANIC, AQUEOUS SOLUTION, N.O.S. 3216 PERSULPHATES, INORGANIC, AQUEOUS SOLUTION, N.O.S. 3218 NITRATES, INORGANIC, AQUEOUS SOLUTION, N.O.S. 3219 NITRITES, INORGANIC, AQUEOUS SOLUTION, N.O.S. 3139 OXIDIZING LIQUID, N.O.S.
<u>Without subsidiary hazard</u>	<u>solid</u>	O2	1450 BROMATES, INORGANIC, N.O.S. 1461 CHLORATES, INORGANIC, N.O.S. 1462 CHLORITES, INORGANIC, N.O.S. 1477 NITRATES, INORGANIC, N.O.S. 1481 PERCHLORATES, INORGANIC, N.O.S. 1482 PERMANGANATES, INORGANIC, N.O.S. 1483 PEROXIDES, INORGANIC, N.O.S. 2627 NITRITES, INORGANIC, N.O.S. 3212 HYPOCHLORITES, INORGANIC, N.O.S. 3215 PERSULPHATES, INORGANIC, N.O.S. 1479 OXIDIZING SOLID, N.O.S.
<u>O</u>	<u>articles</u>	<u>O3</u> <u>O3</u>	3356 OXYGEN GENERATOR, CHEMICAL 3544 ARTICLES CONTAINING OXIDIZING SUBSTANCE, N.O.S.
<u>Solid, flammable</u>		OF	3137 OXIDIZING SOLID, FLAMMABLE, N.O.S. (not allowed, see 2.2.51.2)
<u>Solid, self-heating</u>		OS	3100 OXIDIZING SOLID, SELF-HEATING, N.O.S. (not allowed, see 2.2.51.2)
<u>Solid, water reactive</u>		OW	3121 OXIDIZING SOLID, WATER REACTIVE, N.O.S. (not allowed, see 2.2.51.2)
<u>Toxic</u>	<u>liquid</u>	OT1	3099 OXIDIZING LIQUID, TOXIC, N.O.S.
<u>OT</u>	<u>solid</u>	OT2	3087 OXIDIZING SOLID, TOXIC, N.O.S.
<u>Corrosive</u>	<u>liquid</u>	OC1	3098 OXIDIZING LIQUID, CORROSIVE, N.O.S.
<u>OC</u>	<u>solid</u>	OC2	3085 OXIDIZING SOLID, CORROSIVE, N.O.S.
<u>Toxic, corrosive</u>		OTC	(No collective entry with this classification code available; if need be, classification under a collective entry with a classification code to be determined according to the table of precedence of hazard in 2.1.3.10.)

2.2.52 Class 5.2 Organic peroxides

2.2.52.1 Criteria

2.2.52.1.1 The heading of Class 5.2 covers organic peroxides and formulations of organic peroxides.

2.2.52.1.2 The substances of Class 5.2 are subdivided as follows:

- P1 Organic peroxides, not requiring temperature control;
- P2 Organic peroxides, requiring temperature control.

Definition

- 2.2.52.1.3 *Organic peroxides* are organic substances which contain the bivalent -O-O- structure and may be considered derivatives of hydrogen peroxide, where one or both of the hydrogen atoms have been replaced by organic radicals.

Properties

- 2.2.52.1.4 Organic peroxides are liable to exothermic decomposition at normal or elevated temperatures. The decomposition can be initiated by heat, contact with impurities (e.g. acids, heavy-metal compounds, amines), friction or impact. The rate of decomposition increases with temperature and varies with the organic peroxide formulation. Decomposition may result in the evolution of harmful, or flammable, gases or vapours. For certain organic peroxides the temperature shall be controlled during carriage. Some organic peroxides may decompose explosively, particularly if confined. This characteristic may be modified by the addition of diluents or by the use of appropriate packagings. Many organic peroxides burn vigorously. Contact of organic peroxides with the eyes is to be avoided. Some organic peroxides will cause serious injury to the cornea, even after brief contact, or will be corrosive to the skin.

NOTE: Test methods for determining the flammability of organic peroxides are set out in the Manual of Tests and Criteria, Part III, sub-section 32.4. Because organic peroxides may react vigorously when heated, it is recommended to determine their flash-point using small sample sizes such as described in ISO 3679:1983.

Classification

- 2.2.52.1.5 Any organic peroxide shall be considered for classification in Class 5.2 unless the organic peroxide formulation contains:

- (a) Not more than 1.0% available oxygen from the organic peroxides when containing not more than 1.0% hydrogen peroxide;
- (b) Not more than 0.5% available oxygen from the organic peroxides when containing more than 1.0% but not more than 7.0% hydrogen peroxide.

NOTE: The available oxygen content (%) of an organic peroxide formulation is given by the formula

$$16 \times \sum (n_i \times c_i / m_i)$$

where:

- n_i = number of peroxygen groups per molecule of organic peroxide i ;
- c_i = concentration (mass %) of organic peroxide i ; and
- m_i = molecular mass of organic peroxide i .

- 2.2.52.1.6 Organic peroxides are classified into seven types according to the degree of danger they present. The types of organic peroxide range from type A, which is not accepted for carriage in the packaging in which it is tested, to type G, which is not subject to the provisions of Class 5.2. The classification of types B to F is directly related to the maximum quantity allowed in one package. The principles to be applied to the classification of substances not listed in 2.2.52.4 are set out in the Manual of Tests and Criteria, Part II.

- 2.2.52.1.7 Organic peroxides which have already been classified and are already permitted for carriage in packagings are listed in 2.2.52.4, those already permitted for carriage in IBCs are listed in 4.1.4.2, packing instruction IBC520 and those already permitted for carriage in tanks in accordance with Chapters 4.2 and 4.3 are listed in 4.2.5.2, portable tank instruction T23. Each permitted substance listed is assigned to a generic entry of Table A of Chapter 3.2 (UN Nos. 3101 to 3120) and appropriate subsidiary risks/hazards and remarks providing relevant transport information are given.

These generic entries specify:

- the type (B to F) of organic peroxide (see 2.2.52.1.6 above);
- physical state (liquid/solid); and
- temperature control (when required), see 2.2.52.1.15 ~~and~~ 2.2.52.1.18 ~~16~~.

Mixtures of these formulations may be classified as the same type of organic peroxide as that of the most dangerous component and be carried under the conditions of carriage given for this type. However, as two stable components can form a thermally less stable mixture, the self-accelerating decomposition temperature (SADT) of the mixture shall be determined and, if necessary, the control and emergency temperatures derived from the SADT in accordance with ~~2.2.527.1.16~~ ~~7.3.6~~.

2.2.52.1.8 Classification of organic peroxides not listed in 2.2.52.4, 4.1.4.2 packing instruction IBC520 or 4.2.5.2, portable tank instruction T23, and assignment to a collective entry shall be made by the competent authority of the country of origin. The statement of approval shall contain the classification and the relevant conditions of carriage. If the country of origin is not a Contracting Party to ADR, the classification and conditions of carriage shall be recognized by the competent authority of the first country Contracting Party to ADR reached by the consignment.

2.2.52.1.9 Samples of organic peroxides or formulations of organic peroxides not listed in 2.2.52.4, for which a complete set of test results is not available and which are to be carried for further testing or evaluation, shall be assigned to one of the appropriate entries for organic peroxides type C provided the following conditions are met:

- the available data indicate that the sample would be no more dangerous than organic peroxides type B;
- the sample is packaged in accordance with packing method OP2 and the quantity per transport unit is limited to 10 kg;
- the available data indicate that the control temperature, if any, is sufficiently low to prevent any dangerous decomposition and sufficiently high to prevent any dangerous phase separation.

Desensitization of organic peroxides

2.2.52.1.10 In order to ensure safety during carriage, organic peroxides are in many cases desensitized by organic liquids or solids, inorganic solids or water. Where a percentage of a substance is stipulated, this refers to the percentage by mass, rounded to the nearest whole number. In general, desensitization shall be such that, in case of spillage, the organic peroxide will not concentrate to a dangerous extent.

2.2.52.1.11 Unless otherwise stated for the individual organic peroxide formulation, the following definition(s) shall apply to diluents used for desensitization:

- diluents type A are organic liquids which are compatible with the organic peroxide and which have a boiling point of not less than 150 °C. Type A diluents may be used for desensitizing all organic peroxides;
- diluents type B are organic liquids which are compatible with the organic peroxide and which have a boiling point of less than 150 °C but not less than 60 °C and a flash-point of not less than 5 °C.

Type B diluents may be used for desensitization of all organic peroxides provided that the boiling point of the liquid is at least 60 °C higher than the SADT in a 50 kg package.

2.2.52.1.12 Diluents, other than type A or type B, may be added to organic peroxide formulations as listed in 2.2.52.4 provided that they are compatible. However, replacement of all or part of a type A or type B diluent by another diluent with differing properties requires that the organic peroxide formulation be re-assessed in accordance with the normal acceptance procedure for Class 5.2.

2.2.52.1.13 Water may only be used for the desensitization of organic peroxides which are listed in 2.2.52.4 or in the competent authority decision according to 2.2.52.1.8 as being "with water" or "as a stable dispersion in water". Samples of organic peroxides or formulations of organic peroxides not listed in 2.2.52.4 may also be desensitized with water provided the requirements of 2.2.52.1.9 are met.

2.2.52.1.14 Organic and inorganic solids may be used for desensitization of organic peroxides provided that they are compatible. Compatible liquids and solids are those which have no detrimental influence on the thermal stability and hazard type of the organic peroxide formulation.

Temperature control requirements

~~2.2.51.1.1 Certain organic peroxides may only be carried under temperature controlled conditions. The control temperature is the maximum temperature at which the organic peroxide can be safely carried. It is assumed that the temperature of the immediate surroundings of a package only exceeds 55 °C during carriage for a relatively short time in a 24 hour period. In the event of loss of temperature control, it may be necessary to implement emergency procedures. The emergency temperature is the temperature at which such procedures shall be implemented.~~

~~2.2.51.1.2 The control and emergency temperatures are derived from the SADT which is defined as the lowest temperature at which self-accelerating decomposition may occur with a substance in the packaging as used during carriage (see Table 1). The SADT shall be determined in order to decide whether a substance shall be subjected to temperature control during carriage. Provisions for the determination of the SADT are given in the Manual of Tests and Criteria, Part II, Sections 20 and 28.4.~~

Table 1: Derivation of control and emergency temperatures

Type of receptacle	SADT ^a	Control temperature	Emergency temperature
Single packagings and IBCs	20 °C or less	20 °C below SADT	10 °C below SADT
	over 20 °C to 35 °C	15 °C below SADT	10 °C below SADT
	over 35 °C	10 °C below SADT	5 °C below SADT
Tanks	not greater than 50 °C	10 °C below SADT	5 °C below SADT

^a SADT of the substance as packaged for carriage

2.2.52.1.15 The following organic peroxides shall be subject to temperature control during carriage:

- organic peroxides types B and C with an SADT ≤ 50 °C;
- organic peroxides type D showing a medium effect when heated under confinement with an SADT ≤ 50 °C or showing a low or no effect when heated under confinement with an SADT ≤ 45 °C; and
- organic peroxides types E and F with an SADT ≤ 45 °C.

NOTE: Provisions for the determination of the effects of heating under confinement are given in the Manual of Tests and Criteria, Part II, Section 20 and test series E in Section 25.

See 7.1.7.

2.2.52.1.16 Where applicable, control and emergency temperatures are listed in 2.2.52.4. The actual temperature during carriage may be lower than the control temperature but shall be selected so as to avoid dangerous separation of phases.

2.2.52.2 Substances not accepted for carriage

Organic peroxides, type A, shall not be accepted for carriage under the provisions of Class 5.2 (see Manual of Tests and Criteria, Part II, paragraph 20.4.3 (a)).

2.2.52.3 List of collective entries

Organic peroxides	Not requiring temperature control	P1	ORGANIC PEROXIDE TYPE A, LIQUID	} Not accepted for carriage, see 2.2.52.2
			ORGANIC PEROXIDE TYPE A, SOLID	
			ORGANIC PEROXIDE TYPE A, SOLID	
			3101 ORGANIC PEROXIDE TYPE B, LIQUID	
			3102 ORGANIC PEROXIDE TYPE B, SOLID	
			3103 ORGANIC PEROXIDE TYPE C, LIQUID	
			3104 ORGANIC PEROXIDE TYPE C, SOLID	
			3105 ORGANIC PEROXIDE TYPE D, LIQUID	
			3106 ORGANIC PEROXIDE TYPE D, SOLID	
			3107 ORGANIC PEROXIDE TYPE E, LIQUID	
3108 ORGANIC PEROXIDE TYPE E, SOLID				
3109 ORGANIC PEROXIDE TYPE F, LIQUID				
3110 ORGANIC PEROXIDE TYPE F, SOLID				
3545 ARTICLES CONTAINING ORGANIC PEROXIDE, N.O.S.	} Not subject to the provisions applicable to Class 5.2, see 2.2.52.1.6			
ORGANIC PEROXIDE TYPE G, LIQUID				
ORGANIC PEROXIDE TYPE G, SOLID				
3111 ORGANIC PEROXIDE TYPE B, LIQUID, TEMPERATURE CONTROLLED	}			
3112 ORGANIC PEROXIDE TYPE B, SOLID, TEMPERATURE CONTROLLED				
3113 ORGANIC PEROXIDE TYPE C, LIQUID, TEMPERATURE CONTROLLED				
3114 ORGANIC PEROXIDE TYPE C, SOLID, TEMPERATURE CONTROLLED				
3115 ORGANIC PEROXIDE TYPE D, LIQUID, TEMPERATURE CONTROLLED				
3116 ORGANIC PEROXIDE TYPE D, SOLID, TEMPERATURE CONTROLLED				
3117 ORGANIC PEROXIDE TYPE E, LIQUID, TEMPERATURE CONTROLLED				
3118 ORGANIC PEROXIDE TYPE E, SOLID, TEMPERATURE CONTROLLED				
3119 ORGANIC PEROXIDE TYPE F, LIQUID, TEMPERATURE CONTROLLED				
3120 ORGANIC PEROXIDE TYPE F, SOLID, TEMPERATURE CONTROLLED				
3545 ARTICLES CONTAINING ORGANIC PEROXIDE, N.O.S.				

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List of currently assigned organic peroxides in packagings

In the column "Packing Method", codes "OP1" to "OP8" refer to packing methods in 4.1.4.1, packing instruction P520 (see also 4.1.7.1). Organic peroxides to be carried shall fulfil the classification and the control and emergency temperatures (derived from the SADT) as listed. For substances permitted in IBCs, see 4.1.4.2, packing instruction IBC520 and, for those permitted in tanks according to Chapters 4.2 and 4.3, see 4.2.5.2, ~~portable tank instruction T23,6, portable tank instruction T23~~. The formulations listed in packing instruction IBC520 of 4.1.4.2 and in portable tank instruction T23 of 4.2.5.2.6 may also be carried packed in accordance with packing method OP8 of packing instruction P520 of 4.1.4.1, with the same control and emergency temperatures, if applicable.

ORGANIC PEROXIDE	Concentration (%)	Diluent type A (%)	Diluent type B (%) 1)	Inert solid (%)	Water	Packing Method	Control temperature (°C)	Emergency temperature (°C)	Number (Generic entry)	Subsidiary risks hazards and remarks
ACETYL ACETONE PEROXIDE	≤ 42	≥ 48			≥ 8	OP7			3105	2)
"	≤ 32 as a paste					OP7			3106	20)
ACETYL CYCLOHEXANESULPHONYL PEROXIDE	≤ 82				≥ 12	OP4	-10	0	3112	3)
"	≤ 32		≥ 68			OP7	-10	0	3115	
tert-AMYL HYDROPEROXIDE	≤ 88	≥ 6			≥ 6	OP8			3107	
tert-AMYL PEROXYACETATE	≤ 62	≥ 38				OP7			3105	
tert-AMYL PEROXYBENZOATE	≤ 100					OP5			3103	
tert-AMYL PEROXY-2-ETHYLHEXANOATE	≤ 100					OP7	+20	+25	3115	
tert-AMYL PEROXY-2-ETHYLHEXYL CARBONATE	≤ 100					OP7			3105	
tert-AMYL PEROXY ISOPROPYL CARBONATE	≤ 77	≥ 23				OP5			3103	
tert-AMYL PEROXYNEODECANOATE	≤ 77		≥ 23			OP7	0	+10	3115	
"	≤ 47	≥ 53				OP8	0	+10	3119	
tert-AMYL PEROXYPIVALATE	≤ 77		≥ 23			OP5	+10	+15	3113	
tert-AMYLPEROXY-3,5,5-TRIMETHYLHEXANOATE	≤ 100					OP7			3105	
tert-BUTYL CUMYL PEROXIDE	> 42 - 100					OP8			3109	
"	≤ 52			≥ 48		OP8			3108	
n-BUTYL-4,4-DI-(tert-BUTYLPEROXY)VALERATE	> 52 - 100					OP5			3103	
"	≤ 52			≥ 48		OP8			3108	
tert-BUTYL HYDROPEROXIDE	>79 - 90				≥ 10	OP5			3103	13)
"	≤ 80	≥ 20				OP7			3105	4) 13)
"	≤ 79				> 14	OP8			3107	13) 23)
"	≤ 72				≥ 28	OP8			3109	13)
tert-BUTYL HYDROPEROXIDE + DI-tert-BUTYLPEROXIDE	< 82 + >9				≥ 7	OP5			3103	13)

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ORGANIC PEROXIDE	Concentration (%)	Diluent type A (%)	Diluent type B (%) 1)	Inert solid (%)	Water	Packing Method	Control temperature (°C)	Emergency temperature (°C)	Number (Generic entry)	Subsidiary risks hazards and remarks
tert-BUTYL MONOPEROXYMALEATE	> 52 - 100					OP5			3102	3)
"	≤ 52	≥ 48				OP6			3103	
"	≤ 52			≥ 48		OP8			3108	
"	≤ 52 as a paste					OP8			3108	
tert-BUTYL PEROXYACETATE	> 52 - 77	≥ 23				OP5			3101	3)
"	> 32 - 52	≥ 48				OP6			3103	
"	≤ 32		≥ 68			OP8			3109	
tert-BUTYL PEROXYBENZOATE	> 77 - 100					OP5			3103	
"	> 52 - 77	≥ 23				OP7			3105	
"	≤ 52			≥ 48		OP7			3106	
tert-BUTYL PEROXYBUTYL FUMARATE	≤ 52	≥ 48				OP7			3105	
tert-BUTYL PEROXYCROTONATE	≤ 77	≥ 23				OP7			3105	
tert-BUTYL PEROXYDIETHYLACETATE	≤ 100					OP5	+20	+25	3113	
tert-BUTYL PEROXY-2-ETHYLHEXANOATE	> 52 - 100					OP6	+20	+25	3113	
"	> 32 - 52		≥ 48			OP8	+30	+35	3117	
"	≤ 52			≥ 48		OP8	+20	+25	3118	
"	≤ 32		≥ 68			OP8	+40	+45	3119	
tert-BUTYL PEROXY-2-ETHYLHEXANOATE + 2,2-DI(tert-BUTYLPEROXY)BUTANE	≤ 12 + ≤ 14	≥ 14		≥ 60		OP7			3106	
"	≤ 31 + ≤ 36		≥ 33			OP7	+35	+40	3115	
tert-BUTYL PEROXY-2-ETHYLHEXYLCARBONATE	≤ 100					OP7			3105	
tert-BUTYL PEROXYISOBUTYRATE	> 52 - 77		≥ 23			OP5	+15	+20	3111	3)
"	≤ 52		≥ 48			OP7	+15	+20	3115	
tert-BUTYLPEROXY ISOPROPYLCARBONATE	≤ 77	≥ 23				OP5			3103	

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ORGANIC PEROXIDE	Concentration (%)	Diluent type A (%)	Diluent type B (%) 1)	Inert solid (%)	Water	Packing Method	Control temperature (°C)	Emergency temperature (°C)	Number (Generic entry)	Subsidiary risks hazards and remarks
1-(2-tert-BUTYLPEROXY ISOPROPYL)-3-ISOPROPENYLBENZENE	≤ 77	≥ 23				OP7			3105	
ISOPROPENYLBENZENE										
"	≤ 42			≥ 58		OP8			3108	
tert-BUTYL PEROXY-2-METHYLBENZOATE	≤ 100					OP5			3103	
tert-BUTYL PEROXYNEODECANOATE	> 77 - 100					OP7	-5	+5	3115	
"	≤ 77		≥ 23			OP7	0	+10	3115	
"	≤ 52 as a stable dispersion in water					OP8	0	+10	3119	
"	≤ 42 as a stable dispersion in water (frozen)					OP8	0	+10	3118	
"	dispersion in water (frozen)									
"	≤ 32	≥ 68				OP8	0	+10	3119	
tert-BUTYL PEROXYNEOHEPTANOATE	≤ 77	≥ 23				OP7	0	+10	3115	
"	≤ 42 as a stable dispersion in water					OP8	0	+10	3117	
"	dispersion in water									
tert-BUTYL PEROXYPIVALATE	> 67 - 77	≥ 23				OP5	0	+10	3113	
"	> 27 - 67		≥ 33			OP7	0	+10	3115	
"	≤ 27		≥ 73			OP8	+30	+35	3119	
tert-BUTYLPEROXY STEARYLCARBONATE	≤ 100					OP7			3106	
tert-BUTYL PEROXY-3,5,5-TRIMETHYLHEXANOATE	> 37 - 100					OP7			3105	
"	≤ 42			≥ 58		OP7			3106	
"	≤ 37		≥ 63			OP8			3109	
3-CHLOROPEROXYBENZOIC ACID	> 57 - 86			≥ 14		OP1			3102	3)
"	≤ 57			≥ 3	≥ 40	OP7			3106	

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"	≤ 77			≥ 6	≥ 17	OP7			3106	
CUMYL HYDROPEROXIDE	> 90 - 98	≤ 10				OP8			3107	13)
"	≤ 90	≥ 10				OP8			3109	13) 18)

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ORGANIC PEROXIDE	Concentration (%)	Diluent type A (%)	Diluent type B (%) 1)	Inert solid (%)	Water	Packing Method	Control temperature (°C)	Emergency temperature (°C)	Number (Generic entry)	Subsidiary risks hazards and remarks
CUMYL PEROXYNEODECANOATE	≤ 87	≥ 13				OP7	-10	0	3115	
"	≤ 77		≥ 23			OP7	-10	0	3115	
"	≤ 52 as a stable dispersion in water					OP8	-10	0	3119	
CUMYL PEROXYNEOHEPTANOATE	≤ 77	≥ 23				OP7	-10	0	3115	
CUMYL PEROXYPIVALATE	≤ 77		≥ 23			OP7	-5	+5	3115	
CYCLOHEXANONE PEROXIDE(S)	≤ 91				≥ 9	OP6			3104	13)
"	≤ 72	≥ 28				OP7			3105	5)
"	≤ 72 as a paste					OP7			3106	5) 20)
"	≤ 32			≥ 68					Exempt	29)
([3R-(3R,5aS,6S,8aS,9R,10R,12S,12aR**)]-DECAHYDRO-10-METHOXY-3,6,9-TRIMETHYL-3,12-EPOXY-12H-PYRANO[4,3-j]-1,2-BENZODIOXEPIN)	≤ 100					OP7			3106	
DIACETONE ALCOHOL PEROXIDES	≤ 57		≥ 26		≥ 8	OP7	+40	+45	3115	6)
DIACETYL PEROXIDE	≤ 27		≥ 73			OP7	+20	+25	3115	7) 13)
DI-tert-AMYL PEROXIDE	≤ 100					OP8			3107	
2,2-DI-(tert-AMYLPEROXY)BUTANE	≤ 57	≥ 43				OP7			3105	
1,1-DI-(tert-AMYLPEROXY)CYCLOHEXANE	≤ 82	≥ 18				OP6			3103	
DIBENZOYL PEROXIDE	> 52 - 100			≤ 48		OP2			3102	3)
"	> 77 - 94				≥ 6	OP4			3102	3)
"	≤ 77				≥ 23	OP6			3104	
"	≤ 62			≥ 28	≥ 10	OP7			3106	
"	> 52 - 62 as a paste					OP7			3106	20)
"	> 35 - 52			≥ 48		OP7			3106	
"	> 36 - 42	≥ 18			≤ 40	OP8			3107	
"	≤ 56.5 as a paste				≥ 15	OP8			3108	
"	≤ 52 as a paste					OP8			3108	20)

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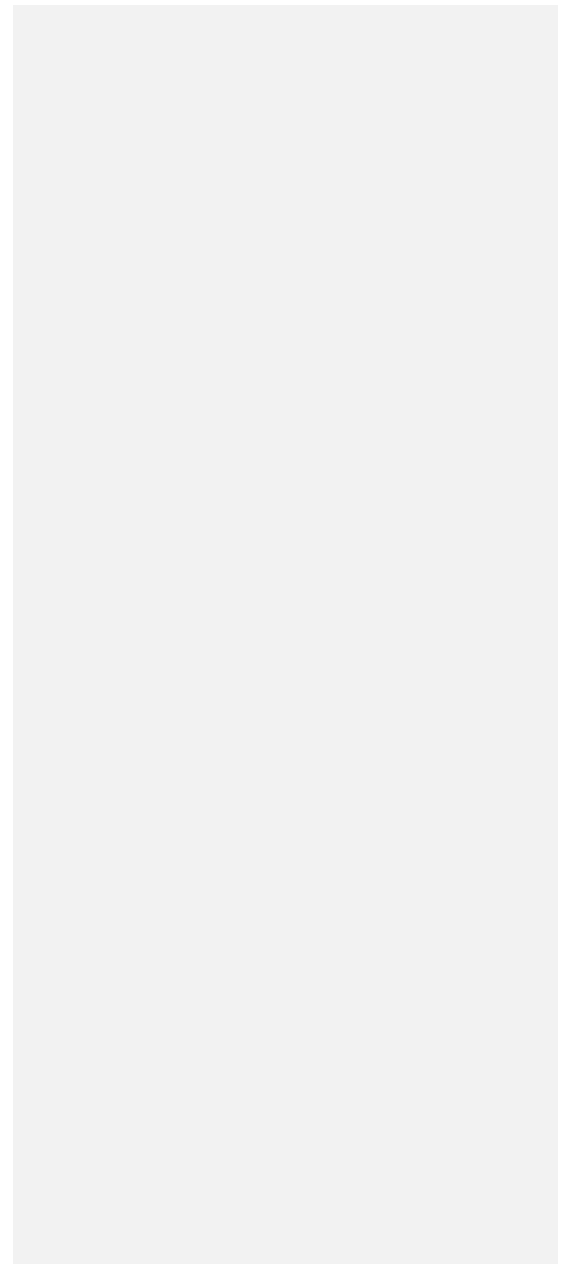
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"	≤ 42 as a stable <u>dispersion in water</u>					OP8			3109		
	<u>dispersion in water</u>										
"	≤ 35			≥ 65					Exempt	29)	



ORGANIC PEROXIDE	Concentration (%)	Diluent type A (%)	Diluent type B (%)(1)	Inert solid (%)	Water	Packing Method	Control temperature (°C)	Emergency temperature (°C)	Number (Generic entry)	Subsidiary risksSubsidiary hazards and remarks
DI-(4-tert-BUTYL CYCLOHEXYL) PEROXYDICARBONATE	≤ 100					OP6	+30	+35	3114	
"	≤ 42 as a stable dispersion in water					OP8	+30	+35	3119	
"	≤ 42 (as a paste)					OP7	+35	+40	3116	
DI-tert-BUTYL PEROXIDE	> 52 - 100					OP8			3107	
"	≤ 52		≥ 48			OP8			3109	25)
DI-tert-BUTYL PEROXYAZELATE	≤ 52	≥ 48				OP7			3105	
2,2-DI-(tert-BUTYLPEROXY)BUTANE	≤ 52	≥ 48				OP6			3103	
1,6-DI-(tert-BUTYLPEROXYCARBONYLOXY) HEXANE	≤ 72	≥ 28				OP5			3103	
1,1-DI-(tert-BUTYLPEROXY) CYCLOHEXANE	> 80 - 100					OP5			3101	3)
"	≤ 72		≥ 28			OP5			3103	30)
"	> 52 - 80	≥ 20				OP5			3103	
"	> 42 - 52	≥ 48				OP7			3105	
"	≤ 42	≥ 13		≥ 45		OP7			3106	
"	≤ 42	≥ 58				OP8			3109	
"	≤ 27	≥ 25				OP8			3107	21)
"	≤ 13	≥ 13	≥ 74			OP8			3109	
1,1-DI-(tert-BUTYLPEROXY) CYCLOHEXANE + tert-BUTYL PEROXY-2-ETHYLHEXANOATE	≤ 43 + ≤ 16	≥ 41				OP 7			3105	
DI-n-BUTYL PEROXYDICARBONATE	> 27 - 52		≥ 48			OP7	-15	-5	3115	
"	≤ 27		≥ 73			OP8	-10	0	3117	
"	≤ 42 as a stable dispersion in water (frozen)					OP8	-15	-5	3118	
	dispersion in water									

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	(frozen)									
DI-sec-BUTYL PEROXYDICARBONATE	> 52 - 100					OP4	-20	-10	3113	
"	≤ 52		≥ 48			OP7	-15	-5	3115	

ORGANIC PEROXIDE	Concentration (%)	Diluent type A (%)	Diluent type B (%) 1)	Inert solid (%)	Water	Packing Method	Control temperature (°C)	Emergency temperature (°C)	Number (Generic entry)	Subsidiary risks Subsidiary hazards and remarks
DI-(tert-BUTYLPEROXYISOPROPYL)BENZENE(S)	> 42 - 100			≤ 57		OP7			3106	
"	≤ 42			≥ 58					Exempt	29)
DI-(tert-BUTYLPEROXY) PHTHALATE	> 42 - 52	≥ 48				OP7			3105	
"	≤ 52 as a paste					OP7			3106	20)
"	≤ 42	≥ 58				OP8			3107	
2,2-DI-(tert-BUTYLPEROXY)PROPANE	≤ 52	≥ 48				OP7			3105	
"	≤ 42	≥ 13		≥ 45		OP7			3106	
1,1-DI-(tert-BUTYLPEROXY)-3,3,5-TRIMETHYLCYCLOHEXANE	> 90 - 100					OP5			3101	3)
"	≤ 90		≥ 10			OP5			3103	30)
"	> 57 - 90		≥ 10			OP5			3105	
"	≤ 77		≥ 23			OP5			3103	
"	≤ 57			≥ 43		OP8			3110	
"	≤ 57	≥ 43				OP8			3107	
"	≤ 32	≥ 26	≥ 42			OP8			3107	
DICETYL PEROXYDICARBONATE	≤ 100					OP8	+30	+35	3120	
"	≤ 42 as a stable dispersion in water					OP8	+30	+35	3119	
"	dispersion in water									
DI-4-CHLOROBENZOYL PEROXIDE	≤ 77				≥ 23	OP5			3102	3)
"	≤ 52 as a paste					OP7			3106	20)
"	≤ 32			≥ 68					Exempt	29)
DICUMYL PEROXIDE	> 52 - 100					OP8			3110	12)

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"	≤ 52			≥ 48					Exempt	29)
DICYCLOHEXYL PEROXYDICARBONATE	> 91 - 100					OP3	+10	+15	3112	3)
"	≤ 91				≥ 9	OP5	+10	+15	3114	
"	≤ 42 as a stable dispersion in water					OP8	+15	+20	3119	
	dispersion in water									

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"	≤ 32	≥ 68				OP7	-15	-5	3115	
DILAUROYL PEROXIDE	≤ 100					OP7			3106	
"	≤ 42 as a stable <u>dispersion in water</u>					OP8			3109	
	<u>dispersion in water</u>									

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<u>ORGANIC PEROXIDE</u>	<u>Concentration (%)</u>	<u>Diluent type A (%)</u>	<u>Diluent type B (%) ↓</u>	<u>Inert solid (%)</u>	<u>Water</u>	<u>Packing Method</u>	<u>Control temperature (°C)</u>	<u>Emergency temperature (°C)</u>	<u>Number (Generic entry)</u>	<u>Subsidiary hazards and remarks</u>
DI-(3-METHOXYBUTYL) PEROXYDICARBONATE	≤ 52		≥ 48			OP7	-5	+5	3115	
DI-(2-METHYLBENZOYL) PEROXIDE	≤ 87				≥ 13	OP5	+30	+35	3112	3)

ORGANIC PEROXIDE	Concentration (%)	Diluent type-A (%)	Diluent type-B (%)±1	Inert solid (%)	Water	Packing Method	Control temperature (°C)	Emergency temperature (°C)	Number (Generic-entry)	Subsidiary risks and remarks
DI-(3-METHYLBENZOYL) PEROXIDE + BENZOYL (3-METHYLBENZOYL) PEROXIDE + DIBENZOYL PEROXIDE	≤ 20 + ≤ 18 + ≤ 4		≥ 58			OP7	+35	+40	3115	
DI-(4-METHYLBENZOYL) PEROXIDE< *	≤ 52 as a paste with silicon oil					OP7			3106	
2,5-DIMETHYL-2,5-DI-(BENZOYLPEROXY)HEXANE	> 82-100					OP5			3102	3)
(BENZOYLPEROXY)HEXANE										
"	≤ 82			≥ 18		OP7			3106	
"	≤ 82				≥ 18	OP5			3104	
2,5-DIMETHYL-2,5-DI-(tert-BUTYLPEROXY)HEXANE	> 90 - 100					OP5			3103	
(tert-BUTYLPEROXY)HEXANE										
"	> 52 - 90	≥ 10				OP7			3105	
"	≤ 77			≥ 23		OP8			3108	
"	≤ 52	≥ 48				OP8			3109	
"	≤ 47 as a paste					OP8			3108	
2,5-DIMETHYL-2,5-DI-(tert-BUTYLPEROXY)HEXYNE-3	> 86-100					OP5			3101	3)
(tert-BUTYLPEROXY)HEXYNE-3										
"	> 52-86	≥ 14				OP5			3103	26)
"	≤ 52			≥ 48		OP7			3106	
2,5-DIMETHYL-2,5-DI-(2-ETHYLHEXANOYLPEROXY)HEXANE< *	≤ 100					OP5	+20	+25	3113	
2,5-DIMETHYL-2,5-DIHYDROPEROXYHEXANE< *	≤ 82				≥ 18	OP6			3104	
2,5-DIMETHYL-2,5-DI-(3,5,5-TRIMETHYLHEXANOYLPEROXY)HEXANE	≤ 77	≥ 23				OP7			3105	
1,1-DIMETHYL-3-HYDROXYBUTYL PEROXYNEOHEPTANOATE	≤ 52	≥ 48				OP8	0	+10	3117	
DIMYRISTYL PEROXYDICARBONATE	≤ 100					OP7	+20	+25	3116	

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"	≤ 42 as a stable dispersion in water					OP8	+20	+25	3119	
DI-(2-NEODECANOYLPEROXYISOPROPYL)- BENZENE	≤ 52					OP7	-10	0	3115	

ORGANIC PEROXIDE	Concentration (%)	Diluent type A (%)	Diluent type B (%)(1)	Inert solid (%)	Water	Packing Method	Control temperature (°C)	Emergency temperature (°C)	Number (Generic entry)	Subsidiary risks hazards and remarks
<u>DI-(2-NEODECANOYLPEROXYISOPROPYL) BENZENE</u>	<u>≤ 52</u>	<u>≥ 48</u>				<u>OP7</u>	<u>-10</u>	<u>0</u>	<u>3115</u>	
DI-n-NONANOYL PEROXIDE	≤ 100					OP7	0	+10	3116	
DI-n-OCTANOYL PEROXIDE	≤ 100					OP5	+10	+15	3114	
<u>DI-(2-PHENOXYETHYL) PEROXYDICARBONATE</u>	<u>>85-100</u>					<u>OP5</u>			<u>3102</u>	<u>3)</u>
"	<u>≤ 85</u>				<u>≥ 15</u>	<u>OP7</u>			<u>3106</u>	
DIPROPIONYL PEROXIDE	≤ 27		≥ 73			OP8	+15	+20	3117	
<u>DI-n-PROPYL PEROXYDICARBONATE</u>	<u>≤ 100</u>					<u>OP3</u>	<u>-25</u>	<u>-15</u>	<u>3113</u>	
"	≤ 77		≥ 23			OP5	-20	-10	3113	
<u>DISUCCINIC ACID PEROXIDE</u>	<u>>72-100</u>					<u>OP4</u>			<u>3102</u>	<u>3) 17)</u>
"	<u>≤ 72</u>				<u>≥ 28</u>	<u>OP7</u>	<u>+10</u>	<u>+15</u>	<u>3116</u>	
<u>DI-(3,5,5-TRIMETHYLHEXANOYL) PEROXIDE</u>	<u>>52-82</u>	<u>≥ 18</u>				<u>OP7</u>	<u>0</u>	<u>+10</u>	<u>3115</u>	
"	<u>≤ 52 as a stable dispersion in water</u>					OP8	+10	+15	3119	
"	<u>dispersion in water</u>									
"	<u>>38-52</u>	<u>≥ 48</u>				<u>OP8</u>	<u>+10</u>	<u>+15</u>	<u>3119</u>	
"	≤ 38	≥ 62				OP8	+20	+25	3119	
ETHYL 3,3-DI-(tert-AMYLPEROXY)BUTYRATE	≤ 67	≥ 33				OP7			3105	
<u>ETHYL 3,3-DI-(tert-BUTYLPEROXY)BUTYRATE</u>	<u>> 77 - 100</u>					<u>OP5</u>			<u>3103</u>	
"	≤ 77	≥ 23				OP7			3105	
"	<u>≤ 52</u>			<u>≥ 48</u>		<u>OP7</u>			<u>3106</u>	
<u>1-(2-ETHYLHEXANOYLPEROXY)-1,3-DIMETHYLBUTYL PEROXYPIVALATE</u>	<u>≤ 52</u>	<u>≥ 45</u>	<u>≥ 10</u>			<u>OP7</u>	<u>-20</u>	<u>-10</u>	<u>3115</u>	
tert-HEXYL PEROXYNEODECANOATE	≤ 71	≥ 29				OP7	0	+10	3115	
tert-HEXYL PEROXYPIVALATE	≤ 72		≥ 28			OP7	+10	+15	3115	
<u>3-HYDROXY-1,1-DIMETHYLBUTYL PEROXYNEODECANOATE</u>	<u>≤ 77</u>	<u>≥ 23</u>				<u>OP 7</u>	<u>- 5</u>	<u>+ 5</u>	<u>3115</u>	

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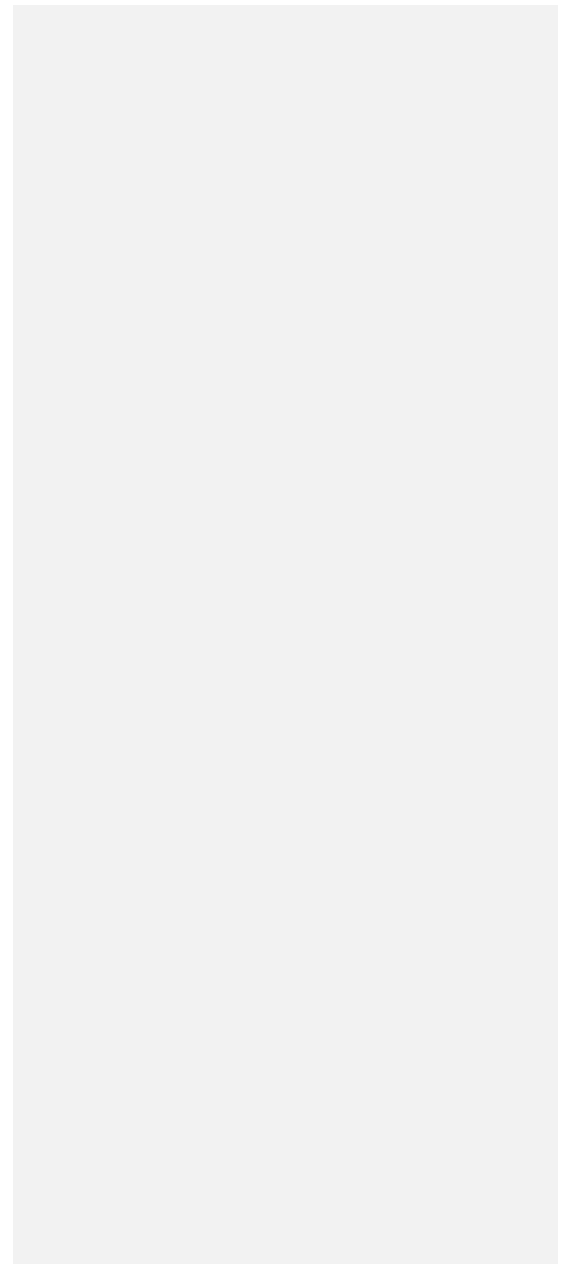
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"	≤ 52	≥ 48				OP 8	- 5	+ 5	3117	
"	≤ 52 as a stable dispersion in water					OP 8	- 5	+ 5	3117	



ORGANIC PEROXIDE	Concentration (%)	Diluent type A (%)	Diluent type B (% 1)	Inert solid (%)	Water	Packing Method	Control temperature (°C)	Emergency temperature (°C)	Number (Generic entry)	Subsidiary risks and remarks
<u>"ISOPROPYL sec-BUTYL-PEROXYDICARBONATE +DI-sec-BUTYL PEROXYDICARBONATE +DI-ISOPROPYL PEROXYDICARBONATE"</u>	<u>≤ 32 + ≤ 15 - 1852 as a stable dispersion in water</u>	<u>≥ 38</u>				<u>OP 8</u>	<u>-20 -5</u>	<u>+10 +5</u>	<u>3115 3119</u>	
<u>ISOPROPYL sec-BUTYL PEROXYDICARBONATE +DI-sec-BUTYL PEROXYDICARBONATE +DI-ISOPROPYL PEROXYDICARBONATE</u>	<u>≤ 32 + ≤ 15 - 18 ≤ 12 - 15</u>	<u>≥ 38</u>				<u>OP7</u>	<u>-20</u>	<u>-10</u>	<u>3115</u>	
"	≤ 52 + ≤ 28 + ≤ 22					OP5	-20	-10	3111	3)
ISOPROPYLCUMYL HYDROPEROXIDE	≤ 72	≥ 28				OP8			3109	13)
p-MENTHYL HYDROPEROXIDE	> 72 - 100					OP7			3105	13)
"	≤ 72	≥ 28				OP8			3109	27)
METHYLCYCLOHEXANONE PEROXIDE(S)	≤ 67		≥ 33			OP7	+35	+40	3115	
METHYL ETHYL KETONE PEROXIDE(S)	see remark 8)	≥ 48				OP5			3101	3) 8) 13)
"	see remark 9)	≥ 55				OP7			3105	9)
"	see remark 10)	≥ 60				OP8			3107	10)
METHYL ISOBUTYL KETONE PEROXIDE(S)	≤ 62	≥ 19				OP7			3105	22)
METHYL ISOPROPYL KETONE PEROXIDE(S)	see remark 31)	≥ 70				OP8			3109	31)
ORGANIC PEROXIDE, LIQUID, SAMPLE						OP2			3103	11)
ORGANIC PEROXIDE, LIQUID, SAMPLE, TEMPERATURE CONTROLLED						OP2			3113	11)
ORGANIC PEROXIDE, SOLID, SAMPLE						OP2			3104	11)
ORGANIC PEROXIDE, SOLID, SAMPLE, TEMPERATURE CONTROLLED						OP2			3114	11)
3,3,5,7,7-PENTAMETHYL-1,2,4-TRIOXEPANE	≤ 100					OP8			3107	
PEROXYACETIC ACID, TYPE D, stabilized	≤ 43					OP7			3105	13) 14) 19)
PEROXYACETIC ACID, TYPE E, stabilized	≤ 43					OP8			3107	13) 15) 19)
PEROXYACETIC ACID, TYPE F, stabilized	≤ 43					OP8			3109	13) 16) 19)
PEROXYLAURIC ACID	≤ 100					OP8	+35	+40	3118	
<u>1-PHENYLETHYL HYDROPEROXIDE</u>	<u>≤ 38</u>		<u>≥ 62</u>			<u>OP8</u>			<u>3109</u>	
PINANYL HYDROPEROXIDE	> 56 - 100					OP7			3105	13)

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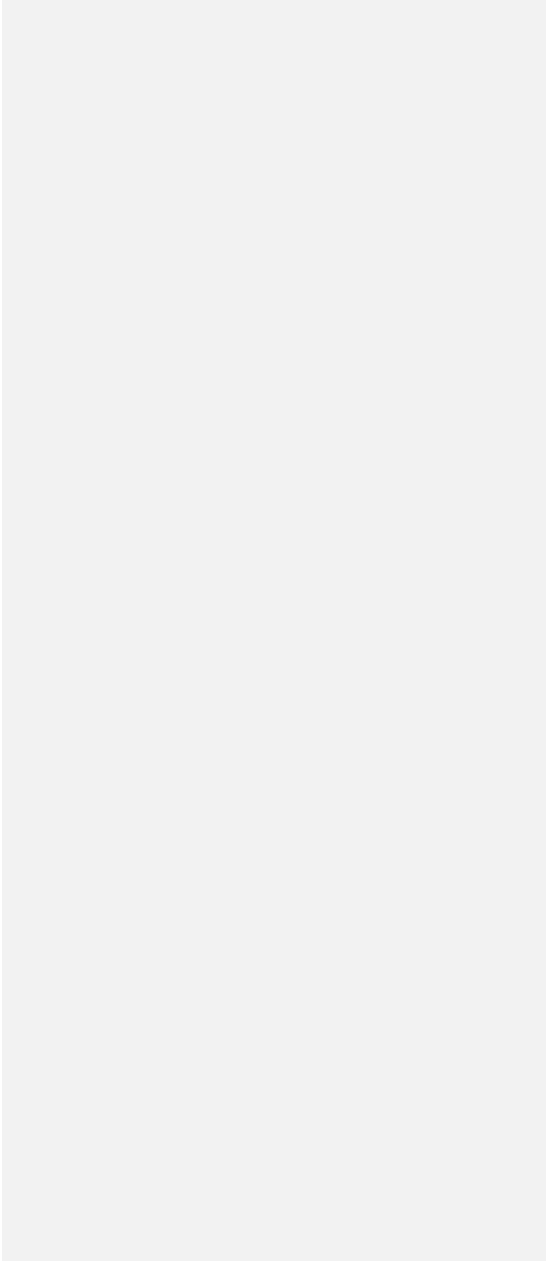
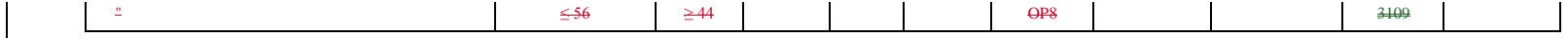
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<u>ORGANIC PEROXIDE</u>	<u>Concentration (%)</u>	<u>Diluent type A (%)</u>	<u>Diluent type B (%) ↓</u>	<u>Inert solid (%)</u>	<u>Water</u>	<u>Packing Method</u>	<u>Control temperature (°C)</u>	<u>Emergency temperature (°C)</u>	<u>Number (Generic entry)</u>	<u>Subsidiary hazards and remarks</u>
"	≤ 56	≥ 44				OP8			3109	
POLYETHER POLY-tert-BUTYLPEROXY-CARBONATE	≤ 52		≥ 48			OP8			3107	

ORGANIC PEROXIDE	Concentration (%)	Diluent type-A (%)	Diluent type-B (%)†	Inert solid (%)	Water	Packing Method	Control-temperature (°C)	Emergency-temperature (°C)	Number (Generic-entry)	Subsidiary-risks and-remarks
1,1,3,3-TETRAMETHYLBUTYL HYDROPEROXIDE	≤ 100					OP7			3105	
1,1,3,3-TETRAMETHYLBUTYL PEROXY-2-ETHYLHEXANOATE	≤ 100					OP7	+15	+20	3115	
1,1,3,3- TETRAMETHYLBUTYL PEROXYNEODECANOATE	≤ 72		≥ 28			OP7	-5	+5	3115	
"	≤ 52 as a stable dispersion in water					OP8	-5	+5	3119	
1,1,3,3-TETRAMETHYLBUTYL PEROXYPIVALATE	≤ 77	≥ 23				OP7	0	+10	3115	
3,6,9-TRIETHYL-3,6,9-TRIMETHYL-1,4,7 TRIPEROXONANE	≤ 17	≥ 18		≥ 65		OP8			3110	
3,6,9-TRIETHYL-3,6,9-TRIMETHYL -1,4,7 TRIPEROXONANE	≤ 42	≥ 58				OP7			3105	28)

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Remarks (refer to the last column of the Table in 2.2.52.4):

- 1) Diluent type B may always be replaced by diluent type A. The boiling point of diluent type B shall be at least 60°C higher than the SADT of the organic peroxide.
- 2) Available oxygen $\leq 4.7\%$.
- 3) "EXPLOSIVE" subsidiary *riskhazard* label required (Model No.1, see 5.2.2.2.2).
- 4) Diluent may be replaced by di-tert-butyl peroxide.
- 5) Available oxygen $\leq 9\%$.
- 6) With $\leq 9\%$ hydrogen peroxide; available oxygen $\leq 10\%$.
- 7) Only non-metallic packagings allowed.
- 8) Available oxygen $> 10\%$ and $\leq 10.7\%$, with or without water.
- 9) Available oxygen $\leq 10\%$, with or without water.
- 10) Available oxygen $\leq 8.2\%$, with or without water.
- 11) See 2.2.52.1.9.
- 12) Up to 2000 kg per receptacle assigned to ORGANIC PEROXIDE TYPE F on the basis of large scale trials.
- 13) "CORROSIVE" subsidiary *riskhazard* label required (Model No.8, see 5.2.2.2.2).
- 14) Peroxyacetic acid formulations which fulfil the criteria of the Manual of Tests and Criteria, paragraph 20.4.3 (d).
- 15) Peroxyacetic acid formulations which fulfil the criteria of the Manual of Tests and Criteria, paragraph 20.4.3 (e).
- 16) Peroxyacetic acid formulations which fulfil the criteria of the Manual of Tests and Criteria, paragraph 20.4.3 (f).
- 17) Addition of water to this organic peroxide will decrease its thermal stability.
- 18) No "CORROSIVE" subsidiary *riskhazard* label (Model No.8, see 5.2.2.2.2) required for concentrations below 80%.
- 19) Mixtures with hydrogen peroxide, water and acid(s).
- 20) With diluent type A, with or without water.
- 21) With $\geq 25\%$ diluent type A by mass, and in addition ethylbenzene.
- 22) With $\geq 19\%$, diluent type A by mass, and in addition methyl isobutyl ketone.
- 23) With $< 6\%$ di-tert-butyl peroxide.
- 24) With $\leq 8\%$ 1-isopropylhydroperoxy-4-isopropylhydroxybenzene.
- 25) Diluent type B with boiling point > 110 °C.
- 26) With $< 0.5\%$ hydroperoxides content.
- 27) For concentrations more than 56%, "CORROSIVE" subsidiary *riskhazard* label required (Model No.8, see 5.2.2.2.2).
- 28) Available active oxygen $\leq 7.6\%$ in diluent type A having a 95% boil-off point in the range of 200 - 260 °C.
- 29) Not subject to the requirements of ADR for Class 5.2.
- 30) Diluent type B with boiling point > 130 °C.
- 31) Active oxygen $\leq 6.7\%$.

2.2.61 Class 6.1 Toxic substances

2.2.61.1 Criteria

2.2.61.1.1 The heading of Class 6.1 covers substances of which it is known by experience or regarding which it is presumed from experiments on animals that in relatively small quantities they are able by a single action or by action of short duration to cause damage to human health, or death, by inhalation, by cutaneous absorption or by ingestion.

NOTE: Genetically modified microorganisms and organisms shall be assigned to this Class if they meet the conditions for this Class.

2.2.61.1.2 Substances of Class 6.1 are subdivided as follows:

T Toxic substances without subsidiary

~~hazard:~~

- T1 Organic, liquid;
- T2 Organic, solid;
- T3 Organometallic substances;
- T4 Inorganic, liquid;
- T5 Inorganic, solid;
- T6 Liquid, used as pesticides;
- T7 Solid, used as pesticides;
- T8 Samples;
- T9 Other toxic substances;

~~TF Toxic substances,
flammable;T10 Articles;~~

~~TF Toxic substances, flammable:~~

- TF1 Liquid;
- TF2 Liquid, used as pesticides;
- TF3 Solid;

TS Toxic substances, self-heating, solid;

TW Toxic substances, which, in contact with water, emit flammable gases:

- TW1 Liquid;
- TW2 Solid;

TO Toxic substances, oxidizing:

- TO1 Liquid;
- TO2 Solid;

TC Toxic substances, corrosive:

- TC1 Organic, liquid;
- TC2 Organic, solid;
- TC3 Inorganic, liquid;
- TC4 Inorganic, solid;

TFC Toxic substances, flammable, corrosive;

TFW Toxic substances, flammable, which, in contact with water, emit flammable gases.

Definitions

2.2.61.1.3 For the purposes of ADR:

LD₅₀ (median lethal dose) for acute oral toxicity is the statistically derived single dose of a substance that can be expected to cause death within 14 days in 50 per cent of young adult albino rats when administered by the oral route. The LD₅₀ value is expressed in terms of mass of test substance per mass of test animal (mg/kg);

LD₅₀ for acute dermal toxicity is that dose of the substance which, administered by continuous contact for 24 hours with the bare skin of albino rabbits, is most likely to cause death within 14 days in one half of the animals tested. The number of animals tested shall be sufficient to give a statistically significant result and be in conformity with good pharmacological practice. The result is expressed in milligrams per kg body mass;

LC₅₀ for acute toxicity on inhalation is that concentration of vapour, mist or dust which, administered by continuous inhalation to both male and female young adult albino rats for one hour, is most likely to cause death within 14 days in one half of the animals tested. A solid substance shall be tested if at least 10% (by mass) of its total mass is likely to be dust in a respirable range, e.g. the aerodynamic diameter of that particle-fraction is 10 µm or less. A liquid substance shall be tested if a mist is likely to be generated in a leakage of the transport containment. Both for solid and liquid substances more than 90% (by mass) of a specimen prepared for inhalation toxicity shall be in the respirable range as defined above. The result is expressed in milligrams per litre of air for dusts and mists or in millilitres per cubic metre of air (parts per million) for vapours.

Classification and assignment of packing groups

2.2.61.1.4 Substances of Class 6.1 shall be classified in three packing groups according to the degree of danger they present for carriage, as follows:

Packing group I: highly toxic substances

Packing group II: toxic substances

Packing group III: slightly toxic substances.

2.2.61.1.5 Substances, mixtures, solutions and articles classified in Class 6.1 are listed in Table A of Chapter 3.2. The assignment of substances, mixtures and solutions not mentioned by name in Table A of Chapter 3.2 to the relevant entry of sub-section 2.2.61.3 and to the relevant packing group in accordance with the provisions of Chapter 2.1, shall be made according to the following criteria in 2.2.61.1.6 to 2.2.61.1.11.

2.2.61.1.6 To assess the degree of toxicity, account shall be taken of human experience of instances of accidental poisoning, as well as special properties possessed by any individual substances: liquid state, high volatility, any special likelihood of cutaneous absorption, and special biological effects.

2.2.61.1.7 In the absence of observations on humans, the degree of toxicity shall be assessed using the available data from animal experiments in accordance with the table below:

	Packing group	Oral toxicity LD ₅₀ (mg/kg)	Dermal toxicity LD ₅₀ (mg/kg)	Inhalation toxicity by dusts and mists LC ₅₀ (mg/l)
Highly toxic	I	≤ 5	≤ 50	≤ 0.2
Toxic	II	> 5 and ≤ 50	> 50 and ≤ 200	> 0.2 and ≤ 2
Slightly toxic	III ^a	> 50 and ≤ 300	> 200 and ≤ 1 000	> 2 and ≤ 4

^a Tear gas substances shall be included in packing group II even if data concerning their toxicity correspond to packing group III criteria.

2.2.61.1.7.1 Where a substance exhibits different degrees of toxicity for two or more kinds of exposure, it shall be classified under the highest such degree of toxicity.

2.2.61.1.7.2 Substances meeting the criteria of Class 8 and with an inhalation toxicity of dusts and mists (LC_{50}) leading to packing group I shall only be accepted for an allocation to Class 6.1 if the toxicity through oral ingestion or dermal contact is at least in the range of packing groups I or II. Otherwise an assignment to Class 8 shall be made if appropriate (see 2.2.8.1.4.5).

2.2.61.1.7.3 The criteria for inhalation toxicity of dusts and mists are based on LC_{50} data relating to 1-hour exposure, and where such information is available it shall be used. However, where only LC_{50} data relating to 4-hour exposure are available, such figures can be multiplied by four and the product substituted in the above criteria, i.e. LC_{50} value multiplied by four (4 hour) is considered the equivalent of LC_{50} (1 hour).

Inhalation toxicity of vapours

2.2.61.1.8 Liquids giving off toxic vapours shall be classified into the following groups where "V" is the saturated vapour concentration (in ml/m^3 of air) (volatility) at 20 °C and standard atmospheric pressure:

	Packing group	
Highly toxic	I	Where $V \geq 10 LC_{50}$ and $LC_{50} \leq 1\,000 ml/m^3$
Toxic	II	Where $V \geq LC_{50}$ and $LC_{50} \leq 3\,000 ml/m^3$ and the criteria for packing group I are not met
Slightly toxic	III ^a	Where $V \geq 1/5 LC_{50}$ and $LC_{50} \leq 5\,000 ml/m^3$ and the criteria for packing groups I and II are not met

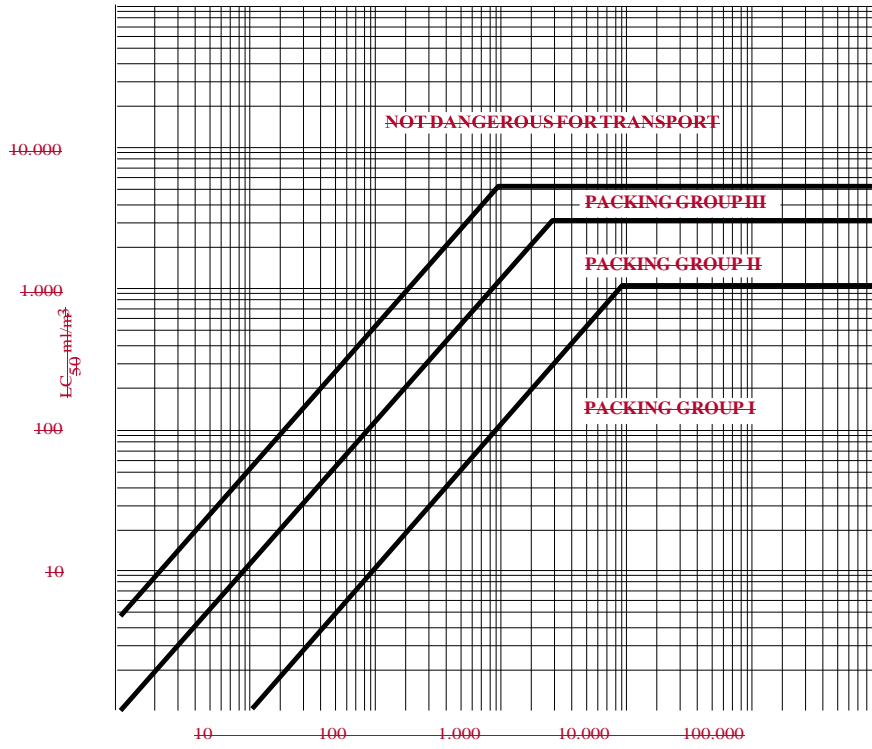
^a *Tear gas substances shall be included in packing group II even if data concerning their toxicity correspond to packing group III criteria.*

These criteria for inhalation toxicity of vapours are based on LC_{50} data relating to 1-hour exposure, and where such information is available, it shall be used.

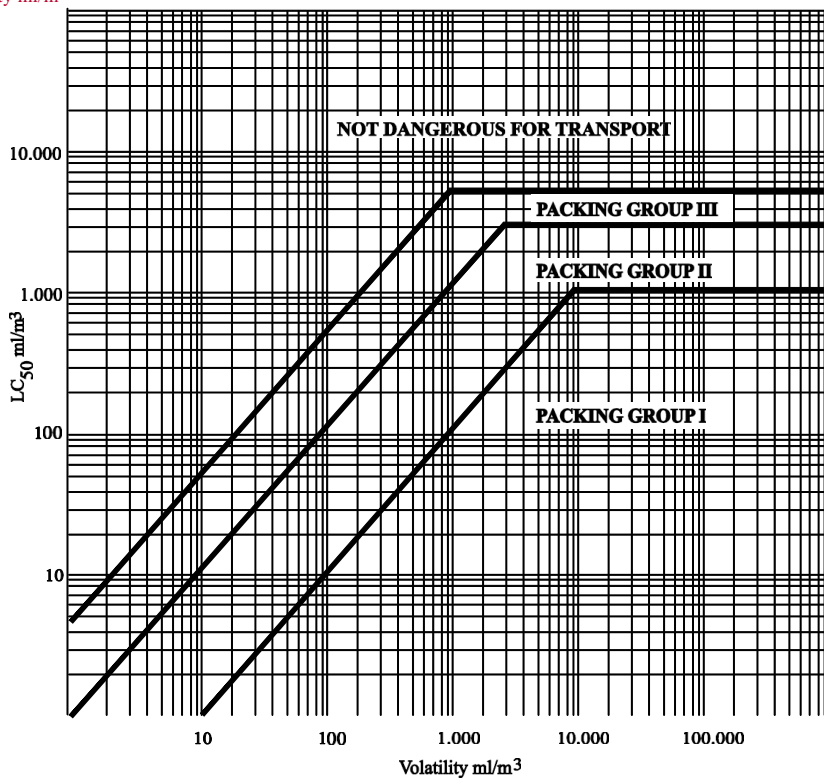
However, where only LC_{50} data relating to 4-hour exposure to the vapours are available, such figures can be multiplied by two and the product substituted in the above criteria, i.e. LC_{50} (4 hour) \times 2 is considered the equivalent of LC_{50} (1 hour).

In this figure, the criteria are expressed in graphical form, as an aid to easy classification. However, due to approximations inherent in the use of graphs, substances falling on or near group borderlines shall be checked using numerical criteria.

GROUP BORDERLINES INHALATION TOXICITY OF VAPOURS



Volatility ml/m³



Mixtures of liquids

2.2.61.1.9 Mixtures of liquids which are toxic on inhalation shall be assigned to packing groups according to the following criteria:

2.2.61.1.9.1 If LC₅₀ is known for each of the toxic substances constituting the mixture, the packing group may be determined as follows:

(a) calculation of the LC₅₀ of the mixture:

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

where f_i = molar fraction of constituent i of the mixture;

LC_{50i} = average lethal concentration of constituent i in ml/m³.

(b) calculation of volatility of each mixture constituent:

$$V_i = \frac{P_i \times 10^6}{101.3} \text{ (ml/m}^3\text{)}$$

where P_i = partial pressure of constituent i in kPa at 20 °C and at standard atmospheric pressure.

- (c) calculation of the ratio of volatility to LC₅₀:

$$R = \frac{\sum_{i=1}^n W_i}{LC_{50i}}$$

- (d) the values calculated for LC₅₀ (mixture) and R are then used to determine the packing group of the mixture:

Packing group I	$R \geq 10$ and $LC_{50}(\text{mixture}) \leq 1\,000 \text{ ml/m}^3$;
Packing group II	$R \geq 1$ and $LC_{50}(\text{mixture}) \leq 3\,000 \text{ ml/m}^3$, if the mixture does not meet the criteria for packing group I;
Packing group III	$R \geq 1/5$ and $LC_{50}(\text{mixture}) \leq 5\,000 \text{ ml/m}^3$, if the mixture does not meet the criteria of packing groups I or II.

2.2.61.1.9.2 In the absence of LC₅₀ data on the toxic constituent substances, the mixture may be assigned to a group based on the following simplified threshold toxicity tests. When these threshold tests are used, the most restrictive group shall be determined and used for carrying the mixture.

2.2.61.1.9.3 A mixture is assigned to packing group I only if it meets both of the following criteria:

- (a) A sample of the liquid mixture is vaporized and diluted with air to create a test atmosphere of 1 000 ml/m³ vaporized mixture in air. Ten albino rats (5 male and 5 female) are exposed to the test atmosphere for 1 hour and observed for 14 days. If five or more of the animals die within the 14-day observation period, the mixture is presumed to have an LC₅₀ equal to or less than 1 000 ml/m³;
- (b) A sample of vapour in equilibrium with the liquid mixture is diluted with 9 equal volumes of air to form a test atmosphere. Ten albino rats (5 male and 5 female) are exposed to the test atmosphere for 1 hour and observed for 14 days. If five or more of the animals die within the 14-day observation period, the mixture is presumed to have a volatility equal to or greater than 10 times the mixture LC₅₀.

2.2.61.1.9.4 A mixture is assigned to packing group II only if it meets both of the following criteria, and does not meet the criteria for packing group I:

- (a) A sample of the liquid mixture is vaporized and diluted with air to create a test atmosphere of 3 000 ml/m³ vaporized mixture in air. Ten albino rats (5 male and 5 female) are exposed to the test atmosphere for 1 hour and observed for 14 days. If five or more of the animals die within the 14-day observation period, the mixture is presumed to have an LC₅₀ equal to or less than 3 000 ml/m³;
- (b) A sample of the vapour in equilibrium with the liquid mixture is used to form a test atmosphere. Ten albino rats (5 male and 5 female) are exposed to the test atmosphere for 1 hour and observed for 14 days. If five or more of the animals die within the 14-day observation period, the mixture is presumed to have a volatility equal to or greater than the mixture LC₅₀.

2.2.61.1.9.5 A mixture is assigned to packing group III only if it meets both of the following criteria, and does not meet the criteria for packing groups I or II:

- (a) A sample of the liquid mixture is vaporized and diluted with air to create a test atmosphere of 5 000 ml/m³ vaporized mixture in air. Ten albino rats (5 male and 5 female) are exposed to the test atmosphere for 1 hour and observed for 14 days. If five or more of the animals die within the 14-day observation period, the mixture is presumed to have an LC₅₀ equal to or less than 5 000 ml/m³;
- (b) The vapour concentration (volatility) of the liquid mixture is measured and if the vapour concentration is equal to or greater than 1 000 ml/m³, the mixture is presumed to have a volatility equal to or greater than 1/5 the mixture LC₅₀.

Methods for determining oral and dermal toxicity of mixtures

2.2.61.1.10 When classifying and assigning the appropriate packing group to mixtures in Class 6.1 in accordance with the oral and dermal toxicity criteria (see 2.2.61.1.3), it is necessary to determine the acute LD₅₀ of the mixture.

2.2.61.1.10.1 If a mixture contains only one active substance, and the LD₅₀ of that constituent is known, in the absence of reliable acute oral and dermal toxicity data on the actual mixture to be carried, the oral or dermal LD₅₀ may be obtained by the following method:

$$\text{LD}_{50} \text{ value of preparation} = \frac{\text{LD}_{50} \text{ value of active substance} \times 100}{\text{percentage of active substance by mass}}$$

2.2.61.1.10.2 If a mixture contains more than one active constituent, there are three possible approaches that may be used to determine the oral or dermal LD₅₀ of the mixture. The preferred method is to obtain reliable acute oral and dermal toxicity data on the actual mixture to be carried. If reliable, accurate data are not available, then either of the following methods may be performed:

(a) Classify the formulation according to the most hazardous constituent of the mixture as if that constituent were present in the same concentration as the total concentration of all active constituents; or

(b) Apply the formula:

$$\frac{C_A}{T_A} + \frac{C_B}{T_B} + \dots + \frac{C_Z}{T_Z} = \frac{100}{T_M}$$

where:

C = the percentage concentration of constituent A, B, ..., Z in the mixture;

T = the oral LD₅₀ values of constituent A, B, ... Z;

T_M = the oral LD₅₀ value of the mixture.

NOTE: This formula can also be used for dermal toxicities provided that this information is available on the same species for all constituents. The use of this formula does not take into account any potentiation or protective phenomena.

Classification of pesticides

2.2.61.1.11 All active pesticide substances and their preparations for which the LC₅₀ and/or LD₅₀ values are known and which are classified in Class 6.1 shall be classified under appropriate packing groups in accordance with the criteria given in 2.2.61.1.6 to 2.2.61.1.9. Substances and preparations which are characterized by subsidiary risks/hazards shall be classified according to the precedence of hazard Table in 2.1.3.10 with the assignment of appropriate packing groups.

2.2.61.1.11.1 If the oral or dermal LD₅₀ value for a pesticide preparation is not known, but the LD₅₀ value of its active substance(s) is known, the LD₅₀ value for the preparation may be obtained by applying the procedures in 2.2.61.1.10.

NOTE: LD₅₀ toxicity data for a number of common pesticides may be obtained from the most current edition of the document "The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification" available from the International Programme on Chemical Safety, World Health Organisation (WHO), 1211 Geneva 27, Switzerland. While that document may be used as a source of LD₅₀ data for pesticides, its classification system shall not be used for purposes of transport classification of, or assignment of packing groups to, pesticides, which shall be in accordance with the requirements of ADR.

2.2.61.1.11.2 The proper shipping name used in the carriage of the pesticide shall be selected on the basis of the active ingredient, of the physical state of the pesticide and any subsidiary risks/hazards it may exhibit (see 3.1.2).

2.2.61.1.12 If substances of Class 6.1, as a result of admixtures, come into categories of ~~risk~~hazard different from those to which the substances mentioned by name in Table A of Chapter 3.2 belong, these mixtures or solutions shall be assigned to the entries to which they belong on the basis of their actual degree of danger.

NOTE: For the classification of solutions and mixtures (such as preparations and wastes), see also 2.1.3.

2.2.61.1.13 On the basis of the criteria of 2.2.61.1.6 to 2.2.61.1.11, it may also be determined whether the nature of a solution or mixture mentioned by name or containing a substance mentioned by name is such that the solution or mixture is not subject to the requirements for this Class.

2.2.61.1.14 Substances, solutions and mixtures, with the exception of substances and preparations used as pesticides, which are not classified as acute toxic category 1, 2 or 3 according to Regulation (EC) No 1272/~~2008~~²⁰⁰⁸, may be considered as substances not belonging to class 6.1.

2.2.61.2 Substances not accepted for carriage

2.2.61.2.1 Chemically unstable substances of Class 6.1 shall not be accepted for carriage unless the necessary precautions have been taken to prevent the possibility of a dangerous decomposition or polymerization under normal conditions of carriage. For the precautions necessary to prevent polymerization, see special provision 386 of Chapter 3.3. To this end particular care shall be taken to ensure that receptacles and tanks do not contain any substances liable to promote these reactions.

2.2.61.2.2 The following substances and mixtures shall not be accepted for carriage:

- Hydrogen cyanide, anhydrous or in solution, which do not meet the descriptions of UN Nos. 1051, 1613, 1614 and 3294;
- metal carbonyls, having a flash-point below 23 °C, other than UN Nos. 1259 NICKEL CARBONYL and 1994 IRON PENTACARBONYL;
- 2,3,7,8-TETRACHLORODIBENZO-P-DIOXINE (TCDD) in concentrations considered highly toxic in accordance with the criteria in 2.2.61.1.7;
- UN No. 2249 DICHLORODIMETHYL ETHER, SYMMETRICAL;
- Preparations of phosphides without additives inhibiting the emission of toxic flammable gases.

³Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directive 67/548/EEC and 1999/45/EC;

and amending Regulation (EC) No 1907/2006, published in the Official Journal of the European Union, L 353, 31 December 2008, p 1-1355.

2.2.61.3 List of collective entries

Toxic substances without subsidiary ~~risk~~hazard(s)

			1583	1583 CHLOROPICRIN MIXTURE, N.O.S.	Deleted Cells
			1602	1602 DYE, LIQUID, TOXIC, N.O.S., or 1602 DYE INTERMEDIATE, LIQUID, TOXIC, N.O.S.	Split Cells
			1693	1693 TEAR GAS SUBSTANCE, LIQUID, N.O.S.	Deleted Cells
			1851	1851 MEDICINE, LIQUID, TOXIC, N.O.S.	Split Cells
			2206	2206 ISOCYANATES, TOXIC, N.O.S. or 2206 ISOCYANATE SOLUTION, TOXIC, N.O.S.	Split Cells
			3140	3140 ALKALOIDS, LIQUID, N.O.S. or 3140 ALKALOID SALTS, LIQUID, N.O.S.	Deleted Cells
		liquid ^{a, b}	T1	3142	3142 DISINFECTANT, LIQUID, TOXIC, N.O.S.
				3144	3144 NICOTINE COMPOUND, LIQUID, N.O.S. or 3144 NICOTINE PREPARATION, LIQUID, N.O.S.
				3172	3172 TOXINS, EXTRACTED FROM LIVING SOURCES, LIQUID, TOXIC, N.O.S.
				3276	3276 NITRILES, LIQUID, TOXIC, N.O.S.
				3278	3278 ORGANOPHOSPHORUS COMPOUND, LIQUID, TOXIC, N.O.S.
Organic				3381	3381 TOXIC BY INHALATION LIQUID, N.O.S. with an LC ₅₀ liquid
				3382	3382 TOXIC BY INHALATION LIQUID, N.O.S. with an LC ₅₀ liquid
				2810	2810 TOXIC LIQUID, ORGANIC, N.O.S.
				1544	1544 ALKALOIDS, SOLID, N.O.S. or 1544 ALKALOID SALTS, SOLID, N.O.S.
				1601	1601 DISINFECTANT, SOLID, TOXIC, N.O.S.
				1655	1655 NICOTINE COMPOUND, SOLID, N.O.S., or 1655 NICOTINE PREPARATION, SOLID, N.O.S.
		solid ^{a, b}	T2	3448	3448 TEAR GAS SUBSTANCE, SOLID, N.O.S.
				3143	3143 DYE, SOLID, TOXIC, N.O.S. or 3143 DYE INTERMEDIATE, SOLID, TOXIC, N.O.S.
				3462	3462 TOXINS, EXTRACTED FROM LIVING SOURCES, SOLID, TOXIC, N.O.S.
				3249	3249 MEDICINE, SOLID, TOXIC, N.O.S.
				3464	3464 ORGANOPHOSPHORUS COMPOUND, SOLID, TOXIC, N.O.S.
				3439	3439 NITRILES, SOLID, TOXIC, N.O.S.
				2811	2811 TOXIC SOLID, ORGANIC, N.O.S.
				2026	2026 PHENYLMERCURIC COMPOUND, N.O.S.
				2788	2788 ORGANOTIN COMPOUND, LIQUID, N.O.S.
				3146	3146 ORGANOTIN COMPOUND, SOLID, N.O.S.
				3280	3280 ORGANOARSENIC COMPOUND, LIQUID, N.O.S.
Organometallic ^{a, b, c, d}			T3	3465	3465 ORGANOARSENIC COMPOUND, SOLID, N.O.S.
				3281	3281 METAL CARBONYLS, LIQUID, N.O.S.
				3466	3466 METAL CARBONYLS, SOLID, N.O.S.
				3282	3282 ORGANOMETALLIC COMPOUND, LIQUID, TOXIC, N.O.S.
				3467	3467 ORGANOMETALLIC COMPOUND, SOLID, TOXIC, N.O.S.

(cont'd on next page)

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^a Substances and preparations containing alkaloids or nicotine used as pesticides shall be classified under UN No. 2588 PESTICIDES, SOLID, TOXIC, N.O.S., UN No. 2902 PESTICIDES, LIQUID, TOXIC, N.O.S. or UN No. 2903 PESTICIDES, LIQUID, TOXIC, FLAMMABLE, N.O.S.

^b Active substances and triturations or mixtures of substances intended for laboratories and experiments and for the manufacture of pharmaceutical products with other substances shall be classified according to their toxicity (see 2.2.61.1.7 to 2.2.61.1.11).

^c Self-heating substances, slightly toxic and spontaneously combustible organometallic compounds, are substances of Class 4.2.

^d Water-reactive substances, slightly toxic, and water-reactive organometallic compounds, are substances of Class 4.3.

2.2.61.3 List of collective entries (cont'd)

Toxic substances without subsidiary risk(s) (cont'd)

1556	ARSENIC COMPOUND, LIQUID, N.O.S., inorganic including: Arsenates, n.o.s., Arsenites, n.o.s.; and Arsenic sulphides, n.o.s.				
1935		liquid ^h T4			
2024					
3440					
3381					
3382					
3287					
Inorganic					
1549					
1557					
Inorganic					
1564					
1566		solids ^{f,g} T5			
1588					
1707					
2025					
2291					
2570					
2630					
2630					
2630		SELENIUM			
2856		T5			
3283					
3284					
3285					
3288					
		TOXIC SOLID, INORGANIC, N.O.S.			
2992		liquid ^h T6			
2994					
2996					
2998					
3006					
3010					
3014					
3016					
3018					
3020					
3026					
3348					
3352					
Pesticides					
2902					
(cont'd on next page)					
		PESTICIDE, LIQUID, TOXIC, N.O.S.			

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^e Mercury fulminate, wetted with not less than 20% water, or mixture of alcohol and water by mass is a substance of Class 1, UN No. 0135.

^f Ferricyanides, ferrocyanides, alkaline thiocyanates and ammonium thiocyanates are not subject to the provisions of ADR.

^g Lead salts and lead pigments which, when mixed in a ratio of 1:1,000 with 0.07M hydrochloric acid and stirred for one hour at a temperature of $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, exhibit a solubility of 5% or less, are not subject to the provisions of ADR.

^h Articles impregnated with this pesticide, such as fibreboard plates, paper strips, cotton-wool balls, sheets of plastics material, in hermetically closed wrappings, are not subject to the provisions of ADR.

TF1

^h *Articles impregnated with this pesticide, such as fibreboard plates, paper strips, cotton-wool balls, sheets of plastics material, in hermetically closed wrappings, are not subject to the provisions of ADR.*

ⁱ *Mixtures of solids which are not subject to the provisions of ADR and of toxic liquids may be carried under UN No. 3243 without first applying the classification criteria of Class 6.1, provided there is no free liquid visible at the time the substance is loaded or at the time the packaging, container or transport unit is closed. Each packaging shall correspond to a design type that has passed a leakproofness test at the packing group II level. This entry shall not be used for solids containing a packing group I liquid.*

^j *Highly toxic and toxic flammable liquids having a flash-point below 23 °C are substances of Class 3 except those which are highly toxic by inhalation, as defined in 2.2.61.1.4 to 2.2.61.1.9. Liquids which are highly toxic by inhalation are indicated as "toxic by inhalation" in their proper shipping name in Column (2) or by special provision 354 in Column (6) of Table A of Chapter 3.2.*

^k *Flammable liquids, slightly toxic, with the exception of substances and preparations used as pesticides, having a flash-point between 23 °C and 60 °C inclusive, are substances of Class 3.*

2.2.61.3 List of collective entries (cont'd)

Toxic substances with subsidiary risk hazard(s)

(cont'd)

<p>Flammable TF (cont'd)</p> <p>pesticides, liquid (flash-point not less than 23 °C)</p> <p>solid</p>	<p>TF2</p> <p>TF3</p>	<p>2991 CARBAMATE PESTICIDE, LIQUID, TOXIC, FLAMMABLE 2993 ARSENICAL PESTICIDE, LIQUID, TOXIC, FLAMMABLE 2995 ORGANOCHLORINE PESTICIDE, LIQUID, TOXIC, FLAMMABLE 2997 TRIAZINE PESTICIDE, LIQUID, TOXIC, FLAMMABLE 3005 THIOCARBAMATE PESTICIDE, LIQUID, TOXIC, FLAMMABLE 3009 COPPER BASED PESTICIDE, LIQUID, TOXIC, FLAMMABLE 3011 MERCURY BASED PESTICIDE, LIQUID, TOXIC, FLAMMABLE 3013 SUBSTITUTED NITROPHENOL PESTICIDE, LIQUID, TOXIC, FLAMMABLE 3015 BIPYRIDILIUM PESTICIDE, LIQUID, TOXIC, FLAMMABLE 3017 ORGANOPHOSPHORUS PESTICIDE, LIQUID, TOXIC, FLAMMABLE 3019 ORGANOTIN PESTICIDE, LIQUID, TOXIC, FLAMMABLE 3025 COUMARIN DERIVATIVE PESTICIDE, LIQUID, TOXIC, FLAMMABLE 3347 PHENOXYACETIC ACID DERIVATIVE PESTICIDE, LIQUID, TOXIC, FLAMMABLE 3351 PYRETHROID PESTICIDE, LIQUID, TOXIC, FLAMMABLE 2903 PESTICIDE, LIQUID, TOXIC, FLAMMABLE, N.O.S.</p> <p>1700 TEAR GAS CANDLES 2930 TOXIC SOLID, FLAMMABLE, ORGANIC, N.O.S. 3535 TOXIC SOLID, FLAMMABLE, INORGANIC, N.O.S.</p>	
<p>Solid, self-heating^c TS</p>		<p>3124 TOXIC SOLID, SELF-HEATING, N.O.S.</p>	
<p>Flammable TF (cont'd)</p> <p>Water-reactive^d</p> <p>liquid pesticides, liquid (flash-point not less than 23 °C)</p> <p>solid</p>	<p>TF2</p> <p>TF3</p> <p>W1</p>	<p>2901 CARBAMATE PESTICIDE, LIQUID, TOXIC, FLAMMABLE ARSENICAL PESTICIDE, LIQUID, TOXIC 2903 TOXIC, FLAMMABLE TRIAZINE PESTICIDE, LIQUID, TOXIC, FLAMMABLE THIOCARBAMATE P 3005 PESTICIDE, LIQUID, TOXIC, FLAMMABLE MERCURY BASED PESTICIDE, LIQUID, TOXIC, FLAMMABLE 3007 SUBSTITUTED NITROPHENOL PESTICIDE, LIQUID, TOXIC, FLAMMABLE BIPYRIDILIUM PESTICIDE, LIQUID, TOXIC, FLAMMABLE ORGANOPHOSPHORUS- 3005 PESTICIDE, LIQUID, TOXIC, FLAMMABLE ORGANOTIN PESTICIDE, LIQUID, TOXIC, FLAMMABLE 3009 COUMARIN DERIVATIVE PESTICIDE, LIQUID, TOXIC, FLAMMABLE PHENOXYACETIC ACID DERIVATIVE PESTICIDE, LIQUID, TOXIC, FLAMMABLE PYRETHRO 3011 PESTICIDE, LIQUID, TOXIC, FLAMMABLE 3013 PESTICIDE, LIQUID, TOXIC, FLAMMABLE, N.O.S. 3015 3017 TEAR GAS CANDLES 3019 TOXIC SOLID, FLAMMABLE, ORGANIC, N.O.S. 3385 TOXIC BY INHALATION LIQUID, WATER-REACTIVE, N.O.S. with an LC₅₀ lower than or 3025 equal to 200 ml/m³ and saturated vapour concentration greater than or equal to 500 LC₅₀ 3347 3351 2903 1700 2930</p> <p>3386 TOXIC BY INHALATION LIQUID, WATER-REACTIVE, N.O.S. with an LC₅₀ lower than or equal to 1000 ml/m³ and saturated vapour concentration greater than or equal to 10 LC₅₀</p> <p>3123 TOXIC LIQUID, WATER-REACTIVE, N.O.S.</p>	<p>Merged Cells</p> <p>Deleted Cells</p>
<p>Solid, self-heating^c TW</p>	<p>3124 solid^a TW2</p>	<p>3125 TOXIC SOLID, SELF-HEATING WATER-REACTIVE, N.O.S.</p>	<p>Split Cells</p>
<p>Oxidizing¹ TO</p>	<p>TO1</p> <p>TO2</p>	<p>3387 TOXIC BY INHALATION LIQUID, OXIDIZING, N.O.S. with an LC₅₀ lower than or equal to 200 ml/m³ 3388 TOXIC BY INHALATION LIQUID, OXIDIZING, N.O.S. with an LC₅₀ lower than or equal to 1000 ml/m³ and saturated vapour concentration greater than or equal to 10 LC₅₀ 3122 TOXIC LIQUID, OXIDIZING, N.O.S. 3086 TOXIC SOLID, OXIDIZING, N.O.S.</p>	<p>Inserted Cells</p> <p>Split Cells</p> <p>Split Cells</p> <p>Deleted Cells</p>
<p>organic</p>	<p>TW1</p>	<p>3385 TOXIC BY INHALATION LIQUID, WATER REACTIVE, N.O.S. with an LC₅₀ lower than or equal to 200 ml/m³ and saturated vapour concentration greater than or equal to 500 LC₅₀ 3386 TOXIC BY INHALATION LIQUID, WATER REACTIVE, N.O.S. with an LC₅₀ lower than or 3277 equal to 1000 ml/m³ and saturated vapour concentration greater than or equal to 10 LC₅₀ TOXIC LIQU 3123 3125 TOXIC SOLID, WATER-REACTIVE, N.O.S.</p>	<p>Split Cells</p> <p>Split Cells</p> <p>Split Cells</p>

	TW2	3387	TOXIC BY INHALATION LIQUID, OXIDIZING, N.O.S. with an LC₅₀ lower than or equal to 200 ml/m³ and saturated vapour concentration greater than or equal to 500 LC₅₀
	TO1	3388	TOXIC BY INHALATION LIQUID, OXIDIZING, N.O.S. with an LC₅₀ lower than or equal to 1000 ml/m³ and saturated vapour concentration greater than or equal to 10 LC₅₀
		3422	CHLOROFORMATES, TOXIC, CORROSIVE, N.O.S.
		3361	CHLOROSILANES, TOXIC, CORROSIVE, N.O.S.
		3389	TOXIC BY INHALATION LIQUID, CORROSIVE, N.O.S. with an LC ₅₀ lower than or equal to 200 ml/m ³ and saturated vapour concentration greater than or equal to 500 LC ₅₀
		3390	TOXIC BY INHALATION LIQUID, CORROSIVE, N.O.S. with an LC ₅₀ lower than or equal to 1000 ml/m ³ and saturated vapour concentration greater than or equal to 10 LC ₅₀
	TO2	3277	TOXIC LIQUID, CORROSIVE, ORGANIC, N.O.S.
	TC1	3364	TOXIC SOLID, CORROSIVE, ORGANIC, N.O.S.
		3389	
		3390	
		2927	
		TC1	
		2928	
	liquid	TC2	
	liquid		
Water-reactive ^d	TW		
		solid ⁿ	
		liquid	
Oxidizing ¹	TO		
		solid	
		liquid	
	organic		
Corro-			
sive ^m			
sive ^m			
TC			
TC			
	solid	TC2	2928 TOXIC SOLID, CORROSIVE, ORGANIC, N.O.S.

(cont'd on next page)

- Split Cells
- Deleted Cells
- Split Cells
- Deleted Cells
- Split Cells

^c Self-heating substances, slightly toxic and spontaneously combustible organometallic compounds, are substances of Class 4.2.

^d Water-reactive substances, slightly toxic, and water-reactive organometallic compounds, are substances of Class 4.3.

¹ Oxidizing substances, slightly toxic, are substances of Class 5.1.

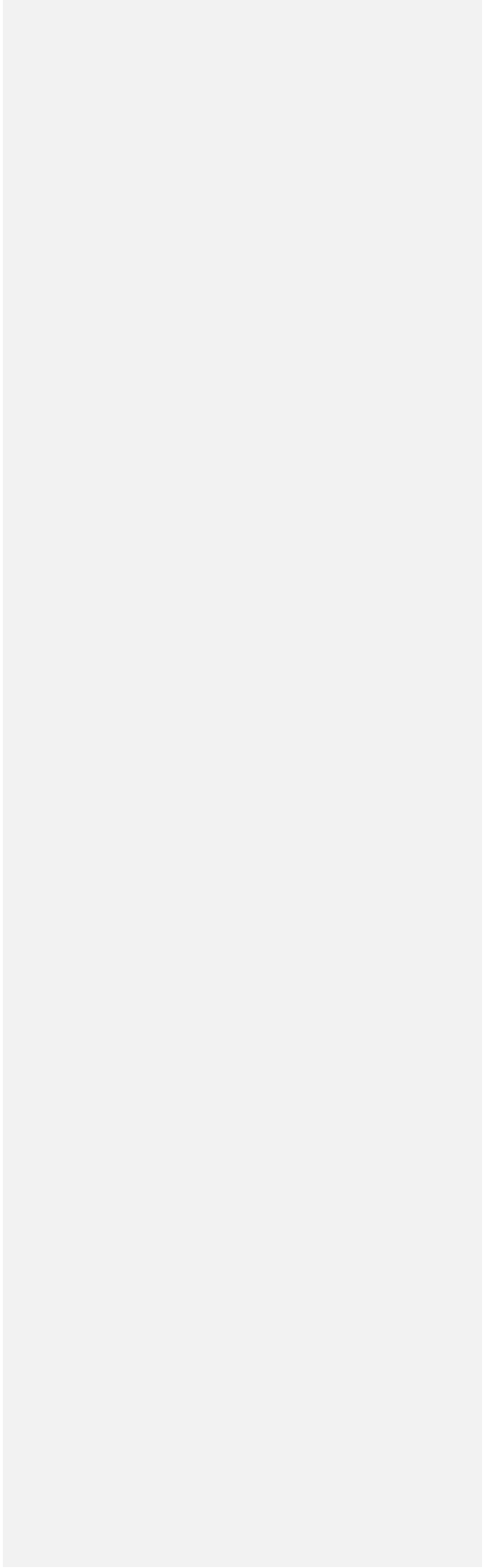
^m Substances slightly toxic and slightly corrosive, are substances of Class 8.

ⁿ Metal phosphides assigned to UN Nos. 1360, 1397, 1432, 1714, 2011 and 2013 are substances of Class 4.3.

2.2.61.3 List of collective entries (cont'd)

Toxic substances with subsidiary risk/hazard(s)

Corrosive^m TC <i>(cont'd)</i> inorganic	liquid	TC3	3389 TOXIC BY INHALATION LIQUID, CORROSIVE, N.O.S., with an LC₅₀ lower than or equal to 200 ml/m³ and saturated vapour concentration greater than or equal to 500 LC₅₀ 3490 TOXIC BY INHALATION LIQUID, CORROSIVE, N.O.S., with an LC₅₀ lower than or equal to 1000 ml/m³ and saturated vapour concentration greater than or equal to 10 LC₅₀ 3289 TOXIC LIQUID, CORROSIVE, INORGANIC, N.O.S.
	solid	TC4	3290 TOXIC SOLID, CORROSIVE, INORGANIC, N.O.S.
	Flammable, corrosive TC		
Flammable, water-reactive TFW			3490 TOXIC BY INHALATION LIQUID, WATER-REACTIVE, FLAMMABLE, N.O.S., with an LC₅₀ lower than or equal to 200 ml/m³ and saturated vapour concentration greater than or equal to 500 LC₅₀ 3491 TOXIC BY INHALATION LIQUID, WATER-REACTIVE, FLAMMABLE, N.O.S., with an LC₅₀ lower than or equal to 1000 ml/m³ and saturated vapour concentration greater than or equal to 10 LC₅₀



^m *Substances slightly toxic and slightly corrosive, are substances of Class 8.*

2.2.62 Class 6.2 Infectious substances

2.2.62.1 Criteria

2.2.62.1.1 The heading of Class 6.2 covers infectious substances. For the purposes of ADR, infectious substances are substances which are known or are reasonably expected to contain pathogens. Pathogens are defined as microorganisms (including bacteria, viruses, rickettsiae, parasites, fungi) and other agents such as prions, which can cause disease in humans or animals.

NOTE 1: Genetically modified microorganisms and organisms, biological products, diagnostic specimens and intentionally infected live animals shall be assigned to this Class if they meet the conditions for this Class.

The carriage of unintentionally or naturally infected live animals is subject only to the relevant rules and regulations of the respective countries of origin, transit and destination.

NOTE 2: Toxins from plant, animal or bacterial sources which do not contain any infectious substances or organisms or which are not contained in them are substances of Class 6.1, UN Nos. 3172 or 3462.

2.2.62.1.2 Substances of Class 6.2 are subdivided as follows:

- I1 Infectious substances affecting humans;
- I2 Infectious substances affecting animals only;
- I3 Clinical waste;
- I4 Biological substances.

Definitions

2.2.62.1.3 For the purposes of ADR,

"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;

"Cultures" are the result of a process by which pathogens are intentionally propagated. This definition does not include human or animal patient specimens as defined in this paragraph;

"Medical or clinical wastes" are wastes derived from the medical treatment of animals or humans or from bio-research;

"Patient specimens" are ~~human or animal materials, 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 carried for purposes such as research, diagnosis, investigational activities, disease treatment and prevention.

Classification

2.2.62.1.4 Infectious substances shall be classified in Class 6.2 and assigned to UN Nos. 2814, 2900, 3291 or 3373, as appropriate.

Infectious substances are divided into the following categories:

2.2.62.1.4.1

Category A: An infectious substance which is carried 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 the table in this paragraph.

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 both in humans and animals shall be assigned to UN No. 2814. Infectious substances which cause disease only in animals shall be assigned to UN No. 2900;
- (b) Assignment to UN No. 2814 or UN No. 2900 shall 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 No. 2814 is "INFECTIOUS SUBSTANCE, AFFECTING HUMANS". The proper shipping name for UN No. 2900 is "INFECTIOUS SUBSTANCE, AFFECTING ANIMALS only".

NOTE 2: The following table is not exhaustive. Infectious substances, including new or emerging pathogens, which do not appear in the table but which meet the same criteria shall be assigned to Category A. In addition, if there is doubt as to whether or not a substance meets the criteria it shall be included in Category A.

NOTE 3: In the following table, the microorganisms written in italics are bacteria, mycoplasmas, rickettsia or fungi.

**INDICATIVE EXAMPLES OF INFECTIOUS SUBSTANCES INCLUDED IN CATEGORY A
IN ANY FORM UNLESS OTHERWISE INDICATED
(2.2.62.1.4.1)**

UN Number and name	Microorganism
<p>UN No. 2814 Infectious substances affecting humans</p>	<p><u><i>Bacillus anthracis (cultures only)</i></u> <u><i>Brucella abortus (cultures only)</i></u> <u><i>Brucella melitensis (cultures only)</i></u> <u><i>Brucella suis (cultures only)</i></u> <u><i>Burkholderia mallei - Pseudomonas mallei – Glanders (cultures only)</i></u> <u><i>Burkholderia pseudomallei – Pseudomonas pseudomallei (cultures only)</i></u> <u><i>Chlamydia psittaci - avian strains (cultures only)</i></u> <u><i>Clostridium botulinum (cultures only)</i></u> <u><i>Coccidioides immitis (cultures only)</i></u> <u><i>Coxiella burnetii (cultures only)</i></u> <u>Crimean-Congo haemorrhagic fever virus</u> <u>Dengue virus (cultures only)</u> <u>Eastern equine encephalitis virus (cultures only)</u> <u><i>Escherichia coli, verotoxigenic (cultures only)</i>^a</u> <u>Ebola virus</u> <u>Flexal virus</u> <u><i>Francisella tularensis (cultures only)</i></u> <u>Guanarito virus</u> <u>Hantaan virus</u> <u>Hantavirus causing haemorrhagic fever with renal syndrome</u> <u>Hendra virus</u> <u>Hepatitis B virus (cultures only)</u> <u>Herpes B virus (cultures only)</u> <u>Human immunodeficiency virus (cultures only)</u> <u>Highly pathogenic avian influenza virus (cultures only)</u> <u>Japanese Encephalitis virus (cultures only)</u> <u>Junin virus</u> <u>Kyasanur Forest disease virus</u> <u>Lassa virus</u> <u>Machupo virus</u> <u>Marburg virus</u> <u>Monkeypox virus</u> <u><i>Mycobacterium tuberculosis (cultures only)</i>^a</u> <u>Nipah virus</u> <u>Omsk haemorrhagic fever virus</u> <u>Poliovirus (cultures only)</u> <u>Rabies virus (cultures only)</u> <u><i>Rickettsia prowazekii (cultures only)</i></u> <u><i>Rickettsia rickettsii (cultures only)</i></u> <u>Rift Valley fever virus (cultures only)</u> <u>Russian spring-summer encephalitis virus (cultures only)</u> <u>Sabia virus</u> <u><i>Shigella dysenteriae type 1 (cultures only)</i>^a</u> <u>Tick-borne encephalitis virus (cultures only)</u> <u>Variola virus</u></p>
<p>UN No. 2814 Infectious substances affecting humans</p>	<p><i>Bacillus anthracis (cultures only)</i> <i>Brucella abortus (cultures only)</i><i>Brucella melitensis (cultures only)</i><i>Brucella suis (cultures only)</i> <i>Burkholderia mallei – Pseudomonas mallei – Glanders (cultures only)</i><i>Burkholderia pseudomallei – Pseudomonas pseudomallei (cultures only)</i><i>Chlamydia psittaci – avian strains (cultures only)</i><i>Clostridium botulinum (cultures only)</i><i>Coccidioides immitis (cultures only)</i> <i>Coxiella burnetii (cultures only)</i>Crimean-Congo haemorrhagic fever virusDengue virus (cultures only)Eastern equine encephalitis virus (cultures only)<i>Escherichia coli, verotoxigenic (cultures only)</i>^aEbola virusFlexal virus<i>Francisella tularensis (cultures only)</i>Guanarito virus Hantaan virusHantavirus causing haemorrhagic fever with renal syndromeHendra virusHepatitis B virus (cultures only)Herpes B virus (cultures only)Human immunodeficiency virus (cultures only)Highly pathogenic avian influenza virus (cultures only)Japanese Encephalitis virus (cultures only)Junin virusKyasanur Forest disease virusLassa virusMachupo virusMarburg virusMonkeypox virus<i>Mycobacterium tuberculosis (cultures only)</i>^aNipah virusOmsk haemorrhagic fever virusPoliovirus (cultures only)Rabies virus (cultures only)<i>Rickettsia prowazekii (cultures only)</i><i>Rickettsia rickettsii (cultures only)</i>Rift Valley fever virus (cultures only)Russian spring-summer encephalitis virus (cultures only)Sabia</p>

Merged Cells

	virus Shigella dysenteriae type I (cultures only) ^a Tick-borne encephalitis virus (cultures only) Varicella virus Venezuelan equine encephalitis virus (cultures only) West Nile virus (cultures only) Yellow fever virus (cultures only) Yersinia pestis (cultures only)
	<u>West Nile virus (cultures only)</u>
	<u>Yellow fever virus (cultures only)</u>
	<u>Yersinia pestis (cultures only)</u>

^a Nevertheless, when the cultures are intended for diagnostic or clinical purposes, they may be classified as infectious substances of Category B.

INDICATIVE EXAMPLES OF INFECTIOUS SUBSTANCES INCLUDED IN CATEGORY A IN ANY FORM UNLESS OTHERWISE INDICATED (2.2.62.1.4.1)	
UN Number and name	Microorganism
UN No. 2900 Infectious substances affecting animals only	African swine fever virus (cultures only) Avian paramyxovirus Type 1 - Velogenic Newcastle disease virus (cultures only) Classical swine fever virus (cultures only) Foot and mouth disease virus (cultures only) Lumpy skin disease virus (cultures only) Mycoplasma mycoides - Contagious bovine pleuropneumonia (cultures only) Peste des petits ruminants virus (cultures only) Rinderpest virus (cultures only) Sheep-pox virus (cultures only) Goatpox virus (cultures only) Swine vesicular disease virus (cultures only) Vesicular stomatitis virus (cultures only)
	Avian paramyxovirus Type 1 - Velogenic Newcastle disease virus (cultures only)
	Classical swine fever virus (cultures only)
	Foot and mouth disease virus (cultures only)
	Lumpy skin disease virus (cultures only)
	Mycoplasma mycoides - Contagious bovine pleuropneumonia (cultures only)
	Peste des petits ruminants virus (cultures only)
	Rinderpest virus (cultures only)
	Sheep-pox virus (cultures only)
	Goatpox virus (cultures only)
	Swine vesicular disease virus (cultures only)
	Vesicular stomatitis virus (cultures only)

Merged Cells

2.2.62.1.4.2 **Category B:** An infectious substance which does not meet the criteria for inclusion in Category A. Infectious substances in Category B shall be assigned to UN No. 3373.

NOTE: The proper shipping name of UN No. 3373 is "BIOLOGICAL SUBSTANCE, CATEGORY B".

2.2.62.1.5 **Exemptions**

2.2.62.1.5.1 Substances which do not contain infectious substances or substances which are unlikely to cause disease in humans or animals are not subject to the provisions of ADR unless they meet the criteria for inclusion in another class.

2.2.62.1.5.2 Substances containing microorganisms which are non-pathogenic to humans or animals are not subject to ADR unless they meet the criteria for inclusion in another class.

2.2.62.1.5.3 Substances in a form that any present pathogens have been neutralized or inactivated such that they no longer pose a health risk are not subject to ADR unless they meet the criteria for inclusion in another class.

NOTE: Medical equipment which has been drained of free liquid is deemed to meet the requirements of this paragraph and is not subject to the provisions of ADR.

2.2.62.1.5.4 Substances where the concentration of pathogens is at a level naturally encountered (including foodstuff and water samples) and which are not considered to pose a significant risk of infection are not subject to ADR unless they meet the criteria for inclusion in another class.

2.2.62.1.5.5 Dried blood spots, collected by applying a drop of blood onto absorbent material, are not subject to ADR.

2.2.62.1.5.6 Faecal occult blood screening samples are not subject to ADR.

2.2.62.1.5.7 Blood or blood components which have been collected for the purposes of transfusion or for the preparation of blood products to be used for transfusion or transplantation and any tissues or organs intended for use in transplantation as well as samples drawn in connection with such purposes are not subject to ADR.

2.2.62.1.5.8 Human or animal specimens for which there is minimal likelihood that pathogens are present are not subject to ADR if the specimen is carried in a packaging which will prevent any leakage and which is marked with the words "Exempt human specimen" or "Exempt animal specimen", as appropriate.

The packaging is deemed to comply with the above requirements if it meets the following conditions:

(a) The packaging consists of three components:

- (i) a leak-proof primary receptacle(s);
- (ii) a leak-proof secondary packaging; and

- (iii) an outer packaging of adequate strength for its capacity, mass and intended use, and with at least one surface having minimum dimensions of 100 mm × 100 mm;
- (b) For liquids, absorbent material in sufficient quantity to absorb the entire contents is placed between the primary receptacle(s) and the secondary packaging so that, during carriage, any release or leak of a liquid substance will not reach the outer packaging and will not compromise the integrity of the cushioning material;
- (c) When multiple fragile primary receptacles are placed in a single secondary packaging, they are either individually wrapped or separated to prevent contact between them.

NOTE 1: An element of professional judgment is required to determine if a substance is exempt under this paragraph. That judgment should be based on the known medical history, symptoms and individual circumstances of the source, human or animal, and endemic local conditions. Examples of specimens which may be carried under this paragraph include the blood or urine tests to monitor cholesterol levels, blood glucose levels, hormone levels, or prostate specific antibodies (PSA); those required to monitor organ function such as heart, liver or kidney function for humans or animals with non-infectious diseases, or for therapeutic drug monitoring; those conducted for insurance or employment purposes and are intended to determine the presence of drugs or alcohol; pregnancy test; biopsies to detect cancer; and antibody detection in humans or animals in the absence of any concern for infection (e.g. evaluation of vaccine induced immunity, diagnosis of autoimmune disease, etc.).

NOTE 2: For air transport, packagings for specimens exempted under this paragraph shall meet the conditions in (a) to (c).

2.2.62.1.5.9

Except for:

- (a) Medical waste (UN No. 3291);
- (b) Medical devices or equipment contaminated with or containing infectious substances in Category A (UN No. 2814 or UN No. 2900); and
- (c) Medical devices or equipment contaminated with or containing other dangerous goods that meet the definition of another class,

medical devices or equipment potentially contaminated with or containing infectious substances which are being carried for disinfection, cleaning, sterilization, repair, or equipment evaluation are not subject to provisions of ADR other than those of this paragraph if packed in packagings designed and constructed in such a way that, under normal conditions of carriage, they cannot break, be punctured or leak their contents. Packagings shall be designed to meet the construction requirements listed in 6.1.4 or 6.6.4.

These packagings shall meet the general packing requirements of 4.1.1.1 and 4.1.1.2 and be capable of retaining the medical devices and equipment when dropped from a height of 1.2 m.

The packagings shall be marked "USED MEDICAL DEVICE" or "USED MEDICAL EQUIPMENT". When using overpacks, these shall be marked in the same way, except when the inscription remains visible.

2.2.62.1.6 to 2.2.62.1.8 (Reserved)

2.2.62.1.9

Biological products

For the purposes of ADR, biological products are divided into the following groups:

- (a) those which are manufactured and packaged in accordance with the requirements of appropriate national authorities and carried for the purposes of final packaging or distribution, and use for personal health care by medical professionals or individuals. Substances in this group are not subject to the provisions of ADR;
- (b) those which do not fall under paragraph (a) and are known or reasonably believed to contain infectious substances and which meet the criteria for inclusion in Category A or Category B. Substances in this group shall be assigned to UN Nos. 2814, 2900 or 3373, as appropriate.

NOTE: Some licensed biological products may present a biohazard only in certain parts of the world. In that case, competent authorities may require these biological products to be in compliance with local requirements for infectious substances or may impose other restrictions.

2.2.62.1.10 *Genetically modified microorganisms and organisms*

Genetically modified microorganisms not meeting the definition of infectious substance shall be classified according to section 2.2.9.

2.2.62.1.11 *Medical or clinical wastes*

2.2.62.1.11.1 Medical or clinical wastes containing Category A infectious substances shall be assigned to UN No. 2814 or UN No. 2900 as appropriate. Medical or clinical wastes containing infectious substances in Category B shall be assigned to UN No. 3291.

NOTE: Medical or clinical wastes assigned to number 18 01 03 (Wastes from human or animal health care and/or related research – wastes from natal care, diagnosis, treatment or prevention of disease in humans – wastes whose collection and disposal is subject to special requirements in order to prevent infection) or 18 02 02 (Wastes from human or animal health care and/or related research – wastes from research, diagnosis, treatment or prevention of disease involving animals – wastes whose collection and disposal is subject to special requirements in order to prevent infection) according to the list of wastes annexed to the Commission Decision 2000/532/EC⁴-EC⁴ as amended, shall be classified according to the provisions set out in this paragraph, based on the medical or veterinary diagnosis concerning the patient or the animal.

2.2.62.1.11.2 Medical or clinical wastes which are reasonably believed to have a low probability of containing infectious substances shall be assigned to UN No. 3291. For the assignment, international, regional or national waste catalogues may be taken into account.

NOTE 1: The proper shipping name for UN No. 3291 is "CLINICAL WASTE, UNSPECIFIED, N.O.S." or "(BIO) MEDICAL WASTE, N.O.S." or "REGULATED MEDICAL WASTE, N.O.S."

NOTE 2: Notwithstanding the classification criteria set out above, medical or clinical wastes assigned to number 18 01 04 (Wastes from human or animal health care and/or related research – wastes from natal care, diagnosis, treatment or prevention of disease in humans – wastes whose collection and disposal is not subject to special requirements in order to prevent infection) or 18 02 03 (Wastes from human or animal health care and/or related research – wastes from research, diagnosis, treatment or prevention of disease involving animals – wastes whose collection and disposal is not subject to special requirements in order to prevent infection) according to the list of wastes annexed to the Commission Decision 2000/532/EC⁵ as amended, are not subject to the provisions of ADR.

2.2.62.1.11.3 Decontaminated medical or clinical wastes which previously contained infectious substances are not subject to the provisions of ADR unless they meet the criteria for inclusion in another class.

2.2.62.1.11.4 Medical or clinical wastes assigned to UN No. 3291 are assigned to packing group II.

2.2.62.1.12 *Infected animals*

2.2.62.1.12.1 Unless an infectious substance cannot be consigned by any other means, live animals shall not be used to consign such a substance. A live animal which has been intentionally infected and is known or suspected to contain an infectious substance shall only be carried under terms and conditions approved by the competent authority.

NOTE: The approval of the competent authorities shall be issued on the basis of the relevant rules for the carriage of live animals, taking into consideration dangerous goods aspects. The authorities

⁴ Commission Decision 2000/532/EC of 3 May 2000 replacing Decision 94/3/EC establishing a list of wastes pursuant to Article 1(a) of Council Directive 75/442/EEC on waste (replaced by the Directive 2006/12/EC of the European Parliament and of the Council (Official Journal of the European Union No. L 114 of 27 April 2006, page 9)) and Council Decision 94/904/EC establishing a list of hazardous waste pursuant to Article 1(4) of Council Directive 91/689/EEC on hazardous waste (Official Journal of the European Communities No. L 226 of 6 September 2000, page 3).

that are competent to lay down these conditions and rules for approval shall be regulated at national level.

If there is no approval by a competent authority of a Contracting Party to ADR, the competent authority of a Contracting Party to ADR may recognize an approval issued by the competent authority of a country that is not a Contracting Party to ADR.

Rules for the carriage of livestock are, for example, contained in Council Regulation (EC) No 1/2005 of 22 December 2004 on the protection of animals during transport (Official Journal of the European Union No L 3 of 5 January 2005) as amended.

~~2.2.62.1.12.1 — Animal material affected by pathogens of Category A or by pathogens which would be assigned to Category A in cultures only, shall be assigned to UN 2814 or UN 2900 as appropriate. Animal material affected by pathogens of Category B, other than those which would be assigned to Category A if they were in cultures, shall be assigned to UN 3373.~~

~~2.2.62.1.12.2 (Deleted)~~

2.2.62.2 Substances not accepted for carriage

Live vertebrate or invertebrate animals shall not be used to carry an infectious agent unless the agent cannot be carried by other means or unless this carriage has been approved by the competent authority (see 2.2.62.1.12.1).

2.2.62.3 List of collective entries

Effects on humans	I1	2814 INFECTIOUS SUBSTANCE, AFFECTING HUMANS
Effects on animals only	I2	2900 INFECTIOUS SUBSTANCE, AFFECTING ANIMALS only
Effects on humans	I1	2814 INFECTIOUS SUBSTANCE, AFFECTING HUMANS
Clinical waste	I3	3291 CLINICAL WASTE, UNSPECIFIED, N.O.S. or
Effects on animals only	I2	3291 (BIO) MEDICAL WASTE, N.O.S. or
		3301 REGULATED MEDICAL WASTE, N.O.S.
		3300 INFECTIOUS SUBSTANCE, AFFECTING ANIMALS only
Biological substances	I4	3373 BIOLOGICAL SUBSTANCE, CATEGORY B
Clinical waste	I3	3291 CLINICAL WASTE, UNSPECIFIED, N.O.S. or
		3291 (BIO) MEDICAL WASTE, N.O.S. or
		3291 REGULATED MEDICAL WASTE, N.O.S.
Biological substances	I4	3373 BIOLOGICAL SUBSTANCE, CATEGORY B

2.2.7 Class 7 Radioactive material

2.2.7.1 Definitions

2.2.7.1.1 *Radioactive material* means any material containing radionuclides where both the activity concentration and the total activity in the consignment exceed the values specified in 2.2.7.2.2.1 to 2.2.7.2.2.6.

2.2.7.1.2 Contamination

Contamination means the presence of a radioactive substance on a surface in quantities in excess of 0.4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 0.04 Bq/cm² for all other alpha emitters.

Non-fixed contamination means contamination that can be removed from a surface during routine conditions of carriage.

Fixed contamination means contamination other than non-fixed contamination.

2.2.7.1.3 Definitions of specific terms

A_1 and A_2

A_1 means the activity value of special form radioactive material which is listed in the Table in 2.2.7.2.2.1 or derived in 2.2.7.2.2.2 and is used to determine the activity limits for the requirements of ADR.

A_2 means the activity value of radioactive material, other than special form radioactive material, which is listed in the Table in 2.2.7.2.2.1 or derived in 2.2.7.2.2.2 and is used to determine the activity limits for the requirements of ADR.

Fissile nuclides means uranium-233, uranium-235, plutonium-239 and plutonium-241. *Fissile material* means a material containing any of the fissile nuclides. Excluded from the definition of fissile material are the following:

- (a) Natural uranium or depleted uranium which is unirradiated;
- (b) Natural uranium or depleted uranium which has been irradiated in thermal reactors only;
- (c) Material with fissile nuclides less than a total of 0.25 g;
- (d) Any combination of (a), (b) and/or (c).

These exclusions are only valid if there is no other material with fissile nuclides in the package or in the consignment if shipped unpackaged.

Low dispersible radioactive material means either a solid radioactive material or a solid radioactive material in a sealed capsule, that has limited dispersibility and is not in powder form.

Low specific activity (LSA) material means radioactive material which by its nature has a limited specific activity, or radioactive material for which limits of estimated average specific activity apply. External shielding materials surrounding the LSA material shall not be considered in determining the estimated average specific activity.

Low toxicity alpha emitters are: natural uranium; depleted uranium; natural thorium; uranium-235 or uranium-238; thorium-232; thorium-228 and thorium-230 when contained in ores or physical and chemical concentrates; or alpha emitters with a half-life of less than 10 days.

Special form radioactive material means either:

- (a) An indispersible solid radioactive material; or
- (b) A sealed capsule containing radioactive material.

Specific activity of a radionuclide means the activity per unit mass of that nuclide. The specific activity of a material shall mean the activity per unit mass of the material in which the radionuclides are essentially uniformly distributed.

Surface contaminated object (SCO) means a solid object which is not itself radioactive but which has radioactive material distributed on its surface.

Unirradiated thorium means thorium containing not more than 10^{-7} g of uranium-233 per gram of thorium-232.

Unirradiated uranium means uranium containing not more than 2×10^3 Bq of plutonium per gram of uranium-235, not more than 9×10^6 Bq of fission products per gram of uranium-235 and not more than 5×10^{-3} g of uranium-236 per gram of uranium-235.

Uranium - natural, depleted, enriched means the following:

Natural uranium means uranium (which may be chemically separated) containing the naturally occurring distribution of uranium isotopes (approximately 99.28% uranium-238, and 0.72% uranium-235 by mass).

Depleted uranium means uranium containing a lesser mass percentage of uranium-235 than in natural uranium.

Enriched uranium means uranium containing a greater mass percentage of uranium-235 than 0.72%.

In all cases, a very small mass percentage of uranium-234 is present.

2.2.7.2 Classification

2.2.7.2.1 General provisions

2.2.7.2.1.1 Radioactive material shall be assigned to one of the UN numbers specified in Table 2.2.7.2.1.1, in accordance with 2.2.7.2.4 and 2.2.7.2.5, taking into account the material characteristics determined in 2.2.7.2.3.

Table 2.2.7.2.1.1 Assignment of UN numbers

UN No.	UN No. — Proper shipping name and description ^a
Excepted packages (1.7.1.5)	
UN 2908	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - EMPTY PACKAGING
UN 2909	Excepted packages (1.7.1.5) UN 2908 RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - EMPTY PACKAGING
UN 2909	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - ARTICLES MANUFACTURED FROM NATURAL URANIUM or DEPLETED URANIUM or NATURAL THORIUM
UN 2910	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - LIMITED QUANTITY OF MATERIAL
UN 2911	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - INSTRUMENTS or ARTICLES UN 3507 URANIUM HEXAFLUORIDE, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE less than 0.1 kg per package, non-fissile or fissile-excepted ^{b,c}
UN 2910	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - LIMITED QUANTITY OF MATERIAL
UN 2911	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - INSTRUMENTS or ARTICLES
UN 3507	URANIUM HEXAFLUORIDE, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE less than 0.1 kg per package, non-fissile or fissile-excepted ^{b,c}
Low specific activity radioactive material (2.2.7.2.3.1)	
UN 2912	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-I), non-fissile or fissile-excepted ^b
UN 3321	Low specific activity radioactive material (2.2.7.2.3.1) UN 2912 RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-I), non-fissile or fissile-excepted ^b
UN 3322	UN 3321 RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), non-fissile or fissile-excepted ^b
UN 3324	UN 3322 RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), non-fissile or fissile-excepted ^b
UN 3325	UN 3324 RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), FISSILE UN 3325 RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY, (LSA-III), FISSILE
Surface contaminated objects (2.2.7.2.3.2)	
UN 2913	RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I or SCO-II), non-fissile or fissile-excepted ^b
UN 3326	RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I or SCO-II), FISSILE
Type A packages (2.2.7.2.4.4)	
UN 2915	RADIOACTIVE MATERIAL, TYPE A PACKAGE, non-special form, non-fissile or fissile-excepted ^b
UN 3327	RADIOACTIVE MATERIAL, TYPE A PACKAGE, FISSILE, non-special form
UN 3332	RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, non-fissile or fissile-excepted ^b
UN 3333	RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, FISSILE
Type B(U) packages (2.2.7.2.4.6)	
UN 2916	RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, non-fissile or fissile-excepted ^b
UN 3328	RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, FISSILE
Type B(M) packages (2.2.7.2.4.6)	
UN 2917	RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, non-fissile or fissile-excepted ^b
UN 3329	RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, FISSILE
Type C packages (2.2.7.2.4.6)	
UN 3323	RADIOACTIVE MATERIAL, TYPE C PACKAGE, non-fissile or fissile-excepted ^b
UN 3330	RADIOACTIVE MATERIAL, TYPE C PACKAGE, FISSILE

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Special arrangement (2.2.7.2.5)	
UN 2919	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, non fissile or fissile-excepted ^b
UN 3331	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, FISSILE
Uranium hexafluoride (2.2.7.2.4.5)	
UN 2977	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE
UN 2978	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, non fissile or fissile-excepted ^b
UN 3507	URANIUM HEXAFLUORIDE, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE less than 0.1 kg per package, non-fissile or fissile-excepted ^{b,c}

^a The proper shipping name is found in the column "proper shipping name and description" and is restricted to that part shown in capital letters. In the cases of UN Nos. 2909, 2911, 2913 and 3326, where alternative proper shipping names are separated by the word "or" only the relevant proper shipping name shall be used.

^b The term "fissile-excepted" refers only to material excepted under 2.2.7.2.3.5.

^c For UN No. 3507, see also special provision 369 in Chapter 3.3.

2.2.7.2.2 *Determination of basic radionuclide values*

2.2.7.2.2.1 The following basic values for individual radionuclides are given in Table 2.2.7.2.2.1:

- (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.

Table 2.2.7.2.2.1: Basic radionuclides values for individual radionuclides

Radionuclide (atomic number)	A_1 (TBq)	A_2 (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Actinium (89)				
Ac-225 (a)	8×10^{-1}	6×10^{-3}	1×10^1	1×10^4
Ac-227 (a)	9×10^{-1}	9×10^{-5}	1×10^{-1}	1×10^3
Ac-228	6×10^{-1}	5×10^{-1}	1×10^1	1×10^6
Silver (47)				
Ag-105	2×10^0	2×10^0	1×10^2	1×10^6
Ag-108m (a)	7×10^{-1}	7×10^{-1}	1×10^1 (b)	1×10^6 (b)
Ag-110m (a)	4×10^{-1}	4×10^{-1}	1×10^1	1×10^6
Ag-111	2×10^0	6×10^{-1}	1×10^3	1×10^6
Aluminium (13)				
Al-26	1×10^{-1}	1×10^{-1}	1×10^1	1×10^5
Americium (95)				
Am-241	1×10^1	1×10^{-3}	1×10^0	1×10^4
Am-242m (a)	1×10^1	1×10^{-3}	1×10^0 (b)	1×10^4 (b)
Am-243 (a)	5×10^0	1×10^{-3}	1×10^0 (b)	1×10^5 (b)
Argon (18)				
Ar-37	4×10^1	4×10^1	1×10^6	1×10^8
Ar-39	4×10^1	2×10^1	1×10^7	1×10^4
Ar-41	3×10^{-1}	3×10^{-1}	1×10^2	1×10^9
Arsenic (33)				
As-72	3×10^{-1}	3×10^{-1}	1×10^1	1×10^5
As-73	4×10^1	4×10^1	1×10^3	1×10^7
As-74	1×10^0	9×10^{-1}	1×10^1	1×10^6
As-76	3×10^{-1}	3×10^{-1}	1×10^2	1×10^5
As-77	2×10^1	7×10^{-1}	1×10^3	1×10^6
Astatine (85)				
At-211 (a)	2×10^1	5×10^{-1}	1×10^3	1×10^7

Radionuclide (atomic number)	A ₁ (TBq)	A ₂ (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Gold (79)				
Au-193	7×10^0	2×10^0	1×10^2	1×10^7
Au-194	1×10^0	1×10^0	1×10^1	1×10^6
Au-195	1×10^1	6×10^0	1×10^2	1×10^7
Au-198	1×10^0	6×10^{-1}	1×10^2	1×10^6
Au-199	1×10^1	6×10^{-1}	1×10^2	1×10^6
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-140 (a)	5×10^{-1}	3×10^{-1}	1×10^1 (b)	1×10^5 (b)
Beryllium (4)				
Be-7	2×10^1	2×10^1	1×10^3	1×10^7
Be-10	4×10^1	6×10^{-1}	1×10^4	1×10^6
Bismuth (83)				
Bi-205	7×10^{-1}	7×10^{-1}	1×10^1	1×10^6
Bi-206	3×10^{-1}	3×10^{-1}	1×10^1	1×10^5
Bi-207	7×10^{-1}	7×10^{-1}	1×10^1	1×10^6
Bi-210	1×10^0	6×10^{-1}	1×10^3	1×10^6
Bi-210m (a)	6×10^{-1}	2×10^{-2}	1×10^1	1×10^5
Bi-212 (a)	7×10^{-1}	6×10^{-1}	1×10^1 (b)	1×10^5 (b)
Berkelium (97)				
Bk-247	8×10^0	8×10^{-4}	1×10^0	1×10^4
Bk-249 (a)	4×10^1	3×10^{-1}	1×10^3	1×10^6
Bromine (35)				
Br-76	4×10^{-1}	4×10^{-1}	1×10^1	1×10^5
Br-77	3×10^0	3×10^0	1×10^2	1×10^6
Br-82	4×10^{-1}	4×10^{-1}	1×10^1	1×10^6
Carbon (6)				
C-11	1×10^0	6×10^{-1}	1×10^1	1×10^6
C-14	4×10^1	3×10^0	1×10^4	1×10^7

Radionuclide (atomic number)	A ₁ (TBq)	A ₂ (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Calcium (20)				
Ca-41	Unlimited	Unlimited	1×10^5	1×10^7
Ca-45	4×10^1	1×10^0	1×10^4	1×10^7
Ca-47 (a)	3×10^0	3×10^{-1}	1×10^1	1×10^6
Cadmium (48)				
Cd-109	3×10^1	2×10^0	1×10^4	1×10^6
Cd-113m	4×10^1	5×10^{-1}	1×10^3	1×10^6
Cd-115 (a)	3×10^0	4×10^{-1}	1×10^2	1×10^6
Cd-115m	5×10^{-1}	5×10^{-1}	1×10^3	1×10^6
Cerium (58)				
Ce-139	7×10^0	2×10^0	1×10^2	1×10^6
Ce-141	2×10^1	6×10^{-1}	1×10^2	1×10^7
Ce-143	9×10^{-1}	6×10^{-1}	1×10^2	1×10^6
Ce-144 (a)	2×10^{-1}	2×10^{-1}	1×10^2 (b)	1×10^5 (b)
Californium (98)				
Cf-248	4×10^1	6×10^{-3}	1×10^1	1×10^4
Cf-249	3×10^0	8×10^{-4}	1×10^0	1×10^3
Cf-250	2×10^1	2×10^{-3}	1×10^1	1×10^4
Cf-251	7×10^0	7×10^{-4}	1×10^0	1×10^3
Cf-252	1×10^{-1}	3×10^{-3}	1×10^1	1×10^4
Cf-253 (a)	4×10^1	4×10^{-2}	1×10^2	1×10^5
Cf-254	1×10^{-3}	1×10^{-3}	1×10^0	1×10^3
Chlorine (17)				
Cl-36	1×10^1	6×10^{-1}	1×10^4	1×10^6
Cl-38	2×10^{-1}	2×10^{-1}	1×10^1	1×10^5
Curium (96)				
Cm-240	4×10^1	2×10^{-2}	1×10^2	1×10^5
Cm-241	2×10^0	1×10^0	1×10^2	1×10^6
Cm-242	4×10^1	1×10^{-2}	1×10^2	1×10^5
Cm-243	9×10^0	1×10^{-3}	1×10^0	1×10^4
Cm-244	2×10^1	2×10^{-3}	1×10^1	1×10^4
Cm-245	9×10^0	9×10^{-4}	1×10^0	1×10^3
Cm-246	9×10^0	9×10^{-4}	1×10^0	1×10^3

Radionuclide (atomic number)	A₁ (TBq)	A₂ (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Cm-247 (a)	3×10^0	1×10^{-3}	1×10^0	1×10^4
Cm-248	2×10^{-2}	3×10^{-4}	1×10^0	1×10^3
Cobalt (27)				
Co-55	5×10^{-1}	5×10^{-1}	1×10^1	1×10^6
Co-56	3×10^{-1}	3×10^{-1}	1×10^1	1×10^5
Co-57	1×10^1	1×10^1	1×10^2	1×10^6
Co-58	1×10^0	1×10^0	1×10^1	1×10^6
Co-58m	4×10^1	4×10^1	1×10^4	1×10^7
Co-60	4×10^{-1}	4×10^{-1}	1×10^1	1×10^5
Chromium (24)				
Cr-51	3×10^1	3×10^1	1×10^3	1×10^7
Caesium (55)				
Cs-129	4×10^0	4×10^0	1×10^2	1×10^5
Cs-131	3×10^1	3×10^1	1×10^3	1×10^6
Cs-132	1×10^0	1×10^0	1×10^1	1×10^5
Cs-134	7×10^{-1}	7×10^{-1}	1×10^1	1×10^4
Cs-134m	4×10^1	6×10^{-1}	1×10^3	1×10^5
Cs-135	4×10^1	1×10^0	1×10^4	1×10^7
Cs-136	5×10^{-1}	5×10^{-1}	1×10^1	1×10^5
Cs-137 (a)	2×10^0	6×10^{-1}	1×10^1 (b)	1×10^4 (b)
Copper (29)				
Cu-64	6×10^0	1×10^0	1×10^2	1×10^6
Cu-67	1×10^1	7×10^{-1}	1×10^2	1×10^6
Dysprosium (66)				
Dy-159	2×10^1	2×10^1	1×10^3	1×10^7
Dy-165	9×10^{-1}	6×10^{-1}	1×10^3	1×10^6
Dy-166 (a)	9×10^{-1}	3×10^{-1}	1×10^3	1×10^6
Erbium (68)				
Er-169	4×10^1	1×10^0	1×10^4	1×10^7
Er-171	8×10^{-1}	5×10^{-1}	1×10^2	1×10^6
Europium (63)				
Eu-147	2×10^0	2×10^0	1×10^2	1×10^6
Eu-148	5×10^{-1}	5×10^{-1}	1×10^1	1×10^6

Radionuclide (atomic number)	A ₁ (TBq)	A ₂ (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Eu-149	2×10^1	2×10^1	1×10^2	1×10^7
Eu-150(short lived)	2×10^0	7×10^{-1}	1×10^3	1×10^6
Eu-150(long lived)	7×10^{-1}	7×10^{-1}	1×10^1	1×10^6
Eu-152	1×10^0	1×10^0	1×10^1	1×10^6
Eu-152m	8×10^{-1}	8×10^{-1}	1×10^2	1×10^6
Eu-154	9×10^{-1}	6×10^{-1}	1×10^1	1×10^6
Eu-155	2×10^1	3×10^0	1×10^2	1×10^7
Eu-156	7×10^{-1}	7×10^{-1}	1×10^1	1×10^6
Fluorine (9)				
F-18	1×10^0	6×10^{-1}	1×10^1	1×10^6
Iron (26)				
Fe-52 (a)	3×10^{-1}	3×10^{-1}	1×10^1	1×10^6
Fe-55	4×10^1	4×10^1	1×10^4	1×10^6
Fe-59	9×10^{-1}	9×10^{-1}	1×10^1	1×10^6
Fe-60 (a)	4×10^1	2×10^{-1}	1×10^2	1×10^5
Gallium (31)				
Ga-67	7×10^0	3×10^0	1×10^2	1×10^6
Ga-68	5×10^{-1}	5×10^{-1}	1×10^1	1×10^5
Ga-72	4×10^{-1}	4×10^{-1}	1×10^1	1×10^5
Gadolinium (64)				
Gd-146 (a)	5×10^{-1}	5×10^{-1}	1×10^1	1×10^6
Gd-148	2×10^1	2×10^{-3}	1×10^1	1×10^4
Gd-153	1×10^1	9×10^0	1×10^2	1×10^7
Gd-159	3×10^0	6×10^{-1}	1×10^3	1×10^6
Germanium (32)				
Ge-68 (a)	5×10^{-1}	5×10^{-1}	1×10^1	1×10^5
Ge-71	4×10^1	4×10^1	1×10^4	1×10^8
Ge-77	3×10^{-1}	3×10^{-1}	1×10^1	1×10^5
Hafnium (72)				
Hf-172 (a)	6×10^{-1}	6×10^{-1}	1×10^1	1×10^6
Hf-175	3×10^0	3×10^0	1×10^2	1×10^6
Hf-181	2×10^0	5×10^{-1}	1×10^1	1×10^6
Hf-182	Unlimited	Unlimited	1×10^2	1×10^6

Radionuclide (atomic number)	A ₁ (TBq)	A ₂ (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Mercury (80)				
Hg-194 (a)	1 × 10 ⁰	1 × 10 ⁰	1 × 10 ¹	1 × 10 ⁶
Hg-195m (a)	3 × 10 ⁰	7 × 10 ⁻¹	1 × 10 ²	1 × 10 ⁶
Hg-197	2 × 10 ¹	1 × 10 ¹	1 × 10 ²	1 × 10 ⁷
Hg-197m	1 × 10 ¹	4 × 10 ⁻¹	1 × 10 ²	1 × 10 ⁶
Hg-203	5 × 10 ⁰	1 × 10 ⁰	1 × 10 ²	1 × 10 ⁵
Holmium (67)				
Ho-166	4 × 10 ⁻¹	4 × 10 ⁻¹	1 × 10 ³	1 × 10 ⁵
Ho-166m	6 × 10 ⁻¹	5 × 10 ⁻¹	1 × 10 ¹	1 × 10 ⁶
Iodine (53)				
I-123	6 × 10 ⁰	3 × 10 ⁰	1 × 10 ²	1 × 10 ⁷
I-124	1 × 10 ⁰	1 × 10 ⁰	1 × 10 ¹	1 × 10 ⁶
I-125	2 × 10 ¹	3 × 10 ⁰	1 × 10 ³	1 × 10 ⁶
I-126	2 × 10 ⁰	1 × 10 ⁰	1 × 10 ²	1 × 10 ⁶
I-129	Unlimited	Unlimited	1 × 10 ²	1 × 10 ⁵
I-131	3 × 10 ⁰	7 × 10 ⁻¹	1 × 10 ²	1 × 10 ⁶
I-132	4 × 10 ⁻¹	4 × 10 ⁻¹	1 × 10 ¹	1 × 10 ⁵
I-133	7 × 10 ⁻¹	6 × 10 ⁻¹	1 × 10 ¹	1 × 10 ⁶
I-134	3 × 10 ⁻¹	3 × 10 ⁻¹	1 × 10 ¹	1 × 10 ⁵
I-135 (a)	6 × 10 ⁻¹	6 × 10 ⁻¹	1 × 10 ¹	1 × 10 ⁶
Indium (49)				
In-111	3 × 10 ⁰	3 × 10 ⁰	1 × 10 ²	1 × 10 ⁶
In-113m	4 × 10 ⁰	2 × 10 ⁰	1 × 10 ²	1 × 10 ⁶
In-114m (a)	1 × 10 ¹	5 × 10 ⁻¹	1 × 10 ²	1 × 10 ⁶
In-115m	7 × 10 ⁰	1 × 10 ⁰	1 × 10 ²	1 × 10 ⁶
Iridium (77)				
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-194	3 × 10 ⁻¹	3 × 10 ⁻¹	1 × 10 ²	1 × 10 ⁵
Potassium (19)				
K-40	9 × 10 ⁻¹	9 × 10 ⁻¹	1 × 10 ²	1 × 10 ⁶
K-42	2 × 10 ⁻¹	2 × 10 ⁻¹	1 × 10 ²	1 × 10 ⁶

Radionuclide (atomic number)	A₁ (TBq)	A₂ (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
K-43	7×10^{-1}	6×10^{-1}	1×10^1	1×10^6
Krypton (36)				
Kr-79	4×10^0	2×10^0	1×10^3	1×10^5
Kr-81	4×10^1	4×10^1	1×10^4	1×10^7
Kr-85	1×10^1	1×10^1	1×10^5	1×10^4
Kr-85m	8×10^0	3×10^0	1×10^3	1×10^{10}
Kr-87	2×10^{-1}	2×10^{-1}	1×10^2	1×10^9
Lanthanum (57)				
La-137	3×10^1	6×10^0	1×10^3	1×10^7
La-140	4×10^{-1}	4×10^{-1}	1×10^1	1×10^5
Lutetium (71)				
Lu-172	6×10^{-1}	6×10^{-1}	1×10^1	1×10^6
Lu-173	8×10^0	8×10^0	1×10^2	1×10^7
Lu-174	9×10^0	9×10^0	1×10^2	1×10^7
Lu-174m	2×10^1	1×10^1	1×10^2	1×10^7
Lu-177	3×10^1	7×10^{-1}	1×10^3	1×10^7
Magnesium (12)				
Mg-28 (a)	3×10^{-1}	3×10^{-1}	1×10^1	1×10^5
Manganese (25)				
Mn-52	3×10^{-1}	3×10^{-1}	1×10^1	1×10^5
Mn-53	Unlimited	Unlimited	1×10^4	1×10^9
Mn-54	1×10^0	1×10^0	1×10^1	1×10^6
Mn-56	3×10^{-1}	3×10^{-1}	1×10^1	1×10^5
Molybdenum (42)				
Mo-93	4×10^1	2×10^1	1×10^3	1×10^8
Mo-99 (a)	1×10^0	6×10^{-1}	1×10^2	1×10^6
Nitrogen (7)				
N-13	9×10^{-1}	6×10^{-1}	1×10^2	1×10^9
Sodium (11)				
Na-22	5×10^{-1}	5×10^{-1}	1×10^1	1×10^6
Na-24	2×10^{-1}	2×10^{-1}	1×10^1	1×10^5
Niobium (41)				
Nb-93m	4×10^1	3×10^1	1×10^4	1×10^7

Radionuclide (atomic number)	A₁ (TBq)	A₂ (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Nb-94	7×10^{-1}	7×10^{-1}	1×10^1	1×10^6
Nb-95	1×10^0	1×10^0	1×10^1	1×10^6
Nb-97	9×10^{-1}	6×10^{-1}	1×10^1	1×10^6
Neodymium (60)				
Nd-147	6×10^0	6×10^{-1}	1×10^2	1×10^6
Nd-149	6×10^{-1}	5×10^{-1}	1×10^2	1×10^6
Nickel (28)				
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
Neptunium (93)				
Np-235	4×10^1	4×10^1	1×10^3	1×10^7
Np-236(short-lived)	2×10^1	2×10^0	1×10^3	1×10^7
Np-236(long-lived)	9×10^0	2×10^{-2}	1×10^2	1×10^5
Np-237	2×10^1	2×10^{-3}	1×10^0 (b)	1×10^3 (b)
Np-239	7×10^0	4×10^{-1}	1×10^2	1×10^7
Osmium (76)				
Os-185	1×10^0	1×10^0	1×10^1	1×10^6
Os-191	1×10^1	2×10^0	1×10^2	1×10^7
Os-191m	4×10^1	3×10^1	1×10^3	1×10^7
Os-193	2×10^0	6×10^{-1}	1×10^2	1×10^6
Os-194 (a)	3×10^{-1}	3×10^{-1}	1×10^2	1×10^5
Phosphorus (15)				
P-32	5×10^{-1}	5×10^{-1}	1×10^3	1×10^5
P-33	4×10^1	1×10^0	1×10^5	1×10^8
Protactinium (91)				
Pa-230 (a)	2×10^0	7×10^{-2}	1×10^1	1×10^6
Pa-231	4×10^0	4×10^{-4}	1×10^0	1×10^3
Pa-233	5×10^0	7×10^{-1}	1×10^2	1×10^7
Lead (82)				
Pb-201	1×10^0	1×10^0	1×10^1	1×10^6
Pb-202	4×10^1	2×10^1	1×10^3	1×10^6
Pb-203	4×10^0	3×10^0	1×10^2	1×10^6

Radionuclide (atomic number)	A₁ (TBq)	A₂ (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Pb-205	Unlimited	Unlimited	1×10^4	1×10^7
Pb-210 (a)	1×10^0	5×10^{-2}	1×10^1 (b)	1×10^4 (b)
Pb-212 (a)	7×10^{-1}	2×10^{-1}	1×10^1 (b)	1×10^5 (b)
Palladium (46)				
Pd-103 (a)	4×10^1	4×10^1	1×10^3	1×10^8
Pd-107	Unlimited	Unlimited	1×10^5	1×10^8
Pd-109	2×10^0	5×10^{-1}	1×10^3	1×10^6
Promethium (61)				
Pm-143	3×10^0	3×10^0	1×10^2	1×10^6
Pm-144	7×10^{-1}	7×10^{-1}	1×10^1	1×10^6
Pm-145	3×10^1	1×10^1	1×10^3	1×10^7
Pm-147	4×10^1	2×10^0	1×10^4	1×10^7
Pm-148m (a)	8×10^{-1}	7×10^{-1}	1×10^1	1×10^6
Pm-149	2×10^0	6×10^{-1}	1×10^3	1×10^6
Pm-151	2×10^0	6×10^{-1}	1×10^2	1×10^6
Polonium (84)				
Po-210	4×10^1	2×10^{-2}	1×10^1	1×10^4
Praseodymium (59)				
Pr-142	4×10^{-1}	4×10^{-1}	1×10^2	1×10^5
Pr-143	3×10^0	6×10^{-1}	1×10^4	1×10^6
Platinum (78)				
Pt-188 (a)	1×10^0	8×10^{-1}	1×10^1	1×10^6
Pt-191	4×10^0	3×10^0	1×10^2	1×10^6
Pt-193	4×10^1	4×10^1	1×10^4	1×10^7
Pt-193m	4×10^1	5×10^{-1}	1×10^3	1×10^7
Pt-195m	1×10^1	5×10^{-1}	1×10^2	1×10^6
Pt-197	2×10^1	6×10^{-1}	1×10^3	1×10^6
Pt-197m	1×10^1	6×10^{-1}	1×10^2	1×10^6
Plutonium (94)				
Pu-236	3×10^1	3×10^{-3}	1×10^1	1×10^4
Pu-237	2×10^1	2×10^1	1×10^3	1×10^7
Pu-238	1×10^1	1×10^{-3}	1×10^0	1×10^4
Pu-239	1×10^1	1×10^{-3}	1×10^0	1×10^4

Radionuclide (atomic number)	A₁ (TBq)	A₂ (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Pu-240	1 × 10 ¹	1 × 10 ⁻³	1 × 10 ⁰	1 × 10 ³
Pu-241 (a)	4 × 10 ¹	6 × 10 ⁻²	1 × 10 ²	1 × 10 ⁵
Pu-242	1 × 10 ¹	1 × 10 ⁻³	1 × 10 ⁰	1 × 10 ⁴
Pu-244 (a)	4 × 10 ⁻¹	1 × 10 ⁻³	1 × 10 ⁰	1 × 10 ⁴
Radium (88)				
Ra-223 (a)	4 × 10 ⁻¹	7 × 10 ⁻³	1 × 10 ² (b)	1 × 10 ⁵ (b)
Ra-224 (a)	4 × 10 ⁻¹	2 × 10 ⁻²	1 × 10 ¹ (b)	1 × 10 ⁵ (b)
Ra-225 (a)	2 × 10 ⁻¹	4 × 10 ⁻³	1 × 10 ²	1 × 10 ⁵
Ra-226 (a)	2 × 10 ⁻¹	3 × 10 ⁻³	1 × 10 ¹ (b)	1 × 10 ⁴ (b)
Ra-228 (a)	6 × 10 ⁻¹	2 × 10 ⁻²	1 × 10 ¹ (b)	1 × 10 ⁵ (b)
Rubidium (37)				
Rb-81	2 × 10 ⁰	8 × 10 ⁻¹	1 × 10 ¹	1 × 10 ⁶
Rb-83 (a)	2 × 10 ⁰	2 × 10 ⁰	1 × 10 ²	1 × 10 ⁶
Rb-84	1 × 10 ⁰	1 × 10 ⁰	1 × 10 ¹	1 × 10 ⁶
Rb-86	5 × 10 ⁻¹	5 × 10 ⁻¹	1 × 10 ²	1 × 10 ⁵
Rb-87	Unlimited	Unlimited	1 × 10 ⁴	1 × 10 ⁷
Rb(nat)	Unlimited	Unlimited	1 × 10 ⁴	1 × 10 ⁷
Rhenium (75)				
Re-184	1 × 10 ⁰	1 × 10 ⁰	1 × 10 ¹	1 × 10 ⁶
Re-184m	3 × 10 ⁰	1 × 10 ⁰	1 × 10 ²	1 × 10 ⁶
Re-186	2 × 10 ⁰	6 × 10 ⁻¹	1 × 10 ³	1 × 10 ⁶
Re-187	Unlimited	Unlimited	1 × 10 ⁶	1 × 10 ⁹
Re-188	4 × 10 ⁻¹	4 × 10 ⁻¹	1 × 10 ²	1 × 10 ⁵
Re-189 (a)	3 × 10 ⁰	6 × 10 ⁻¹	1 × 10 ²	1 × 10 ⁶
Re(nat)	Unlimited	Unlimited	1 × 10 ⁶	1 × 10 ⁹
Rhodium (45)				
Rh-99	2 × 10 ⁰	2 × 10 ⁰	1 × 10 ¹	1 × 10 ⁶
Rh-101	4 × 10 ⁰	3 × 10 ⁰	1 × 10 ²	1 × 10 ⁷
Rh-102	5 × 10 ⁻¹	5 × 10 ⁻¹	1 × 10 ¹	1 × 10 ⁶
Rh-102m	2 × 10 ⁰	2 × 10 ⁰	1 × 10 ²	1 × 10 ⁶
Rh-103m	4 × 10 ¹	4 × 10 ¹	1 × 10 ⁴	1 × 10 ⁸
Rh-105	1 × 10 ¹	8 × 10 ⁻¹	1 × 10 ²	1 × 10 ⁷
Radon (86)				

Radionuclide (atomic number)	A ₁ (TBq)	A ₂ (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Rn-222 (a)	3×10^{-1}	4×10^{-3}	1×10^1 (b)	1×10^8 (b)
Ruthenium (44)				
Ru-97	5×10^0	5×10^0	1×10^2	1×10^7
Ru-103 (a)	2×10^0	2×10^0	1×10^2	1×10^6
Ru-105	1×10^0	6×10^{-1}	1×10^1	1×10^6
Ru-106 (a)	2×10^{-1}	2×10^{-1}	1×10^2 (b)	1×10^5 (b)
Sulphur (16)				
S-35	4×10^1	3×10^0	1×10^5	1×10^8
Antimony (51)				
Sb-122	4×10^{-1}	4×10^{-1}	1×10^2	1×10^4
Sb-124	6×10^{-1}	6×10^{-1}	1×10^1	1×10^6
Sb-125	2×10^0	1×10^0	1×10^2	1×10^6
Sb-126	4×10^{-1}	4×10^{-1}	1×10^1	1×10^5
Scandium (21)				
Sc-44	5×10^{-1}	5×10^{-1}	1×10^1	1×10^5
Sc-46	5×10^{-1}	5×10^{-1}	1×10^1	1×10^6
Sc-47	1×10^1	7×10^{-1}	1×10^2	1×10^6
Sc-48	3×10^{-1}	3×10^{-1}	1×10^1	1×10^5
Selenium (34)				
Se-75	3×10^0	3×10^0	1×10^2	1×10^6
Se-79	4×10^1	2×10^0	1×10^4	1×10^7
Silicon (14)				
Si-31	6×10^{-1}	6×10^{-1}	1×10^3	1×10^6
Si-32	4×10^1	5×10^{-1}	1×10^3	1×10^6
Samarium (62)				
Sm-145	1×10^1	1×10^1	1×10^2	1×10^7
Sm-147	Unlimited	Unlimited	1×10^1	1×10^4
Sm-151	4×10^1	1×10^1	1×10^4	1×10^8
Sm-153	9×10^0	6×10^{-1}	1×10^2	1×10^6
Tin (50)				
Sn-113 (a)	4×10^0	2×10^0	1×10^3	1×10^7
Sn-117m	7×10^0	4×10^{-1}	1×10^2	1×10^6
Sn-119m	4×10^1	3×10^1	1×10^3	1×10^7

Radionuclide (atomic number)	A₁ (TBq)	A₂ (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Sn-121m (a)	4×10^1	9×10^{-1}	1×10^3	1×10^7
Sn-123	8×10^{-1}	6×10^{-1}	1×10^3	1×10^6
Sn-125	4×10^{-1}	4×10^{-1}	1×10^2	1×10^5
Sn-126 (a)	6×10^{-1}	4×10^{-1}	1×10^1	1×10^5
Strontium (38)				
Sr-82 (a)	2×10^{-1}	2×10^{-1}	1×10^1	1×10^5
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
Tritium (1)				
T(H-3)	4×10^1	4×10^1	1×10^6	1×10^9
Tantalum (73)				
Ta-178(long-lived)	1×10^0	8×10^{-1}	1×10^1	1×10^6
Ta-179	3×10^1	3×10^1	1×10^3	1×10^7
Ta-182	9×10^{-1}	5×10^{-1}	1×10^1	1×10^4
Terbium (65)				
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
Technetium (43)				
Tc-95m (a)	2×10^0	2×10^0	1×10^1	1×10^6
Tc-96	4×10^{-1}	4×10^{-1}	1×10^1	1×10^6
Tc-96m (a)	4×10^{-1}	4×10^{-1}	1×10^3	1×10^7
Tc-97	Unlimited	Unlimited	1×10^3	1×10^8
Tc-97m	4×10^1	1×10^0	1×10^3	1×10^7
Tc-98	8×10^{-1}	7×10^{-1}	1×10^1	1×10^6
Tc-99	4×10^1	9×10^{-1}	1×10^4	1×10^7
Tc-99m	1×10^1	4×10^0	1×10^2	1×10^7
Tellurium (52)				

Radionuclide (atomic number)	A₁ (TBq)	A₂ (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Te-121	2×10^0	2×10^0	1×10^1	1×10^6
Te-121m	5×10^0	3×10^0	1×10^2	1×10^6
Te-123m	8×10^0	1×10^0	1×10^2	1×10^7
Te-125m	2×10^1	9×10^{-1}	1×10^3	1×10^7
Te-127	2×10^1	7×10^{-1}	1×10^3	1×10^6
Te-127m (a)	2×10^1	5×10^{-1}	1×10^3	1×10^7
Te-129	7×10^{-1}	6×10^{-1}	1×10^2	1×10^6
Te-129m (a)	8×10^{-1}	4×10^{-1}	1×10^3	1×10^6
Te-131m (a)	7×10^{-1}	5×10^{-1}	1×10^1	1×10^6
Te-132 (a)	5×10^{-1}	4×10^{-1}	1×10^2	1×10^7
Thorium (90)				
Th-227	1×10^1	5×10^{-3}	1×10^1	1×10^4
Th-228 (a)	5×10^{-1}	1×10^{-3}	1×10^0 (b)	1×10^4 (b)
Th-229	5×10^0	5×10^{-4}	1×10^0 (b)	1×10^3 (b)
Th-230	1×10^1	1×10^{-3}	1×10^0	1×10^4
Th-231	4×10^1	2×10^{-2}	1×10^3	1×10^7
Th-232	Unlimited	Unlimited	1×10^1	1×10^4
Th-234 (a)	3×10^{-1}	3×10^{-1}	1×10^3 (b)	1×10^5 (b)
Th(nat)	Unlimited	Unlimited	1×10^0 (b)	1×10^3 (b)
Titanium (22)				
Ti-44 (a)	5×10^{-1}	4×10^{-1}	1×10^1	1×10^5
Thallium (81)				
Tl-200	9×10^{-1}	9×10^{-1}	1×10^1	1×10^6
Tl-201	1×10^1	4×10^0	1×10^2	1×10^6
Tl-202	2×10^0	2×10^0	1×10^2	1×10^6
Tl-204	1×10^1	7×10^{-1}	1×10^4	1×10^4
Thulium (69)				
Tm-167	7×10^0	8×10^{-1}	1×10^2	1×10^6
Tm-170	3×10^0	6×10^{-1}	1×10^3	1×10^6
Tm-171	4×10^1	4×10^1	1×10^4	1×10^8
Uranium (92)				
U-230 (fast lung absorption) (a)(d)	4×10^1	1×10^{-1}	1×10^1 (b)	1×10^5 (b)
U-230 (medium lung absorption) (a)(e)	4×10^1	4×10^{-3}	1×10^1	1×10^4

Radionuclide (atomic number)	A₁ (TBq)	A₂ (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
U-230 (slow lung absorption) (a)(f)	3×10^1	3×10^{-3}	1×10^1	1×10^4
U-232 (fast lung absorption) (d)	4×10^1	1×10^{-2}	1×10^0 (b)	1×10^3 (b)
U-232 (medium lung absorption) (e)	4×10^1	7×10^{-3}	1×10^1	1×10^4
U-232 (slow lung absorption) (f)	1×10^1	1×10^{-3}	1×10^1	1×10^4
U-233 (fast lung absorption) (d)	4×10^1	9×10^{-2}	1×10^1	1×10^4
U-233 (medium lung absorption) (e)	4×10^1	2×10^{-2}	1×10^2	1×10^5
U-233 (slow lung absorption) (f)	4×10^1	6×10^{-3}	1×10^1	1×10^5
U-234 (fast lung absorption) (d)	4×10^1	9×10^{-2}	1×10^1	1×10^4
U-234 (medium lung absorption) (e)	4×10^1	2×10^{-2}	1×10^2	1×10^5
U-234 (slow lung absorption) (f)	4×10^1	6×10^{-3}	1×10^1	1×10^5
U-235 (all lung absorption types) (a)(d)(e)(f)	Unlimited	Unlimited	1×10^1 (b)	1×10^4 (b)
U-236 (fast lung absorption) (d)	Unlimited	Unlimited	1×10^1	1×10^4
U-236 (medium lung absorption) (e)	4×10^1	2×10^{-2}	1×10^2	1×10^5
U-236 (slow lung absorption) (f)	4×10^1	6×10^{-3}	1×10^1	1×10^4
U-238 (all lung absorption types) (d)(e)(f)	Unlimited	Unlimited	1×10^1 (b)	1×10^4 (b)
U (nat)	Unlimited	Unlimited	1×10^0 (b)	1×10^3 (b)
U (enriched to 20% or less) (g)	Unlimited	Unlimited	1×10^0	1×10^3
U (dep)	Unlimited	Unlimited	1×10^0	1×10^3
Vanadium (23)				
V-48	4×10^{-1}	4×10^{-1}	1×10^1	1×10^5
V-49	4×10^1	4×10^1	1×10^4	1×10^7
Tungsten (74)				
W-178 (a)	9×10^0	5×10^0	1×10^1	1×10^6
W-181	3×10^1	3×10^1	1×10^3	1×10^7
W-185	4×10^1	8×10^{-1}	1×10^4	1×10^7
W-187	2×10^0	6×10^{-1}	1×10^2	1×10^6
W-188 (a)	4×10^{-1}	3×10^{-1}	1×10^2	1×10^5
Xenon (54)				
Xe-122 (a)	4×10^{-1}	4×10^{-1}	1×10^2	1×10^9
Xe-123	2×10^0	7×10^{-1}	1×10^2	1×10^9
Xe-127	4×10^0	2×10^0	1×10^3	1×10^5
Xe-131m	4×10^1	4×10^1	1×10^4	1×10^4
Xe-133	2×10^1	1×10^1	1×10^3	1×10^4

Radionuclide (atomic number)	A ₁ (TBq)	A ₂ (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Xe-135	3×10^0	2×10^0	1×10^3	1×10^{10}
Yttrium (39)				
Y-87 (a)	1×10^0	1×10^0	1×10^1	1×10^6
Y-88	4×10^{-1}	4×10^{-1}	1×10^1	1×10^6
Y-90	3×10^{-1}	3×10^{-1}	1×10^3	1×10^5
Y-91	6×10^{-1}	6×10^{-1}	1×10^3	1×10^6
Y-91m	2×10^0	2×10^0	1×10^2	1×10^6
Y-92	2×10^{-1}	2×10^{-1}	1×10^2	1×10^5
Y-93	3×10^{-1}	3×10^{-1}	1×10^2	1×10^5
Ytterbium (70)				
Yb-169	4×10^0	1×10^0	1×10^2	1×10^7
Yb-175	3×10^1	9×10^{-1}	1×10^3	1×10^7
Zinc (30)				
Zn-65	2×10^0	2×10^0	1×10^1	1×10^6
Zn-69	3×10^0	6×10^{-1}	1×10^4	1×10^6
Zn-69m (a)	3×10^0	6×10^{-1}	1×10^2	1×10^6
Zirconium (40)				
Zr-88	3×10^0	3×10^0	1×10^2	1×10^6
Zr-93	Unlimited	Unlimited	1×10^3 (b)	1×10^7 (b)
Zr-95 (a)	2×10^0	8×10^{-1}	1×10^1	1×10^6
Zr-97 (a)	4×10^{-1}	4×10^{-1}	1×10^1 (b)	1×10^5 (b)

(a) A₁ and/or A₂ values for these parent radionuclides include contributions from their progeny with half-lives less than 10 days, as listed in the following:

Mg-28	Al-28
Ar-42	K-42
Ca-47	Sc-47
Ti-44	Sc-44
Fe-52	Mn-52m
Fe-60	Co-60m
Zn-69m	Zn-69
Ge-68	Ga-68
Rb-83	Kr-83m
Sr-82	Rb-82
Sr-90	Y-90
Sr-91	Y-91m
Sr-92	Y-92
Y-87	Sr-87m
Zr-95	Nb-95m
Zr-97	Nb-97m, Nb-97
Mo-99	Tc-99m
Tc-95m	Tc-95
Tc-96m	Tc-96

Ru-103	Rh-103m
Ru-106	Rh-106
Pd-103	Rh-103m
Ag-108m	Ag-108
Ag-110m	Ag-110
Cd-115	In-115m
In-114m	In-114
Sn-113	In-113m
Sn-121m	Sn-121
Sn-126	Sb-126m
Te-118	Sb-118
Te-127m	Te-127
Te-129m	Te-129
Te-131m	Te-131
Te-132	I-132
I-135	Xe-135m
Xe-122	I-122
Cs-137	Ba-137m
Ba-131	Cs-131
Ba-140	La-140
Ce-144	Pr-144m, Pr-144
Pm-148m	Pm-148
Gd-146	Eu-146
Dy-166	Ho-166
Hf-172	Lu-172
W-178	Ta-178
W-188	Re-188
Re-189	Os-189m
Os-194	Ir-194
Ir-189	Os-189m
Pt-188	Ir-188
Hg-194	Au-194
Hg-195m	Hg-195
Pb-210	Bi-210
Pb-212	Bi-212, Tl-208, Po-212
Bi-210m	Tl-206
Bi-212	Tl-208, Po-212
At-211	Po-211
Rn-222	Po-218, Pb-214, At-218, Bi-214, Po-214
Ra-223	Rn-219, Po-215, Pb-211, Bi-211, Po-211, Tl-207
Ra-224	Rn-220, Po-216, Pb-212, Bi-212, Tl-208, Po-212
Ra-225	Ac-225, Fr-221, At-217, Bi-213, Tl-209, Po-213, Pb-209
Ra-226	Rn-222, Po-218, Pb-214, At-218, Bi-214, Po-214
Ra-228	Ac-228
Ac-225	Fr-221, At-217, Bi-213, Tl-209, Po-213, Pb-209
Ac-227	Fr-223
Th-228	Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208, Po-212
Th-234	Pa-234m, Pa-234
Pa-230	Ac-226, Th-226, Fr-222, Ra-222, Rn-218, Po-214
U-230	Th-226, Ra-222, Rn-218, Po-214
U-235	Th-231
Pu-241	U-237
Pu-244	U-240, Np-240m
Am-242m	Am-242, Np-238
Am-243	Np-239
Cm-247	Pu-243
Bk-249	Am-245
Cf-253	Cm-249

(b) Parent nuclides and their progeny included in secular equilibrium are listed in the following:

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, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Th-229	Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213, Pb-209
Th-nat	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
U-nat	Th-234, Pa-234m, U-234, Th-230, Ra-226, Rn-222, Po-218, 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 UF₆, UO₂F₂ and UO₂(NO₃)₂ in both normal and accident conditions of carriage.
- (e) These values apply only to compounds of uranium that take the chemical form of UO₃, UF₄, UCl₄ and hexavalent compounds in both normal and accident conditions of carriage.
- (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.

2.2.7.2.2.2

For individual radionuclides:

- (a) Which are not listed in Table 2.2.7.2.2.1 the determination of the basic radionuclide values referred to in 2.2.7.2.2.1 shall require multilateral approval. For these radionuclides, activity concentration limits for exempt material and activity limits for exempt consignments shall be calculated in accordance with the principles established 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). It is permissible to use an A₂ 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 carriage are taken into consideration. Alternatively, the radionuclide values in Table 2.2.7.2.2.2 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 2.2.7.2.4.1.3 (c), alternative basic radionuclide values to those in Table 2.2.7.2.2.1 for the activity limit for an exempt consignment are permitted and shall require multilateral approval. Such alternative activity limits for an exempt consignment shall 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).

Table 2.2.7.2.2.2: Basic radionuclide values for unknown radionuclides or mixtures

Radioactive contents	A ₁	A ₂	Activity concentration limit for exempt material	Activity limit for exempt consignments
	(TBq)	(TBq)	(Bq/g)	(Bq)
Only beta or gamma emitting nuclides are known to be present	0.1	0.02	1 × 10 ¹	1 × 10 ⁴
Alpha emitting nuclides but no neutron emitters are known to be present	0.2	9 × 10 ⁻⁵	1 × 10 ⁻¹	1 × 10 ³
Neutron emitting nuclides are known to be present or no relevant data are available	0.001	9 × 10 ⁻⁵	1 × 10 ⁻¹	1 × 10 ³

2.2.7.2.2.3 In the calculations of A₁ and A₂ for a radionuclide not in Table 2.2.7.2.2.1, a single radioactive decay chain in which the radionuclides are present in their naturally occurring proportions, and in which no daughter nuclide has a half-life either longer than 10 days or longer than that of the parent nuclide, shall be considered as a single radionuclide; and the activity to be taken into account and the A₁ or A₂ value to be applied shall be those corresponding to the parent nuclide of that chain. In the case of radioactive decay chains in which any daughter nuclide has a half-life either longer than 10 days or greater than that of the parent nuclide, the parent and such daughter nuclides shall be considered as mixtures of different nuclides.

2.2.7.2.2.4 For mixtures of radionuclides, the basic radionuclide values referred to in 2.2.7.2.2.1 may be determined as follows:

$$X_m = \frac{1}{\sum_i \frac{f(i)}{X(i)}}$$

where,

f(i) is the fraction of activity or activity concentration of radionuclide i in the mixture;

X(i) is the appropriate value of A₁ or A₂, or the activity concentration limit for exempt material or the activity limit for an exempt consignment as appropriate for the radionuclide i; and

X_m is the derived value of A₁ or A₂, or the activity concentration limit for exempt material or the activity limit for an exempt consignment in the case of a mixture.

2.2.7.2.2.5 When the identity of each radionuclide is known but the individual activities of some of the radionuclides are not known, the radionuclides may be grouped and the lowest radionuclide value, as appropriate, for the radionuclides in each group may be used in applying the formulas in 2.2.7.2.2.4 and 2.2.7.2.4.4. Groups may be based on the total alpha activity and the total beta/gamma activity when these are known, using the lowest radionuclide values for the alpha emitters or beta/gamma emitters, respectively.

2.2.7.2.2.6 For individual radionuclides or for mixtures of radionuclides for which relevant data are not available, the values shown in Table 2.2.7.2.2.2 shall be used.

2.2.7.2.3 *Determination of other material characteristics*

2.2.7.2.3.1 Low specific activity (LSA) material

2.2.7.2.3.1.1 (Reserved)

2.2.7.2.3.1.2 LSA material shall 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 2.2.7.2.3.5;
 - (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 2.2.7.2.2.1 to 2.2.7.2.2.6. Fissile material may be included only if excepted under 2.2.7.2.3.5;
- (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;
- (c) LSA-III - Solids (e.g. consolidated wastes, activated materials), excluding powders, that meet the requirements of 2.2.7.2.3.1.3, 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);
 - (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 $2 \times 10^{-3} A_2/g$.

2.2.7.2.3.1.3 LSA-III material shall be a solid of such a nature that if the entire contents of a package were subjected to the test specified in 2.2.7.2.3.1.4 the activity in the water would not exceed $0.1 A_2$.

2.2.7.2.3.1.4 LSA-III material shall be tested as follows:

A solid material sample representing the entire contents of the package shall be immersed for 7 days in water at ambient temperature. The volume of water to be used in the test shall 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% of the volume of the solid test sample itself. The water shall 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 shall be measured following the 7 day immersion of the test sample.

2.2.7.2.3.1.5 Demonstration of compliance with the performance standards in 2.2.7.2.3.1.4 shall be in accordance with 6.4.12.1 and 6.4.12.2.

2.2.7.2.3.2 Surface contaminated object (SCO)

SCO is classified in one of two groups:

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

- (i) the non-fixed contamination on the accessible surface averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 0.4 Bq/cm² for all other alpha emitters; and
 - (ii) the fixed contamination on the accessible surface averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 4 × 10⁴ Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 4 × 10³ Bq/cm² for all other alpha emitters; and
 - (iii) the non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 4 × 10⁴ Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 4 × 10³ Bq/cm² 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 cm² (or the area of the surface if less than 300 cm²) does not exceed 400 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 40 Bq/cm² for all other alpha emitters; and
 - (ii) the fixed contamination on the accessible surface, averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 8 × 10⁵ Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 8 × 10⁴ Bq/cm² for all other alpha emitters; and
 - (iii) the non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm² (or the area of the surface if less than 300 cm²) does not exceed 8 × 10⁵ Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 8 × 10⁴ Bq/cm² for all other alpha emitters.

2.2.7.2.3.3 Special form radioactive material

2.2.7.2.3.3.1 Special form radioactive material shall have at least one dimension not less than 5 mm. When a sealed capsule constitutes part of the special form radioactive material, the capsule shall be so manufactured that it can be opened only by destroying it. The design for special form radioactive material requires unilateral approval.

2.2.7.2.3.3.2 Special form radioactive material shall be of such a nature or shall be so designed that if it is subjected to the tests specified in 2.2.7.2.3.3.4 to 2.2.7.2.3.3.8, it shall meet the following requirements:

- (a) It would not break or shatter under the impact, percussion and bending tests 2.2.7.2.3.3.5 (a), (b), (c) and 2.2.7.2.3.3.6 (a) as applicable;
- (b) It would not melt or disperse in the applicable heat test 2.2.7.2.3.3.5 (d) or 2.2.7.2.3.3.6 (b) as applicable; and
- (c) The activity in the water from the leaching tests specified in 2.2.7.2.3.3.7 and 2.2.7.2.3.3.8 would not exceed 2 kBq; or alternatively for sealed sources, the leakage rate for the volumetric leakage assessment test specified in ISO 9978:1992 "Radiation Protection - Sealed Radioactive Sources - Leakage Test Methods", would not exceed the applicable acceptance threshold acceptable to the competent authority.

2.2.7.2.3.3.3 Demonstration of compliance with the performance standards in 2.2.7.2.3.3.2 shall be in accordance with 6.4.12.1 and 6.4.12.2.

2.2.7.2.3.3.4 Specimens that comprise or simulate special form radioactive material shall be subjected to the impact test, the percussion test, the bending test, and the heat test specified in 2.2.7.2.3.3.5 or alternative tests as authorized in 2.2.7.2.3.3.6. A different specimen may be used for each of the tests. Following each test, a leaching assessment or volumetric leakage test shall be performed on the specimen by a method no less sensitive than the methods given in 2.2.7.2.3.3.7 for indispersible solid material or 2.2.7.2.3.3.8 for encapsulated material.

2.2.7.2.3.3.5 The relevant test methods are:

- (a) Impact test: The specimen shall drop onto the target from a height of 9 m. The target shall be as defined in 6.4.14;
- (b) Percussion test: The specimen shall 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 1 m. The lower part of the bar shall 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, shall cover an area greater than that covered by the specimen. A fresh surface of lead shall be used for each impact. The bar shall strike the specimen so as to cause maximum damage;
- (c) Bending test: The test shall 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 shall 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 shall 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 shall strike the specimen so as to cause an impact equivalent to that resulting from a free vertical drop of 1.4 kg through 1 m. The lower part of the bar shall be 25 mm in diameter with the edges rounded off to a radius of (3.0 ± 0.3) mm;
- (d) Heat test: The specimen shall be heated in air to a temperature of 800 °C and held at that temperature for a period of 10 minutes and shall then be allowed to cool.

2.2.7.2.3.3.6 Specimens that comprise or simulate radioactive material enclosed in a sealed capsule may be excepted from:

- (a) The tests prescribed in 2.2.7.2.3.3.5 (a) and (b) provided that the specimens are alternatively subjected to the impact test prescribed in ISO 2919:2012: "Radiation Protection - Sealed Radioactive Sources - General requirements and classification":
 - (i) The Class 4 impact test if the mass of the special form radioactive material is ~~equal to or~~ less than 200 g;
 - (ii) The Class 5 impact test if the mass of the special form radioactive material is equal to or more than 200 g but is less than 500 g;
- (b) The test prescribed in 2.2.7.2.3.3.5 (d) provided they are alternatively subjected to the Class 6 temperature test specified in ISO 2919:2012 "Radiation protection - Sealed radioactive sources - General requirements and classification".

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

- (a) The specimen shall be immersed for 7 days in water at ambient temperature. The volume of water to be used in the test shall 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% of the volume of the solid test sample itself. The water shall have an initial pH of 6-8 and a maximum conductivity of 1 mS/m at 20 °C;
- (b) The water with specimen shall then be heated to a temperature of (50 ± 5) °C and maintained at this temperature for 4 hours;
- (c) The activity of the water shall then be determined;
- (d) The specimen shall then be kept for at least 7 days in still air at not less than 30 °C and relative humidity not less than 90%;
- (e) The specimen shall then be immersed in water of the same specification as in (a) above and the water with the specimen heated to (50 ± 5) °C and maintained at this temperature for 4 hours;
- (f) The activity of the water shall then be determined.

- 2.2.7.2.3.3.8 For specimens which comprise or simulate radioactive material enclosed in a sealed capsule, either a leaching assessment or a volumetric leakage assessment shall be performed as follows:
- (a) The leaching assessment shall consist of the following steps:
 - (i) the specimen shall be immersed in water at ambient temperature. The water shall have an initial pH of 6-8 with a maximum conductivity of 1 mS/m at 20 °C;
 - (ii) the water and specimen shall be heated to a temperature of (50 ± 5) °C and maintained at this temperature for 4 hours;
 - (iii) the activity of the water shall then be determined;
 - (iv) the specimen shall 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%;
 - (v) the process in (i), (ii) and (iii) shall be repeated;
 - (b) The alternative volumetric leakage assessment shall 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.
- 2.2.7.2.3.4 Low dispersible radioactive material
- 2.2.7.2.3.4.1 The design for low dispersible radioactive material shall require multilateral approval. Low dispersible radioactive material shall be such that the total amount of this radioactive material in a package, taking into account the provisions of 6.4.8.14, shall meet the following requirements:
- (a) The radiation level at 3 m from the unshielded radioactive material does not exceed 10mSv/h;
 - (b) If subjected to the tests specified in 6.4.20.3 and 6.4.20.4, 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
 - (c) If subjected to the test specified in 2.2.7.2.3.1.4 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 shall be taken into account.
- 2.2.7.2.3.4.2 Low dispersible radioactive material shall be tested as follows:
- A specimen that comprises or simulates low dispersible radioactive material shall be subjected to the enhanced thermal test specified in 6.4.20.3 and the impact test specified in 6.4.20.4. A different specimen may be used for each of the tests. Following each test, the specimen shall be subjected to the leach test specified in 2.2.7.2.3.1.4. After each test it shall be determined if the applicable requirements of 2.2.7.2.3.4.1 have been met.
- 2.2.7.2.3.4.3 Demonstration of compliance with the performance standards in 2.2.7.2.3.4.1 and 2.2.7.2.3.4.2 shall be in accordance with 6.4.12.1 and 6.4.12.2.
- 2.2.7.2.3.5 Fissile material
- Fissile material and packages containing fissile material shall be classified under the relevant entry as "FISSILE" in accordance with Table 2.2.7.2.1.1 unless excepted by one of the provisions of subparagraphs (a) to (f) below and carried subject to the requirements of 7.5.11 CV33 (4.3). All provisions apply only to material in packages that meets the requirements of 6.4.7.2 unless unpackaged material is specifically allowed in the provision.
- (a) Uranium enriched in uranium-235 to a maximum of 1% by mass, and with a total plutonium and uranium-233 content not exceeding 1% 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 shall not form a lattice arrangement;

- (b) Liquid solutions of uranyl nitrate enriched in uranium-235 to a maximum of 2% by mass, with a total plutonium and uranium-233 content not exceeding 0.002% 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% 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% of the mass of uranium-235 per package;
 - (iii) Carriage of the package is subject to the consignment limit provided in 7.5.11 CV33 (4.3) (c);
- (d) Fissile nuclides with a total mass not greater than 2.0 g per package provided the package is carried subject to the consignment limit provided in 7.5.11 CV33 (4.3) (d);
- (e) Fissile nuclides with a total mass not greater than 45 g either packaged or unpackaged subject to limits provided in 7.5.11 CV33 (4.3) (e);
- (f) A fissile material that meets the requirements of 7.5.11 CV33 (4.3) (b), 2.2.7.2.3.6 and 5.1.5.2.1.

2.2.7.2.3.6 A fissile material excepted from classification as "FISSILE" under 2.2.7.2.3.5 (f) shall be subcritical without the need for accumulation control under the following conditions:

- (a) The conditions of 6.4.11.1 (a);
- (b) The conditions consistent with the assessment provisions stated in 6.4.11.12 (b) and 6.4.11.13 (b) for packages.

2.2.7.2.4 *Classification of packages or unpacked material*

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

2.2.7.2.4.1 Classification as excepted package

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

- (a) It is an empty package having contained radioactive material;
- (b) It contains instruments or articles not exceeding the activity limits specified in columns (2) and (3) of Table 2.2.7.2.4.1.2;
- (c) It contains articles manufactured of natural uranium, depleted uranium or natural thorium;
- (d) It contains radioactive material not exceeding the activity limits specified in column (4) of Table 2.2.7.2.4.1.2; or
- (e) It contains less than 0.1 kg of uranium hexafluoride not exceeding the activity limits specified in column (4) of Table 2.2.7.2.4.1.2.

2.2.7.2.4.1.2 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 μ Sv/h.

Table 2.2.7.2.4.1.2: Activity limits for excepted packages

Physical state of contents (1)	Instruments or articles		Materials Package limits ^a (4)
	Item limits ^a (2)	Package limits ^a (3)	
Solids			
Solids special form	$10^{-2} A_1 \pm 10^{-2} A_2$	$A_1 - A_2$	$10^{-3} A_1 \pm 10^{-2} A_2$
other form	$10^{-2} A_2$	A_2	$10^{-3} A_2$
Liquids	$10^{-3} A_2$	$10^{-1} A_2$	$10^{-4} A_2$
Gases			
Gases tritium	$2 \times 10^{-2} A_2$	$2 \times 10^{-1} A_2$	$2 \times 10^{-2} A_2$
special form	$10^{-3} A_1$	$10^{-2} A_1$	$10^{-3} A_1$
other forms	$10^{-3} A_2$	$10^{-2} A_2$	$10^{-3} A_2$

Deleted Cells

^a For mixtures of radionuclides, see 2.2.7.2.2.4 to 2.2.7.2.2.6.

2.2.7.2.4.1.3 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 No. 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;
- (b) Each instrument or manufactured article bears the mark "RADIOACTIVE" on its external surface except for the following:
 - (i) radioluminescent time-pieces or devices;
 - (ii) consumer products that have either received regulatory approval in accordance with 1.7.1.4 (e) or do not individually exceed the activity limit for an exempt consignment in Table 2.2.7.2.2.1 (column 5), provided such products 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; 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 shall not be considered to be an instrument or manufactured article); and
- (d) The limits specified in columns 2 and 3 of Table 2.2.7.2.4.1.2 are met for each individual item and each package, respectively.

2.2.7.2.4.1.4 Radioactive material in forms other than as specified in 2.2.7.2.4.1.3 and with an activity not exceeding the limits specified in column 4 of Table 2.2.7.2.4.1.2, may be classified under UN No. 2910 RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - LIMITED QUANTITY OF MATERIAL provided that:

- (a) The package retains its radioactive contents under routine conditions of carriage; 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.

- 2.2.7.2.4.1.5 Uranium hexafluoride not exceeding the limits specified in Column 4 of Table 2.2.7.2.4.1.2 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:
- The mass of uranium hexafluoride in the package is less than 0.1 kg;
 - The conditions of 2.2.7.2.4.5.2 and 2.2.7.2.4.1.4 (a) and (b) are met.
- 2.2.7.2.4.1.6 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 No. 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.
- 2.2.7.2.4.1.7 An empty packaging which had previously contained radioactive material may be classified under UN No. 2908 RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - EMPTY PACKAGING, provided that:
- It is in a well-maintained condition and securely closed;
 - 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;
 - The level of internal non-fixed contamination, when averaged over any 300 cm², does not exceed:
 - 400 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters; and
 - 40 Bq/cm² for all other alpha emitters; and
 - Any labels which may have been displayed on it in conformity with 5.2.2.1.11.1 are no longer visible.
- 2.2.7.2.4.2 Classification as Low specific activity (LSA) material
- Radioactive material may only be classified as LSA material if the definition of LSA in 2.2.7.1.3 and the conditions of 2.2.7.2.3.1, 4.1.9.2 and 7.5.11 CV33 (2) are met.
- 2.2.7.2.4.3 Classification as Surface contaminated object (SCO)
- Radioactive material may be classified as SCO if the definition of SCO in 2.2.7.1.3 and the conditions of 2.2.7.2.3.2, 4.1.9.2 and 7.5.11 CV33 (2) are met.
- 2.2.7.2.4.4 Classification as Type A package
- Packages containing radioactive material may be classified as Type A packages provided that the following conditions are met:
- Type A packages shall not contain activities greater than either of the following:
- For special form radioactive material - A₁;
 - For all other radioactive material - A₂.
- For mixtures of radionuclides whose identities and respective activities are known, the following condition shall apply to the radioactive contents of a Type A package:

$$\sum_i \frac{B(i)}{A_1^+(i)} + \sum_j \frac{C(j)}{A_2^+(j)} \leq 1$$

~~where $B(i)$ is the activity of radionuclide i as special form radioactive material; $A_1(i)$ is the A_1 value for radionuclide i ;~~

~~$C(j)$ is the activity of radionuclide j as other than special form radioactive material; $A_2(j)$ is the A_2 value for radionuclide j .~~

where $B(i)$ is the activity of radionuclide i as special form radioactive material;

$A_1(i)$ is the A_1 value for radionuclide i ;

$C(j)$ is the activity of radionuclide j as other than special form radioactive material;

$A_2(j)$ is the A_2 value for radionuclide j .

2.2.7.2.4.5 Classification of uranium hexafluoride

2.2.7.2.4.5.1 Uranium hexafluoride shall only be assigned to:

- (a) UN No. 2977, RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE;
- (b) UN No. 2978, RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, non-fissile or fissile-excepted; or
- (c) UN No. 3507, URANIUM HEXAFLUORIDE, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE less than 0.1 kg per package, non-fissile or fissile-excepted.

2.2.7.2.4.5.2 The contents of a package containing uranium hexafluoride shall comply with the following requirements:

- (a) For UN Nos. 2977 and 2978, the mass of uranium hexafluoride shall not be different from that allowed for the package design, and for UN No. 3507, the mass of uranium hexafluoride shall be less than 0.1 kg;
- (b) The mass of uranium hexafluoride shall not be greater than a value that would lead to an ullage smaller than 5% at the maximum temperature of the package as specified for the plant systems where the package shall be used; and
- (c) The uranium hexafluoride shall be in solid form and the internal pressure shall not be above atmospheric pressure when presented for carriage.

2.2.7.2.4.6 Classification as Type B(U), Type B(M) or Type C packages

2.2.7.2.4.6.1 Packages not otherwise classified in 2.2.7.2.4 (2.2.7.2.4.1 to 2.2.7.2.4.5) shall be classified in accordance with the competent authority certificate of approval for the package issued by the country of origin of design.

2.2.7.2.4.6.2 The contents of a Type B(U), Type B(M) or Type C package shall be as specified in the certificate of approval.

2.2.7.2.5 *Special arrangements*

Radioactive material shall be classified as transported under special arrangement when it is intended to be carried in accordance with 1.7.4.