Attachment D – Draft Code under Option 4

New cover page to be inserted

PART 1

General provisions

CHAPTER 1.1

SCOPE AND APPLICABILITY

1.1.1 Structure

The requirements in this Code are grouped into nine parts. Each part is subdivided into chapters and each chapter into sections and sub-sections. Within each part the number of the part is included with the numbers of the chapters, sections and sub-sections, for example Part 4, Chapter 2, Section 1 is numbered "4.2.1".

1.1.2 Scope

1.1.2.1 This Code specifies:

(a) Dangerous goods which are barred from carriage;

(b) Dangerous goods which are authorized for carriage and the conditions attaching to them (including exemptions) particularly with regard to:

- classification of goods, including classification criteria and relevant test methods;
- use of packagings (including mixed packing);
- use of tanks (including filling);
- consignment procedures (including marking and labelling of packages and placarding and marking of means of transport as well as documentation and information required);
- provisions concerning the construction, testing and approval of packagings and tanks;
- use of means of transport (including loading, mixed loading and unloading).

1.1.2.2 - 4 (Reserved)

1.1.3 Exemptions

1.1.3.1 ***Exemptions related to the nature of the transport operation***

NOTE 1: *The exemptions in 1.1.3.1 (a) and (c) respectively apply to private individuals and businesses who are not in the business of transporting dangerous goods.*

NOTE 2: *For the purposes of the exemptions in 1.1.3.1 (a) and (c) "measures taken to mitigate risks in normal conditions of carriage" include ensuring:*

- *The dangerous goods are in packagings that are suitable for the type of dangerous goods*
- *The packagings are properly closed to prevent leaks;*
- *The packages are clearly marked indicating the type of dangerous goods;*
- *The packages are loaded, secured, unloaded, and otherwise transported so that they remain fit for purpose and risks to a person or property, or the environment, are mitigated.*
- *Where necessary, instruction and/or training to support safe transport is provided.*

NOTE 3: *The transport of dangerous goods carries risks, even when it is subject to an exemption. Where possible, the volumes of dangerous goods being transported should be minimised as far as possible, especially when transported in an enclosed space.*

The provisions laid down in this Code do not apply to:

(a) The carriage of dangerous goods, other than of class 1, by private individuals where the goods in question are packaged for retail sale and are intended for their personal or domestic use or for their leisure or sporting activities provided that measures have been taken to mitigate risks in

normal conditions of carriage. Dangerous goods in IBCs, large packagings or tanks are not considered to be packaged for retail sale.

Where the dangerous goods are in refillable receptacles, filled by, or for, a private individual the following limits apply:

(i) The total quantity shall not exceed 250 litres;

(ii) For flammable liquids, the maximum capacity of each receptacle shall not exceed 60 litres; and

Where cylinders containing flammable gases are being carried, no more than 33 litres (water capacity) shall be carried in an enclosed vehicle compartment.

(b) *(Deleted)*

(c) The carriage undertaken by enterprises which is ancillary to their main activity, such as deliveries to or returns from building or civil engineering sites, or in relation to surveying, repairs and maintenance, in quantities of not more than 450 litres per packaging, including intermediate bulk containers (IBCs) and large packagings, and within the maximum quantities specified in 1.1.3.6.5. Measures shall be taken to mitigate risks in normal conditions of carriage. This exemption does not apply to Classes 1 or 7.

Carriage undertaken by such enterprises for their supply or external or internal distribution does not fall within the scope of this exemption;

(d) The carriage undertaken by the competent authorities for the emergency response or under their supervision, insofar as such carriage is necessary in relation to the emergency response, in particular carriage undertaken:

- by breakdown vehicles carrying vehicles which have been involved in accidents or have broken down and contain dangerous goods; or

- to contain and recover the dangerous goods involved in an incident or accident and move them to the nearest appropriate safe place;

(e) Emergency transport intended to save human lives or protect the environment provided that all measures are taken to ensure that such transport is carried out in complete safety;

(f) The carriage of uncleaned empty static storage vessels which have contained gases of Class 2, groups A, O or F, substances of Class 3 or Class 9 belonging to packing group II or III or pesticides of Class 6.1 belonging to packing group II or III, subject to the following conditions:

- All openings with the exception of pressure relief devices (when fitted) are hermetically closed;

- Measures have been taken to prevent any leakage of contents in normal conditions of carriage; and

- The load is fixed in cradles or crates or other handling devices or to the vehicle or container in such a way that they will not become loose or shift during normal conditions of carriage.

This exemption does not apply to static storage vessels which have contained desensitized explosives or substances the carriage of which is prohibited by this Code.

NOTE 1: *For radioactive material, see also 1.7.1.4.*

1.1.3.2 ***Exemptions related to the carriage of gases***

The provisions laid down in this Code do not apply to the carriage of:

(a) Gases contained in the fuel tanks or cylinders of a vehicle performing a transport operation and destined for its propulsion or for the operation of any of its equipment used or intended for use during carriage (e.g. refrigerating equipment).

The gases may be carried in fixed fuel tanks or cylinders, directly connected to the vehicle's engine and/or auxiliary equipment or transportable pressure receptacles, which comply with the pertinent legal provisions.

The total capacity of the fuel tanks or cylinders for a transport unit, including those allowed in accordance with 1.1.3.3 (a), shall not exceed the amount of energy (MJ) or mass (kg) corresponding to 54 000 MJ energy-equivalent.

NOTE 1: *The value of 54 000 MJ energy-equivalent corresponds to the fuel limit of 1.1.3.3 (a) (1500 litres). For the energy content of fuels see the following Table:*

Fuel	***Energy content***
Diesel	*36 MJ/litre*
Petrol	*32 MJ/litre*
Natural Gas/Biogas	*35 MJ/Nm³* [a]
Liquefied Petroleum Gas (LPG)	*24 MJ/litre*
Ethanol	*21 MJ/litre*
Biodiesel	*33 MJ/litre*
Emulsion fuel	*32 MJ/litre*
Hydrogen	*11 MJ/Nm³* [a]

[a] *1 Nm³ refers to a normal cubic metre: the amount of a gas occupying 1 m³ under temperature and pressure conditions of 0 °C and 1.01325 bar (0.101325 MPa).*

The total capacity shall not exceed:
- 1 080 kg for LNG and CNG;
- 2 250 litres for LPG;

NOTE 2: *A container fitted with equipment for use during carriage, secured on a vehicle, is considered as an integral part of the vehicle and benefits from the same exemptions as regards the fuel necessary to operate the equipment.*

(b) *(Deleted)*

(c) Gases of Groups A and O (according to 2.2.2.1), if the pressure of the gas in the receptacle or tank at a temperature of 20 °C does not exceed 200 kPa (2 bar) and if the gas is not a liquefied or a refrigerated liquefied gas. This includes every kind of receptacle or tank, e.g. also parts of machinery and apparatus;

NOTE: *This exemption does not apply to lamps. For lamps see 1.1.3.10.*

(d) Gases contained in the equipment used for the operation of the vehicle (e.g. fire extinguishers), including in spare parts (e.g. inflated pneumatic tyres); this exemption also applies to inflated pneumatic tyres carried as a load;

(e) Gases contained in the special equipment of vehicles and necessary for the operation of this special equipment during transport (cooling systems, fish-tanks, heaters, etc.) as well as spare receptacles for such equipment or uncleaned empty exchange receptacles, transported in the same transport unit;

(f) Gases contained in foodstuffs (except UN 1950), including carbonated beverages; and

(g) Gases contained in balls intended for use in sports.

(h) *(Deleted)*

1.1.3.3 ***Exemptions related to the carriage of liquid fuels***

The provisions laid down in this Code do not apply to the carriage of:

(a) Fuel contained in the tanks of a vehicle performing a transport operation and destined for its propulsion or for the operation of any of its equipment used or intended for use during carriage.

The fuel may be carried in fixed fuel tanks, directly connected to the vehicle's engine and/or auxiliary equipment, which comply with the pertinent legal provisions, or may be carried in portable fuel containers (such as jerricans).

The total capacity of the fixed tanks shall not exceed 1500 litres per transport unit and the capacity of a tank fitted to a trailer shall not exceed 500 litres. A maximum of 60 litres per transport unit may be carried in portable fuel containers. These restrictions shall not apply to vehicles operated by the emergency services.

NOTE 1: *A container fitted with equipment for use during carriage, secured on a vehicle, is considered as an integral part of the vehicle and benefits from the same exemptions as regards the fuel necessary to operate the equipment.*

NOTE 2: *The total capacity of the tanks or cylinders, including those containing gaseous fuels, shall not exceed 54 000 MJ energy-equivalent (see NOTE 1 in 1.1.3.2 (a)).*

(b) and (c) *(Deleted)*

1.1.3.4 ***Exemptions related to special provisions or to dangerous goods packed in limited or excepted quantities***

NOTE: *For radioactive material, see also 1.7.1.4.*

1.1.3.4.1 Certain special provisions of Chapter 3.3 exempt partially or totally the carriage of specific dangerous goods from the requirements of this Code. The exemption applies when the special provision is referred to in Column (6) of Table A of Chapter 3.2 against the dangerous goods entry concerned.

1.1.3.4.2 Certain dangerous goods may be subject to exemptions provided that the conditions of Chapter 3.4 are met.

1.1.3.4.3 Certain dangerous goods may be subject to exemptions provided that the conditions of Chapter 3.5 are met.

1.1.3.5 ***Exemptions related to empty uncleaned packagings***

Empty uncleaned packagings (including IBCs and large packagings) which have contained substances of Classes 2, 3, 4.1, 5.1, 6.1, 8 and 9 are not subject to the conditions of this Code if adequate measures have been taken to nullify any hazard. Hazards are nullified if adequate measures have been taken to nullify all hazards of Classes 1 to 9.

1.1.3.6 ***Provisions for small loads***

NOTE 1: *The small load provisions in 1.1.3.6 replaces the concept of "less than a placard load" from ADG 7. Where the quantity transported is below the aggregate quantity threshold, a transporter may choose to take advantage of this concession. This concession is not available when transporting dangerous goods in tanks, bulk containers or in a transport unit that is displaying placards.*

NOTE 2: *A vehicle carrying dangerous goods that is displaying placards is required to be compliant with all the provisions of this code for the dangerous goods being transported.*

NOTE 3: *It remains an offence to placard a vehicle that contains no dangerous goods.*

1.1.3.6.1 The provisions for small loads in 1.1.3.6 do not apply to the carriage of the following:

(a) Substances or articles of class 1, except where …; and
(b) Substances or articles of class 7, which are subject to the Code of Practice for the Safe Transport of Radioactive Substances.

NOTE 1: *Substances and articles of class 1 are subject to separate of concessions when the load is classified as explosives category 1 in accordance with 1.1.8.*

NOTE 2: *Substances and articles of class 7 are subject to state and territory legislation and the Code of Practice for the Safe Transport of Radioactive Substances, published by ARPANSA. It contains exemptions for radioactive substances presenting a lower hazard.*

1.1.3.6.2 The concessions for small loads provided in 1.1.3.6.6 do not apply to a transport unit:

(a) Carrying dangerous goods in tanks, bulk containers, MEGCs or tube-vehicles;
(b) Carrying substances or articles of class 1, other than low hazard explosives; or
(c) Displaying, or required to display, placards for dangerous goods being transported.

1.1.3.6.3 When the aggregate quantity on the transport unit determined in accordance with 1.1.3.6.4, is less than the aggregate quantity threshold value show in column (3) in 1.1.3.6.5, the concessions in 1.1.3.6.6 may be applied.

1.1.3.6.4 Aggregate quantity is determined by summing all the dangerous goods on the transport unit, using the following values:

- For solids, net mass in kilograms;
- For liquids, the total quantity of dangerous goods contained in litres;
- For gases and chemicals under pressure, the water capacity of the pressure receptacle in litres;
- For articles, total mass in kilograms of the articles without their packagings (for dangerous goods in machinery and equipment specified in this Code, the total quantity of dangerous goods contained therein in kilograms or litres as appropriate);
- For automotive batteries, where the acid volume is not known, 25% of the gross weight of the battery in kilograms;

NOTE: *Aggregate quantity does not have units, values in kilograms and litres are added together.*

1.1.3.6.5 The aggregate quantity threshold for the transport unit is determined by identifying the lowest value in column (3), based on the substances or articles that are present in the load in column (2).

Transport category [a] **(1)**	**Substances or articles present in load** **(2)**	**Aggregate quantity threshold [b]** **(3)**
0	UN 2814, UN 2900 or UN 3459 (Division 6.2, Category A)	0
1	Division 6.2, other than category A	10
2	Substances in packing group I; Toxic, corrosive or flammable gases (other than UN 1950); Self reactive substances or organic peroxides assigned to types B through F. [c]	250
3	Substances in packing group II or III; Gases other than toxic, corrosive or flammable; UN 1950 (Aerosols); Articles not assigned elsewhere.	1 000

4	Empty, uncleaned packagings; [d] UN 3077 or UN 3082 (environmentally hazardous substances); [e] Fumigated cargo transport units. [e]	Unlimited [f]

Table notes

[a] Column (1) "transport category" is provided for communication and descriptive purposes.

[b] "Aggregate quantity" does not have any units (such as kilograms or litres).

[c] These substances are self-reactive substances of division 4.1 and organic peroxides of division 5.2, which are not assigned a packing group, but are assigned to a type from A through to G.

[d] Empty uncleaned packages contain only a nominal amount of dangerous goods. They have been emptied, but are not free from dangerous goods or residues. This does not apply to gases or chemcials under pressure.

[e] These entries are subject to other provisions that mean they do not contribute to vehicle placarding. Other provisions may still apply to the transport of these goods.

[f] If the only dangerous goods in the load are in the "Unlimited" threshold category, then the load will always be a small load. Other dangerous goods may also be subject to special provisions that provide conditional concessions from transport as dangerous goods, provided these coditions are met.

1.1.3.6.6 Where the load is determined to be eligible for the concessions for small loads, in accordance with 1.1.3.6.1 – 1.1.3.6.5, the following may be applied. All relevant provisions of this Code not listed in 1.1.3.6.5 (a) continue to apply.

NOTE: *The provisions listed in column (1) in each table below provides definitive inclusions and exclusions, the information provided in column (2) are descriptions only.*

(a) The following provisions need not be applied when carriage is undertaken under the provisions for small loads, except as detailed in 1.1.3.6.6 (b):

Provision (1)	**Description (2)**
1.8.5	Transport emergency response plan and insurance
Chapter 1.10	Security provisions
Chapter 5.3	Vehicle placarding
5.4.3	Emergency information
7.5.2 [a]	Segregation (except for class 1)
Chapter 8.1 [a]	Equipment on vehicles, including fire extinguishers and emergency equipment
Chapter 8.4	Parking and supervision of vehicles
Chapter 8.5	Provisions for certain dangerous goods
Part 9	Provisions for dangerous goods vehicles

Table notes

[a] There are provisions within this item that continue to apply, these are detailed in 1.1.3.6.6 (b).

(b) The following provisions of this Code continue to apply, even where it is included within a provision in 1.1.3.6.6 (a):

Provision (1)	**Description (2)**
7.5.2.2 & 7.5.2.5	Segregation and mixed loading of class 1
8.1.2.1 (a)	Requirement to carry transport documentation
8.1.2.3	Location of transport documentation

1.1.3.7 ***Exemptions related to the carriage of electric energy storage and production systems***

The provisions laid down in this Code do not apply to electric energy storage and production systems (e.g., lithium batteries, electric capacitors, asymmetric capacitors, metal hydride storage systems and fuel cells):

(a) installed in a vehicle, performing a transport operation and destined for its propulsion or for the operation of any of its equipment;

(b) contained in equipment for the operation of this equipment used or intended for use during carriage (e.g. a laptop), except for equipment such as data loggers and cargo tracking devices attached to or placed in packages, overpacks, containers or load compartments which are only subject to the requirements in 5.5.4.

1.1.3.8 *(Reserved)*

1.1.3.9 ***Exemptions related to dangerous goods used as a coolant or conditioner during carriage***

When used in vehicles or containers for cooling or conditioning purposes, dangerous goods that are only asphyxiant (which dilute or replace the oxygen normally in the atmosphere) are only subject to the provisions of section 5.5.3.

1.1.3.10 ***Exemptions related to the carriage of lamps containing dangerous goods***

The following lamps are not subject to this Code provided that they do not contain radioactive material and do not contain mercury in quantities above those specified in special provision 366 of Chapter 3.3:

(a) Lamps that are collected directly from individuals and households when carried to a collection or recycling facility;

NOTE: *This also includes lamps brought by individuals to a first collection point, and then carried to another collection point, intermediate processing or recycling facility.*

(b) Lamps each containing not more than 1 g of dangerous goods and packaged so that there is not more than 30 g of dangerous goods per package, provided that:

(i) the lamps are manufactured according to a certified quality management system;

NOTE: *ISO 9001 may be used for this purpose.*

and

(ii) each lamp is either individually packed in inner packagings, separated by dividers, or surrounded with cushioning material to protect the lamps and packed into strong outer packagings meeting the general provisions of 4.1.1.1 and capable of passing a 1.2 m drop test;

(c) Used, damaged or defective lamps each containing not more than 1 g of dangerous goods with not more than 30 g of dangerous goods per package when carried from a collection or recycling facility. The lamps shall be packed in strong outer packagings sufficient for preventing release of the contents under normal conditions of carriage meeting the general provisions of 4.1.1.1 and that are capable of passing a drop test of not less than 1.2 m;

(d) Lamps containing only gases of Groups A and O (according to 2.2.2.1) provided they are packaged so that the projectile effects of any rupture of the lamp will be contained within the package.

NOTE: *Lamps containing radioactive material are addressed in 2.2.7.2.2.2 (b).*

1.1.3.11 ***Exemptions related to the transport of dangerous goods for retail sale***

Dangerous goods that are being transported from the point of sale or distribution to a retail consumer (or an equivalent return journey) are not subject to this code, provided that:

(a) The goods are not dangerous goods of class 1, 4.2, 6.2 or 7.

(b) The goods were originally packed in accordance with the limited quantities provisions of Chapter 3.4, or in a combination package in accordance with Chapter 4.1.

NOTE: *The goods may be removed from their outer packaging for retail sale or final distribution to the retail consumer.*

(c) The quantity carried on the transport unit does not exceed 30 kilograms or litres per type, colour, strength or inner package size of a substance or an article, and a total of 333 kilograms or litres per transport unit.

1.1.3.12 ***Exemptions relating to the transport of diesel***

1.1.3.12.1 The provisions in 1.1.3.12.1 and 1.1.3.12.2 apply to dangerous goods of UN 1202 (GAS OIL or DIESEL OIL or HEATING OIL, LIGHT or PETROLEUM DISTILLATE) where the goods:

(a) do not meet the classification criteria in section 2.2.3 for a class 3 flammable liquid; and

(b) are transported below the flash point of the goods.

NOTE: *The Fuel Quality Standard for automative diesel in Australia (at the time of publication) requires diesel to have a flashpoint of no less than 61.5 °C. Class 3 flammable liquids have a flash point of no more than 60 °C.*

1.1.3.12.2 Such dangerous goods are not subject to this Code, provided that:

(a) the quantity carried on the transport unit does not exceed 3,000 litres; and

(b) no other dangerous goods are being transported, except under an exemption laid down in 1.1.3.

1.1.3.12.3 Where the provisions in 1.1.3.12.2 do not apply, the dangerous goods may be transported without application of the following provisions:
<LIST OF PROVISIONS THAT DON'T APPLY>

1.1.3.13 ***Exemptions relating to extremely short journeys that cross public roads***

Dangerous goods, other than those of class 1 or class 7, being transported over extremely short journeys are not subject to this code provided that appropriate measures are taken to mitigate risks:

(a) Between private premises and a vehicle in the immediate vicinity (for example loading a vehicle just outside the premises);

(b) Between private premises (in the immediate vicinity) occupied by the same person, including where separated by a road.

1.1.3.14 ***Exemptions relating to the transport of substances and articles of class 1***

PLACEHOLDER FOR CLASS 1 EXEMPTIONS

1.1.4 Applicability of other regulations

1.1.4.1 *(Reserved)*

1.1.4.2 ***Carriage in a transport chain including maritime or air carriage***

1.1.4.2.1 Packages, containers, bulk-containers, portable tanks, tank-containers and MEGCs, which do not entirely meet the requirements for packing, mixed packing, marking, labelling of packages or placarding (including with emergency information panels, of this Code), but are in conformity with the requirements of the IMDG Code or the ICAO Technical Instructions shall be accepted for carriage in a transport chain including maritime or air carriage subject to the following conditions:

(a) If the packages are not marked and labelled in accordance with this Code, they shall bear marks and danger labels in accordance with the requirements of the IMDG Code or the ICAO Technical Instructions;

(b) The requirements of the IMDG Code or the ICAO Technical Instructions shall be applicable to mixed packing within a package;

(c) For carriage in a transport chain including maritime carriage, if the containers, bulk-containers, portable tanks, tank-containers or MEGCs are not marked and placarded in accordance with

Chapter 5.3 of this Annex, they shall be marked and placarded in accordance with Chapter 5.3 of the IMDG Code. In such case, only 5.3.2.1.1 of this Annex is applicable to the marking of the vehicle itself. For empty, uncleaned portable tanks, tank-containers and MEGCs, this requirement shall apply up to and including the subsequent transfer to a cleaning station.

This derogation does not apply in the case of goods classified as dangerous goods in classes 1 to 9 of this Code and considered as non-dangerous goods according to the applicable requirements of the IMDG Code or the ICAO Technical Instructions.

1.1.4.2.2 Transport units composed of a vehicle or vehicles other than those carrying containers, portable tanks, tank-containers or MEGCs as provided for in 1.1.4.2.1 (c), which are not placarded in accordance with the provisions of 5.3.1 of this Code but which are marked and placarded in accordance with Chapter 5.3 of the IMDG Code, shall be accepted for carriage in a transport chain including maritime transport provided that the orange-coloured plate marking provisions of 5.3.2 of this Code are complied with.

1.1.4.2.3 For carriage in a transport chain including maritime or air carriage, the information required under 5.4.1 and 5.4.2 and under any special provision of Chapter 3.3 may be substituted by the transport document and information required by the IMDG Code or the ICAO Technical Instructions respectively provided that any additional information required by this Code is also included.

NOTE: *For carriage in accordance with 1.1.4.2.1, see also 5.4.1.1.7. For carriage in containers, see also 5.4.2.*

1.1.4.3 ***Use of IMO type portable tanks approved for maritime transport***

IMO type portable tanks (types 1, 2, 5 and 7) which do not meet the requirements of Chapters 6.7 or 6.8, but which were built and approved before 1 January 2003 in accordance with the provisions of the IMDG Code (Amdt. 29-98) may continue to be used provided that they meet the applicable periodic inspection and test provisions of the IMDG Code[1]. In addition, they shall meet the provisions corresponding to the instructions set out in columns (10) and (11) of Table A in Chapter 3.2 and the provisions of Chapter 4.2 of this Code. See also 4.2.0.1 of the IMDG Code.

1.1.4.4 *(Reserved)*

1.1.4.5 *(Reserved)*

1.1.4.6 *(Reserved)*

1.1.4.7 ***Refillable pressure receptacles authorized by the United States of America Department of Transportation***

NOTE: *For carriage in accordance with 1.1.4.7, see also 5.4.1.1.24.*

1.1.4.7.1 *Import of gases*

Refillable pressure receptacles authorised by the United States of America Department of Transportation and constructed and tested in accordance with standards listed in Part 178, Specifications for Packagings of Title 49, Transportation, of the Code of Federal Regulations accepted for carriage in a transport chain in accordance with 1.1.4.2 may be carried from the location of the temporary storage at the end point of the transport chain to the end user.

1.1.4.7.2 Export of gases and empty uncleaned pressure receptacles

Refillable pressure receptacles authorised by the United States of America Department of Transportation and constructed in accordance with standards listed in Part 178, Specifications for Packagings of Title 49, Transportation, of the Code of Federal Regulations may be filled and carried only for the purpose of exporting to countries which are not Contracting Parties to this Code provided the following provisions are met:

[1] *The International Maritime Organization (IMO) has issued "Guidance on the Continued Use of Existing IMO Type Portable Tanks and Road Tank Vehicles for the Transport of Dangerous Goods" as circular CCC.1/Circ.3. The text of this guidance can be found on the IMO website at: www.imo.org.*

(a) The filling of the pressure receptacle is in accordance with the relevant requirements of the Code of Federal Regulations of the United States of America;

(b) The pressure receptacles shall be marked and labelled in accordance with Chapter 5.2;

(c) The provisions of 4.1.6.12 and 4.1.6.13 shall apply to pressure receptacles. Pressure receptacles shall not be filled after they become due for periodic inspection but may be carried after the expiry of the time-limit for purposes of performing inspection, including the intermediate carriage operations.

1.1.4.8 ***Import and export of substances and articles of class 1***

PLACEHOLDER FOR CLASS 1 IMPORT/EXPORT PROVISIONS

1.1.5 Application of standards

Where the application of a standard is required and there is any conflict between the standard and the provisions of this Code, the provisions of this Code take precedence. The requirements of the standard that do not conflict with this Code shall be applied as specified, including the requirements of any other standard, or part of a standard, referenced within that standard as normative.

NOTE: *A standard provides details on how to meet the provisions of this Code and may include requirements in addition to those set out in this Code.*

1.1.6 ***Determinations and exemptions issued by the competent authority***

NOTE: *This section outlines the provisions for competent authorities to make determinations or exemptions.*

1.1.6.1 The competent authority may determine that goods are or are not:

(a) dangerous goods; or

(b) dangerous goods of a particular UN Class, UN Division or Category; or

(c) dangerous goods with a particular subsidiary hazard; or

(d) substances of a particular Packing Group; or

(e) incompatible with particular dangerous goods.

1.1.6.2 The competent authority may determine that:

(a) particular dangerous goods are or are not too dangerous to be transported; or

(b) particular dangerous goods shall not be or may be transported in or on the same cargo transport unit or freight container as other goods, whether or not dangerous goods; or (1.18)

(c) particular dangerous goods may or may not be transported in any packaging despite any prohibition or authorisation in the Dangerous Goods List.

1.1.6.3 The competent authority may determine that particular dangerous goods may be or shall or shall not be transported:

(a) using a specified vehicle, or kind of vehicle; or

(b) on a specified route; or

(c) in or through a specified area; or

(d) at a specified time; or

(e) in quantities in excess of a specified amount; or

(f) in specified packaging.

1.1.6.4 The competent authority may issue an exemption from compliance with a provision of this Code, provided the competent authority is satisfied that:

(a) it is not reasonably practicable for the person or class of persons to comply with the provision; and

(b) granting the exemption:

(i) would not be likely to create a risk of death or injury to a person, or harm to the environment or to property, greater than that which would be the case if the person or class of persons were required to comply; and

(ii) would not cause unnecessary administrative or enforcement difficulties, particularly with respect to maintaining national uniformity of road and rail transport laws.

1.1.6.5 A determination or exemption may be issued along with conditions that the competent authority considers necessary for the effectiveness of the determination or exemption. This may include:

(a) the period of time for which the determination or exemption remains in force;
(b) the conditions to which the determination or exemption is subject;
(c) the geographical area for which the determination or exemption is valid.

1.1.6.6 Any person undertaking transport subject to a determination or exemption shall do so in accordance with all conditions that the determination or exemption is issued with.

1.1.7 Determination of division for mixed loads of explosives

Where explosives of more than one division are transported together in a single load, the division of the load overall shall be determined in accordance with the table below. Where more than two Divisions are present in any load, any two of those Divisions shall be considered in determining a resultant Division, which shall then be considered with the next Division and so on until all Divisions present in the load have been considered.

Division	**1.1**	**1.2**	**1.3**	**1.4**	**1.5**	**1.6**
1.1	1.1	1.1	1.1	1.1	1.1	1.1
1.2	1.1	1.2	1.1	1.2	1.1	1.2
1.3	1.1	1.1	1.3	1.3	1.1	1.1
1.4	1.1	1.2	1.3	1.4	1.5	1.6
1.5	1.1	1.1	1.1	1.5	1.5	1.5
1.6	1.1	1.2	1.3	1.6	1.5	1.6 **a**

Table notes

a Different types of articles of Division 1.6 may be transported together as Division 1.6 only when it is proved by testing or analogy that there is no additional risk of sympathetic detonation between the articles. Otherwise, they shall be treated as Division 1.1.

1.1.8 Determination of explosives categories for the transport of substances and articles of class 1

1.1.8.1 This Code establishes three explosives categories which are applied to loads of explosives on vehicles and form the basis for the transport of explosives.

1.1.8.2 Where the load consists of more than one division of explosives, the overall division of the load shall be determined in accordance with 1.1.7.

1.1.8.3 Where explosives are transported with ammonium nitrate of division 5.1, the mass of ammonium nitrate shall be included in the calculation in accordance with the following:

(a) where the ammonium nitrate is of UN 1942[, UN 2067, UN 2071,] or UN 2426, half the mass of the ammonium nitrate shall be treated as explosives; and
(b) where the ammonium nitrate is of UN 3375, the total mass of the ammonium nitrate shall be treated as explosives;

For the purposes of this calculation, the ammonium nitrate shall be considered as division 1.1, except where no division 1.1 is present in the load, in which case the ammonium nitrate shall be considered as division 1.5.

1.1.8.4 The determination of explosives risk categories shall be determined based on Net Explosive Quantity (NEQ), except where otherwise specified.

1.1.8.5 Substances and articles of division 1.1A are prohibited for carriage except with the authorisation of the competent authority.

1.1.8.6 The explosives risk category of the load shall be determined in accordance with the table below. References in this Code to 'Explosives Category 1', 'Explosives Category 2' or 'Explosives Category 3' shall be taken to be to this table.

Type of explosive	**Quantity in load**		
Division	**Explosives category 1**	**Explosives category 2**	**Explosives category 3**
Division 1.1A	Transport shall be specifically approved by the Competent Authority		
All other Division 1.1	≤5 kg	>5–250 kg	>250 kg
Division 1.2	≤5 kg	>5–250 kg	>250 kg
Division 1.3	≤50 kg	>50–1000 kg	>1000 kg
Detonators of Division 1.4B or 1.4S	≤125 items	>125 items	n/a
Division 1.4S, other than detonators	Any quantity	n/a	n/a
All other Division 1.4	≤250 kg	>250 kg	n/a
Division 1.5	≤25 kg	>25-250 kg	>250 kg
Division 1.6	≤25 kg	>25 kg	n/a

CHAPTER 1.2

DEFINITIONS, UNITS OF MEASUREMENT AND ABBREVIATIONS

1.2.1 Definitions

NOTE: *This section contains all general or specific definitions.*

For the purposes of this Code:

A

*"**ADR**" means the Agreement concerning the International Carriage of Dangerous Goods by Road, including all special agreements signed by those states involved in the transport operation;*

"Aerosol or *aerosol dispenser"* means an article consisting of any non-refillable receptacle meeting the requirements of 6.2.6, made of metal, glass or plastics and containing a gas, compressed, liquefied or dissolved under pressure, with or without a liquid, paste or powder, and fitted with a release device allowing the contents to be ejected as solid or liquid particles in suspension in a gas, as a foam, paste or powder or in a liquid state or in a gaseous state;

"Animal material" means animal carcasses, animal body parts, foodstuffs or feedstuffs derived from animals;

NOTE: *Exceptionally a third party (for instance a tank-container operator in accordance with the definition of 1.2.1) may apply for the conformity assessment.*

"Approval"

Multilateral approval, for the carriage of radioactive material, means approval by the relevant competent authority of the country of origin of the design or shipment, as applicable, and by the competent authority of each country through or into which the consignment is to be carried;

Unilateral approval, for the carriage of radioactive material, means an approval of a design which is required to be given by the competent authority of the country of origin of the design only. If the country of origin is not a Contracting Party to ADR, the approval shall require validation by the competent authority of a Contracting Party to ADR (see 6.4.22.8);

B

"Bag" means a flexible packaging made of paper, plastics film, textiles, woven material or other suitable material;

"Body" (for all categories of IBC other than composite IBCs) means the receptacle proper, including openings and closures, but does not include service equipment;

"Box" means a packaging with complete rectangular or polygonal faces, made of metal, wood, plywood, reconstituted wood, fibreboard, plastics or other suitable material. Small holes for purposes of ease of handling or opening or to meet classification requirements, are permitted as long as they do not compromise the integrity of the packaging during carriage;

"Bulk container" means a containment system (including any liner or coating) intended for the carriage of solid substances which are in direct contact with the containment system. Packagings, intermediate bulk containers (IBCs), large packagings and tanks are not included.

A bulk container is:

- of a permanent character and accordingly strong enough to be suitable for repeated use;
- specially designed to facilitate the carriage of goods by one or more means of transport without intermediate reloading;
- fitted with devices permitting its ready handling;

- of a capacity of not less than 1.0 m³;

Examples of bulk containers are containers, offshore bulk containers, skips, bulk bins, swap bodies, trough-shaped containers, roller containers, load compartments of vehicles or wagons;

NOTE: *This definition only applies to bulk containers meeting the requirements of Chapter 6.11.*

"Closed bulk container" means a totally closed bulk container having a rigid roof, sidewalls, end walls and floor (including hopper-type bottoms). The term includes bulk containers with an opening roof, side or end wall that can be closed during carriage. Closed bulk containers may be equipped with openings to allow for the exchange of vapours and gases with air and which prevent under normal conditions of carriage the release of solid contents as well as the penetration of rain and splash water;

"Flexible bulk container" means a flexible container with a capacity not exceeding 15 m³ and includes liners and attached handling devices and service equipment;

"Sheeted bulk container" means an open top bulk container with rigid bottom (including hopper-type bottom), side and end walls and a non-rigid covering;

"Bundle of cylinders" means a pressure receptacle comprising an assembly of cylinders or cylinder shells that are fastened together and which are interconnected by a manifold and carried as a unit. The total water capacity shall not exceed 3 000 litres except that bundles intended for the carriage of toxic gases of Class 2 (groups starting with letter T according to 2.2.2.1.3) shall be limited to 1 000 litres water capacity;

C

"Calculation pressure" means a theoretical pressure at least equal to the test pressure which, according to the degree of danger exhibited by the substance being carried, may to a greater or lesser degree exceed the working pressure. It is used solely to determine the thickness of the walls of the shell, independently of any external or internal reinforcing device (see also *"Discharge pressure"*, *"Filling pressure"*, *"Maximum working pressure (gauge pressure)"* and *"Test pressure"*);

NOTE: *For portable tanks, see Chapter 6.7.*

"Capacity of shell or shell compartment" for tanks, means the total inner volume of the shell or shell compartment expressed in litres or cubic metres. When it is impossible to completely fill the shell or the shell compartment because of its shape or construction, this reduced capacity shall be used for the determination of the degree of filling and for the marking of the tank;

"Cargo transport unit" means a vehicle, a wagon, a container, a tank-container, a portable tank or an MEGC;

"Carriage" means the change of place of dangerous goods, including stops made necessary by transport conditions and including any period spent by the dangerous goods in vehicles, tanks and containers made necessary by traffic conditions before, during and after the change of place.

This definition also covers the intermediate temporary storage of dangerous goods in order to change the mode or means of transport (trans-shipment). This shall apply provided that transport documents showing the place of dispatch and the place of reception are presented on request and provided that packages and tanks are not opened during intermediate storage, except to be checked by the competent authorities;

"Carriage in bulk" means the carriage of unpackaged solids or articles in vehicles, wagons containers or bulk containers. The term does not apply to packaged goods nor to substances carried in tanks;

"Carrier" means the enterprise which carries out the transport operation with or without a transport contract;

"Closed bulk container", see *"Bulk container"*;

"Closed container", see *"Container"*;

"Closed cryogenic receptacle" means a thermally insulated pressure receptacle for refrigerated liquefied gases of a water capacity of not more than 1 000 litres;

"Closed vehicle" means a vehicle having a body capable of being closed;

"Closed wagon" means a *wagon* with fixed or movable sides or roof;

"Closure" means a device which closes an opening in a receptacle;

NOTE: *For pressure receptacles, closures are, for example, valves, pressure relief devices, pressure gauges or level indicators.*

"Collective entry" means an entry for a defined group of substances or articles (see 2.1.1.2, B, C and D);

"Combination packaging" means a combination of packagings for carriage purposes, consisting of one or more inner packagings secured in an outer packaging in accordance with 4.1.1.5;

NOTE: *The term "inner packaging" used for combination packagings shall not be confused with the term "inner receptacle" used for composite packagings.*

"Combustion heater" means a device directly using liquid or gaseous fuel and not using the waste heat from the engine used for propulsion of the vehicle;

"Competent authority" means the authority or authorities or any other body or bodies designated as such in each State and in each specific case in accordance with domestic law;

"Compliance assurance" (radioactive material) means a systematic programme of measures applied by a competent authority which is aimed at ensuring that the requirements of this Code are met in practice;

"Composite IBC with plastics inner receptacle" means an IBC comprising structural equipment in the form of a rigid outer casing encasing a plastics inner receptacle together with any service or other structural equipment. It is so constructed that the inner receptacle and outer casing once assembled form, and are used as, an integrated single unit to be filled, stored, transported or emptied as such;

NOTE: *"Plastics material", when used in connection with inner receptacles for composite IBCs, is taken to include other polymeric materials such as rubber.*

"Composite packaging" means a packaging consisting of an outer packaging and an inner receptacle so constructed that the inner receptacle and the outer packaging form an integral packaging. Once assembled it remains thereafter an integrated single unit; it is filled, stored, carried and emptied as such;

NOTE: *The term "inner receptacle" used for composite packagings shall not be confused with the term "inner packaging" used for combination packagings. For example, the inner of a 6HA1 composite packaging (plastics material) is such an inner receptacle since it is normally not designed to perform a containment function without its outer packaging and is not therefore an inner packaging.*

Where a material is mentioned in brackets after the term "composite packaging", it refers to the inner receptacle.

"Compressed natural gas (CNG)" means a compressed gas composed of natural gas with a high methane content assigned to UN No. 1971;

"Confinement system", for the carriage of radioactive material, means the assembly of fissile material and packaging components specified by the designer and agreed to by the competent authority as intended to preserve criticality safety;

"Conformity assessment" means the process of verifying the conformity of a product according to the provisions of sections 1.8.6 and 1.8.7 related to type examination, supervision of manufacture and initial inspection and testing;

"Consignee" means the consignee according to the contract for carriage. If the consignee designates a third party in accordance with the provisions applicable to the contract for carriage, this person shall be deemed to be the consignee within the meaning of this Code. If the transport operation takes place without a contract for carriage, the enterprise which takes charge of the dangerous goods on arrival shall be deemed to be the consignee;

"Consignment" means any package or packages, or load of dangerous goods, presented by a consignor for carriage;

"Consignor" means the enterprise which consigns dangerous goods either on its own behalf or for a third party. If the transport operation is carried out under a contract for carriage, consignor means the consignor according to the contract for carriage;

"Container" means an article of transport equipment (lift van or other similar structure):

- of a permanent character and accordingly strong enough to be suitable for repeated use;
- specially designed to facilitate the carriage of goods, by one or more means of transport, without breakage of load;
- fitted with devices permitting its ready stowage and handling, particularly when being transloaded from one means of transport to another;
- so designed as to be easy to fill and empty;
- having an internal volume of not less than 1 m^3, except for containers for the carriage of radioactive material.

In addition:

"Small container" means a container which has an internal volume of not more than 3 m^3;

"Large container" means

(a) A container which does not meet the definition of a small container;

(b) In the meaning of the CSC, a container of a size such that the area enclosed by the four outer bottom corners is either

(i) at least 14 m^2 (150 square feet); or

(ii) at least 7 m^2 (75 square feet) if fitted with top corner fittings;

"Closed container" means a totally enclosed container having a rigid roof, rigid side walls, rigid end walls and a floor. The term includes containers with an opening roof where the roof can be closed during transport;

"Open container" means an open top container or a platform based container;

"Sheeted container" means an open container equipped with a sheet to protect the goods loaded;

A *"swap body"* is a container which, in accordance with EN 283:1991 has the following characteristics:

- from the point of view of mechanical strength, it is only built for carriage on a wagon or a vehicle on land or by roll-on roll-of ship;
- it cannot be stacked;
- it can be removed from vehicles by means of equipment on board the vehicle and on its own supports, and can be reloaded;

NOTE: *The term "container" does not cover conventional packagings, IBCs, tank-containers or vehicles. Nevertheless, a container may be used as a packaging for the carriage of radioactive material.*

"Containment system", for the carriage of radioactive material, means the assembly of components of the packaging specified by the designer as intended to retain the radioactive material during carriage;

"Control temperature" means the maximum temperature at which the organic peroxide, the self-reactive substance or the polymerizing substance can be safely carried;

"Conveyance" means, for carriage by road or by rail, a vehicle or a wagon;

"Crate" means an outer packaging with incomplete surfaces;

"Criticality safety index (CSI) assigned to a package, overpack or container containing fissile material", for the carriage of radioactive material, means a number which is used to provide control over the accumulation of packages, overpacks or containers containing fissile material;

"Critical temperature" means the temperature above which the substance cannot exist in the liquid state;

"Cryogenic receptacle" means a transportable thermally insulated pressure receptacle for refrigerated liquefied gases of a water capacity of not more than 1 000 litres (see also "Open cryogenic receptacle");

"CSC" means the International Convention for Safe Containers (Geneva, 1972) as amended and published by the International Maritime Organization (IMO), London;

"Cylinder" means a pressure receptacle of a water capacity not exceeding 150 litres (see also *"Bundle of cylinders"*);

D

"Dangerous goods" means those substances and articles the carriage of which is prohibited by this Code, or authorized only under the conditions prescribed therein;

"Dangerous reaction" means:

(a) Combustion or evolution of considerable heat;

(b) Evolution of flammable, asphyxiant, oxidizing or toxic gases;

(c) The formation of corrosive substances;

(d) The formation of unstable substances; or

(e) Dangerous rise in pressure (for tanks only);

"Demountable tank" means a tank, other than a fixed tank, a portable tank, a tank-container or an element of a tube-vehicle or a MEGC which has a capacity of more than 450 litres, is not designed for the carriage of goods without breakage of load, and normally can only be handled when it is empty;

"Design", for the carriage of radioactive material, means the description of fissile material excepted under 2.2.7.2.3.5 (f), special form radioactive material, low dispersible radioactive material, package or packaging which enables such an item to be fully identified. The description may include specifications, engineering drawings, reports demonstrating compliance with regulatory requirements, and other relevant documentation;

"Design life", for composite cylinders and tubes, means the maximum life (in number of years) for which the cylinder or tube is designed and approved in accordance with the applicable standard;

"Diameter" (for shells of tanks) means the internal diameter of the shell;

"Discharge pressure" means the maximum pressure actually built up in the tank when it is being discharged under pressure (see also *"Calculation pressure", "Filling pressure", "Maximum working pressure (gauge pressure)"* and *"Test pressure"*);

"Dose rate" means the ambient dose equivalent or the directional dose equivalent, as appropriate, per unit time, measured at the point of interest;

"Drum" means a flat-ended or convex-ended cylindrical packaging made out of metal, fibreboard, plastics, plywood or other suitable materials. This definition also includes packagings of other shapes, e.g. round, taper-necked packagings or pail-shaped packagings. Wooden barrels and jerricans are not covered by this definition;

E

"EC Directive" means provisions decided by the competent institutions of the European Community and which are binding, as to the result to be achieved, upon each Member State to which it is addressed, but shall leave to the national authorities the choice of form and methods;

"Emergency temperature" means the temperature at which emergency procedures shall be implemented in the event of loss of temperature control;

"Enterprise" means any natural person, any legal person, whether profit-making or not, any association or group of persons without legal personality, whether profit-making or not, or any official body, whether it has legal personality itself or is dependent upon an authority that has such personality;

"Exclusive use", for the carriage of radioactive material, means the sole use, by a single consignor, of a vehicle or wagon or of a large container, in respect of which all initial, intermediate and final loading and unloading and shipment are carried out in accordance with the directions of the consignor or consignee, where so required by this Code;

F

"Fibreboard IBC" means a fibreboard body with or without separate top and bottom caps, if necessary, an inner liner (but no inner packagings), and appropriate service and structural equipment;

"Fibre-reinforced plastics" means material consisting of fibrous and/or particulate reinforcement contained within a thermoset or thermoplastic polymer (matrix);

"Filler" means any enterprise which fills dangerous goods into a tank (tank-vehicle, tank-wagon, demountable tank, portable tank or tank-container) and/or into a vehicle, wagon, large container or small container for carriage in bulk, or into a tube-vehicle, tube-wagon or MEGC;

"Filling pressure" means the maximum pressure actually built up in the tank when it is being filled under pressure (see also *"Calculation pressure"*, *"Discharge pressure"*, *"Maximum working pressure (gauge pressure)"* and *"Test pressure"*);

"Filling ratio" means the ratio of the mass of gas to the mass of water at 15 °C that would fill completely a pressure receptacle fitted ready for use;

"Fixed tank" means a tank having a capacity of more than 1 000 litres which is permanently attached to a vehicle or a wagon (which then becomes a tank-vehicle or a tank-wagon) or is an integral part of the frame of such vehicle or wagon;

"Flammable component" (for aerosols) means 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;

"Flash-point" means the lowest temperature of a liquid at which its vapours form a flammable mixture with air;

"Flexible bulk container", see *"Bulk container"*;

"Flexible IBC" means a body constituted of film, woven fabric or any other flexible material or combinations thereof, and if necessary, an inner coating or liner, together with any appropriate service equipment and handling devices;

"Fuel cell" means an electrochemical device that converts the chemical energy of a fuel to electrical energy, heat and reaction products;

"Fuel cell engine" means a device used to power equipment and which consists of a fuel cell and its fuel supply, whether integrated with or separate from the fuel cell, and includes all appurtenances necessary to fulfil its function;

"Full load" means any load originating from one consignor for which the use of a vehicle or of a wagon or of a large container is exclusively reserved and all operations for the loading and unloading of which are carried out in conformity with the instructions of the consignor or of the consignee;

NOTE: *The corresponding term for radioactive material is "exclusive use".*

G

"Gas" means 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 under standard pressure of 101.3 kPa;

"Gas cartridge", see *"Small receptacle containing gas"*;

"Globally Harmonized System of Classification and Labelling of Chemicals" means the ninth revised edition of the United Nations publication bearing this title (ST/SG/AC.10/30/Rev.9);

H

"Handling device" (for flexible IBCs) means any sling, loop, eye or frame attached to the body of the IBC or formed from the continuation of the IBC body material;

"Hermetically closed tank" means a tank that:

- is not equipped with safety valves, bursting discs, other similar safety devices or vacuum valves; or

- is equipped with safety valves preceded by a bursting disc according to 6.8.2.2.10, but is not equipped with vacuum valves.

A tank intended for the carriage of liquid substances with a calculation pressure of at least 4 bar or intended for the carriage of solid substances (powdery or granular) regardless of its calculation pressure is also considered hermetically closed if it:

- is equipped with safety valves preceded by a bursting disc according to 6.8.2.2.10 and vacuum valves, in accordance with the requirements of 6.8.2.2.3; or,

- is not equipped with safety valves, bursting discs or other similar safety devices, but is equipped with vacuum valves, in accordance with the requirements of 6.8.2.2.3.;

"Holding time" means the time that will elapse from the establishment of the initial filling condition until the pressure has risen due to heat influx to the lowest set pressure of the pressure limiting devices (s) of tanks intended for the carriage of refrigerated liquefied gases;

NOTE: *For portable tanks, see 6.7.4.1.*

I

"IAEA Regulations for the Safe Transport of Radioactive Material" means one of the editions of those Regulations, as follows:

(a) For the 1985 and 1985 (as amended 1990) editions: IAEA Safety Series No. 6;

(b) For the 1996 edition: IAEA Safety Series No. ST-1;

(c) For the 1996 (revised) edition: IAEA Safety Series No. TS-R-1 (ST-1, Revised);

(d) For the 1996 (as amended 2003), 2005 and 2009 editions: IAEA Safety Standards Series No. TS-R-1;

(e) For the 2012 edition: IAEA Safety Standards Series No. SSR-6;

(f) For the 2018 edition: IAEA Safety Standards Series No. SSR–6 (Rev.1);

"ICAO Technical Instructions" means the Technical Instructions for the Safe Transport of Dangerous Goods by Air, which complement Annex 18 to the Chicago Convention on International Civil Aviation (Chicago 1944), published by the International Civil Aviation Organization (ICAO) in Montreal;

"IMDG Code" means the International Maritime Dangerous Goods Code, for the implementation of Chapter VII, Part A, of the International Convention for the Safety of Life at Sea, 1974 (SOLAS Convention), published by the International Maritime Organization (IMO), London;

"Inner packaging" means a packaging for which an outer packaging is required for carriage;

"Inner receptacle" means a receptacle which requires an outer packaging in order to perform its containment function;

"Inspection body" means an independent inspection and testing body approved by the competent authority;

"Intermediate bulk container" (IBC) means a rigid, or flexible portable packaging, other than those specified in Chapter 6.1, that:

(a) Has a capacity of:

(i) not more than 3 m³ for solids and liquids of packing groups II and III;

(ii) not more than 1.5 m³ for solids of packing group I when packed in flexible, rigid plastics, composite, fibreboard and wooden IBCs;

(iii) not more than 3 m³ for solids of packing group I when packed in metal IBCs;

(iv) not more than 3 m³ for radioactive material of Class 7;

(b) Is designed for mechanical handling;

(c) Is resistant to the stresses produced in handling and transport as determined by the tests specified in Chapter 6.5;

(see also *"Composite IBC with plastics inner receptacle", "Fibreboard IBC", "Flexible IBC", "Metal IBC", "Rigid plastics IBC"* and *"Wooden IBC"*).

NOTE 1: *Portable tanks or tank-containers that meet the requirements of Chapter 6.7 or 6.8 respectively are not considered to be intermediate bulk containers (IBCs).*

NOTE 2: *Intermediate bulk containers (IBCs) which meet the requirements of Chapter 6.5 are not considered to be containers for the purposes of this Code.*

"Remanufactured IBC" means a metal, rigid plastics or composite IBC that:

(a) Is produced as a UN type from a non-UN type; or

(b) Is converted from one UN design type to another UN design type.

Remanufactured IBCs are subject to the same requirements of this Code that apply to new IBCs of the same type (see also design type definition in 6.5.6.1.1);

"Repaired IBC" means a metal, rigid plastics or composite IBC that, as a result of impact or for any other cause (e.g. corrosion, embrittlement or other evidence of reduced strength as compared to the design type) is restored so as to conform to the design type and to be able to withstand the design type tests. For the purposes of this Code, the replacement of the rigid inner receptacle of a composite IBC with a receptacle conforming to the original design type from the same manufacturer is considered repair. However, routine maintenance of rigid IBCs is not considered repair. The bodies of rigid plastics IBCs and the inner receptacles of composite IBCs are not repairable. Flexible IBCs are not repairable unless approved by the competent authority;

"Routine maintenance of flexible IBCs" means the routine performance on plastics or textile flexible IBCs of operations, such as:

(a) Cleaning; or

(b) Replacement of non-integral components, such as non-integral liners and closure ties, with components conforming to the original manufacturer's specification;

provided that these operations do not adversely affect the containment function of the flexible IBC or alter the design type.

"Routine maintenance of rigid IBCs" means the routine performance on metal, rigid plastics or composite IBCs of operations such as:

(a) Cleaning;

(b) Removal and reinstallation or replacement of body closures (including associated gaskets), or of service equipment, conforming to the original manufacturer’s specifications, provided that the leaktightness of the IBC is verified; or

(c) Restoration of structural equipment not directly performing a dangerous goods containment or discharge pressure retention function so as to conform to the design type (e.g. the straightening of legs or lifting attachments) provided that the containment function of the IBC is not affected;

"Inner vessel", for a closed cryogenic receptacle, means the pressure vessel intended to contain the refrigerated liquefied gas;

"Intermediate packaging" means a packaging placed between inner packagings or articles, and an outer packaging;

J

"Jerrican" means a metal or plastics packaging of rectangular or polygonal cross-section with one or more orifices;

L

"Large container", see *"Container"*;

"Large packaging" means a packaging consisting of an outer packaging which contains articles or inner packagings and which

(a) Is designed for mechanical handling;

(b) Exceeds 400 kg net mass or 450 litres capacity but has a volume of not more than 3 m^3;

"Large salvage packaging" means a special packaging which

(a) is designed for mechanical handling; and

(b) exceeds 400 kg net mass or 450 litres capacity but has a volume of not more than 3 m^3;

into which damaged, defective, leaking or non-conforming dangerous goods packages, or dangerous goods that have spilled or leaked are placed for purposes of carriage for recovery or disposal;

"Leakproofness test" means a test to determine the leakproofness of a tank, a packaging or an IBC and of the equipment and closure devices;

NOTE: *For portable tanks, see Chapter 6.7.*

"Light-gauge metal packaging" means a packaging of circular, elliptical, rectangular or polygonal cross-section (also conical) and taper-necked and pail-shaped packaging made of metal, having a wall thickness of less than 0.5 mm (e.g. tinplate), flat or convex bottomed and with one or more orifices, which is not covered by the definitions for drums or jerricans;

"Liner" means a tube or bag inserted into a packaging, including large packagings or IBCs, but not forming an integral part of it, including the closures of its openings;

"Liquid" means a substance which at 50 °C has a vapour pressure of not more than 300 kPa (3 bar), which is not completely gaseous at 20 °C and 101.3 kPa, and which

(a) Has a melting point or initial melting point of 20 °C or less at a pressure of 101.3 kPa; or

(b) Is liquid according to the ASTM D 4359-90 test method; or

(c) Is not pasty according to the criteria applicable to the test for determining fluidity (penetrometer test) described in 2.3.4;

NOTE: *"Carriage in the liquid state", for the purpose of tank requirements, means:*

- *Carriage of liquids according to the above definition; or*

- *Solids handed over for carriage in the molten state.*

"Liquefied natural gas (LNG)" means a refrigerated liquefied gas composed of natural gas with a high methane content assigned to UN No. 1972;

"Liquefied petroleum gas (LPG)" means a low pressure liquefied gas composed of one or more light hydrocarbons which are assigned to UN Nos. 1011, 1075, 1965, 1969 or 1978 only and which consists mainly of propane, propene, butane, butane isomers, butene with traces of other hydrocarbon gases;

NOTE 1: *Flammable gases assigned to other UN numbers shall not be regarded as LPG.*

NOTE 2: *For UN No. 1075 see NOTE 2 under 2F, UN No. 1965, in the table for Liquefied gases in 2.2.2.3.*

"Loader" means any enterprise which:

(a) Loads packaged dangerous goods, small containers or portable tanks into or onto a vehicle or a wagon or a container; or

(b) Loads a container, bulk-container, MEGC, tank-container or portable tank onto a vehicle or a wagon.

"Loading" means all actions carried out by the loader, in accordance with the definition of loader;

M

"Management system", for the carriage of radioactive material, means a set of interrelated or interacting elements (system) for establishing policies and objectives and enabling the objectives to be achieved in an efficient and effective manner;

"Manual of Tests and Criteria" means the seventh revised edition of the United Nations publication bearing this title (ST/SG/AC.10/11/Rev.7 and Amend.1);

"Mass of package" means gross mass of the package unless otherwise stated. The mass of containers and tanks used for the carriage of goods is not included in the gross mass;

"Maximum capacity" means the maximum inner volume of receptacles or packagings including intermediate bulk containers (IBCs) and large packagings expressed in cubic metres or litres;

"Maximum net mass" means the maximum net mass of contents in a single packaging or maximum combined mass of inner packagings and the contents thereof expressed in kilograms;

"Maximum normal operating pressure", for the carriage of radioactive material, means the maximum pressure above atmospheric pressure at mean sea-level that would develop in the containment system in a period of one year under the conditions of temperature and solar radiation corresponding to environmental conditions in the absence of venting, external cooling by an ancillary system, or operational controls during carriage;

"Maximum permissible gross mass"

(a) (for IBCs) means the mass of the IBC and any service or structural equipment together with the maximum net mass;

(b) (for tanks) means the tare of the tank and the heaviest load authorized for carriage;

NOTE: *For portable tanks, see Chapter 6.7.*

"Maximum working pressure (gauge pressure)" means the highest of the following three pressures that may occur at the top of the tank in the operating position:

(a) The highest effective pressure allowed in the tank during filling (maximum filling pressure allowed);

(b) The highest effective pressure allowed in the tank during discharge (maximum discharge pressure allowed); and

(c) The effective gauge pressure to which the tank is subjected by its contents (including such extraneous gases as it may contain) at the maximum working temperature.

Unless the special requirements prescribed in Chapter 4.3 provide otherwise, the numerical value of this working pressure (gauge pressure) shall not be lower than the vapour pressure (absolute pressure) of the filling substance at 50 °C.

For tanks equipped with safety valves (with or without bursting disc) other than tanks for the carriage of compressed, liquefied or dissolved gases of Class 2, the maximum working pressure (gauge pressure) shall however be equal to the prescribed opening pressure of such safety valves.

(See also *"Calculation pressure"*, *"Discharge pressure"*, *"Filling pressure"* and *"Test pressure"*);

NOTE 1: *Maximum working pressure is not applicable to gravity-discharge tanks according to 6.8.2.1.14 (a).*

NOTE 2: *For portable tanks, see Chapter 6.7.*

NOTE 3: *For closed cryogenic receptacles, see NOTE to 6.2.1.3.6.5.*

"Member of a vehicle crew" means a driver or any other person accompanying the driver for safety, security, training or operational reasons;

"Metal hydride storage system" means a single complete hydrogen storage system, including a pressure receptacle shell, metal hydride, pressure relief device, shut-off valve, service equipment and internal components used for the carriage of hydrogen only;

"Metal IBC" means a metal body together with appropriate service and structural equipment;

"Mild steel" means a steel having a minimum tensile strength between 360 N/mm² and 440 N/mm²;

NOTE: *For portable tanks, see Chapter 6.7.*

"Mobile explosives manufacturing unit" (MEMU) see *"mobile processing unit";*

"Mobile processing unit" (MPU) means a unit, or a vehicle mounted with a unit, for manufacturing and charging explosives from dangerous goods that are not explosives. The unit consists of various tanks and bulk containers and process equipment as well as pumps and related equipment. The MPU may have special compartments for packaged explosives;

NOTE 1: *Even though the definition of MPU includes the expression "manufacturing and charging explosives" the requirements for MPUs apply only to carriage and not to manufacturing and charging of explosives.*

NOTE 2: *Mobile processing units are also known as mobile explosives manufacturing units (MEMUs)*

"Multiple-element gas container" (MEGC) means a unit containing elements which are linked to each other by a manifold and mounted on a frame. The following elements are considered to be elements of a multiple-element gas container: cylinders, tubes, pressure drums or bundles of cylinders as well as tanks for the carriage of gases as defined in 2.2.2.1.1 having a capacity of more than 450 litres;

NOTE: *For UN MEGCs, see Chapter 6.7.*

N

"Net explosive mass (NEM)" means the total mass of the explosive substances, without the packagings, casings, etc. (*net explosive quantity (NEQ)*, *net explosive contents (NEC)*, *net explosive weight (NEW)* or *net mass of explosive contents* are often used to convey the same meaning);

"Neutron radiation detector" means a device that detects neutron radiation. In such a device, a gas may be contained in a hermetically sealed electron tube transducer that converts neutron radiation into a measureable electric signal;

"N.O.S. entry (not otherwise specified entry)" means a collective entry to which substances, mixtures, solutions or articles may be assigned if they:

(a) Are not mentioned by name in Table A of Chapter 3.2; and

(b) Exhibit chemical, physical and/or dangerous properties corresponding to the Class, classification code, packing group and the name and description of the n.o.s. entry;

O

"Offshore bulk container" means a bulk container specially designed for repeated use for carriage to, from and between offshore facilities. An offshore bulk container is designed and constructed in accordance with the guidelines for the approval of offshore containers handled in open seas specified by the International Maritime Organization (IMO) in document MSC/Circ.860;

"Open container", see *"Container";*

"Open cryogenic receptacle" means a transportable thermally insulated receptacle for refrigerated liquefied gases maintained at atmospheric pressure by continuous venting of the refrigerated liquefied gas;

"Open vehicle" means a vehicle the platform of which has no superstructure or is merely provided with side boards and a tailboard;

"Open wagon" means a wagon with or without side boards and a tailboard, the loading surfaces of which are open;

"Outer packaging" means the outer protection of the composite or combination packaging together with any absorbent materials, cushioning and any other components necessary to contain and protect inner receptacles or inner packagings;

"Over-moulded cylinder" means a cylinder intended for the carriage of LPG with a water capacity not exceeding 13 litres made of a coated welded steel inner cylinder shell with an over-moulded protective case made from cellular plastic, which is non-removable and bonded to the outer surface of the steel cylinder shell wall;

"Overpack" means an enclosure used (by a single consignor in the case of radioactive material) to contain one or more packages, consolidated into a single unit easier to handle and stow during carriage;

Examples of overpacks:

(a) A loading tray such as a pallet, on which several packages are placed or stacked and secured by a plastics strip, shrink or stretch wrapping or other appropriate means; or

(b) An outer protective packaging such as a box or a crate;

P

"Package" means the complete product of the packing operation, consisting of the packaging or large packaging or IBC and its contents prepared for dispatch. The term includes receptacles for gases as defined in this section as well as articles which, because of their size, mass or configuration may be carried unpackaged or carried in cradles, crates or handling devices. Except for the carriage of radioactive material, the term does not apply to goods which are carried in bulk, nor to substances carried in tanks;

NOTE: *For radioactive material, see 2.2.7.2, 4.1.9.1.1 and Chapter 6.4.*

"Packaging" means one or more receptacles and any other components or materials necessary for the receptacles to perform their containment and other safety functions (see also *"Combination packaging", "Composite packaging", "Inner packaging", "Intermediate bulk container (IBC)", "Intermediate packaging", "Large packaging", "Light-gauge metal packaging", "Outer packaging", "Reconditioned packaging", "Remanufactured packaging", "Reused packaging", "Salvage packaging"* and *"Sift-proof packaging")*;

"Packer" means any enterprise which puts dangerous goods into packagings, including large packagings and intermediate bulk containers (IBCs) and, where necessary, prepares packages for carriage;

"Packing group" means a group to which, for packing purposes, certain substances may be assigned in accordance with their degree of danger. The packing groups have the following meanings which are explained more fully in Part 2:

Packing group I: Substances presenting high danger;

Packing group II: Substances presenting medium danger; and

Packing group III: Substances presenting low danger;

"Portable tank" means a multimodal tank having, when used for the carriage of gases as defined in 2.2.2.1.1, a capacity of more than 450 litres in accordance with the definitions in Chapter 6.7 or the IMDG Code and indicated by a portable tank instruction (T-Code) in Column (10) of Table A of Chapter 3.2;

"Portable tank operator", see *"Tank-container/portable tank operator"*;

"Pressure drum" means a welded pressure receptacle of a water capacity exceeding 150 litres and of not more than1 000 litres, (e.g. cylindrical receptacles equipped with rolling hoops, spheres on skids);"

"Pressure receptacle" means a transportable receptacle intended for holding substances under pressure including its closure(s) and other service equipment and is a collective term that includes cylinders, tubes, pressure drums, closed cryogenic receptacles, metal hydride storage systems, bundles of cylinders and salvage pressure receptacles;

"pressure receptacle legislation" means legislation relating to the design, registration and use of pressure receptacles in the jurisdiction where the pressure receptacle is transported.

NOTE: *Pressure receptacles are treated as plant requiring registration under the model work health and safety laws, as implemented in each state and territory in Australia. This legislation includes a system of mutual recognition of registration.*

"Pressure receptacle shell" means a cylinder, a tube, a pressure drum or a salvage pressure receptacle without its closures or other service equipment, but including any permanently attached device(s) (e.g. neck ring, foot ring);

NOTE: *The terms "cylinder shell", "pressure drum shell" and "tube shell" are also used.*

"Pressurized gas cartridge", see *"Aerosol* or *aerosol dispenser"*;

"Protected IBC" (for metal IBCs) means an IBC provided with additional protection against impact, the protection taking the form of, for example, a multi-layer (sandwich) or double-wall construction, or a frame with a metal lattice-work casing;

"Protective lining" (for tanks) means a lining or coating protecting the metallic tank material against the substances to be carried;

NOTE: *This definition does not apply to a lining or coating used only to protect the substance to be carried.*

Q

"Quality assurance" means a systematic programme of controls and inspections applied by any organization or body which is aimed at providing confidence that the safety prescriptions in this Code are met in practice;

R

"Radiation detection system" means an apparatus that contains radiation detectors as components;

"Radioactive contents", for the carriage of radioactive material, mean the radioactive material together with any contaminated or activated solids, liquids, and gases within the packaging;

"Railway infrastructure" means all tracks and fixed equipment necessary for the movement of rail traffic and transport safety;

"Railway infrastructure manager" means any public body or undertaking responsible in particular for establishing or maintaining the railway infrastructure, and for managing the control and safety systems;

"Railway vehicle" means a vehicle suitable to circulate on its own wheels on railway lines with or without traction;

NOTE: A *Railway vehicle* is also referred to as rolling stock.

"Receptacle" (Class 1) includes boxes, bottles, cans, drums, jars and tubes, including any means of closure used in the inner or intermediate packaging;

"Receptacle" means a containment vessel for receiving and holding substances or articles, including any means of closing. This definition does not apply to shells (see also *"Closed cryogenic receptacle", "Open cryogenic receptacles", "Inner receptacle", "Pressure receptacle", "Rigid inner receptacle"* and *"Gas cartridge"*);

"Reconditioned packaging" means in particular

(a) Metal drums that are:

(i) cleaned to original materials of construction, with all former contents, internal and external corrosion, and external coatings and labels removed;

(ii) restored to original shape and contour, with chimes (if any) straightened and sealed and all non-integral gaskets replaced; and

(iii) inspected after cleaning but before painting, with rejection of packagings with visible pitting, significant reduction in the material thickness, metal fatigue, damaged threads or closures or other significant defects;

(b) Plastics drums and jerricans that:

(i) are cleaned to original materials of construction, with all former contents, external coatings and labels removed;

(ii) have all non-integral gaskets replaced; and

(iii) are inspected after cleaning with rejection of packagings with visible damage such as tears, creases or cracks, or damaged threads or closures or other significant defects;

"Recycled plastics material" means material recovered from used industrial packagings that has been cleaned and prepared for processing into new packagings. The specific properties of the recycled material used for production of new packagings shall be assured and documented regularly as part of a quality assurance programme recognized by the competent authority. The quality assurance programme shall include a record of proper pre-sorting and verification that each batch of recycled plastics material has the proper melt flow rate, density, and tensile yield strength, consistent with that of the design type manufactured from such recycled material. This necessarily includes knowledge about the packaging material from which the recycled plastics have been derived, as well as awareness of the prior contents of those packagings if those prior contents might reduce the capability of new packagings produced using that material. In addition, the packaging manufacturer's quality assurance programme under 6.1.1.4 shall include performance of the mechanical design type test in 6.1.5 on packagings manufactured from each batch of recycled plastics material. In this testing, stacking performance may be verified by appropriate dynamic compression testing rather than static load testing;

NOTE: *ISO 16103:2005 "Packaging – Transport packages for dangerous goods – Recycled plastics material", provides additional guidance on procedures to be followed in approving the use of recycled plastics material. These guidelines have been developed based on the experience of the manufacturing of drums and jerricans from recycled plastics material and as such may need to be adapted for other types of packagings, IBCs and large packagings made of recycled plastics material.*

"Reel" (Class 1) means a device made of plastics, wood, fibreboard, metal or other suitable material comprising a central spindle with, or without, side walls at each end of the spindle. Articles and substances can be wound onto the spindle and may be retained by side walls;

"Reference steel" means a steel with a tensile strength of 370 N/mm² and an elongation at fracture of 27 %;

"Remanufactured IBC", see *"Intermediate Bulk Container* (*IBC)"*;

"Remanufactured large packaging" means a metal or rigid plastics large packaging that:

(a) Is produced as a UN type from a non-UN type; or

(b) Is converted from one UN design type to another UN design type.

Remanufactured large packagings are subject to the same requirements of this Code that apply to new large packagings of the same type (see also design type definition in 6.6.5.1.2);

"Remanufactured packaging" means in particular

(a) Metal drums that:

(i) are produced as a UN type complying with the requirements of Chapter 6.1 from a non-UN type;

(ii) are converted from one UN type complying with the requirements of Chapter 6.1 to another UN type; or

(iii) undergo the replacement of integral structural components (such as non-removable heads);

(b) Plastics drums that:

(i) are converted from one UN type to another UN type (e.g. 1H1 to 1H2); or

(ii) undergo the replacement of integral structural components.

Remanufactured drums are subject to the requirements of Chapter 6.1 which apply to new drums of the same type;

"Repaired IBC", see *"Intermediate Bulk Container* (*IBC)";*

"Reused large packaging" means a large packaging to be refilled which has been examined and found free of defects affecting the ability to withstand the performance tests; the term includes those which are refilled with the same or similar compatible contents and are carried within distribution chains controlled by the consignor of the product;

"Reused packaging" means a packaging which has been examined and found free of defects affecting the ability to withstand the performance tests. The term includes those which are refilled with the same or similar compatible contents and are carried within distribution chains controlled by the consignor of the product;

"Rigid inner receptacle" (for composite IBCs) means a receptacle which retains its general shape when empty without its closures in place and without benefit of the outer casing. Any inner receptacle that is not "rigid" is considered to be "flexible";

"Rigid plastics IBC" means a rigid plastics body, which may have structural equipment together with appropriate service equipment;

"Routine maintenance of flexible IBCs", see *"Intermediate Bulk Container* (*IBC)"*;

"Routine maintenance of rigid IBCs", see *"Intermediate Bulk Container* (*IBC)"*;

S

"Safety valve" means a spring-loaded device which is activated automatically by pressure the purpose of which is to protect the tank against unacceptable excess internal pressure;

"Salvage packaging" means a special packaging into which damaged, defective, leaking or non-conforming dangerous goods packages, or dangerous goods that have spilled or leaked are placed for purposes of carriage for recovery or disposal;

"Salvage pressure receptacle" means a pressure receptacle with a water capacity not exceeding 3 000 litres into which are placed damaged, defective, leaking or non-conforming pressure receptacle(s) for the purpose of carriage e.g. for recovery or disposal;

"Self-accelerating decomposition temperature" (SADT), means the lowest temperature at which self-accelerating decomposition may occur in a substance in the packaging, IBC or tank as offered for carriage. The SADT shall be determined in accordance with the test procedures given in Part II, Section 28 of the Manual of Tests and Criteria;

"Self-accelerating polymerization temperature (SAPT)" means the lowest temperature at which self-accelerating polymerization may occur with a substance in the packaging, IBC or tank as offered for carriage. The SAPT shall be determined in accordance with the test procedures established for the self-accelerating decomposition temperature for self-reactive substances in accordance with Part II, section 28 of the Manual of Tests and Criteria;

"Service equipment"

(a) Of the tank means filling and discharge, breather, safety, heating, heat insulating and additive devices and measuring instruments;

(b) Of the elements of a battery-vehicle or of a MEGC means filling and discharge devices, including the manifold, safety devices and measuring instruments;

(c) Of an IBC means the filling and discharge devices and any pressure-relief or venting, safety, heating and heat insulating devices and measuring instruments;

(d) Of a pressure receptacle, means closures, manifolds, piping, porous, absorbent or adsorbent material and any structural devices, e.g. for handling;

NOTE: *For portable tanks, see Chapter 6.7.*

"Service life", for composite cylinders and tubes, means the number of years the cylinder or tube is permitted to be in service;

"Settled pressure" means the pressure of the contents of a pressure receptacle in thermal and diffusive equilibrium;

"Sheeted bulk container", see *"Bulk container"*;

"Sheeted container", see *"Container"*;

"Sheeted vehicle" means a curtain sided vehicle with a solid roof structure supported by a headboard and tailboard;

"Shell" (for tanks), means the part of the tank which retains the substance intended for carriage, including openings and their closures, but does not include service equipment or external structural equipment;

NOTE: *For portable tanks, see Chapter 6.7.*

"Sift-proof packaging" means a packaging impermeable to dry contents, including fine solid material produced during carriage;

"Small container", see *"Container"*;

"Small receptacle containing gas (gas cartridge)" means a non-refillable receptacle having a water capacity not exceeding 1000 ml for receptacles made of metal and not exceeding 500 ml for receptacles made of synthetic material or glass, containing, under pressure, a gas or a mixture of gases. It may be fitted with a valve;

"Solid" means:

(a) A substance with a melting point or initial melting point of more than 20 °C at a pressure of 101.3 kPa; or

(b) A substance which is not liquid according to the ASTM D 4359-90 test method or which is pasty according to the criteria applicable to the test for determining fluidity (penetrometer test) described in 2.3.4;

"Structural equipment"

(a) For tanks of a tank-vehicle, tank-wagon or demountable tank, means the external or internal reinforcing, fastening, protective or stabilizing members of the shell;

(b) For tanks of a tank-container, means the external or internal reinforcing, fastening, protective or stabilizing members of the shell;

(c) For elements of a tube-vehicle, tube-wagon or an MEGC means the external or internal reinforcing, fastening, protective or stabilizing members of the shell or receptacle;

(d) For IBCs other than flexible IBCs means the reinforcing, fastening, handling, protective or stabilizing members of the body (including the base pallet for composite IBCs with plastics inner receptacle);

NOTE: *For portable tanks, see Chapter 6.7.*

"Swap body", see *"Container"*;

T

"Tank" means a shell, including its service and structural equipment. When used alone, the term tank means a tank-container, portable tank, demountable tank or fixed tank as defined in this Section, including tanks forming elements of tube-vehicles, tube-wagons or MEGCs (see also *"Demountable tank"*, *"Fixed tank"*, *"Portable tank"* and *"Multiple-element gas container"*);

"Tank-container" means an article of transport equipment meeting the definition of a container, and comprising a shell and items of equipment, including the equipment to facilitate movement of the tank-container without significant change of attitude, used for the carriage of gases, liquid, powdery or granular substances and, when used for the carriage of gases as defined in 2.2.2.1.1, having a capacity of more than 0.45 m³ (450 litres);

NOTE: *IBCs which meet the requirements of Chapter 6.5 are not considered to be tank-containers.*

"Tank-container or portable tank operator" means any enterprise in whose name the tank-container or portable tank is operated;

In addition:

"Extra-large tank-container" means a tank-container with a capacity of more than 40 000 litres.

"Tank record" means a file containing all the important technical information concerning a tank, a battery-vehicle or a MEGC, such as certificates referred to in 6.8.2.3, 6.8.2.4 and 6.8.3.4;

"Tank swap body" is considered to be a tank-container;

"Tank-vehicle" means a vehicle built to carry liquids, gases or powdery or granular substances and comprising one or more fixed tanks. In addition to the vehicle proper, or the units of running gear used in its stead, a tank-vehicle comprises one or more shells, their items of equipment and the fittings for attaching them to the vehicle or to the running-gear units;

"Tank-wagon" means a *wagon* intended for the *carriage* of *liquids*, *gases*, powdery or granular substances, comprising a superstructure, consisting of one or more *tanks* and an underframe fitted with its own items of equipment (running gear, suspension, buffing, traction, braking gear and inscriptions);

NOTE: *Tank-wagon* also includes *wagons* with *demountable tanks*.

"Tank-wagon operator" means any *enterprise* in whose name the *tank-wagon* is registered or approved for transport;

NOTE: *Tank-wagon operator* may also be referred to as a rolling stock operator.

"Technical name" means a recognized chemical name, if relevant a biological name, or other name currently used in scientific and technical handbooks, journals and texts (see 3.1.2.8.1.1);

"Telephone advisory service" means a service providing access by telephone to persons competent to give advice about:

(a) the construction and properties of the receptacles in which the dangerous goods are being transported; and
(b) the use of equipment on vehicles on which the dangerous goods are being transported; and
(c) the properties of the dangerous goods; and
(d) methods of safely handling the dangerous goods; and
(e) methods of safely containing and controlling the dangerous goods in a dangerous situation.

"Test pressure" means the required pressure applied during a pressure test for initial or periodic inspection (see also *"Calculation pressure"*, *"Discharge pressure"*, *"Filling pressure"* and *"Maximum working pressure (gauge pressure)"*);

NOTE: *For portable tanks, see Chapter 6.7.*

"Through or into", for the carriage of radioactive material, means through or into the countries in which a consignment is carried but specifically excludes countries "over" which a consignment is carried by air provided that there are no scheduled stops in those countries;

"Transport index (TI)" assigned to a package, overpack or container, or to unpackaged LSA-I or SCO-I or SCO-III, for the carriage of radioactive material, means a number which is used to provide control over radiation exposure;

"Transport unit" means a motor vehicle without an attached trailer, or a combination consisting of a motor vehicle and an attached trailer;

"Tray" (Class 1) means a sheet of metal, plastics, fibreboard or other suitable material which is placed in the inner, intermediate or outer packaging and achieves a close-fit in such packaging. The surface of the tray may be shaped so that packagings or articles can be inserted, held secure and separated from each other;

"Tube" (Class 2) means a pressure receptacle of seamless or composite construction having a water capacity exceeding 150 litres and of not more than 3 000 litres;

"Tube-vehicle" means a vehicle containing elements which are linked to each other by a manifold and permanently fixed to this vehicle. The following elements are considered to be elements of a tube-vehicle: cylinders, tubes, bundles of cylinders (also known as frames), pressure drums as well as tanks destined for the carriage of gases as defined in 2.2.2.1.1 with a capacity of more than 450 litres;

"Tube-wagon" means a *wagon* containing elements which are linked to each other by a manifold and permanently fixed to this *wagon*. The following elements are considered to be elements of a tube-wagon: *cylinders*, *tubes*, *bundles of cylinders* (also known as frames), *pressure drums* as well as *tanks* destined for the carriage of *gases* as defined in 2.2.2.1.1 with a capacity of more than 450 litres;

U

"UIC" means the International Union of Railways (UIC, 16 rue Jean Rey, F-75015 Paris);

"Undertaking", see *"Enterprise"*;

"Unloader" means any enterprise which:

(a) Removes a container, bulk-container, MEGC, tank-container or portable tank from a vehicle; or

(b) Unloads packaged dangerous goods, small containers or portable tanks out of or from a vehicle or a container; or

(c) Discharges dangerous goods from a tank (tank-vehicle, demountable tank, portable tank or tank-container) or from a battery-vehicle, MEMU or MEGC or from a vehicle, large container or small container for carriage in bulk or a bulk-container;

"Unloading" means all actions carried out by the unloader, in accordance with the definition of unloader;

"UN Model Regulations" means the Model Regulations annexed to the twenty-second revised edition of the Recommendations on the Transport of Dangerous Goods published by the United Nations (ST/SG/AC.10/1/Rev.22);

"UN number" means the four-figure identification number of the substance or article taken from the UN Model Regulations;

"UN Regulation" means a regulation annexed to the Agreement concerning the adoption of uniform technical prescriptions for wheeled vehicles equipment and parts which can be fitted and or used on wheeled vehicles and the conditions for reciprocal recognition of approvals granted on the basis of these prescriptions (1958 Agreement, as amended);

V

"Vacuum-operated waste tank" means a fixed tank, demountable tank, tank-container or tank swap body primarily used for the carriage of dangerous wastes, with special constructional features and/or equipment to facilitate the filling and discharging of wastes as specified in Chapter 6.10. A tank which fully complies with the requirements of Chapter 6.7 or 6.8 is not considered to be a vacuum-operated waste tank;

"Vacuum valve" means a spring-loaded device which is activated automatically by pressure the purpose of which is to protect the tank against unacceptable negative internal pressure;

"Vehicle" see *"Battery-vehicle", "Closed vehicle", "Open vehicle", "Sheeted vehicle"* and *"Tank-vehicle";*

W

"Wagon" means a railway vehicle, not provided with a means of traction, which is intended to carry goods (see also tube-wagon, closed wagon, open wagon, sheeted wagon and tank-wagon);

"Wastes" means substances, solutions, mixtures or articles for which no direct use is envisaged but which are transported for reprocessing, dumping, elimination by incineration or other methods of disposal;

"Wooden barrel" means a packaging made of natural wood, of round cross-section, having convex walls, consisting of staves and heads and fitted with hoops;

"Wooden IBC" means a rigid or collapsible wooden body, together with an inner liner (but no inner packaging) and appropriate service and structural equipment;

"Working pressure"

(a) For a compressed gas, means the settled pressure at a reference temperature of 15 °C in a full pressure receptacle;

(b) For UN 1001 acetylene, dissolved, means the calculated settled pressure at a uniform reference temperature of 15 °C in an acetylene cylinder containing the specified solvent content and the maximum acetylene content;

(c) For UN 3374 acetylene, solvent free, means the working pressure which was calculated for the equivalent cylinder for UN 1001 acetylene, dissolved;

NOTE: *For tanks, see "Maximum working pressure".*

"Woven plastics" (for flexible IBCs) means a material made from stretch tapes or monofilaments of suitable plastics material.

1.2.2 Units of measurement

1.2.2.1 The following units of measurement [a] are applicable in this Code:

Measurement of	SI Unit [b]	Acceptable alternative unit	Relationship between units
Length	m (metre)	-	-
Area	m^2 (square metre)	-	-
Volume	m^3 (cubic metre)	*l* [c] (litre)	1 *l* = 10^{-3} m^3
Time	s (second)	min (minute)	1 min = 60 s
		h (hour)	1 h = 3 600 s
		d (day)	1 d = 86 400 s
Mass	kg (kilogram)	g (gram)	1g = 10^{-3} kg
		t (ton)	1 t = 10^3 kg
Mass density	kg/m^3	kg/l	1 kg/l = 10^3 kg/m^3
Temperature	K (kelvin)	°C (degree Celsius)	0 °C = 273.15 K
Temperature difference	K (kelvin)	°C (degree Celsius)	1 °C = 1 K
Force	N (newton)	-	1 N = 1 $kg.m/s^2$
Pressure	Pa (pascal)		1 Pa = 1 N/m^2
		bar (bar)	1 bar = 10^5 Pa
Stress	N/m^2	N/mm^2	1 N/mm^2 = 1 MPa
Work		kWh (kilowatt hours)	1 kWh = 3.6 MJ
Energy	J (joule)		1 J = 1 N.m = 1 W.s
Quantity of heat		eV (electronvolt)	1 eV = 0.1602 H 10^{-18}J
Power	W (watt)	-	1 W = 1 J/s = 1 N.m/s
Electrical resistance	Ω (ohm)	-	1 Ω = 1 kg · m^2 / s^3 / A^2
Kinematic viscosity	m^2/s	mm^2/s	1 mm^2/s = 10^{-6} m^2/s
Dynamic viscosity	Pa.s	mPa.s	1 mPa.s = 10^{-3} Pa.s
Activity	Bq (becquerel)		
Dose equivalent	Sv (sievert)		

[a] *The following round figures are applicable for the conversion of the units hitherto used into SI Units.*

Force

1 kg = 9.807 N
1 N = 0.102 kg

Stress

1 kg/mm² = 9.807 N/mm²
1 N/mm² = 0.102 kg/mm²

Pressure

1 Pa = 1 N/m²	*= 10^{-5} bar*	*= 1.02×10^{-5} kg/cm²*	*= 0.75×10^{-2} torr*
1 bar = 10^5 Pa	*= 1.02 kg/cm²*	*= 750 torr*	
1 kg/cm² = 9.807×10^4 Pa	*= 0.9807 bar*	*= 736 torr*	
1 torr = 1.33×10^2 Pa	*= 1.33×10^{-3} bar*	*= 1.36×10^{-3} kg/cm²*	

Energy, Work, Quantity of heat

1 J = 1 N.m	*= 0.278×10^{-6} kWh*	*= 0.102 kgm*	*= 0.239×10^{-3} kcal*
1 kWh = 3.6×10^6 J	*= 367×10^3 kgm*	*= 860 kcal*	
1 kgm = 9.807 J	*= 2.72×10^{-6} kWh*	*= 2.34×10^{-3} kcal*	
1 kcal = 4.19×10^3 J	*= 1.16×10^{-3} kWh*	*= 427 kgm*	

Power

1 W = 0.102 kgm/s	*= 0.86 kcal/h*	
1 kgm/s = 9.807 W	*= 8.43 kcal/h*	
1 kcal/h = 1.16 W	*= 0.119 kgm/s*	

Kinematic viscosity

1 m²/s = 10^4 St (Stokes)
1 St = 10^{-4} m²/s

Dynamic viscosity

1 Pa.s = 1 N.s/m²	*= 10 P (poise)*	*= 0.102 kg.s/m²*	
1 P = 0.1 Pa.s	*= 0.1 N.s/m²*	*= 1.02×10^{-2} kg.s/m²*	
1 kg.s/m² = 9.807 Pa.s	*= 9.807 N.s/m²*	*= 98.07 P*	

[b] *The International System of Units (SI) is the result of decisions taken at the General Conference on Weights and Measures (Address: Pavillon de Breteuil, Parc de St-Cloud, F-92 310 Sèvres).*

[c] *The abbreviation "L" for litre may also be used in place of the abbreviation "l" when a typewriter cannot distinguish between figure "1" and letter "l".*

The decimal multiples and sub-multiples of a unit may be formed by prefixes or symbols, having the following meanings, placed before the name or symbol of the unit:

Factor			Prefix	Symbol
1 000 000 000 000 000 000	= 10^{18}	quintillion	exa	E
1 000 000 000 000 000	= 10^{15}	quadrillion	peta	P
1 000 000 000 000	= 10^{12}	trillion	tera	T
1 000 000 000	= 10^{9}	billion	giga	G
1 000 000	= 10^{6}	million	mega	M
1 000	= 10^{3}	thousand	kilo	k
100	= 10^{2}	hundred	hecto	h
10	= 10^{1}	ten	deca	da
0.1	= 10^{-1}	tenth	deci	d
0.01	= 10^{-2}	hundredth	centi	c
0.001	= 10^{-3}	thousandth	milli	m
0.000 001	= 10^{-6}	millionth	micro	µ
0.000 000 001	= 10^{-9}	billionth	nano	n
0.000 000 000 001	= 10^{-12}	trillionth	pico	p
0.000 000 000 000 001	= 10^{-15}	quadrillionth	femto	f
0.000 000 000 000 000 001	= 10^{-18}	quintillionth	atto	a

NOTE: *10^{9} billion is United Nations usage in English. By analogy, so is 10^{-9} = 1 billionth.*

1.2.2.2 Unless expressly stated otherwise, the sign "%" in this Code represents:

(a) In the case of mixtures of solids or of liquids, and also in the case of solutions and of solids wetted by a liquid, a percentage mass based on the total mass of the mixture, the solution or the wetted solid;

(b) In the case of mixtures of compressed gases, when filled by pressure, the proportion of the volume indicated as a percentage of the total volume of the gaseous mixture, or, when filled by mass, the proportion of the mass indicated as a percentage of the total mass of the mixture;

(c) In the case of mixtures of liquefied gases and dissolved gases, the proportion of the mass indicated as a percentage of the total mass of the mixture.

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

1.2.2.4 Where this Code specifies a degree of filling for receptacles, this is always related to a reference temperature of the substances of 15 °C, unless some other temperature is indicated.

1.2.3 List of abbreviations

In this Code, abbreviations, acronyms and abbreviated designations of regulatory texts are used, with the following meaning:

A

"ADN"[*] means the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways;

"ASTM" means the American Society for Testing and Materials (ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959, United States of America), www.astm.org;

[*] *The acronym "ADN" corresponds to the French term "Accord européen relatif au transport international des marchandises dangereuses par voies de navigation intérieures".*

C

"CGA" means the Compressed Gas Association, 8484 Westpark Drive, Suite 220, McLean, Virginia 22102, United States of America, www.cganet.com;

*"CIM"*** means the Uniform Rules Concerning the Contract of International Carriage of Goods by Rail (Appendix B to the Convention concerning International Carriage by Rail (COTIF)), as amended;

*"CMR"**** means the Convention on the Contract for the International Carriage of Goods by Road (Geneva, 19 May 1956), as amended;

"CNG" means compressed natural gas (see 1.2.1);

"CSC" means the International Convention for Safe Containers (Geneva, 1972) as amended and published by the International Maritime Organization (IMO), London;

"CSI" means criticality safety index (see 1.2.1);

E

"EIGA" means European Industrial Gas Association, 30 Avenue de l'Astronomie, 1210 Brussels (Belgium), www.eiga.eu;

"EN" (standard) means a European standard published by the European Committee for Standardization (CEN) (CEN, Avenue Marnix 17, B-1000 Brussels, Belgium), www.cen.eu;

F

"FRP" means fibre-reinforced plastics (see 1.2.1);

G

"GHS" means Globally Harmonized System of Classification and Labelling of Chemicals (see 1.2.1);

I

"IAEA" means the International Atomic Energy Agency, P.O. Box 100, 1400 Vienna, Austria, www.iaea.org;

"IBC" means intermediate bulk container (see 1.2.1);

"ICAO" means the International Civil Aviation Organization, 999 University Street, Montreal, Quebec H3C 5H7, Canada, www.icao.org;

"IMDG" see definition of "IMDG Code" in 1.2.1;

"IMO" means the International Maritime Organization, 4 Albert Embankment, London SE1 7SR, United Kingdom, www.imo.org;

"ISO" (standard) means an international standard published by the International Organization for Standardization, 1, rue de Varembé, 1204 Geneva 20, Switzerland, www.iso.org;

L

"LNG" means liquefied natural gas (see 1.2.1);

"LPG" means liquefied petroleum gas (see 1.2.1);

** *The acronym "CIM" corresponds to the French term "Contrat de transport international ferroviaire de marchandises".*

*** *The acronym "CMR" corresponds to the French term "Convention relative au contrat de transport international de marchandises par route".*

"LSA" (material) means low specific activity material (see 2.2.7.1.3);

M

"MEGC" means multiple-element gas container (see 1.2.1);

"MEMU" means mobile explosives manufacturing unit (see 1.2.1);

N

"N.O.S." means not otherwise specified entry (see 1.2.1);

R

"RID" means Regulations concerning the International Carriage of Dangerous Goods by Rail (Appendix C of COTIF (Convention concerning international carriage by rail));

S

"SADT" means self-accelerating decomposition temperature (see 1.2.1);

"SAPT" means self-accelerating polymerization temperature (see 1.2.1);

"SCO" means surface contaminated object (see 2.2.7.1.3);

T

"TI" means transport index (see 1.2.1);

U

"UIC"[†] means the International Union of Railways, 16 rue Jean Rey, 75015 Paris, France, www.uic.org;

"UNECE" means the United Nations Economic Commission for Europe, Palais des Nations, 8-14 avenue de la Paix, 1211 Geneva 10, Switzerland, www.unece.org.

[†] *The acronym "UIC" corresponds to the French term "Union internationale des chemins de fer".*

CHAPTER 1.3

TRAINING OF PERSONS INVOLVED IN THE CARRIAGE OF DANGEROUS GOODS

1.3.1 Scope and applicability

Persons employed by the participants referred to in Chapter 1.4, whose duties concern the carriage of dangerous goods, shall be trained in the requirements governing the carriage of such goods appropriate to their responsibilities and duties. Employees shall be trained in accordance with 1.3.2 before assuming responsibilities and shall only perform functions, for which required training has not yet been provided, under the direct supervision of a trained person. Training requirements specific to security of dangerous goods in Chapter 1.10 shall also be addressed.

NOTE 1: *Reserved*

NOTE 2: *With regard to the training of the vehicle crew, see Chapter 8.2 instead of this section.*

NOTE 3: *For training with regard to Class 7, see also 1.7.2.5.*

1.3.2 Nature of the training

The training shall take the following form, appropriate to the responsibility and duties of the individual concerned.

1.3.2.1 *General awareness training*

Personnel shall be familiar with the general requirements of the provisions for the carriage of dangerous goods.

1.3.2.2 *Function-specific training*

Personnel shall be trained, commensurate directly with their duties and responsibilities in the requirements of the regulations concerning the carriage of dangerous goods.

Where the carriage of dangerous goods involves a multimodal transport operation, the personnel shall be aware of the requirements concerning other transport modes.

1.3.2.3 *Safety training*

Commensurate with the degree of risk of injury or exposure arising from an incident involving the carriage of dangerous goods, including loading and unloading, personnel shall be trained in the hazards and dangers presented by dangerous goods.

The training provided shall aim to make personnel aware of the safe handling and emergency response procedures.

1.3.2.4 The training shall be periodically supplemented with refresher training to take account of changes in regulations.

1.3.3 Documentation

Records of training received according to this Chapter shall be kept by the employer and made available to the employee or competent authority, upon request. Records shall be kept by the employer for a period of time established by the competent authority. Records of training shall be verified upon commencing a new employment.

CHAPTER 1.4

SAFETY OBLIGATIONS OF THE PARTICIPANTS

1.4.1 General safety measures

1.4.1.1 The participants in the carriage of dangerous goods shall take appropriate measures according to the nature and the extent of foreseeable dangers, so as to avoid damage or injury and, if necessary, to minimize their effects. They shall, in all events, comply with the requirements of this Code in their respective fields.

NOTE: *All participants in the transport of dangerous goods have an obligation to ensure that the transport complies with this Code. Where a non-compliance is identified, the transport operation shall be safely halted, and the non-compliance rectified. Where other parties may be affected by the non-compliance, they shall be notified of the non-compliance so they may take appropriate action.*

For example, where a driver determines that a vehicle they have been assigned does not comply with this Code, they shall inform the carrier who assigned the vehicle so it may be properly rectified.

1.4.1.2 When there is an immediate risk that public safety may be jeopardized, the participants shall immediately notify the emergency services and shall make available to them the information they require to take action.

1.4.1.3 This Code may specify certain of the obligations falling to the various participants.

The requirements of 1.2.1, 1.4.2 and 1.4.3 concerning the definitions of participants and their respective obligations shall not affect the provisions of laws concerning the legal consequences (criminal nature, liability, etc.) stemming from the fact that the participant in question is e.g. a legal entity, a self-employed worker, an employer or an employee.

1.4.2 Obligations of the main participants

NOTE 1: *Several participants to which safety obligations are assigned in this section may be one and the same enterprise. Also, the activities and the corresponding safety obligations of a participant can be assumed by several enterprises.*

NOTE 2: *For radioactive material, see also 1.7.6.*

1.4.2.1 *Consignor*

1.4.2.1.1 The consignor of dangerous goods is required to hand over for carriage only consignments which conform to the requirements of this Code. In the context of 1.4.1, they shall in particular:

(a) Ascertain that the dangerous goods are classified and authorized for carriage in accordance with this Code;

(b) Furnish the carrier with information and data in a traceable form and, if necessary, the required transport documents and accompanying documents (authorizations, approvals, notifications, certificates, etc.), taking into account in particular the requirements of Chapter 5.4 and of the tables in Part 3;

(c) Use only packagings, large packagings, intermediate bulk containers (IBCs) and tanks (tank-vehicles, tank-wagons, demountable tanks, tube-vehicles, tube-wagons, MEGCs, portable tanks and tank-containers) approved for and suited to the carriage of the substances concerned and bearing the marks prescribed by this Code;

(d) Comply with the requirements on the means of dispatch and on forwarding restrictions;

(e) Ensure that even empty uncleaned and not degassed tanks (tank-vehicles, tank-wagons, demountable tanks, tube-vehicles, tube-wagons, MEGCs, portable tanks and tank-containers) or empty uncleaned vehicles, wagons and bulk containers are placarded, marked and labelled in accordance with Chapter 5.3 and that empty uncleaned tanks are closed and present the same degree of leakproofness as if they were full.

1.4.2.1.2 If the consignor uses the services of other participants (packer, loader, filler, etc.), they shall take appropriate measures to ensure that the consignment meets the requirements of this Code. They may, however, in the case of 1.4.2.1.1 (a), (b), (c) and (e), rely on the information and data made available to them by other participants.

1.4.2.1.3 When the consignor acts on behalf of a third party, the latter shall inform the consignor in writing that dangerous goods are involved and make available to the consignor all the information and documents they need to perform their obligations.

1.4.2.2 ***Carrier***

1.4.2.2.1 In the context of 1.4.1, where appropriate, the carrier shall in particular:

(a) Ascertain that the dangerous goods to be carried are authorized for carriage in accordance with this Code;

(b) Ascertain that all information prescribed in this Code related to the dangerous goods to be carried has been provided by the consignor before carriage, that the prescribed documentation is on board the transport unit or if electronic data processing (EDP) or if electronic data interchange (EDI) techniques are used instead of paper documentation, that data is available during transport in a manner at least equivalent to that of paper documentation;

(c) Ascertain visually that the vehicles, wagons and loads have no obvious defects, leakages or cracks, missing equipment, etc.;

(d) Ascertain that the date specified for the next inspection for tank-vehicles, tank-wagons, tube-vehicles, tube-wagons, demountable tanks, portable tanks, tank-containers and MEGCs has not expired;

NOTE: *Tanks, tube-vehicles, tube-wagons and MEGCs may however be carried after the expiry of this deadline under the conditions of 4.1.6.10 (in the case of tube-vehicles, tube-wagons and MEGCs containing pressure receptacles as elements), 4.2.4.4, 4.3.2.3.7, 4.3.2.4.4, 6.7.2.19.6, 6.7.3.15.6 or 6.7.4.14.6.*

(e) verify that the vehicles or wagons are not overloaded;

(f) ascertain that the placards and marks prescribed for the vehicles or wagons in Chapter 5.3 have been affixed;

(g) ascertain that the equipment prescribed in this Code for the transport unit, vehicle crew and certain classes is on board the transport unit.

Where appropriate, this shall be done on the basis of the transport documents and accompanying documents, by a visual inspection of the vehicle, wagons or the containers and, where appropriate, the load.

1.4.2.2.2 The carrier may, however, in the case of 1.4.2.2.1 (a), (b), (e) and (f), rely on information and data made available to them by other participants. In the case of 1.4.2.2.1 (c) they may rely on what is certified in the "container/vehicle packing certificate" provided in accordance with 5.4.2.

1.4.2.2.3 If the carrier observes an infringement of the requirements of this Code, in accordance with 1.4.2.2.1, they shall not forward the consignment until the matter has been rectified.

1.4.2.2.4 If, during the journey, an infringement which could jeopardize the safety of the operation is observed, the consignment shall be halted as soon as possible bearing in mind the requirements of traffic safety, of the safe immobilisation of the consignment, and of public safety. The transport operation may only be continued once the consignment complies with applicable regulations. The competent authority(ies) concerned by the rest of the journey may grant an authorization to pursue the transport operation.

In case the required compliance cannot be achieved and no authorization is granted for the rest of the journey, the competent authority(ies) shall provide the carrier with the necessary administrative assistance. The same shall apply in case the carrier informs this/these competent authority(ies) that the dangerous nature of the goods carried was not communicated to them by the consignor and that they wish, by virtue of the law applicable in particular to the contract of carriage, to unload, destroy or render the goods harmless.

1.4.2.2.5 *(Reserved)*

1.4.2.2.6 The carrier shall provide the vehicle crew with the instructions in writing as prescribed in this Code.

1.4.2.3 ***Consignee***

1.4.2.3.1 The consignee has the obligation not to defer acceptance of the goods without compelling reasons and to verify, after unloading, that the requirements of this Code concerning the consignee have been complied with.

1.4.2.3.2 If, in the case of a container, this verification brings to light an infringement of the requirements of this Code, the consignee shall return the container to the carrier only after the infringement has been remedied.

1.4.2.3.3 If the consignee makes use of the services of other participants (unloader, cleaner, decontamination facility, etc.) they shall take appropriate measures to ensure that the requirements of 1.4.2.3.1 and 1.4.2.3.2 of this Code have been complied with.

1.4.3 Obligations of the other participants

A non-exhaustive list of the other participants and their respective obligations is given below. The obligations of the other participants flow from section 1.4.1 above insofar as they know or should have known that their duties are performed as part of a transport operation subject to this Code.

1.4.3.1 ***Loader***

1.4.3.1.1 In the context of 1.4.1, the loader has the following obligations in particular:

(a) They shall hand the dangerous goods over to the carrier only if they are authorized for carriage in accordance with this Code;

(b) They shall, when handing over for carriage packed dangerous goods or uncleaned empty packagings, check whether the packaging is damaged. They shall not hand over a package the packaging of which is damaged, especially if it is not leakproof, and there are leakages or the possibility of leakages of the dangerous substance, until the damage has been repaired; this obligation also applies to empty uncleaned packagings;

(c) They shall comply with the special requirements concerning loading and handling;

(d) They shall, after loading dangerous goods into a container comply with the requirements concerning placarding and marking conforming to Chapter 5.3;

(e) They shall, when loading packages, comply with the prohibitions on mixed loading taking into account dangerous goods already in the vehicle, wagon or large container and requirements concerning the separation of foodstuffs, other articles of consumption or animal feedstuffs.

1.4.3.1.2 The loader may, however, in the case of 1.4.3.1.1 (a), (d) and (e), rely on information and data made available to them by other participants.

1.4.3.2 ***Packer***

In the context of 1.4.1, the packer shall comply with in particular:

(a) The requirements concerning packing conditions, or mixed packing conditions; and

(b) When they prepare packages for carriage, the requirements concerning marking and labelling of the packages.

1.4.3.3 ***Filler***

In the context of 1.4.1, the filler has the following obligations in particular:

(a) They shall ascertain prior to the filling of tanks that both they and their equipment are technically in a satisfactory condition;

(b) They shall ascertain that the date specified for the next inspection for tank-vehicles, tank-wagons, tube-vehicles, tube-wagons, demountable tanks, portable tanks, tank-containers and MEGCs has not expired;

(c) They shall only fill tanks with the dangerous goods authorized for carriage in those tanks;

(d) They shall, in filling the tank, comply with the requirements concerning dangerous goods in adjoining compartments;

(e) They shall, during the filling of the tank, observe the permissible degree of filling or the permissible mass of contents per litre of capacity for the substance being filled;

(f) They shall, after filling the tank, ensure that all closures are in a closed position and that there is no leakage;

(g) They shall ensure that no dangerous residue of the filling substance adheres to the outside of the tanks filled by them;

(h) They shall, in preparing the dangerous goods for carriage, ensure that the placards, marks and labels are affixed on the tanks, on the vehicles, on the wagons and on the containers for carriage in bulk in accordance with Chapter 5.3;

(i) *(Reserved)*;

(j) They shall, when filling vehicles, wagons or containers with dangerous goods in bulk, ascertain that the relevant provisions of Chapter 7.3 are complied with.

1.4.3.4 ***Tank-container/portable tank operator***

In the context of 1.4.1, the tank-container/portable tank operator shall in particular:

(a) Ensure compliance with the requirements for construction, equipment, inspections and tests and marking;

(b) Ensure that the maintenance of shells and their equipment is carried out in such a way as to ensure that, under normal operating conditions, the tank-container/portable tank satisfies the requirements of this Code until the next inspection;

(c) Have an exceptional inspection made when the safety of the shell or its equipment is liable to be impaired by a repair, an alteration or an accident.

1.4.3.5 and 1.4.3.6 *(Reserved)*

1.4.3.7 ***Unloader***

1.4.3.7.1 In the context of 1.4.1, the unloader shall in particular:

(a) Ascertain that the correct goods are unloaded by comparing the relevant information on the transport document with the information on the package, container, tank, MEMU, MEGC, vehicle or wagon;

(b) Before and during unloading, check whether the packagings, the tank, the vehicle or container have been damaged to an extent which would endanger the unloading operation. If this is the case, ascertain that unloading is not carried out until appropriate measures have been taken;

(c) Comply with all relevant requirements concerning unloading and handling;

(d) Immediately following the unloading of the tank, vehicle, wagon or container:

(i) Remove any dangerous residues which have adhered to the outside of the tank, vehicle, wagon or container during the process of unloading; and

(ii) Ensure the closure of valves and inspection openings;

(e) Ensure that the prescribed cleaning and decontamination of the vehicles, wagons or containers is carried out; and

(f) Ensure that the vehicle, wagon and containers once completely unloaded, cleaned and decontaminated, no longer display the placards and marks that had been displayed in accordance with Chapter 5.3.

1.4.3.7.2 If the unloader makes use of the services of other participants (cleaner, decontamination facility, etc.) they shall take appropriate measures to ensure that the requirements of this Code have been complied with.

1.4.4 Transfer obligations

DRAFTING NOTE: These obligations may be shifted into 1.4.3, but are kept separate here for development purposes. There is likely some overlap with the provisions above.

A non-exhaustive list of the participants in the transfer of dangerous goods, and their respective obligations is given below. The obligations of the other participants flow from section 1.4.1 above insofar as they know or should have known that their duties are performed as part of a transport operation subject to this Code. These obligations apply in addition to the obligations above in 1.4.2 and 1.4.3.

1.4.4.1 Transferor

1.4.4.1.1 In the context of 1.4.1, the transferor shall in particular:

(a) Ascertain that the hose assemblies, pumps and equipment used for transfer comply with the inspection and testing provisions in Chapter 8.1

(b) Ascertain that hoses assemblies, pumps and other equipment required to undertake the transfer comply with the suitability provisions of Chapter 8.1

(c) They shall only undertake the transfer operation after determining that it is possible to do so in accordance with the provisions in Chapter 8.7.

1.4.4.1.2 The Transferor may, however, in the case of 1.4.4.1.1 (a) and (b), rely on information and data made available to them by other participants.

1.4.4.2 Site occupier

In the context of 1.4.1, the site occupier shall in particular:

(a) Ascertain that the hose assemblies, pumps and equipment used for transfer, and that are provided by the site occupier, comply with the inspection and testing provisions in Chapter 8.1

(b) Ascertain that hoses assemblies, pumps and other equipment required to undertake the transfer, and that are provided by the site occupier, comply with the suitability provisions of Chapter 8.1

(c) They shall only permit the transfer operation to take place after ensuring that it is possible to do so in accordance with the provisions in Chapter 8.7.

1.4.4.3 Carrier

In the context of 1.4.1, the carrier shall in particular:

(a) Ascertain that the hose assemblies, pumps and equipment used for transfer, and that are provided by the carrier, comply with the inspection and testing provisions in Chapter 8.1

(b) Ascertain that hoses assemblies, pumps and other equipment required to undertake the transfer, and that are provided by the carrier, comply with the suitability provisions of Chapter 8.1

(c) They shall only permit the transfer operation to take place after ensuring that it is possible to do so in accordance with the provisions in Chapter 8.7.

1.4.5 Additional obligations applicable to class 1

NOTE: Except if explicitly stated otherwise, these obligations apply to the transport of substances and articles of class 1.

1.4.5.1 A person undertaking carriage of substances and articles of class 1 shall additionally comply with the following obligations. In the event of conflict with the obligations set out in 1.4.1 – 1.4.4, these obligations shall prevail.

1.4.5.1.1 General

1.4.5.1.2 Additional obligations for consignors

1.4.5.1.3 Additional obligations for carriers

1.4.5.1.4 Additional obligations for vehicles crews

CHAPTER 1.5

DEROGATIONS

1.5.1 Reserved

CHAPTER 1.6

TRANSITIONAL MEASURES

1.6.1 General

1.6.1.1 Unless otherwise provided, the substances and articles of this Code may be carried until 30 September 202? in accordance with the requirements of the Code applicable up to 30 September 202?.

1.6.1.2 *(Reserved)*

1.6.1.3 *(Reserved)*

1.6.1.4 *(Reserved)*

1.6.1.5 *(Reserved)*

1.6.1.6 Intermediate bulk containers (IBCs) manufactured before 1 January 2003 in accordance with the requirements of marginal 3612 (1) applicable up to 30 June 2001 and which do not conform to the requirements of 6.5.2.1.1 regarding the height of letters, numerals and symbols applicable as from 1 July 2001 may continue to be used.

1.6.1.7 Type approvals for drums, jerricans and composite packagings made of high or medium molecular mass polyethylene issued before 1 July 2005 in accordance with the requirements of 6.1.5.2.6 in force up to 31 December 2004, but which are not in accordance with the requirements of 4.1.1.21, continue to be valid until 31 December 2009. Any such packagings manufactured and marked on the basis of these type approvals may be used until the end of their period of use determined in 4.1.1.15.

1.6.1.8 (*Reserved)*

1.6.1.9 and 1.6.1.10 *(Reserved)*

1.6.1.11 Type approvals for drums, jerricans and composite packagings made of high or medium molecular mass polyethylene, and for high molecular mass polyethylene IBCs, issued before 1 July 2007 in accordance with the requirements of 6.1.6.1 (a) in force up to 31 December 2006, but which are not in accordance with the requirements of 6.1.6.1 (a) applicable as from 1 January 2007, continue to be valid.

1.6.1.12 and 1.6.1.13 *(Reserved)*

1.6.1.14 IBCs manufactured before 1 January 2011 and conforming to a design type which has not passed the vibration test of 6.5.6.13 or which was not required to meet the criteria of 6.5.6.9.5 (d) at the time it was subjected to the drop test, may still be used.

1.6.1.15 IBCs manufactured, remanufactured or repaired before 1 January 2011 need not be marked with the maximum permitted stacking load in accordance with 6.5.2.2.2. Such IBCs, not marked in accordance with 6.5.2.2.2, may still be used after 31 December 2010 but shall be marked in accordance with 6.5.2.2.2 if they are remanufactured or repaired after that date. IBCs manufactured, remanufactured or repaired between 1 January 2011 and 31 December 2016 and marked with the maximum permitted stacking load in accordance with 6.5.2.2.2 in force up to 31 December 2014 may continue to be used.

1.6.1.16 to 1.6.1.22 *(Reserved)*

1.6.1.23 Fire extinguishers constructed before 1 July 2011 in accordance with the requirements of 8.1.4.3 applicable until 31 December 2010 may continue to be used.

1.6.1.24 and 1.6.1.25 *(Deleted)*

1.6.1.26 Large packagings manufactured or remanufactured before 1 January 2014 and which do not conform to the requirements of 6.6.3.1 regarding the height of letters, numerals and symbols applicable as from 1 January 2013 may continue to be used. Those manufactured or remanufactured before 1 January 2015 need not be marked with the maximum permitted stacking load in accordance with 6.6.3.3. Such large packagings not marked in accordance with 6.6.3.3 may still be used after 31 December 2014 but shall be marked in accordance with 6.6.3.3 if they are remanufactured after that date. Large packagings

manufactured or remanufactured between 1 January 2011 and 31 December 2016 and marked with the maximum permitted stacking load in accordance with 6.6.3.3 in force up to 31 December 2014 may continue to be used.

1.6.1.27 Means of containment integral to equipment or machinery containing liquid fuels of UN Nos. 1202, 1203, 1223, 1268, 1863 and 3475 constructed before 1 July 2013, which do not conform to the requirements of paragraph (a) of special provision 363 of Chapter 3.3 applicable as from 1 January 2013, may still be used.

1.6.1.28 *(Reserved)*

1.6.1.29 Lithium cells and batteries manufactured according to a type meeting the requirements of sub-section 38.3 of the Manual of Tests and Criteria, Revision 3, Amendment 1 or any subsequent revision and amendment applicable at the date of the type testing may continue to be carried, unless otherwise provided in this Code.

Lithium cells and batteries manufactured before 1 July 2003 meeting the requirements of the Manual of Tests and Criteria, Revision 3, may continue to be carried if all other applicable requirements are fulfilled.

1.6.1.30 to 1.6.1.32 *(Reserved)*

1.6.1.33 Electric double layer capacitors of UN No. 3499, manufactured before 1 January 2014, need not be marked with the energy storage capacity in Wh as required by sub-paragraph (e) of special provision 361 of Chapter 3.3.

1.6.1.34 Asymmetric capacitors of UN No. 3508, manufactured before 1 January 2016, need not be marked with the energy storage capacity in Wh as required by sub-paragraph (c) of special provision 372 of Chapter 3.3.

1.6.1.35 and 1.6.1.36 *(Reserved)*

1.6.1.37 *(Reserved)*

1.6.1.38 *(Reserved)*

1.6.1.39 to 1.6.1.42 *(Deleted)*

1.6.1.43 Vehicles registered or brought into service before 1 July 2017, as defined in special provisions 388 and 669 of Chapter 3.3, and their equipment intended for use during carriage, which conform to the requirements of this Code applicable until 31 December 2016 but containing lithium cells and batteries which do not conform to the provisions of 2.2.9.1.7 may continue to be carried as a load in accordance with the requirements of special provision 666 of Chapter 3.3.

1.6.1.44 *(Deleted)*

1.6.1.45 Contracting Parties may, until 31 December 2020, continue to issue training certificates for dangerous goods safety advisers conforming to the model applicable until 31 December 2018, instead of those conforming to the requirements of 1.8.3.18 applicable from 1 January 2019. Such certificates may continue in use to the end of their five-year validity.

1.6.1.46 and 1.6.1.47 *(Deleted)*

1.6.1.48 Certificates of approval for vehicles carrying certain dangerous goods conforming to the model in 9.1.3.5 applicable until 31 December 2020, issued before 1 July 2021, may still be used.

1.6.1.49 The mark shown in Figure 5.2.1.9.2 applicable until 31 December 2022, may continue to be applied until 31 December 2026.

1.6.1.50 For articles that meet the definition for DETONATORS, ELECTRONIC as described in 2.2.1.4 Glossary of names, and assigned to UN Nos. 0511, 0512 and 0513, the entries for DETONATORS, ELECTRIC (UN Nos. 0030, 0255 and 0456) may continue to be used until 30 June 2025.

1.6.1.51 Adhesives, paint and paint related materials, printing inks and printing ink related materials and resin solutions assigned to UN 3082 environmentally hazardous substance, liquid, N.O.S., packing group III

in accordance with 2.2.9.1.10.6 as a consequence of 2.2.9.1.10.5[1] containing 0.025 % or more of the following substances, on their own or in combination:

- 4,5-dichloro-2-octyl-2H-isothiazol-3-one (DCOIT);
- octhilinone (OIT); and
- zinc pyrithione (ZnPT);

may be carried until 30 June 2025 in steel, aluminium, other metal or plastic packagings, which do not meet the requirements of 4.1.1.3, when carried in quantities of 30 litres or less per packaging as follows:

(a) In palletized loads, a pallet box or unit load device, e.g. individual packagings placed or stacked and secured by strapping, shrink or stretch-wrapping or other suitable means to a pallet; or

(b) As inner packagings of combination packagings with a maximum net mass of 40 kg.

1.6.1.52 Inner receptacles of composite IBCs manufactured before 1 July 2021 in accordance with the requirements of 6.5.2.2.4 in force up to 31 December 2020 and which are not in accordance with the requirements of 6.5.2.2.4 regarding the marks on the inner receptacles that are not readily accessible for inspection due to the design of the outer casing applicable as from 1 January 2021 may continue be used until the end of their period of use determined in 4.1.1.15.

1.6.1.53 *(Reserved)*

1.6.2 Pressure receptacles and receptacles for Class 2

1.6.2.1 Receptacles built before 1 January 1997 and which do not conform to the requirements of ADR applicable as from 1 January 1997, but the carriage of which was permitted under the requirements of ADR applicable up to 31 December 1996, may continue to be transported after that date if the periodic test requirements in packing instructions P200 and P203 are complied with.

1.6.2.2 *(Deleted)*

1.6.2.3 Receptacles intended for the carriage of Class 2 substances constructed before 1 January 2003, may continue to bear, after 1 January 2003, the marks conforming to the requirements applicable until 31 December 2002.

1.6.2.4 Pressure receptacles designed and constructed in accordance with technical codes no longer recognized according to 6.2.5 may still be used.

1.6.2.5 Pressure receptacles and their closures designed and constructed in accordance with standards applicable at the time of their construction (see 6.2.4) according to the provisions of ADR which were applicable at that time may still be used unless restricted by a specific transitional measure.

1.6.2.6 Pressure receptacles for substances other than those of Class 2, built before 1 July 2009 in accordance with the requirements of 4.1.4.4 in force up to 31 December 2008, but which do not conform to the requirements of 4.1.3.6 applicable as from 1 January 2009, may continue to be used provided that the requirements of 4.1.4.4 in force up to 31 December 2008 are complied with.

1.6.2.7 and 1.6.2.8 *(Deleted)*

1.6.2.9 The provisions of packing instruction P200 (10), special packing provision v of 4.1.4.1 applicable until 31 December 2010 may be applied by Contracting Parties to ADR to cylinders constructed before 1 January 2015.

1.6.2.10 Refillable welded steel cylinders for the carriage of gases of UN Nos. 1011, 1075, 1965, 1969 or 1978, granted 15 year intervals for periodic inspection in accordance with packing instruction P200 (10), special packing provision v of 4.1.4.1 as applicable until 31 December 2010 by the competent authority

[1] *Commission Delegated Regulation (EU) 2020/1182 of 19 May 2020 amending, for the purposes of its adaptation to technical and scientific progress, Part 3 of Annex VI to Regulation (EC) No 1272/2008 of the European Parliament and of the Council on classification, labelling and packaging of substances and mixtures (fifteenth ATP to the CLP), applicable from 1 March 2022.*

of the country (countries) of carriage, may continue to be periodically inspected according to those provisions.

1.6.2.11 Gas cartridges constructed and prepared for carriage before 1 January 2013 for which the requirements of 1.8.6, 1.8.7 or 1.8.8 for the conformity assessment of gas cartridges have not been applied may still be carried after this date, provided all the other applicable provisions of ADR are met.

1.6.2.12 Salvage pressure receptacles may continue to be constructed and approved according to national regulations up to 31 December 2013. Salvage pressure receptacles constructed and approved in accordance with national regulations before 1 January 2014 may continue to be used with the approval of the competent authorities of the countries of use.

1.6.2.13 Bundles of cylinders manufactured before 1 July 2013 which are not marked in accordance with 6.2.3.9.7.2 and 6.2.3.9.7.3 applicable from 1 January 2013 or 6.2.3.9.7.2 applicable from 1 January 2015 may be used until the next periodic inspection after 1 July 2015.

1.6.2.14 Cylinders constructed before 1 January 2016 in accordance with 6.2.3 and a specification approved by the competent authorities of the countries of transport and use, but not in accordance with ISO 11513:2011 or ISO 9809-1:2010 as required in 4.1.4.1, packing instruction P208 (1), may be used for the carriage of adsorbed gases provided the general packing requirements of 4.1.6.1 are met.

1.6.2.15 Bundles of cylinders periodically inspected before 1 July 2015 which are not marked in accordance with 6.2.3.9.7.3 applicable from 1 January 2015 may be used until the next periodic inspection after 1 July 2015.

1.6.2.16 *(Deleted)*

1.6.2.17 The requirements of Note 3 of 6.2.1.6.1 applicable until 31 December 2022 may continue to be applied until 31 December 2024.

1.6.2.18 Closed cryogenic receptacles constructed before 1 July 2023 which were subject to the initial inspection and test requirements of 6.2.1.5.2 applicable until 31 December 2022 but which do not however conform to the requirements of 6.2.1.5.2 relating to the initial inspection and test applicable as from 1 January 2023, may continue to be used.

1.6.2.19 Acetylene cylinders constructed before 1 July 2023 which are not marked in accordance with 6.2.2.7.3 (k) or (l) applicable from 1 January 2023 may continue to be used until the next periodic inspection and test after 1 July 2023.

1.6.2.20 Closures of refillable pressure receptacles constructed before 1 July 2023 which are not marked in accordance with 6.2.2.11 or 6.2.3.9.8 applicable from 1 January 2023 may continue to be used.

1.6.2.21 Standard 14912:2005 referenced in packing instruction P200 (12) 3.4 of 4.1.4.1 in force up to 31 December 2022 may continue to be used for valve refurbishing or inspection until 31 December 2024.

1.6.2.22 Standard EN ISO 22434:2011 referenced in packing instruction P200 (13) 3.4 of 4.1.4.1 in force up to 31 December 2022 may continue to be used for valve refurbishing or inspection until 31 December 2024.

1.6.3 Fixed tanks (tank-vehicles), demountable tanks and battery-vehicles

1.6.3.1 Fixed tanks (tank-vehicles), demountable tanks and battery-vehicles built before the entry into force of the requirements applicable as from 1 October 1978 may be kept in service if the equipment of the shell meets the requirements of Chapter 6.8. The thickness of the shell wall, except in the case of shells intended for the carriage of refrigerated liquefied gases of Class 2, shall be appropriate to a calculation pressure of not less than 0.4 MPa (4 bar) (gauge pressure) in the case of mild steel or of not less than 200 kPa (2 bar) (gauge pressure) in the case of aluminium and aluminium alloys. For other than circular cross-sections of tanks, the diameter to be used as a basis for calculation shall be that of a circle whose area is equal to that of the actual cross-section of the tank.

1.6.3.2 The periodic inspections for fixed tanks (tank-vehicles), demountable tanks and battery-vehicles kept in service under these transitional requirements shall be conducted in accordance with the requirements of 6.8.2.4 and 6.8.3.4 and with the pertinent special requirements for the various classes. Unless the

earlier requirements prescribed a higher test pressure, a test pressure of 200 kPa (2 bar) (gauge pressure) shall suffice for aluminium shells and aluminium alloy shells.

1.6.3.3 Fixed tanks (tank-vehicles), demountable tanks and battery-vehicles which meet the transitional requirements in 1.6.3.1 and 1.6.3.2 may be used until 30 September 1993 for the carriage of the dangerous goods for which they have been approved. This transitional period shall not apply to fixed tanks (tank-vehicles), demountable tanks and battery-vehicles intended for the carriage of substances of Class 2, or to fixed tanks (tank-vehicles), demountable tanks and battery-vehicles whose wall thickness and items of equipment meet the requirements of Chapter 6.8.

1.6.3.4 (a) Fixed tanks (tank-vehicles), demountable tanks and battery-vehicles constructed before 1 May 1985 in accordance with the requirements of ADR in force between 1 October 1978 and 30 April 1985 but not conforming to the requirements applicable as from 1 May 1985 may continue to be used after that date;

(b) Fixed tanks (tank-vehicles), demountable tanks and battery-vehicles, constructed between 1 May 1985 and the entry into force of the requirements applicable as from 1 January 1988 which do not conform to those requirements but were constructed according to the requirements of ADR in force until that date, may continue to be used after that date.

1.6.3.5 Fixed tanks (tank-vehicles), demountable tanks and battery-vehicles, constructed before 1 January 1993 in accordance with the requirements in force up to 31 December 1992 but which do not conform to the requirements applicable as from 1 January 1993 may still be used.

1.6.3.6 (a) Fixed tanks (tank-vehicles), demountable tanks and battery-vehicles constructed between 1 January 1978 and 31 December 1984, if used after 31 December 2004, shall conform to the requirements of marginal 211 127 (5), applicable as from 1 January 1990, concerning shell thickness and protection against damage;

(b) Fixed tanks (tank-vehicles), demountable tanks and battery-vehicles constructed between 1 January 1985 and 31 December 1989, if used after 31 December 2010, shall conform to the requirements of marginal 211 127 (5), applicable as from 1 January 1990, concerning shell thickness and protection against damage.

1.6.3.7 Fixed tanks (tank-vehicles), demountable tanks and battery-vehicles constructed before 1 January 1999 in accordance with the requirements in force up to 31 December 1998 but which do not, however, conform to the requirements applicable as from 1 January 1999 may still be used.

1.6.3.8 When, because of amendments to ADR, some proper shipping names of gases have been modified, it is not necessary to modify the names on the plate or on the shell itself (see 6.8.3.5.2 or 6.8.3.5.3), provided that the names of the gases on the fixed tanks (tank-vehicles), demountable tanks and battery-vehicles or on the plates (see 6.8.3.5.6 (b) or (c)) are adapted at the first periodic inspection thereafter.

1.6.3.9 and 1.6.3.10 *(Reserved)*

1.6.3.11 Fixed tanks (tank-vehicles) and demountable tanks constructed before 1 January 1997 in accordance with the requirements in force up to 31 December 1996 but which do not, however, conform to the requirements of marginals 211 332 and 211 333 applicable as from 1 January 1997, may still be used.

1.6.3.12 *(Reserved)*

1.6.3.13 *(Deleted)*

1.6.3.14 *(Reserved)*

1.6.3.15 *(Deleted)*

1.6.3.16 For fixed tanks (tank-vehicles), demountable tanks and battery-vehicles constructed before 1 January 2007 which do not conform to the requirements of 4.3.2, 6.8.2.3, 6.8.2.4 and 6.8.3.4 concerning the tank record, the retention of files for the tank record shall start at the latest at the first periodic inspection after 30 June 2007.

1.6.3.17 *(Deleted)*

1.6.3.18 Fixed tanks (tank-vehicles), demountable tanks and battery-vehicles constructed before 1 January 2003 in accordance with the requirements in force up to 30 June 2001, but which do not, however, conform to the requirements applicable as from 1 July 2001, may still be used provided that the assignment to the relevant tank code has been carried out.

1.6.3.19 Fixed tanks (tank-vehicles) and demountable tanks constructed before 1 January 2003 in accordance with the requirements of 6.8.2.1.21 in force up to 31 December 2002 but which do not, however, conform to the requirements applicable as from 1 January 2003 may still be used.

1.6.3.20 Fixed tanks (tank-vehicles) and demountable tanks constructed before 1 July 2003 in accordance with the requirements in force up to 31 December 2002 but which do not, however, conform to the requirements of 6.8.2.1.7 applicable as from 1 January 2003 and special provision TE15 of 6.8.4 (b) applicable from 1 January 2003 to 31 December 2006 may still be used.

1.6.3.21 *(Deleted)*

1.6.3.22 to 1.6.3.24 *(Reserved)*

1.6.3.25 *(Deleted)*

1.6.3.26 Fixed tanks (tank-vehicles) and demountable tanks constructed before 1 January 2007 in accordance with the requirements in force up to 31 December 2006 but which do not, however, conform to the requirements applicable as from 1 January 2007 regarding the marking of the external design pressure in accordance with 6.8.2.5.1, may still be used.

1.6.3.27 to 1.6.3.29 *(Reserved)*

1.6.3.30 Vacuum-operated waste fixed tanks (tank-vehicles) and demountable tanks constructed before 1 July 2005 in accordance with the requirements applicable up to 31 December 2004 but which do not conform to the requirements of 6.10.3.9 applicable as from 1 January 2005, may still be used.

1.6.3.31 Fixed tanks (tank-vehicles), demountable tanks and tanks forming elements of battery-vehicles designed and constructed in accordance with a technical code which was recognized at the time of their construction according to the provisions of 6.8.2.7 which were applicable at that time may still be used.

1.6.3.32 Fixed tanks (tank vehicles) and demountable tanks constructed before 1 July 2007 in accordance with the requirements in force up to 31 December 2006, equipped with manhole cover assemblies in accordance with the provisions of standard EN 13317:2002 referred to in the table of paragraph 6.8.2.6, applicable until 31 December 2006, including those of the figure and table B.2 of annex B of the said standard which are no longer accepted as from 1 January 2007, or the material of which does not meet the requirements of EN 13094:2004, paragraph 5.2, may still be used.

1.6.3.33 *(Reserved)*

1.6.3.34 Notwithstanding the provisions of 4.3.2.2.4, fixed tanks (tank-vehicles) and demountable tanks intended for the carriage of liquefied gases or refrigerated liquefied gases, which meet the applicable construction requirements of ADR but which were divided, before 1 July 2009, by partitions or surge plates into sections of more than 7 500 litres capacity may still be filled to more than 20 % and less than 80 % of their capacity.

1.6.3.35 *(Deleted)*

1.6.3.36 Fixed tanks (tank-vehicles) intended for the carriage of liquefied non-toxic flammable gases constructed before 1 July 2011 and which are equipped with non-return valves instead of internal stop-valves and which do not conform to the requirements of 6.8.3.2.3, may still be used.

1.6.3.37 *(Deleted)*

1.6.3.38 Fixed tanks (tank-vehicles), demountable tanks and battery-vehicles designed and constructed in accordance with standards applicable at the time of their construction (see 6.8.2.6 and 6.8.3.6) according to the provisions of ADR which were applicable at that time may still be used unless restricted by a specific transitional measure.

1.6.3.39 Fixed tanks (tank-vehicles) and demountable tanks constructed before 1 July 2011 in accordance with the requirements of 6.8.2.2.3 in force up to 31 December 2010 but which do not, however, conform to

the requirements of 6.8.2.2.3, third paragraph, concerning the position of the flame trap or flame arrester may still be used.

1.6.3.40 *(Deleted)*

1.6.3.41 Fixed tanks (tank-vehicles) and demountable tanks constructed before 1 July 2013 in accordance with the requirements in force up to 31 December 2012, but which do not, however, meet the marking provisions of 6.8.2.5.2 or 6.8.3.5.6 applicable as from 1 January 2013, may continue to be marked in accordance with the requirements applicable up to 31 December 2012 until the next periodic inspection after 1 July 2013.

1.6.3.42 *(Deleted)*

1.6.3.43 Fixed tanks (tank-vehicles) and demountable tanks constructed before 1 January 2012 in accordance with the requirements in force up to 31 December 2012, but which do not however conform to the requirements of 6.8.2.6 relating to standards EN 14432:2006 and EN 14433:2006 applicable as from 1 January 2011, may still be used.

1.6.3.44 Fixed tanks (tank-vehicles) and demountable tanks intended for the carriage of UN Nos. 1202, 1203, 1223, 3475 and aviation fuel classified under UN Nos. 1268 or 1863, equipped with additive devices designed and constructed before 1 July 2015 in accordance with national provisions, but which do not, however, conform to the construction, approval and testing requirements of special provision 664 of Chapter 3.3 applicable as from 1 January 2015 shall only be used with the agreement of the competent authorities in the countries of use.

1.6.3.45 *(Reserved)*

1.6.3.46 Fixed tanks (tank-vehicles) and demountable tanks constructed before 1 July 2017 in accordance with the requirements in force up to 31 December 2016 but which do not however conform to the requirements of 6.8.2.1.23 applicable as from 1 January 2017 may still be used.

1.6.3.47 Fixed tanks (tank-vehicles) and demountable tanks constructed before 1 July 2019, fitted with safety valves meeting the requirements in force up to 31 December 2018 but which do not meet the requirements of 6.8.3.2.9 last sub-paragraph concerning their design or protection applicable from 1 January 2019 may continue to be used until the next intermediate or periodic inspection after 1 January 2021.

1.6.3.48 Notwithstanding the requirements of special provision TU42 of 4.3.5 applicable from 1 January 2019, fixed tanks (tank vehicles) and demountable tanks with a shell constructed of aluminium alloy, including those with protective lining, which were used before 1 January 2019 for the carriage of substances with a pH value less than 5.0 or more than 8.0, may continue to be used for the carriage of such substances until 31 December 2026.

1.6.3.49 Fixed tanks (tank-vehicles) and demountable tanks constructed before 1 July 2019 in accordance with the requirements in force up to 31 December 2018 but which do not conform to the requirements of 6.8.2.2.10 concerning the burst pressure of the bursting disc applicable as from 1 January 2019 may continue to be used.

1.6.3.50 Fixed tanks (tank-vehicles) and demountable tanks constructed before 1 July 2019 in accordance with the requirements of 6.8.2.2.3 in force up to 31 December 2018 but which however do not conform to the requirements of 6.8.2.2.3 last paragraph concerning the flame arresters on breather devices applicable from 1 January 2019 may continue to be used.

1.6.3.51 Fixed tanks (tank-vehicles) and demountable tanks constructed before 1 July 2019 in accordance with the requirements in force up to 31 December 2018 but which do not however conform to the requirements of 6.8.2.1.23 concerning the check of the welds in the knuckle area of the tank ends applicable as from 1 January 2019 may continue to be used.

1.6.3.52 Fixed tanks (tank-vehicles) and demountable tanks constructed before 1 July 2019 in accordance with the requirements in force up to 31 December 2018 but which however do not conform to the requirements of 6.8.2.2.11 applicable from 1 January 2019 may continue to be used.

1.6.3.53 Type approval certificates issued for fixed tanks (tank-vehicles), demountable tanks and battery-vehicles before 1 July 2019 in accordance with the requirements of 6.8.2.3.1 in force up to 31 December 2018 but which do not, however, conform to the requirements of 6.8.2.3.1 to show the distinguishing

sign used on vehicles in international road traffic[2] of the state whose territory the approval was granted and a registration number applicable as from 1 January 2019 may continue to be used.

1.6.3.54 Procedures used by the competent authority for the approval of experts performing activities concerning fixed tanks (tank vehicles) and demountable tanks intended for the carriage of substances other than those for which TA4 and TT9 of 6.8.4 apply which conform to the requirements of Chapter 6.8 in force up to 31 December 2022 but which do not conform to the requirements of 1.8.6 applicable to inspection bodies from 1 January 2023 may continue to be used until 31 December 2032.

NOTE: *The term "expert" has been replaced by the term "inspection body".*

1.6.3.55 Type approval certificates issued for fixed tanks (tank vehicles) and demountable tanks intended for the carriage of substances other than those for which TA4 and TT9 of 6.8.4 apply, issued before 1 July 2023 in compliance with Chapter 6.8 which not comply with 1.8.7 as applicable from 1 January 2023 may continue to be used until the end of their validity.

1.6.3.56 Fixed tanks (tank-vehicles) and demountable tanks constructed before 1 July 2033 in accordance with the requirements of Chapter 6.9 in force up to 31 December 2022 but which do not however conform to the requirements of Chapter 6.13 applicable as from 1 January 2023, may still be used.

1.6.3.57 Fixed tanks (tank-vehicles) and demountable tanks constructed before 1 January 2024 in accordance with the requirements in force up to 31 December 2022 but which do not, however, conform to the requirements applicable as from 1 January 2023 regarding the fitting of safety valves in accordance with 6.8.3.2.9 may still be used.

1.6.3.58 *(Reserved)*

1.6.3.59 Fixed tanks (tank-vehicles) and demountable tanks constructed before 1 July 2023 in accordance with the requirements in force up to 31 December 2022, but which do not, however, meet the requirements of special provision TE26 of 6.8.4 (b) applicable as from 1 January 2023 may continue to be used.

1.6.3.60 Fixed tanks (tank-vehicles) and demountable tanks that are already fitted with safety valves meeting the requirements of 6.8.3.2.9 as applicable from 1 January 2023 do not need to display the marks in accordance with 6.8.3.2.9.6 until the next intermediate or periodic inspection after 31 December 2023.

1.6.3.61 to 1.6.3.99 *(Reserved)*

1.6.3.100 ***Fibre-reinforced plastics (FRP) tanks***

1.6.3.100.1 FRP tanks which have been constructed before 1 July 2002 in conformity with a design type approved before 1 July 2001 in accordance with the requirements of Appendix B.1c which were in force until 30 June 2001 may continue to be used until the end of their lifetime provided that all the requirements in force up to 30 June 2001 have been and continue to be complied with. However, as from 1 July 2001, no new design type may be approved in accordance with the requirements in force until 30 June 2001.

1.6.3.100.2 FRP tanks constructed before 1 July 2021 in accordance with the requirements in force up to 31 December 2020 but which do not, however, meet the requirements for the marking of the tank code of 6.9.6.1 applicable from 1 January 2021 to 31 December 2022 or 6.13.6.1 applicable as from 1 January 2023 may continue to be marked in accordance with the requirements applicable up to 31 December 2020 until the next periodic inspection after 1 July 2021.

1.6.4 Tank-containers, portable tanks and MEGCs

1.6.4.1 Tank-containers constructed before 1 January 1988 in accordance with the requirements in force up to 31 December 1987 but which do not, however, conform to the requirements applicable as from 1 January 1988, may still be used.

[2] *Distinguishing sign of the state of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*

1.6.4.2 Tank-containers constructed before 1 January 1993 in accordance with the requirements in force up to 31 December 1992 but which do not, however, conform to the requirements applicable as from 1 January 1993, may still be used.

1.6.4.3 Tank-containers constructed before 1 January 1999 in accordance with the requirements in force up to 31 December 1998 but which do not, however, conform to the requirements applicable as from 1 January 1999, may still be used.

1.6.4.4 *(Reserved)*

1.6.4.5 When, because of amendments to ADR, some proper shipping names of gases have been modified, it is not necessary to modify the names on the plate or on the shell itself (see 6.8.3.5.2 or 6.8.3.5.3), provided that the names of the gases on the tank-containers and MEGCs or on the plates [see 6.8.3.5.6 (b) or (c)] are adapted at the first periodic inspection thereafter.

1.6.4.6 Tank-containers constructed before 1 January 2007 in accordance with the requirements in force up to 31 December 2006 but which do not, however, conform to the requirements applicable as from 1 January 2007 regarding the marking of the external design pressure in accordance with 6.8.2.5.1, may still be used.

1.6.4.7 Tank-containers constructed before 1 January 1997 in accordance with the requirements in force up to 31 December 1996 but which do not, however, conform to the requirements of marginals 212 332 and 212 333 applicable as from 1 January 1997, may still be used.

1.6.4.8 *(Reserved)*

1.6.4.9 Tank-containers and MEGCs designed and constructed in accordance with a technical code which was recognized at the time of their construction according to the provisions of 6.8.2.7 which were applicable at that time may still be used.

1.6.4.10 *(Deleted)*

1.6.4.11 (*Reserved)*

1.6.4.12 Tank-containers and MEGCs constructed before 1 January 2003 in accordance with the requirements applicable up to 30 June 2001, but which do not, however, conform to the requirements applicable as from 1 July 2001, may still be used.

However, they shall be marked with the relevant tank code and if applicable the relevant alphanumeric codes of special provisions TC and TE in accordance with 6.8.4.

1.6.4.13 Tank-containers constructed before 1 July 2003 in accordance with the requirements in force up to 31 December 2002 but which do not, however, conform to the requirements of 6.8.2.1.7 applicable as from 1 January 2003 and special provision TE15 of 6.8.4 (b) applicable from 1 January 2003 to 31 December 2006 may still be used.

1.6.4.14 *(Reserved)*

1.6.4.15 to 1.6.4.17 *(Deleted)*

1.6.4.18 For tank-containers and MEGCs constructed before 1 January 2007 which do not conform to the requirements of 4.3.2, 6.8.2.3, 6.8.2.4 and 6.8.3.4 concerning the tank record, the retention of files for the tank record shall start at the latest at the first periodic inspection after 30 June 2007.

1.6.4.19 *(Deleted)*

1.6.4.20 Vacuum-operated waste tank-containers constructed before 1 July 2005 in accordance with the requirements applicable up to 31 December 2004 but which do not conform to the requirements of 6.10.3.9 applicable as from 1 January 2005, may still be used.

1.6.4.21 to 1.6.4.29 *(Reserved)*

1.6.4.30 Portable tanks and UN MEGCs which do not meet the design requirements applicable as from 1 January 2007 but which have been constructed according to a design approval certificate which has been issued before 1 January 2008 may continue to be used.

1.6.4.31 and 1.6.4.32 *(Deleted)*

1.6.4.33 Notwithstanding the provisions of 4.3.2.2.4, tank-containers intended for the carriage of liquefied gases or refrigerated liquefied gases, which meet the applicable construction requirements of ADR but which were divided, before 1 July 2009, by partitions or surge plates into sections of more than 7 500 litres capacity may still be filled to more than 20 % and less than 80 % of their capacity.

1.6.4.34 to 1.6.4.36 *(Deleted)*

1.6.4.37 Portable tanks and MEGCs manufactured before 1 January 2012, that conform to the marking requirements of 6.7.2.20.1, 6.7.3.16.1, 6.7.4.15.1 or 6.7.5.13.1 applicable up to 31 December 2010, as relevant, may continue to be used if they comply with all other relevant requirements of ADR applicable as from 1 January 2011 including, when applicable, the requirement of 6.7.2.20.1 (g) for marking the symbol "S" on the plate when the shell or the compartment is divided by surge plates into sections of not more than 7 500 litres capacity.

1.6.4.38 *(Deleted)*

1.6.4.39 Tank-containers and MEGCs designed and constructed in accordance with standards applicable at the time of their construction (see 6.8.2.6 and 6.8.3.6) according to the provisions of ADR which were applicable at that time may still be used unless restricted by a specific transitional measure.

1.6.4.40 Tank-containers constructed before 1 July 2011 in accordance with the requirements of 6.8.2.2.3 in force up to 31 December 2010 but which do not, however, conform to the requirements of 6.8.2.2.3, third paragraph, concerning the position of the flame trap or flame arrester may still be used.

1.6.4.41 *(Deleted)*

1.6.4.42 Tank-containers constructed before 1 July 2013 in accordance with the requirements in force up to 31 December 2012, but which do not, however, meet the marking provisions of 6.8.2.5.2 or 6.8.3.5.6 applicable as from 1 January 2013, may continue to be marked in accordance with the requirements applicable up to 31 December 2012 until the next periodic inspection after 1 July 2013.

1.6.4.43 Portable tanks and MECGs manufactured before 1 January 2014 need not comply with the requirements of 6.7.2.13.1 (f), 6.7.3.9.1 (e), 6.7.4.8.1 (e) and 6.7.5.6.1 (d) concerning the marking of the pressure relief devices.

1.6.4.44 and 1.6.4.45 *(Deleted)*

1.6.4.46 Tank-containers constructed before 1 January 2012 in accordance with the requirements in force up to 31 December 2012, but which do not however conform to the requirements of 6.8.2.6 relating to standards EN 14432:2006 and EN 14433:2006 applicable as from 1 January 2011, may still be used.

1.6.4.47 Tank containers for refrigerated liquefied gases constructed before 1 July 2017 in accordance with the requirements in force up to 31 December 2016 but which do not conform to the requirements of 6.8.3.4.10, 6.8.3.4.11 and 6.8.3.5.4 applicable from 1 January 2017 may continue to be used until the next inspection after 1 July 2017. Until this time, to meet the requirements of 4.3.3.5 and 5.4.1.2.2(d), the actual holding times may be estimated without recourse to the reference holding time.

1.6.4.48 Tank-containers constructed before 1 July 2017 in accordance with the requirements in force up to 31 December 2016 but which do not however conform to the requirements of 6.8.2.1.23 applicable as from 1 January 2017 may still be used.

1.6.4.49 Tank-containers constructed before 1 July 2019, fitted with safety valves meeting the requirements in force up to 31 December 2018 but which do not meet the requirements of 6.8.3.2.9 last sub-paragraph concerning their design or protection applicable from 1 January 2019 may continue to be used until the next intermediate or periodic inspection after 1 January 2021.

1.6.4.50 Notwithstanding the requirements of special provision TU42 of 4.3.5 applicable from 1 January 2019, tank-containers with a shell constructed of aluminium alloy, including those with a protective lining, which were used before 1 January 2019 for the carriage of substances with a pH value less than 5.0 or more than 8.0, may continue to be used for the carriage of such substances until 31 December 2026.

1.6.4.51 Tank-containers constructed before 1 July 2019 in accordance with the requirements in force up to 31 December 2018 but which do not conform to the requirements of 6.8.2.2.10 concerning the burst pressure of the bursting disc applicable as from 1 January 2019 may continue to be used.

1.6.4.52 Tank-containers constructed before 1 July 2019 in accordance with the requirements of 6.8.2.2.3 in force up to 31 December 2018 but which however do not conform to the requirements of 6.8.2.2.3 last paragraph concerning the flame arresters on breather devices applicable from 1 January 2019 may continue to be used.

1.6.4.53 Tank-containers constructed before 1 July 2019 in accordance with the requirements in force up to 31 December 2018 but which do not however conform to the requirements of 6.8.2.1.23 concerning the check of the welds in the knuckle area of the tank ends applicable as from 1 January 2019 may continue to be used.

1.6.4.54 Tank-containers constructed before 1 July 2019 in accordance with the requirements in force up to 31 December 2018 but which however do not conform to the requirements of 6.8.2.2.11 applicable from 1 January 2019 may continue to be used.

1.6.4.55 *(Reserved)*

1.6.4.56 Tank-containers which do not comply with the requirements of 6.8.3.4.6 (b) applicable from 1 January 2023, may continue to be used if an intermediate inspection takes place at least six years after each periodic inspection performed after 1 July 2023.

1.6.4.57 Except in relation to 6.8.1.5, second paragraph, second indent, procedures used by the competent authority for the approval of experts performing activities concerning tank-containers intended for the carriage of substances other than those for which TA4 and TT9 of 6.8.4 apply which conform to the requirements of Chapter 6.8 in force up to 31 December 2022 but which do not conform to the requirements of 1.8.6 applicable to inspection bodies from 1 January 2023 may continue to be used until 31 December 2032.

NOTE: *The term "expert" has been replaced by the term "inspection body".*

1.6.4.58 Type approval certificates issued for tank-containers intended for the carriage of substances other than those for which TA4 and TT9 of 6.8.4 apply, issued before 1 July 2023 in compliance with Chapter 6.8, but which do not comply with 1.8.7 as applicable from 1 January 2023, may continue to be used until the end of their validity.

1.6.4.59 Tank-containers constructed before 1 July 2033 in accordance with the requirements of Chapter 6.9 in force up to 31 December 2022, may still be used.

1.6.4.60 Tank-containers constructed before 1 January 2024 in accordance with the requirements in force up to 31 December 2022 but which do not, however, conform to the requirements applicable as from 1 January 2023 regarding the fitting of safety valves in accordance with 6.8.3.2.9, may still be used.

1.6.4.61 Tank-containers constructed before 1 July 2023 in accordance with the requirements in force up to 31 December 2022, but which do not meet the requirements of 6.8.2.2.4, second and third paragraph, applicable from 1 January 2023, may still be used.

1.6.4.62 Extra-large tank-containers constructed before 1 July 2023 in accordance with the requirements in force up to 31 December 2022, but which do not meet the requirements of 6.8.2.1.18, third paragraph, concerning the minimum thickness of the shell applicable as from 1 January 2023 may still be used.

1.6.4.63 Tank-containers constructed before 1 July 2023 in accordance with the requirements in force up to 31 December 2022, but which do not, however, meet the requirements of special provision TE26 of 6.8.4 (b) applicable as from 1 January 2023 may continue to be used.

1.6.4.64 Tank-containers that are already fitted with safety valves meeting the requirements of 6.8.3.2.9 as applicable from 1 January 2023 do not need to display the marks in accordance with 6.8.3.2.9.6 until the next intermediate or periodic inspection after 31 December 2023.

1.6.5 Vehicles

1.6.5.1 and 1.6.5.2 *(Reserved)*

1.6.5.3 *(Deleted)*

1.6.5.4 *(Reserved)*

1.6.5.5 Vehicles registered or entering into service before 1 January 2003 the electric equipment of which does not comply with the requirements of 9.2.2, 9.3.7 or 9.7.8 but complies with the requirements applicable until 30 June 2001 may still be used.

1.6.5.6 *(Deleted)*

1.6.5.7 Complete or completed vehicles which have been type-approved before 31 December 2002 according to UN Regulation No. 105[3] as amended by the 01 series of amendments or the corresponding provisions of Directive 98/91/EC[4] and which do not comply with the requirements of Chapter 9.2 but comply with the requirements applicable to the construction of base vehicles (marginals 220 100 to 220 540 of Appendix B.2) applicable until 30 June 2001 may continue to be approved and used provided they are first registered or they entered into service before 1 July 2003.

1.6.5.8 EX/II and EX/III vehicles which have been first approved before 1 July 2005 and which comply with the requirements of Part 9 in force up to 31 December 2004 but which do not however conform to the requirements applicable as from 1 January 2005 may still be used.

1.6.5.9 Tank-vehicles with fixed tanks with a capacity of more than 3 m^3 intended for the carriage of dangerous goods in the liquid or molten state tested with a pressure of less than 4 bar, which do not comply with the requirements of 9.7.5.2, first registered (or which entered into service if the registration is not mandatory) before 1 July 2004, may still be used.

1.6.5.10 Certificates of approval which conform to the model shown in 9.1.3.5 applicable up to 31 December 2006 and those which conform to the model shown in 9.1.3.5 applicable from 1 January 2007 to 31 December 2008 may continue to be used. Certificates of approval which conform to the model shown in 9.1.3.5 applicable from 1 January 2009 up to 31 December 2014 may continue to be used.

1.6.5.11 MEMUs which have been constructed and approved before 1 July 2009 in accordance with the provisions of national law but which do not, however, conform to the construction and approval requirements applicable as from 1 January 2009 may be used with the approval of the competent authorities in the countries of use.

1.6.5.12 EX/III and FL vehicles registered or entering into service before 1 April 2012, the electrical connections of which do not comply with the requirements of 9.2.2.6.3, but comply with the requirements applicable until 31 December 2010, may still be used.

1.6.5.13 Trailers first registered (or which entered into service if registration was not mandatory) before 1 July 1995 equipped with anti-lock braking system in conformity with UN Regulation No. 13, 06 series of amendments but which do not comply with the technical requirements for category A anti-lock braking system may still be used.

1.6.5.14 MEMUs which have been approved before 1 July 2013 in accordance with the provisions of ADR in force up to 31 December 2012, but which do not conform to the requirements of 6.12.3.1.2 or 6.12.3.2.2 applicable as from 1 January 2013, may still be used.

1.6.5.15 As regards the application of the provisions of Part 9, vehicles first registered or entered into service before 1 November 2014 and which have been approved according to the provisions of the directives repealed by the Regulation (EC) No. 661/2009[5], may continue to be used.

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[3] *UN Regulation No. 105 (Uniform provisions concerning the approval of vehicles intended for the carriage of dangerous goods with regard to their specific constructional features).*

[4] *Directive 98/91/EC of the European Parliament and of the Council of 14 December 1998 relating to motor vehicles and their trailers intended for the transport of dangerous goods by road and amending Directive 70/156/EEC relating to the type approval of motor vehicles and their trailers (Official Journal of the European Communities No. L 011 of 16 January 1999, pp. 0025-0036).*

[5] *Regulation (EC) 661/2009 of 13 July 2009 concerning type-approval requirements for the general safety of motor vehicles, their trailers and systems, components and separate technical units intended therefor (Official Journal L 200 of 31.7.2009, p. 1).*

1.6.5.16 EX/II, EX/III, FL and OX vehicles registered before 1 April 2018, fitted with fuel tanks not approved according to UN Regulation No. 34 may still be used.

1.6.5.17 Vehicles first registered or entering into service before 1 April 2018 that do not comply with subsection 9.2.2.8.5 or standards ISO 6722-1:2011 + Cor 01:2012 or ISO 6722-2:2013 for cables of subsection 9.2.2.2.1, but comply with the requirements applicable until 31 December 2016, may continue to be used.

1.6.5.18 Vehicles first registered or entering into service before 1 April 2018 approved specifically as OX vehicle may continue to be used for the carriage of substances of UN No. 2015.

1.6.5.19 As regards the annual technical inspection of the vehicles first registered or entering into service before 1 April 2018 approved specifically as OX vehicle, the requirements of Part 9 in force up to 31December 2016 may still be applied.

1.6.5.20 Certificates of approval for OX vehicles which conform to the model shown in 9.1.3.5 applicable up to 31 December 2016 may continue to be used.

1.6.5.21 *(Deleted)*

1.6.5.22 Vehicles first registered (or which entered into service if registration is not mandatory) before 1 January 2021 in compliance with the requirements of 9.7.3 applicable until 31 December 2018, but not in compliance with the requirements of 9.7.3 applicable as from 1 January 2019, may continue to be used.

1.6.5.23 EX/III vehicles first registered or entering into service before 1 January 2029, in accordance with the requirements of 9.7.9.2 applicable until 31 December 2022, but which do not conform to the requirements of 9.7.9.2 applicable as from 1 January 2023, may continue to be used.

1.6.5.24 FL vehicles first registered or entering into service before 1 January 2029, which do not conform to the requirements of 9.7.9.1 applicable as from 1 January 2023, may continue to be used.

1.6.5.25 FL vehicles first registered or entering into service before 1 January 2029, which do not conform to the requirements of 9.7.9.2 applicable as from 1 January 2023, may continue to be used.

1.6.6 Class 7

1.6.6.1 ***Packages not requiring competent authority approval of design under the 1985, 1985 (as amended 1990), 1996, 1996 (revised), 1996 (as amended 2003), 2005, 2009 or 2012 editions of the IAEA Regulations for the Safe Transport of Radioactive Material***

Packages not requiring competent authority approval of design (excepted packages, Type IP-1, Type IP-2, Type IP-3 and Type A packages) shall meet the requirements of ADR in full, except that:

(a) Packages that meet the requirements of the 1985 or 1985 (as amended 1990) editions of the IAEA Regulations for the Safe Transport of Radioactive Material:

(i) May continue to be carried provided that they were prepared for carriage prior to 31 December 2003 and are subject to the requirements of 1.6.6.2.3, if applicable; or

(ii) May continue to be used, provided that all the following conditions are met:

- They were not designed to contain uranium hexafluoride;
- The applicable requirements of 1.7.3 are applied;
- The activity limits and classification in 2.2.7 are applied;
- The requirements and controls for carriage in Parts 1, 3, 4, 5 and 7 are applied; and
- The packaging was not manufactured or modified after 31 December 2003;

(b) Packages that meet the requirements of the 1996, 1996 (revised), 1996 (as amended 2003), 2005, 2009 or 2012 editions of the IAEA Regulations for the Safe Transport of Radioactive Material:

(i) May continue to be carried provided that they were prepared for carriage prior to 31 December 2025 and are subject to the requirements of 1.6.6.2.3, if applicable; or

(ii) May continue to be used, provided that all the following conditions are met:

- The applicable requirements of 1.7.3 are applied;
- The activity limits and classification in 2.2.7 are applied;
- The requirements and controls for carriage in Parts 1, 3, 4, 5 and 7 are applied; and
- The packaging was not manufactured or modified after 31 December 2025.

1.6.6.2 ***Package designs approved under the 1985, 1985 (as amended 1990), 1996, 1996 (revised), 1996 (as amended 2003), 2005, 2009 or 2012 editions of the IAEA Regulations for the Safe Transport of Radioactive Material***

1.6.6.2.1 Packages requiring competent authority approval of the design shall meet the requirements of ADR in full except that:

(a) Packagings that were manufactured to a package design approved by the competent authority under the provisions of the 1985 or 1985 (as amended 1990) editions of the IAEA Regulations for the Safe Transport of Radioactive Material may continue to be used provided that all of the following conditions are met:

(i) The package design is subject to multilateral approval;

(ii) The applicable requirements of 1.7.3 are applied;

(iii) The activity limits and classification in 2.2.7 are applied; and

(iv) The requirements and controls for carriage in Parts 1, 3, 4, 5 and 7 are applied;

(v) *(Reserved)*;

(b) Packagings that were manufactured to a package design approved by the competent authority under the provisions of the 1996, 1996 (revised), 1996 (as amended 2003), 2005, 2009 or 2012 editions of the IAEA Regulations for the Safe Transport of Radioactive Material may continue to be used provided that all of the following conditions are met:

(i) The package design is subject to multilateral approval after 31 December 2025;

(ii) The applicable requirements of 1.7.3 are applied;

(iii) The activity limits and material restrictions of 2.2.7 are applied;

(iv) The requirements and controls for carriage in Parts 1, 3, 4, 5 and 7 are applied.

1.6.6.2.2 No new manufacture of packagings to a package design meeting the provisions of the 1985 and 1985 (as amended 1990) editions of the IAEA Regulations for the Safe Transport of Radioactive Material shall be permitted to commence.

1.6.6.2.3 No new manufacture of packagings of a package design meeting the provisions of the 1996, 1996 (revised), 1996 (as amended 2003), 2005, 2009 or 2012 editions of the IAEA Regulations for the Safe Transport of Radioactive Material shall be permitted to commence after 31 December 2028.

1.6.6.3 ***Packages excepted from the requirements for fissile materials under the 2011 and 2013 editions of ADR (2009 edition of the IAEA Regulations for the Safe Transport of Radioactive Material)***

Packages containing fissile material that is excepted from classification as "FISSILE" according to 2.2.7.2.3.5 (a) (i) or (iii) of the 2011 and 2013 editions of ADR (paras. 417 (a) (i) or (iii) of the 2009 edition of the IAEA Regulations for the Safe Transport of Radioactive Material) prepared for carriage before 31 December 2014 may continue in carriage and may continue to be classified as non-fissile or fissile-excepted except that the consignment limits in Table 2.2.7.2.3.5 of these editions shall apply to the vehicle. The consignment shall be carried under exclusive use.

1.6.6.4 ***Special form radioactive material approved under the 1985, 1985 (as amended 1990), 1996, 1996 (revised), 1996 (as amended 2003), 2005, 2009 or 2012 editions of the IAEA Regulations for the Safe Transport of Radioactive Material***

Special form radioactive material manufactured to a design that had received unilateral approval by the competent authority under the 1985, 1985 (as amended 1990), 1996, 1996 (revised), 1996 (as amended 2003), 2005, 2009 or 2012 editions of the IAEA Regulations for the Safe Transport of Radioactive Material may continue to be used when in compliance with the mandatory management system in accordance with the applicable requirements of 1.7.3. There shall be no new manufacture of special form radioactive material to a design that had received unilateral approval by the competent authority under the 1985 or 1985 (as amended 1990) editions of the IAEA Regulations for the Safe Transport of Radioactive Material. No new manufacture of special form radioactive material to a design that had received unilateral approval by the competent authority under the 1996, 1996 (revised), 1996 (as amended 2003), 2005, 2009 or 2012 editions of the IAEA Regulations for the Safe Transport of Radioactive Material shall be permitted to commence after 31 December 2025.

CHAPTER 1.7

GENERAL PROVISIONS CONCERNING RADIOACTIVE MATERIAL

1.7.1 Scope and application

NOTE 1: *In the event of a nuclear or radiological emergency during the carriage of radioactive material, provisions as established by relevant national and/or international organizations shall be observed to protect people, property and the environment. This includes arrangements for preparedness and response established in accordance with the national and/or international requirements and in a consistent and coordinated manner with the national and/or international emergency arrangements.*

NOTE 2: *The arrangements for preparedness and response shall be based on the graded approach and take into consideration the identified hazards and their potential consequences, including the formation of other dangerous substances that may result from the reaction between the contents of a consignment and the environment in the event of a nuclear or radiological emergency. Guidance for the establishment of such arrangements is contained in "Preparedness and Response for a Nuclear or Radiological Emergency", IAEA Safety Standards Series No. GSR Part 7, IAEA, Vienna (2015); "Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency", IAEA Safety Standards Series No. GSG-2, IAEA, Vienna (2011); "Arrangements for Preparedness for a Nuclear or Radiological Emergency", IAEA Safety Standards Series No. GS-G-2.1, IAEA, Vienna (2007), and "Arrangements for the Termination of a Nuclear or Radiological Emergency", IAEA Safety Standards Series No. GSG-11, IAEA, Vienna (2018).*

1.7.1.1 This Code establishes standards of safety which provide an acceptable level of control of the radiation, criticality and thermal hazards to people, property and the environment that are associated with the carriage of radioactive material. The Code is based on the 2018 edition of the IAEA Regulations for the Safe Transport of Radioactive Material. Explanatory material can be found in "Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material (2018 Edition)", Safety Standards Series No. SSG-26 (Rev.1), IAEA, Vienna (2019).

1.7.1.2 The objective of this Code is to establish requirements that shall be satisfied to ensure safety and to protect people, property and the environment from harmful effects of ionizing radiation during the carriage of radioactive material. This protection is achieved by requiring:

(a) Containment of the radioactive contents;

(b) Control of external dose rate;

(c) Prevention of criticality; and

(d) Prevention of damage caused by heat.

These requirements are satisfied firstly by applying a graded approach to contents limits for packages and vehicles and to performance standards applied to package designs depending upon the hazard of the radioactive contents. Secondly, they are satisfied by imposing conditions on the design and operation of packages and on the maintenance of packagings, including a consideration of the nature of the radioactive contents. Thirdly, they are satisfied by requiring administrative controls including, where appropriate, approval by competent authorities. Finally, further protection is provided by making arrangements for planning and preparing emergency response to protect people, property and the environment.

1.7.1.3 This Code applies to the carriage of radioactive material by road including carriage which is incidental to the use of the radioactive material. Carriage comprises all operations and conditions associated with and involved in the movement of radioactive material; these include the design, manufacture, maintenance and repair of packaging, and the preparation, consigning, loading, carriage including in-transit storage, unloading and receipt at the final destination of loads of radioactive material and packages. A graded approach is applied to the performance standards in this Code that are characterized by three general severity levels:

(a) Routine conditions of carriage (incident free);

(b) Normal conditions of carriage (minor mishaps);

(c) Accident conditions of carriage.

1.7.1.4 The provisions laid down in this Code do not apply to any of the following:

(a) Radioactive material that is an integral part of the means of transport;

(b) Radioactive material moved within an establishment which is subject to appropriate safety regulations in force in the establishment and where the movement does not involve public roads or railways;

(c) Radioactive material implanted or incorporated into a person or live animal for diagnosis or treatment;

(d) Radioactive material in or on a person who is to be transported for medical treatment because the person has been subject to accidental or deliberate intake of radioactive material or to contamination;

(e) Radioactive material in consumer products which have received regulatory approval, following their sale to the end user;

(f) Natural material and ores containing naturally occurring radionuclides (which may have been processed), provided the activity concentration of the material does not exceed 10 times the values specified in Table 2.2.7.2.2.1, or calculated in accordance with 2.2.7.2.2.2 (a) and 2.2.7.2.2.3 to 2.2.7.2.2.6. For natural materials and ores containing naturally occurring radionuclides that are not in secular equilibrium the calculation of the activity concentration shall be performed in accordance with 2.2.7.2.2.4;

(g) Non-radioactive solid objects with radioactive substances present on any surfaces in quantities not in excess of the limit set out in the definition for "contamination" in 2.2.7.1.2.

1.7.1.5 ***Specific provisions for the carriage of excepted packages***

1.7.1.5.1 Excepted packages which may contain radioactive material in limited quantities, instruments, manufactured articles or empty packagings as specified in 2.2.7.2.4.1 shall be subject only to the following provisions of Parts 5 to 7:

(a) The applicable provisions specified in 5.1.2.1, 5.1.3.2, 5.1.5.2.2, 5.1.5.2.3, 5.1.5.4, 5.2.1.10, 5.4.1.2.5.1 (f) (i) and (ii), 5.4.1.2.5.1 (i), 7.5.11 CV33 (3.1), (4.3), (5.1) to (5.4) and (6); and

(b) The requirements for excepted packages specified in 6.4.4.

except when the radioactive material possesses other hazardous properties and has to be classified in a class other than Class 7 in accordance with special provision 290 or 369 of Chapter 3.3, where the provisions listed in (a) and (b) above apply only as relevant and in addition to those relating to the main class.

1.7.1.5.2 Excepted packages are subject to the relevant provisions of all other parts of ADR.

1.7.2 Radiation protection programme

1.7.2.1 The carriage of radioactive material shall be subject to a Radiation protection programme which shall consist of systematic arrangements aimed at providing adequate consideration of radiation protection measures.

1.7.2.2 Doses to persons shall be below the relevant dose limits. Protection and safety shall be optimized in order that the magnitude of individual doses, the number of persons exposed and the likelihood of incurring exposure shall be kept as low as reasonably achievable, economic and social factors being taken into account within the restriction that the doses to individuals be subject to dose constraints. A structured and systematic approach shall be adopted and shall include consideration of the interfaces between carriage and other activities.

1.7.2.3 The nature and extent of the measures to be employed in the programme shall be related to the magnitude and likelihood of radiation exposures. The programme shall incorporate the requirements in 1.7.2.2, 1.7.2.4, 1.7.2.5 and 7.5.11 CV33 (1.1). Programme documents shall be available, on request, for inspection by the relevant competent authority.

1.7.2.4 For occupational exposures arising from transport activities, where it is assessed that the effective dose either:

(a) Is likely to be between 1 mSv and 6 mSv in a year, a dose assessment programme via work place monitoring or individual monitoring shall be conducted; or

(b) Is likely to exceed 6 mSv in a year, individual monitoring shall be conducted.

When workplace monitoring or individual monitoring is conducted, appropriate records shall be kept.

NOTE: *For occupational exposures arising from transport activities, where it is assessed that the effective dose is most unlikely to exceed 1 mSv in a year, no special work patterns, detailed monitoring, dose assessment programmes or individual record keeping need be required.*

1.7.2.5 Workers (see 7.5.11, CV33 Note 3) shall be appropriately trained in radiation protection including the precautions to be observed in order to restrict their occupational exposure and the exposure of other people who might be affected by their actions.

1.7.3 Management system

A management system based on international, national or other standards acceptable to the competent authority shall be established and implemented for all activities within the scope of ADR, as identified in 1.7.1.3, to ensure compliance with the relevant provisions of ADR. Certification that the design specification has been fully implemented shall be available to the competent authority. The manufacturer, consignor or user shall be prepared:

(a) To provide facilities for inspection during manufacture and use; and

(b) To demonstrate compliance with this Code to the competent authority.

Where competent authority approval is required, such approval shall take into account and be contingent upon the adequacy of the management system.

1.7.4 Special arrangement

1.7.4.1 Special arrangement shall mean those provisions, approved by the competent authority, under which consignments which do not satisfy all the requirements of this Code applicable to radioactive material may be transported.

NOTE: *Special arrangement is not considered to be a temporary derogation in accordance with 1.5.1.*

1.7.4.2 Consignments for which conformity with any provision applicable to radioactive material is impracticable shall not be transported except under special arrangement. Provided the competent authority is satisfied that conformity with the radioactive material provisions of this Code is impracticable and that the requisite standards of safety established by this Code have been demonstrated through means alternative to the other provisions of ADR, the competent authority may approve special arrangement transport operations for a single consignment or a planned series of multiple consignments. The overall level of safety in carriage shall be at least equivalent to that which would be provided if all the applicable requirements of this Code had been met. For international consignments of this type, multilateral approval shall be required.

1.7.5 Radioactive material possessing other dangerous properties

In addition to the radioactive and fissile properties, any subsidiary hazard of the contents of the package, such as explosiveness, flammability, pyrophoricity, chemical toxicity and corrosiveness, shall also be taken into account in the documentation, packing, labelling, marking, placarding, stowage, segregation and carriage, in order to be in compliance with all relevant provisions for dangerous goods of ADR.

1.7.6 Non-compliance

1.7.6.1 In the event of non-compliance with any limit in this Code applicable to dose rate or contamination,

(a) The consignor, carrier, consignee and any organization involved during carriage who may be affected, as appropriate, shall be informed of the non-compliance by:

(i) the carrier if the non-compliance is identified during carriage; or

(ii) the consignee if the non-compliance is identified at receipt;

(b) The consignor, carrier or consignee, as appropriate shall:

(i) take immediate steps to mitigate the consequences of the non-compliance;

(ii) investigate the non-compliance and its causes, circumstances and consequences;

(iii) take appropriate action to remedy the causes and circumstances that led to the non-compliance and to prevent a recurrence of the causes and circumstances similar to those that led to the non-compliance; and

(iv) communicate to the competent authority(ies) on the causes of the non-compliance and the corrective or preventive actions taken or to be taken;

(c) The communication of the non-compliance to the consignor and competent authority(ies), respectively, shall be made as soon as practicable and it shall be immediate whenever an emergency exposure situation has developed or is developing.

CHAPTER 1.8

CHECKS AND OTHER SUPPORT MEASURES TO ENSURE COMPLIANCE WITH SAFETY REQUIREMENTS

1.8.1 Administrative controls of dangerous goods

1.8.1.1 The competent authorities may, in their jurisdiction, at any time, conduct spot checks to verify whether the requirements concerning the carriage of dangerous goods have been met including.

These checks shall, however, be made without endangering persons, property or the environment and without major disruption of road services.

1.8.1.2 Participants in the carriage of dangerous goods (Chapter 1.4) shall, without delay, in the context of their respective obligations, provide the competent authorities and their agents with the necessary information for carrying out the checks.

1.8.1.3 The competent authorities may also, for the purposes of carrying out checks on the premises of the enterprises participating in the carriage of dangerous goods (Chapter 1.4), make inspections, consult the necessary documents and remove samples of dangerous goods or packagings for examination, provided that safety is not jeopardized thereby. The participants in the carriage of dangerous goods (Chapter 1.4) shall also make the vehicles or parts of vehicles and the equipment and installations accessible for the purpose of checking where this is possible and reasonable. They may, if they deem necessary, designate a person from the enterprise to accompany the representative of the competent authority.

1.8.1.4 If the competent authorities observe that the requirements of this Code have not been met, they may prohibit a consignment or interrupt a transport operation until the defects observed are rectified, or they may prescribe other appropriate measures. Immobilization may take place on the spot or at another place selected by the authorities for safety reasons. These measures shall not cause a major disruption in road services.

1.8.2 Mutual administrative support

1.8.2.1 The competent authorities shall agree on mutual administrative support for the implementation of this Code.

1.8.2.2 When a competent authority has reasons to observe that the safety of the carriage of dangerous goods in its jurisdiction is compromised as a result of very serious or repeated infringements by an enterprise which has its headquarters in the jurisdiction of another competent authority, it shall notify the competent authorities in that jurisdiction of such infringements. The competent authorities of the jurisdiction of which the very serious or repeated infringements were observed may request the competent authorities of the jurisdiction of which the enterprise has its headquarters to take appropriate measures against the offender(s). The transmission of data referring to persons shall not be permitted unless it is necessary for the prosecution of very serious or repeated infringements.

1.8.2.3 The authorities notified shall communicate to the competent authorities of the jurisdiction of which the infringements were observed, the measures which have, if necessary, been taken with respect to the enterprise.

1.8.3 Safety adviser

NOTE 1: *Under ADR, the safety adviser role is mandatory for any undertaking that transports dangerous goods, except where the transport is exempted from this requirement. Under this Code, the safety adviser role is not mandated. Nonetheless, organisations that are involved in the transport of dangerous goods are encouraged to identify and appoint a safety adviser in line with the requirements of this section.*

1.8.3.1 Each undertaking, the activities of which include the consigning or the carriage of dangerous goods by road, or the related packing, loading, filling or unloading should appoint one or more safety advisers for the carriage of dangerous goods, responsible for helping to prevent the risks inherent in such activities with regard to persons, property and the environment.

1.8.3.2 These requirements shall not apply to undertakings:

(a) The activities of which concern quantities in each transport unit not exceeding those referred to in 1.1.3.6, 1.7.1.4 and in Chapters 3.3, 3.4 and 3.5; or

(b) The main or secondary activities of which are not the carriage or the related packing, filling, loading or unloading of dangerous goods but which occasionally engage in the national carriage or the related packing, filling, loading or unloading of dangerous goods posing little danger or risk of pollution.

1.8.3.3 The main task of the adviser is, under the responsibility of the head of the undertaking, to seek by all appropriate means and by all appropriate action, within the limits of the relevant activities of that undertaking, to facilitate the conduct of those activities in accordance with the requirements applicable and in the safest possible way.

With regard to the undertaking's activities, the adviser has the following duties in particular:

- monitoring compliance with the requirements governing the carriage of dangerous goods;
- advising his undertaking on the carriage of dangerous goods;
- preparing an annual report to the management of his undertaking or a local public authority, as appropriate, on the undertaking's activities in the carriage of dangerous goods. Such annual reports shall be preserved for five years and made available to the national authorities at their request.

The adviser's duties also include monitoring the following practices and procedures relating to the relevant activities of the undertaking:

- the procedures for compliance with the requirements governing the identification of dangerous goods being transported;
- the undertaking's practice in taking account, when purchasing means of transport, of any special requirements in connection with the dangerous goods being transported;
- the procedures for checking the equipment used in connection with the carriage, packing, filling, loading or unloading of dangerous goods;
- the proper training of the undertaking's employees, including on the changes to the regulations, and the maintenance of records of such training;
- the implementation of proper emergency procedures in the event of any accident or incident that may affect safety during the carriage, packing, filling, loading or unloading of dangerous goods;
- investigating and, where appropriate, preparing reports on serious accidents, incidents or serious infringements recorded during the carriage, packing, filling, loading or unloading of dangerous goods;
- the implementation of appropriate measures to avoid the recurrence of accidents, incidents or serious infringements;
- the account taken of the legal prescriptions and special requirements associated with the carriage of dangerous goods in the choice and use of sub-contractors or third parties;
- verification that employees involved in the consigning, carriage, packing, filling, loading or unloading of dangerous goods have detailed operational procedures and instructions;
- the introduction of measures to increase awareness of the risks inherent in the carriage, packing, filling, loading and unloading of dangerous goods;
- the implementation of verification procedures to ensure the presence on board the means of transport of the documents and safety equipment which shall accompany transport and the compliance of such documents and equipment with the regulations;
- the implementation of verification procedures to ensure compliance with the requirements governing packing, filling, loading and unloading;
- the existence of the security plan indicated in 1.10.3.2.

1.8.3.4 The adviser may also be the head of the undertaking, a person with other duties in the undertaking, or a person not directly employed by that undertaking, provided that that person is capable of performing the duties of adviser.

1.8.3.5 (Reserved)

1.8.3.6 Whenever an accident affects persons, property or the environment or results in damage to property or the environment during carriage, packing, filling, loading or unloading carried out by the undertaking concerned, the adviser should, after collecting all the relevant information, prepare an accident report to the management of the undertaking or to a local public authority, as appropriate. That report shall not replace any report by the management of the undertaking which might be required under any other international or national legislation.

1.8.3.7 (Reserved)

1.8.3.8 (Reserved)

1.8.3.9 An adviser should be provided with appropriate training related to the transport of dangerous goods. The main aims of the training shall be to provide candidates with sufficient knowledge of the risks inherent in the carriage, packing, filling, loading or unloading of dangerous goods, of the applicable laws, regulations and administrative provisions and of the duties listed in 1.8.3.3.

1.8.3.10-19 (Reserved – examination requirements for safety adviser)

1.8.4 List of competent authorities and bodies designated by them

The States and Territories shall communicate to the Secretariat of the Competent Authorities Panel the names, addresses and contact details of the authorities and bodies designated by them which are competent in accordance with national law to implement this Code, referring in each case to the relevant requirement of this Code and giving the addresses to which the relevant applications should be made.

The Secretariat of the Competent Authorities Panel shall establish a list on the basis of the information received and shall keep it up-to-date. It shall make the list publicly available.

1.8.5 Occurrences and incidents involving dangerous goods

NOTE: *Incidents occurring during the transport of dangerous goods are required to be reported to the emergency services and competent authorities to ensure that a proper incident response is undertaken, and to support the gathering of information to developd safer transport requirements for dangerous goods. This typically consists of an immediate report by telephone; followed by a written report on the incident after the response has concluded.*

1.8.5.1 ***Dangerous situation***

A *dangerous situation* has occurred if dangerous goods were released or if there was an imminent risk of loss of product, if personal injury, material or environmental damage occurred, or if the authorities were involved and one or more of the following criteria has/have been met:

Personal injury means an occurrence in which death or injury directly relating to the dangerous goods carried has occurred, and where the injury

(a) Requires intensive medical treatment;

(b) Requires a stay in hospital of at least one day; or

(c) Results in the inability to work for at least three consecutive days.

Loss of product means the release (or imminent risk of release) of dangerous goods:

(a) Of transport category 0 in any quantity;

(b) Of transport category 1 in quantities of 250 kg / 250 *l* or more; or

(c) Of transport category 3 in quantities of 1 000 kg / 1 000 *l* or more.

The loss of product criterion also applies if there was an imminent risk of loss of product in the above-mentioned quantities. As a rule, this has to be assumed if, owing to structural damage, the means of containment is no longer suitable for further carriage or if, for any other reason, a sufficient level of safety is no longer ensured (e.g. owing to distortion of tanks or containers, overturning of a tank or fire in the immediate vicinity).

The loss of any quantity of dangerous goods due to theft shall be additionally reported to the police.

If dangerous goods of Class 1 are involved, the obligation to report applies without quantity limitation.

NOTE: *Explosives legislation in each state or territory may impose additional reporting obligations on transporters of substances and articles of class 1.*

If dangerous goods of Class 6.2 are involved, the obligation to report applies without quantity limitation.

In occurrences involving radioactive material, the criteria for loss of product are:

(a) Any release of radioactive material from the packages;

(b) Exposure leading to a breach of the limits set out in the regulations for protection of workers and members of the public against ionizing radiation ("Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards", IAEA Safety Standards Series No. GSR Part 3, IAEA, Vienna (2014)); or

(c) Where there is reason to believe that there has been a significant degradation in any package safety function (containment, shielding, thermal protection or criticality) that may have rendered the package unsuitable for continued carriage without additional safety measures.

NOTE: *See the requirements of 7.5.11 CV33 (6) for undeliverable consignments.*

Material damage or environmental damage means the release of dangerous goods, irrespective of the quantity, where the estimated amount of damage exceeds $100,000. Damage to any directly involved means of carriage containing dangerous goods and to the modal infrastructure shall not be taken into account for this purpose.

Involvement of authorities means the direct involvement of the authorities or emergency services during the occurrence involving dangerous goods and the evacuation of persons or closure of public traffic routes (roads/railways) for at least three hours owing to the danger posed by the dangerous goods.

If necessary, the competent authority may request further relevant information.

1.8.5.2 Transport emergency response plan

NOTE: *A consignor and a carrier may agree to share a plan or plans for emergency response, however each remain responsible for ensuring that the shared plan addresses their responsibilities below.*

1.8.5.2.1 A consignor of dangerous goods for transport shall have a written emergency response plan for a dangerous situation involving the goods being transported.

1.8.5.2.2 A carrier of dangerous goods shall have a written emergency response plan for a dangerous situation occurring during the transport of the goods.

1.8.5.2.3 The emergency response plan shall account for the following factors as a minimum:

(a) The types of goods being transported

(b) The packagings used for the goods

(c) The quantities of goods

(d) The places, areas or routes through or along which the transport will take place

(e) A means of contact to provide information in the event of an incident

(f) Any additional requirements of the competent authority in the jurisdiction where the transport takes place

1.8.5.2.3.1 A consignor's emergency response plan shall additionally provide for:

(a) Specific properties of the goods being transported

(b) Safe handling of the goods

(c) Appropriate information and means to contain, control, recover and dispose of the goods

1.8.5.2.3.2 A carrier's emergency response plan shall additionally provide for:

(a) The types of vehicles and modes of transport involved

(b) Reasonably foreseeable incidents that could arise in transport

(c) Instructions and information for a driver involved in an incident

(d) Appropriate information and means to recover a vehicle or equipment involved in an incident

1.8.5.2.4 The emergency response plan shall provide for:

(a) Mechanisms for alerting and notifying the following:

(i) The emergency services and competent authority

NOTE: *The correct competent authority to notify needs to be clearly defined, as it can vary depending on the type of dangerous goods and the location where the incident occurs.*

(ii) Response personnel internal to the organisation

(iii) Any other parties who may be required to take action to support the incident response

(b) How information will be communicated to the emergency services responding to an incident

(c) The provision, in a timely manner, of appropriate equipment and skilled personnel to the location of an incident

(d) A means to record information about an incident

(e) Provision of training to personnel involved in the plan

(f) Disseminating the plan to personnel who are involved in the plan

(g) Testing the plan

(h) Reviewing the effectiveness of the plan following an incident or test

(i) A means for amending and updating the plan

1.8.5.2.5 In the event of a serious incident, as defined in 1.8.5.1, involving the transport of the dangerous goods:

(a) The driver shall notify the emergency services and the carrier as soon as practicable after the incident

(b) The carrier shall, immediately after becoming aware of the incident:

(i) Activate their emergency plan, and take all actions required by the plan

(ii) Notify the emergency services and competent authority about the incident

(iii) Notify any internal personnel and external parties who need to take action under the plan.

(iv) If necessary, alert the consignor to an incident involving the goods.

(c) If an officer of an emergency service or competent authority requires information or resources to manage the incident, the carrier or consignor shall provide all necessary information or resources in a timely manner.

NOTE: *If both the carrier and consignor are both requested to provide information or resources, it is sufficient if one or the other provides it.*

1.8.5.2.6 The carrier shall prepare and provide a report to the competent authority about the incident in accordance with 1.8.5.5

1.8.5.3 Notifications of occurrences involving dangerous goods

1.8.5.3.1 If a dangerous situation occurs during loading, filling, carriage or unloading of dangerous, the loader, filler, carrier, unloader or consignee, respectively, shall ascertain that a report substantially conforming to the model prescribed in 1.8.5.5 is made to the competent authority in the jurisdiction where the incident occurred at the latest one month after the occurrence.

1.8.5.3.2 The competent authority shall in turn, if appropriate, provide information to the Secretariat of the Competent Authorities Panel with a view to informing the other competent authorities.

NOTE: *This information is used to provide information and education about the types, causes and prevention of incidents involving the transport of dangerous goods.*

1.8.5.4 ***Insurance for occurrences during the carriage of dangerous goods***

A transport unit used for the transport of dangerous goods, other than those subject to an exemption in 1.1.3, shall be covered by a policy of insurance or another form of indemnity for a sum of not less than $5,000,000.

This insurance policy or indemnity shall cover:

(a) personal injury, death, property damage and other damage (other than consequential economic loss) arising out of any fire, explosion, leakage or spillage of dangerous goods in, on or from the transport unit or any packaging transported in or on the transport unit; and
(b) costs incurred by or on behalf of a Commonwealth, State or Territory government authority in a clean-up resulting from such a fire, explosion, leakage or spillage

1.*8.5.5* ***Model for report on occurrences during the carriage of dangerous goods***

NOTE: *A competent authority may have another particular form that they require this information to be provided in.*

Report on occurrences during the carriage of dangerous goods in accordance with section 1.8.5 of this Code

Carrier/Railway infrastructure operator: .....

Address: .....

Contact name: ..... Telephone: ..... Fax: .....

(The competent authority shall remove this cover sheet before forwarding the report)

1. Mode	
□ Rail Wagon number (optional) .....……	□ Road Vehicle registration (optional) .....……..
2. Date and location of occurrence	
Year: …….. Month: …….	Day: ……. Time: ……...
Rail □ Station □ Shunting/marshalling yard □ Loading/unloading/transhipment site Location / State / Territory: …… or □ Open line: Description of line: …… Kilometres: ……..……....	Road □ Built-up area □ Loading/unloading/transhipment site □ Open road Location / State / Territory: ……..…
3. Topography	
□ Gradient/incline □ Tunnel □ Bridge/Underpass □ Crossing	
4. Particular weather conditions	
□ Rain □ Snow □ Ice □ Fog □ Thunderstorm □ Storm Temperature: ..... °C	
5. Description of occurrence	
□ Derailment/Leaving the road □ Collision □ Overturning/Rolling over □ Fire □ Explosion □ Loss □ Technical fault Additional description of occurrence: .....…….....	

6. Dangerous goods involved						
UN Number (1)	Class	Packing Group	Estimated quantity of loss of products (kg or *l*) (2)	Means of containment (3)	Means of containment material	Type of failure of means of containment (4)

(1) For dangerous goods assigned to collective entries to which special provision 274 applies, also the technical name shall be indicated.

(2) For Class 7, indicate values according to the criteria in 1.8.5.3.

(3) Indicate the appropriate number
1 Packaging
2 IBC
3 Large packaging
4 Small container
5 Wagon
6 Vehicle
7 Tank-wagon
8 Tank-vehicle
9 Tube-wagon
10 Tube-vehicle
11 Wagon with demountable tanks
12 Demountable tank
13 Large container
14 Tank-container
15 MEGC
16 Portable tank
17 MPU
18 Extra-large tank-container

(4) Indicate the appropriate number
1 Loss
2 Fire
3 Explosion
4 Structural failure

7. Cause of occurrence (if clearly known)

□ Technical fault
□ Faulty load securing
□ Operational cause (rail operation)
□ Other:
.....
.....
.....

8. Consequences of occurrence

Personal injury in connection with the dangerous goods involved:
□ Deaths (number: .....)
□ Injured (number: .....)

Loss of product:
□ Yes
□ No
□ Imminent risk of loss of product

Material/Environmental damage:
□ Estimated level of damage ≤ $ 100,000
□ Estimated level of damage > $ 100,000

Involvement of authorities:
□ Yes
  □ Evacuation of persons for a duration of at least three hours caused by the dangerous goods involved
  □ Closure of public traffic routes for a duration of at least three hours caused by the dangerous goods involved
□ No

If necessary, the competent authority may request further relevant information.

1.8.6 (Reserved)

1.8.7 Procedures for conformity assessment, type approval certificate issue and inspections

NOTE: *In this section, "manufacturer" means the enterprise who is responsible to the competent authority for all aspects of the conformity assessment and for ensuring the conformity of construction whose name and mark appear in the approvals and on the markings. It is not essential that the enterprise is directly involved in all stages of the construction of the product (see 1.8.7.1.5) which is subject of the conformity assessment.*

1.8.7.1 ***General provisions***

1.8.7.1.1 The procedures in section 1.8.7 shall be applied as specified in Chapters 6.2 and 6.8.

If the competent authority performs the tasks itself, the competent authority shall meet the provisions of this section.

NOTE: *the inspections referred to in this section do not relate to inspections undertaken by a competent authority for the verification of compliance with dangerous goods transport requirements.*

1.8.7.1.2 Each application for the type approval certificate issue in accordance with 1.8.7.2.2 shall be lodged by the professional engineer or manufacturer with a competent authority, as applicable, in conformity with Chapter 6.8.

1.8.7.1.3 The application shall include:

(a) The name and address of the applicant according to 1.8.7.1.2;

(b) A written declaration that the same application has not been lodged with any other competent authority or inspection body;

(c) The relevant technical documentation in 1.8.7.8;

(d) A statement allowing the competent authority or an inspection body, as appropriate, access for conformity assessment or inspection purposes to the locations of manufacture, inspection, testing and storage and providing it with all necessary information to perform their tasks.

1.8.7.1.4 Where the manufacturer or an enterprise with a testing facility is allowed to establish an in-house inspection service according to 6.2.2.12, 6.2.3.6.1, 6.8.1.5.3 (b) or 6.8.1.5.4 (b), it shall demonstrate to the satisfaction of the inspection body that the in-house inspection service is able to perform inspections and tests in conformity with 1.8.7.

1.8.7.1.5 Type approval certificates, inspection certificates and reports for the products (pressure receptacles, tanks, service equipment and the assembly of the elements, structural equipment and service equipment of battery-vehicles or MEGCs), including the technical documentation, shall be kept:

(a) By the manufacturer for a period of at least 20 years from the expiry date of the type approval;

(b) By the issuing competent authority or the issuing inspection body, for a period of at least 20 years from the issuing date;

(c) By the owner or operator for a period of at least 15 months after the product is taken out of service.

1.8.7.1.6 *Pressure vessels recognized under pressure vessel legislation*

NOTE: *Australia implements a system of design and item registration for plant under work health and safety legislation in each jurisdiction, including a system of mutual recognition. The definition of plant includes pressure receptacles used for transport under this Code. This Code provides for that system of pressure receptacle registration to be used to determine whether a pressure receptacle is appropriate for use for the transport of dangerous goods.*

1.8.7.1.6.1 A pressure receptacle that is used for the transport of dangerous goods is considered to have met the provisions for approval of a pressure receptacle laid down in this Code, provided the following is met:

(a) The pressure receptacle meets the following requirements of pressure receptacle legislation:

(i) It is of a design that is appropriately registered;

(ii) It is appropriately registered as an item, if required by the legislation;

NOTE: *Not all pressure receptacles used in transport require individual item registration under pressure receptacle registration.*

(iii) It is appropriately marked or otherwise readily identified as complying with these requirements.

(b) Additionally, the pressure receptacle:

(i) Is designed for the transport of the goods under pressure;

(ii) Is suitable for transporting the goods, in the conditions that will be encountered in transport;

(iii) Meets all other applicable provisions of this code, in so far as they do not conflict with the requirements of the pressure receptacle legislation.

NOTE: Where conflict between this Code and the pressure receptacle legislation arises, generally the more conservative provisions should be followed. This needs to be assessed on a case-by-case basis.

1.8.7.1.6.2 A pressure receptacle that is used for the transport of dangerous goods is considered to have met the provisions for the initial inspection and test of a pressure receptacle laid down in this Code, provided that prior to being put into service, the pressure receptacle has undergone appropriate:

(a) Design verification;

(b) Initial inspections; and

(c) Performance tests

1.8.7.1.6.3 A pressure receptacle that is used for the transport of dangerous goods is considered to have met the provisions for inspection and test of a pressure receptacle laid down in this Code, provided the following is met:

(a) The pressure receptacle is subject to periodic inspection and testing in accordance with the requirements of pressure receptacle legislation and the standards used for the design and construction of the pressure receptacle. This includes:

(i) Frequency of inspections;

(ii) Features of the shell, service and structural equipment that are required to be inspected;

(iii) Record keeping or marking requirements required by the inspections; and

(iv) Meeting competency requirements set out for personnel and organisations undertaking inspections;

(b) Where there is conflict between the provisions of this code and the requirements of pressure receptacle legislation, the more conservative provisions shall prevail.

1.8.7.2 ***Type examination and type approval certificate issue***

1.8.7.2.1 *Type examination*

1.8.7.2.1.1 The manufacturer shall:

(a) In the case of pressure receptacles, place at the disposal of the professional engineer samples of the production envisaged. The professional engineer may request further samples if required by the test programme;

(b) In the case of tanks, tank-vehicles, tube-vehicles or MEGCs, give access to the prototype for type testing;

(c) In the case of service equipment, place at the disposal of the professional engineer samples of the production envisaged. The professional engineer may request further samples if required by the test programme.

NOTE: *The results of assessments and tests according to other regulations or standards may be taken into account.*

1.8.7.2.1.2 The professional engineer shall:

(a) Examine the technical documentation specified in 1.8.7.8.1 to verify that the design is in accordance with the relevant provisions of this Code, and the prototype or the prototype lot has been manufactured in conformity with the technical documentation and is representative of the design;

(b) Perform the examinations and the tests, or perform the examinations and verify the test conditions and supervise the tests on site, as specified in this Code, including the relevant standards, to determine that the provisions have been applied and fulfilled, and the procedures adopted by the manufacturer meet the requirements;

(c) Check the material(s) certificate(s) issued by the manufacturer(s) of the materials against the relevant provisions of this Code;

(d) As applicable, approve the procedures for the permanent joining of parts or check that they have been previously approved, and verify that the staff undertaking the permanent joining of parts and the non-destructive tests are qualified or approved;

(e) Agree with the manufacturer the location(s) where the examinations and necessary tests are to be carried out.

1.8.7.2.1.3 The professional engineer shall issue a report of the type examination to the manufacturer. The report shall contain:

(a) A declaration of conformity to the requirements of the design standard(s); or

(b) Evidence of equivalent safety (in accordance with 6.8.6.7) where alternative criteria that are acceptable to the competent authority are used.

1.8.7.2.2 *Type approval certificate issue*

Type approvals authorize the construction of products within the period of validity of that approval.

1.8.7.2.2.1 Where the type satisfies all applicable provisions, the competent authority or the inspection body, shall issue a type approval certificate to the manufacturer in conformity with Chapters 6.2 and 6.8.

This certificate shall contain:

(a) The name and address of the issuer;

(b) The competent authority under whom the certificate is issued;

(c) The name and address of the manufacturer;

(d) A reference to the version of this Code and standards used for the type examination;

(e) Any requirements resulting from the type examination;

(f) The data contained in the documents for the type-examination according to 1.8.7.8.1, necessary for the identification of the type and variation, as defined by the relevant standards. The documents, or a list identifying the documents, containing the data shall be included or annexed to the certificate;

(g) The reference to the type examination report(s);

(h) The maximum period of validity of the type approval; and

(i) Any specific requirements in accordance with Chapters 6.2 and 6.8.

1.8.7.2.2.2 The type approval shall be valid for a maximum of ten years. If within that period the relevant technical requirements of this Code have changed so that the approved type is no longer in conformity with them, then the type approval is no longer valid. If within that period, the withdrawal date according to column (3) of the tables in 6.2.2.1 and 6.2.2.3 or column (5) of the tables in 6.2.4.1, 6.8.2.6.1 and 6.8.3.6 applies, the type approval is also no longer valid. It shall then be considered withdrawn by the competent authority.

NOTE: *For the latest date for withdrawal of existing type approvals, see column (5) of the tables in 6.2.4.1 and 6.8.2.6.1 or 6.8.3.6 as appropriate.*

If a type approval has expired, or has been withdrawn, the manufacture of the products according to that type approval is no longer authorized.

NOTE: *The relevant provisions concerning the use, periodic inspection and intermediate inspection of products contained in a type approval which has expired or has been withdrawn shall continue to apply to the products constructed according to that type approval before its expiry or its withdrawal if they may continue to be used.*

Type approvals may be renewed on the basis of a new type examination. Results of the previous type examination tests shall be taken into account if these tests are still in accordance with the provisions of this Code including the standards applicable at the date of renewal. Renewal is not permitted after a type approval has been withdrawn.

NOTE: *The type examination for renewal may be performed by a professional engineer other than the one which issued the original type examination report.*

Interim amendments of an existing type approval (e.g. for pressure receptacles minor amendments such as the addition of further sizes or volumes not affecting conformity, or for tanks see 6.8.2.3.3) do not extend or modify the original validity of the certificate.

1.8.7.2.2.3 In the case of a modification of a product with a valid, expired or withdrawn type approval, the relevant type examination, testing, inspection and approval are limited to the parts of the product that have been modified.

The modification shall meet the provisions of this Code applicable at the time of the modification. For all parts of the product not affected by the modification, the documentation of the initial type approval remains valid.

A modification may apply to one or more product(s) covered by the same type approval.

Where the modified product satisfies all applicable provisions, a supplementary approval certificate for the modification shall be issued to the owner or operator by the competent authority or inspection body in conformity with Chapters 6.2 and 6.8. For tanks, tube-vehicles or MEGCs, a copy shall be kept as part of the tank record.

1.8.7.3 ***Supervision of manufacture***

1.8.7.3.1 The manufacturer shall take all the necessary measures to ensure that the manufacturing process complies with the applicable provisions of this Code and of the type approval certificate, the technical documentation according to 1.8.7.8.3 and reports.

1.8.7.3.2 The manufacturing process shall be subject to supervision by the relevant body.

The relevant body shall:

(a) Verify the conformity with the technical documentation specified in 1.8.7.8.3 and with the applicable provisions of this Code and of the type approval certificate and reports;

(b) Verify that the manufacturing process produces products in conformity with the requirements and the documentation which apply to it;

(c) Verify the traceability of materials and check the material(s) certificate(s) against the specifications;

(d) As applicable, verify that the personnel undertaking the permanent joining of parts and the non-destructive tests are qualified or approved;

(e) Agree with the manufacturer on the location where the examinations and necessary tests are to be carried out; and

(f) Provide a written report of the results of the supervision of manufacture.

1.8.7.4 ***Initial inspection and tests***

1.8.7.4.1 The manufacturer shall:

(a) Affix the marks specified in this Code; and

(b) Supply to the relevant body the technical documentation specified in 1.8.7.8.4.

1.8.7.4.2 The relevant body shall:

(a) Perform the examinations and the tests, or perform the examinations and verify the test conditions and supervise the tests on site to ensure that the product is manufactured in accordance with the type approval and the relevant provisions;

(b) Check the certificates supplied by the manufacturers of service equipment against the service equipment;

(c) Issue an initial inspection and tests report relating to the detailed tests and verifications carried out and the verified technical documentation;

(d) Issue an initial inspection and tests certificate and affix its mark when the manufacture satisfies the provisions; and

(e) Check if the type approval remains valid after provisions of this Code (including the referenced standards) relevant to the type approval have changed. If the type approval is no longer valid, the relevant body shall issue a refusal inspection report and inform the competent authority or the inspection body which issued the type approval certificate.

The certificate in (d) and report in (c) may cover a number of products of the same type (group certificate or report).

1.8.7.4.3 The certificate in 1.8.7.4.2 (d) shall contain as a minimum:

(a) The name and address of the inspection body and the name and address of the in-house inspection service when applicable;

(b) The name and address of the manufacturer;

(c) The location of the initial inspection;

(d) A reference to the version of this Code and the standards used for the initial inspections and tests;

(e) The results of the inspections and tests;

(f) The data for identification of the inspected product(s), at least the serial number or for non refillable cylinders the batch number;

(g) The type approval number; and

(h) The reference to the certificate of authorization of the in-house inspection service when applicable.

1.8.7.5 ***Verification of conformance***

1.8.7.5.1 If a verification of conformance is required by the competent authority under 6.8.1.5.5, the owner or operator shall engage an inspection body to perform the entry into service verification and shall provide it with the type approval certificate and the technical documentation specified in 1.8.7.8.4.

1.8.7.5.2 The inspection body shall review the documentation and:

(a) Perform external checks (e.g. marking, condition);

(b) Verify conformity with the type approval certificate;

(c) Verify that any relevant transitional measures of 1.6.3 or 1.6.4 have been fulfilled.

1.8.7.5.3 The inspection body shall issue a verification report that contains the results of the assessment. The owner or operator shall present this report at the request of the competent authority requiring the verification, and to the inspection body(ies) in charge of subsequent inspections and tests.

In the event of a failed entry into service verification, the non-conformities shall be rectified and a new entry into service verification passed before the tank is used.

The inspection body in charge of the entry into service verification shall, without delay, inform its competent authority of any refusal.

1.8.7.6 ***Periodic inspection, intermediate inspection and exceptional inspection***

1.8.7.6.1 The inspection body shall:

(a) Perform the identification and verify the conformity with the documentation;

(b) Perform the inspections and the tests, or perform the inspections and verify the test conditions and supervise the tests on site in order to check that the requirements are met;

(c) Issue reports and certificates, as appropriate, of the results of the inspections and tests, which may cover a number of products; and

(d) Ensure that the required marks are applied.

1.8.7.6.2 Reports of periodic inspections and tests of pressure receptacles shall be retained by the owner or operator at least until the next periodic inspection.

NOTE: *For tanks, see provisions for tank records in 4.3.2.1.7.*

1.8.7.7 ***Surveillance of the in-house inspection service***

1.8.7.7.1 Where an in-house inspection service is used according to 6.2.2.12, 6.2.3.6.1, 6.8.1.5.3 (b) or 6.8.1.5.4 (b), the manufacturer or the testing facility shall:

(a) Implement a quality system for the in-house inspection service, including technical procedures, for inspections and tests documented in 1.8.7.8.6 and subject to surveillance;

(b) Fulfil the obligations arising out of the quality system as approved and ensure that it remains satisfactory and efficient in particular:

(i) Authorize trained and competent personnel for the in-house inspection service; and

(ii) Affix the identity mark or stamp, as specified in Chapters 6.2 and 6.8, of the inspection body, and the mark of the in-house inspection service where appropriate on the product to ensure traceability.

1.8.7.7.2 (Reserved – not adopted by this Code)

1.8.7.7.3 (Reserved – not adopted by this Code)

1.8.7.7.4 (Reserved – not adopted by this Code)

1.8.7.7.5 (Reserved – not adopted by this Code)

1.8.7.8 ***Documents***

The technical documentation shall enable an assessment to be made of conformity with the relevant requirements.

1.8.7.8.1 *Documents for the type examination*

The manufacturer shall provide as appropriate:

(a) The list of standards used for the design and manufacture;

(b) A description of the type including all variations;

(c) The instructions according to the relevant column of table A of Chapter 3.2 or a list of dangerous goods to be carried for dedicated products;

(d) A general assembly drawing or drawings;

(e) The detailed drawings, including the dimensions used for the calculations, of the product, the service equipment, the structural equipment, the marking and the labelling necessary to verify the conformity;

(f) The calculation notes, results and conclusions;

(g) The list of the service equipment with the relevant technical data and information on the safety devices including the calculation of the relief capacity if relevant;

(h) The list of material requested in the standard for manufacture used for every part, sub-part, lining, service and structural equipment and the corresponding material specifications or the corresponding declaration of conformity to this Code;

(i) The approved qualification of permanent joining processes;

(j) The description of the heat treatment process(es); and

(k) The procedures, descriptions and records of all relevant tests listed in the standards or this Code for the type approval and for the manufacture.

1.8.7.8.2 *Documents for the type approval certificate issue*

The manufacturer shall provide as appropriate:

(a) The list of standards used for the design and manufacture;

(b) A description of the type, including all variations;

(c) The instructions according to the relevant column of table A of Chapter 3.2 or a list of dangerous goods to be carried for dedicated products;

(d) A general assembly drawing or drawings;

(e) The list of materials in contact with the dangerous goods;

(f) The list of service equipment;

(g) The type-examination report; and

(h) Further documents mentioned under 1.8.7.8.1 on request of the competent authority or inspection body.

1.8.7.8.3 *Documents for the supervision of manufacture*

The manufacturer shall provide as appropriate:

(a) The documents listed in 1.8.7.8.1 and 1.8.7.8.2;

(b) A copy of the type approval certificate;

(c) The manufacturing procedures including test procedures;

(d) The manufacturing records;

(e) The approved qualifications of permanent joining operators;

(f) The approved qualifications of the non-destructive test operators;

(g) The reports of the destructive and non-destructive tests;

(h) The heat treatment records; and

(i) The calibration records.

1.8.7.8.4 *Documents for initial inspection and tests, and for verification of conformance*

The manufacturer for initial inspection and tests, and the owner or operator for verification of conformance shall provide as appropriate:

(a) The documents listed in 1.8.7.8.1, 1.8.7.8.2, and 1.8.7.8.3;

(b) The material certificates of the product and any sub-parts including the service equipment;

(c) The certificates of conformity of the service equipment; and

(d) A declaration of conformity including the description of the product and all the variations adopted from the type approval.

1.8.7.8.5 *Documents for periodic inspection, intermediate inspection and exceptional inspection*

The owner or operator, or its authorized representative shall provide as appropriate:

(a) For pressure receptacles, the documents specifying special requirements when the manufacturing and periodic inspections and tests standards so require;

(b) For tanks:

(i) the tank record; and

(ii) any relevant document mentioned in 1.8.7.8.1 to 1.8.7.8.4 if requested by the inspection body.

1.8.7.8.6 *Documents for the surveillance of in-house inspection service*

The in-house inspection service shall provide the quality system documentation as appropriate:

(a) The organizational structure and responsibilities;

(b) The relevant inspection and test, quality control, quality assurance and process operation instructions, and systematic actions that will be used;

(c) The quality records, such as inspection reports, test data, calibration data and certificates;

(d) The management reviews to ensure the effective operation of the quality system arising from the on-site audits in accordance with 1.8.7.7;

(e) The process describing how customer and regulation requirements are met;

(f) The process for control of documents and their revision;

(g) The procedures for dealing with non-conforming products; and

(h) The training programmes and qualification procedures for relevant personnel.

1.8.8 (Reserved – not relevant to this Code)

1.8.9 Administrative controls for the approval of packagings for dangerous goods

1.8.9.1 The Competent Authority may on application approve a design for a packaging for use in the transport of dangerous goods if it is satisfied that a packaging of that design:

(a) will comply with, or is permitted by, Part 6 of this Code; and
(b) satisfies all the relevant testing and inspection requirements set out in that Part.

1.8.9.2 In giving its approval, the Competent Authority may impose in relation to the approval any condition about the construction, packing, use or maintenance of a packaging manufactured in accordance with the design necessary for the safe use of the packaging to transport dangerous goods.

1.8.9.3 In determining whether packaging of a particular design satisfies any particular testing requirement, the Competent Authority may rely on any test certificate issued by a recognised testing facility. A recognised testing facility is:

(a) a testing facility registered by NATA to conduct performance tests under Part 6 of the ADG Code for the packaging design type;
(b) a testing facility in Australia capable of conducting the tests, if there is no testing facility registered by NATA to conduct performance tests of that kind;
(c) a facility in a foreign country approved by a public authority of the country to conduct performance tests of that kind.

1.8.9.4 A recognised testing facility may certify in writing that a packaging design type has passed particular performance tests for particular dangerous goods.

1.8.9.4.1 If a performance test is conducted by a testing facility registered by NATA, any test certificate, or report on the test, shall:

(a) contain any details required under the relevant Chapter of Part 6 of this Code; and
(b) be in the appropriate form used by NATA registered testing facilities.

1.8.9.4.2 If a performance test is conducted in Australia by a recognised testing facility that is not registered by NATA:

(a) the Competent Authority shall be provided an opportunity to witness the test, and the competent authority may define requirements for an observer; and
(b) any test certificate, or report on the test, shall contain any details required under the relevant Chapter of Part 6 of the ADG Code.

1.8.9.5 The competent authority may authorise another person or body to issue approvals on its behalf. Any such approvals shall be issued subject to the following additional provisions:

1.8.9.5.1 In giving its authorisation, the Competent Authority may impose in relation to the authorisation any condition it considers appropriate in relation to the issuing of approvals by the person or body.

1.8.9.5.2 In issuing an approval, in addition to complying with any condition imposed under 1.8.9.5.1, the person or body shall also:

(f) comply with any relevant requirements imposed by Part 6 of this Code in relation to the issuing of the approval;
(g) give the Competent Authority, in relation to the approval, all of the information the competent authority requires were it to issue the approval itself; and
(h) notify the competent authority prior to issuing any approval that does not strictly conform to the relevant requirements imposed by Part 6 of this Code.

1.8.9.6 The approval shall include information that allows a packaging manufacturer to manufacture packagings using equivalent input materials from alternative suppliers.

NOTE: *This should include information about the properties of the materials, such as melt flow rate, density, and tensile yield strength.*

1.8.10 Licences for dangerous goods transport

NOTE: *This Part is in addition to any other law in force regarding the licensing of drivers, the employment or engaging of drivers, the registration of vehicles, or the transport of goods by road.*

FURTHER DEVELOPMENT REQUIRED – THIS SECTION MAY BE INFORMATIVE ONLY IN INITIAL EDITION OF THE CODE

CHAPTER 1.9

RESERVED

CHAPTER 1.10

SECURITY PROVISIONS

NOTE 1: *For the purposes of this Chapter, security means measures or precautions to be taken to minimise theft or misuse of dangerous goods that may endanger persons, property or the environment.*

NOTE 2: *Legislation other than dangerous goods transport legislation may impose additional security requirements in transport, in particular for explosives, security sensitive substances and radioactive materials. This may include formal security clearances and licensing. The provisions of this chapter do not describe all security requirements for the transport of such materials subject to other legislation.*

NOTE 3: *In addition to these requirements, transporters of dangerous goods should be familiar with, and implement as necessary, the National Code of Practice for Chemicals of Security Concern.*

1.10.1 General provisions

1.10.1.1 All persons engaged in the carriage of dangerous goods shall consider the security requirements set out in this Chapter commensurate with their responsibilities.

1.10.1.2 Dangerous goods shall only be offered for carriage to carriers that have been appropriately identified.

1.10.1.3 Areas within temporary storage terminals, temporary storage sites, vehicle depots, berthing areas and marshalling yards used for the temporary storage during carriage of dangerous goods shall be properly secured, well-lit and, where possible and appropriate, not accessible to the general public.

1.10.1.4 Each member of a vehicle crew shall carry with them means of identification, which includes their photograph, during carriage of dangerous goods.

1.10.1.5 Safety inspections in accordance with 1.8.1 and 7.5.1.1 shall cover appropriate security measures.

1.10.1.6 The competent authority shall maintain up-to-date registers of all valid training certificates for drivers stipulated in 8.2.1 issued by it or by any recognized organization within its jurisdiction.

1.10.2 Security training

1.10.2.1 The training and the refresher training specified in Chapter 1.3 shall also include elements of security awareness. The security refresher training need not be linked to regulatory changes only.

1.10.2.2 Security awareness training shall address the nature of security risks, recognising security risks, methods to address and reduce such risks and actions to be taken in the event of a security breach. It shall include awareness of security plans (if appropriate) commensurate with the responsibilities and duties of individuals and their part in implementing security plans.

1.10.2.3 Such training shall be provided or verified upon employment in a position involving dangerous goods transport and shall be periodically supplemented with refresher training.

1.10.2.4 Records of all security training received shall be kept by the employer and made available to the employee or competent authority, upon request. Records shall be kept by the employer for a period of time established by the competent authority.

1.10.3 Provisions for high consequence dangerous goods

1.10.3.1 *Definition of high consequence dangerous goods for transport purposes*

NOTE: *Other legislation may also use the term "high consequence dangerous goods" or similar to describe substances of security concern, in particular ammonium nitrate-based substances.*

1.10.3.1.1 High consequence dangerous goods are those which have the potential for misuse in a terrorist event and which may, as a result, produce serious consequences such as mass casualties, mass destruction or, particularly for Class 7, mass socio-economic disruption.

1.10.3.1.2 High consequence dangerous goods in classes other than Class 7 are those listed in Table 1.10.3.1.2 below and carried in quantities greater than those indicated therein.

Table 1.10.3.1.2: List of high consequence dangerous goods

Class	Substance or article	Quantity		
		Tank (*l*) [c]	Bulk (kg) [d]	Packages (kg)
1	Explosives, other than unrestricted explosives or 1.4S	0	0	0
2	Flammable, non-toxic gases (classification codes including only letters F or FC)	3000	[a]	[b]
	Toxic gases (classification codes including letters T, TF, TC, TO, TFC or TOC) excluding aerosols	0	[a]	0
3	Flammable liquids of packing groups I and II	3000	[a]	[b]
	Desensitized explosives	0	[a]	0
4.1	Desensitized explosives	[a]	[a]	0
4.2	Packing group I substances	3000	[a]	[b]
4.3	Packing group I substances	3000	[a]	[b]
5.1	Oxidizing liquids of packing group I	3000	[a]	[b]
	Security sensitive ammonium nitrate [e]	?	?	?
	Perchlorates, ammonium nitrate other than security sensitive ammonium nitrate	3000	3000	[b]
6.1	Toxic substances of packing group I	0	[a]	0
6.2	Infectious substances of Category A (UN Nos. 2814 and 2900, except for animal material) and medical waste of Category A (UN No. 3549)	[a]	0	0
8	Corrosive substances of packing group I	3000	[a]	[b]

[a] *Not relevant.*

[b] *The provisions of 1.10.3 do not apply, whatever the quantity is.*

[c] *A value indicated in this column is applicable only if carriage in tanks is authorized, in accordance with Chapter 3.2, Table A, column (10) or (12). For substances that are not authorized for carriage in tanks, the instruction in this column is not relevant.*

[d] *A value indicated in this column is applicable only if carriage in bulk is authorized, in accordance with Chapter 3.2, Table A, column (10) or (17). For substances that are not authorized for carriage in bulk, the instruction in this column is not relevant.*

[e] *Australian jurisdictions have variously adopted provisions relating to security sensitive ammonium nitrate. This Chapter provides requirements for security in transport. Compliance with the requirements of this chapter will not address all regulatory requirements relating to security sensitive ammonium nitrate.*

1.10.3.1.3 For dangerous goods of Class 7, high consequence radioactive material is that with an activity equal to or greater than a transport security threshold of 3 000 A_2 per single package (see also 2.2.7.2.2.1) except for the following radionuclides where the transport security threshold is given in Table 1.10.3.1.3 below.

Table 1.10.3.1.3: Transport security thresholds for specific radionuclides

Element	Radionuclide	Transport security threshold (TBq)
Americium	Am-241	0.6
Gold	Au-198	2
Cadmium	Cd-109	200
Californium	Cf-252	0.2
Curium	Cm-244	0.5
Cobalt	Co-57	7
Cobalt	Co-60	0.3
Caesium	Cs-137	1
Iron	Fe-55	8000
Germanium	Ge-68	7
Gadolinium	Gd-153	10
Iridium	Ir-192	0.8
Nickel	Ni-63	600
Palladium	Pd-103	900
Promethium	Pm-147	400
Polonium	Po-210	0.6
Plutonium	Pu-238	0.6
Plutonium	Pu-239	0.6
Radium	Ra-226	0.4
Ruthenium	Ru-106	3
Selenium	Se-75	2
Strontium	Sr-90	10
Thallium	Tl-204	200
Thulium	Tm-170	200
Ytterbium	Yb-169	3

1.10.3.1.4 For mixtures of radionuclides, determination of whether or not the transport security threshold has been met or exceeded can be calculated by summing the ratios of activity present for each radionuclide divided by the transport security threshold for that radionuclide. If the sum of the fractions is less than 1, then the radioactivity threshold for the mixture has not been met nor exceeded.

This calculation can be made with the formula:

$$\sum_i \frac{A_i}{T_i} < 1$$

Where:

Ai = activity of radionuclide *i* that is present in a package (TBq)

Ti = transport security threshold for radionuclide *i* (TBq).

1.10.3.1.5 When radioactive material possesses subsidiary hazards of other classes, the criteria of table 1.10.3.1.2 shall also be taken into account (see also 1.7.5).

1.10.3.2 ***Security plans***

1.10.3.2.1 Carriers, consignors and other participants specified in 1.4.2 and 1.4.3 engaged in the carriage of high consequence dangerous goods (see Table 1.10.3.1.2) or high consequence radioactive material (see 1.10.3.1.3) shall adopt, implement and comply with a security plan that addresses at least the elements specified in 1.10.3.2.2.

1.10.3.2.2 The security plan shall comprise at least the following elements:

(a) Specific allocation of responsibilities for security to competent and qualified persons with appropriate authority to carry out their responsibilities;

(b) Records of dangerous goods or types of dangerous goods concerned;

(c) Review of current operations and assessment of security risks, including any stops necessary to the transport operation, the keeping of dangerous goods in the vehicle, tank or container before, during and after the journey and the intermediate temporary storage of dangerous goods during the course of intermodal transfer or transhipment between units as appropriate;

(d) Clear statement of measures that are to be taken to reduce security risks, commensurate with the responsibilities and duties of the participant, including:

- training;
- security policies (e.g. response to higher threat conditions, new employee/employment verification, etc.);
- operating practices (e.g. choice/use of routes where known, access to dangerous goods in intermediate temporary storage (as defined in (c)), proximity to vulnerable infrastructure etc.);
- equipment and resources that are to be used to reduce security risks;

(e) Effective and up to date procedures for reporting and dealing with security threats, breaches of security or security incidents;

(f) Procedures for the evaluation and testing of security plans and procedures for periodic review and update of the plans;

(g) Measures to ensure the physical security of transport information contained in the security plan; and

(h) Measures to ensure that the distribution of information relating to the transport operation contained in the security plan is limited to those who need to have it. Such measures shall not preclude the provision of information required elsewhere in this Code.

NOTE: *Carriers, consignors and consignees should co-operate with each other and with competent authorities to exchange threat information, apply appropriate security measures and respond to security incidents.*

1.10.3.2.3 Additional security requirements for articles and substances of class 1

NOTE: *The requirements of 1.10.3.2.3 apply in addition to the requirements outlined above in 1.10.3.2*

1.10.3.2.3.1 Carriers, consignors and other participants shall ensure that the security plan, addresses the following additional requirements for articles and substances of class 1, other than for unrestricted explosives:

(a) Only persons authorised to drive a vehicle under the relevant legislation are permitted to do so;
(b) All practicable measures are taken to avoid theft of or accident involving explosives, including:
  (i) that all openings to tanks or other enclosures are appropriately lockable and locked during transport;
  (ii) suitable guarding or other permitted security arrangements are implemented; and
  (iii) reporting procedures for suspected and actual incidents during transport.
(c) Recorded checks or audits are undertaken to determine whether there has been any breach of any secured enclosure:
  (i) Throughout the journey; and
  (ii) At the final destination.
(d) Any unexplained discrepancy that cannot be legitimately explained or reconciled within a short period of time shall be reported to the police and competent authority;
(e) Only persons who have been security cleared are permitted unsupervised access to explosives.
(f) Suitable procedures are implemented to ensure that the transport complies with the other requirements of this code as they relate to:

(i) Transport procedures such as vehicle refuelling and locations of breaks;
(ii) Procedures for breakdowns and accidents that account for the hazards presented by the goods being transported;
(iii) The location and procedures for loading and unloading of explosives.

1.10.3.2.3.2 Prior to articles and substances of class 1 being consigned, the consignor shall:

(a) Notify the proposed shipment to the consignee and the carrier engaged to transport the explosives; and
(b) receive advice that the consignee, or a person authorised by the consignee, is prepared to receive the consignment on arrival, or that arrangements have been made for the driver to store the explosives in a place authorised for that purpose by the Competent Authority.

If such advice is not received, the transport shall not proceed.

1.10.3.2.4 *Security plans for explosives category 3 loads*

1.10.3.2.4.1 Where a load is an explosives category 3 load as determined in accordance with 1.1.8, the written security plan shall additionally meet the following minimum requirements:

(a) a description of the measures for preventing the theft of the explosives being transported by road or rail and for preventing unauthorised people from having access to those explosives;
(b) a statement setting out the vehicle design requirements for vehicles used to transport the explosives, and the load securing requirements for securing and protecting those explosives;
(c) a description of the arrangements for emergency communications in the event of an emergency involving those explosives;
(d) a statement setting out the requirements for training for persons involved in the transport of the explosives by road or rail (training would include dealing with security emergencies and transporting explosives safely);
(e) a statement setting out the requirements for ensuring that vehicles transporting the explosives travel by the safest practicable route, considering the risk, including the procedures for planning transport routes;
(f) procedures for the testing, evaluation, review and update of the security plan;
(g) nomination of the responsible person/security manager to implement and maintain the security plan, including the instruction of workers in the relevant access controls, recording procedures and reporting security incidents;
(h) a list of all those, including any contractors, who will have unsupervised access to explosives, and who have been appropriately security cleared, including provisions for adding to or removing from the list; and
(i) a means for ensuring that the involvement of any other person ensures that the other person is operating under the relevant security plan.

1.10.3.2.4.2 A vehicle used to transport high security risk loads shall be fitted with a monitoring system that ensures, independent of the vehicle crew:

(a) the location of an explosives category 3 load is known and recorded, in compliance with the security plan;
(b) in the event of a breach of security involving an explosives category 3 load of explosives, immediate notification is made of the nature, location and time of the event to enable response assistance.

1.10.3.2.4.3 Only security cleared personnel shall be permitted to drive or ride on a vehicle transporting an explosives category 3 load, or in an escort vehicle providing monitoring for an explosives category 3 load in accordance with 1.10.3.2.4.2.

1.10.3.3 Devices, equipment or arrangements to prevent the theft of the vehicle carrying high consequence dangerous goods (see Table 1.10.3.1.2) or high consequence radioactive material (see 1.10.3.1.3) and its cargo, shall be applied and measures taken to ensure that these are operational and effective at all times. The application of these protective measures shall not jeopardize emergency response.

NOTE: *When appropriate and already fitted, the use of transport telemetry or other tracking methods or devices should be used to monitor the movement of high consequence dangerous goods (see Table 1.10.3.1.2) or high consequence radioactive material (see 1.10.3.1.3).*

1.10.4 The requirements of 1.10.1, 1.10.2, 1.10.3 and 8.1.2.1 (d) do not apply when the quantities carried in tanks or in bulk on a transport unit do not exceed those referred to in 1.1.3.6.3. In addition the provisions of this Chapter do not apply to the carriage of UN No. 2912 RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-I) and UN No. 2913 RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I).

1.10.5 For radioactive material, the provisions of this Chapter are deemed to be complied with when the provisions of the Convention on Physical Protection of Nuclear Material (INFCIRC/274/Rev.1, IAEA, Vienna (1980)) and the IAEA circular on "Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities" (INFCIRC/225/Rev.5, IAEA, Vienna (2011)) are applied.

PART 2

Classification

CHAPTER 2.1

GENERAL PROVISIONS

2.1.1 Introduction

2.1.1.1 The classes of dangerous goods according to this Code 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 hazard(s) to a dangerous substance or article is made according to the criteria of the class or classes corresponding to those hazards, 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 provisions[1]. 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 hazard (if any) and the packing group (if any) shall be determined. Once the class, subsidiary hazard (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] *An alphabetic list of these entries can be found in Table B of Chapter 3.2. This table is not an official part of this Code.*

– Under the same UN number and name but with additional hazard communication information as appropriate to reflect the additional subsidiary hazard(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 also recognize an approval granted by another competent authority provided that this approval has been granted in accordance with the procedures applicable according to this Code, 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 this Code composed of a single predominant substance mentioned by name in Table A of Chapter 3.2 and one or more substances not subject to this Code 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 hazards 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 this Code.

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.

2.1.3.4.3 Used articles, e.g. transformers and condensers, containing a solution or mixture mentioned in 2.1.3.4.2 shall always be classified under the same entry of Class 9, provided:

(a) they do not contain any additional dangerous components, other than polyhalogenated dibenzodioxins and dibenzofurans of Class 6.1 or components of packing group III of Class 3, 4.1, 4.2, 4.3, 5.1, 6.1 or 8; and

(b) they do not have the hazard characteristics as indicated in 2.1.3.5.3 (a) to (g) and (i).

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 this Code 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 (LC_{50}) 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.

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 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 or of no other substance of Class 9, 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.

2.1.3.10 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, I DERMAL	6.1, I ORAL	6.1, II	6.1, III	8, I	8, II	8, III	9
3, I	SOL LIQ 4.1 3, I	SOL LIQ 4.1 3, I	SOL LIQ 4.2 3, I	SOL LIQ 4.2 3, I	4.3, I	4.3, I	4.3, I	SOL LIQ 5.1, I 3, I	SOL LIQ 5.1, I 3, I	SOL LIQ 5.1, I 3, I	3, I	3, I	3, I	3, I	3, I	3, I	3, I	3, I
3, II	SOL LIQ 4.1 3, II	SOL LIQ 4.1 3, II	SOL LIQ 4.2 3, II	SOL LIQ 4.2 3, II	4.3, I	4.3, II	4.3, II	SOL LIQ 5.1, I 3, I	SOL LIQ 5.1, II 3, II	SOL LIQ 5.1, II 3, II	3, I	3, I	3, II	3, II	8, I	3, II	3, II	3, II
3, III	SOL LIQ 4.1 3, II	SOL LIQ 4.1 3, III	SOL LIQ 4.2 3, II	SOL LIQ 4.2 3, III	4.3, I	4.3, II	4.3, III	SOL LIQ 5.1, I 3, I	SOL LIQ 5.1, II 3, II	SOL LIQ 5.1, III 3, III	6.1, I	6.1, I	6.1, II	3, III [a]	8, I	8, II	3, III	3, III
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, I	6.1, I	SOL LIQ 4.1, II 6.1, II	SOL LIQ 4.1, II 6.1, II	8, I	SOL LIQ 4.1, II 8, II	SOL LIQ 4.1, II 8, II	4.1, II
4.1, III			4.2, II	4.2, III	4.3, I	4.3, II	4.3, III	5.1, I	4.1, II	4.1, III	6.1, I	6.1, I	6.1, II	SOL LIQ 4.1, III 6.1, III	8, I	8, II	SOL LIQ 4.1, III 8, III	4.1, III
4.2, II					4.3, I	4.3, II	4.3, II	5.1, I	4.2, II	4.2, II	6.1, I	6.1, I	4.2, II	4.2, II	8, I	4.2, II	4.2, II	4.2, II
4.2, III					4.3, I	4.3, II	4.3, III	5.1, I	5.1, II	4.2, III	6.1, I	6.1, I	6.1, II	4.2, III	8, I	8, II	4.2, III	4.2, III
4.3, I								5.1, I	4.3, I	4.3, I	6.1, I	4.3, I	4.3, I	4.3, I	4.3, I	4.3, I	4.3, I	4.3, I
4.3, II								5.1, I	4.3, II	4.3, II	6.1, I	4.3, I	4.3, II	4.3, II	8, I	4.3, II	4.3, II	4.3, II
4.3, III								5.1, I	5.1, II	4.3, III	6.1, I	6.1, I	6.1, II	4.3, III	8, I	8, II	4.3, III	4.3, III
5.1, I											5.1, I	5.1, I	5.1, I	5.1, I	5.1, I	5.1, I	5.1, I	5.1, I
5.1, II											6.1, I	5.1, I	5.1, II	5.1, II	8, I	5.1, II	5.1, II	5.1, II
5.1, III											6.1, I	6.1, I	6.1, II	5.1, III	8, I	8, II	5.1, III	5.1, III
6.1, I DERMAL															SOL LIQ 6.1, I 8, I	6.1, I	6.1, I	6.1, I
6.1, I ORAL															SOL LIQ 6.1, I 8, I	6.1, I	6.1, I	6.1, I
6.1, II INHAL															SOL LIQ 6.1, I 8, I	6.1, II	6.1, II	6.1, II
6.1, II DERMAL															SOL LIQ 6.1, I 8, I	SOL LIQ 6.1, II 8, II	6.1, II	6.1, II
6.1, II ORAL															8.I	SOL LIQ 6.1, II 8, II	6.1, II	6.1, II
6.1, III															8.I	8, II	8, III	6.1, III
8, I																		8, I
8, II																		8, II
8, III																		8, III

SOL = Solid substances and mixtures
LIQ = Liquid substances, mixtures and solutions
DERMAL = Dermal toxicity
ORAL = Oral toxicity
INHAL = Inhalation toxicity

[a] *Class 6.1 for pesticides*

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:

(i) Known explosives;
(ii) Substances showing explosive effects in testing;
(iii) Compounds designed with the view of producing a practical explosive or pyrotechnic effect; or
(iv) 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:

(i) Less than 15 %, by mass, if assigned to packing group I (high hazard) or II (medium hazard); or
(ii) 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 and which contain only dangerous goods within the permitted limited quantity amounts specified in Column (7a) of Table A of Chapter 3.2, UN No. 3363 and special provisions 301 and 672 of Chapter 3.3 may be applied.*

2.1.5.1 Articles containing dangerous goods may be classified as otherwise provided by this Code 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 this Code (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. However, this section applies to articles containing explosives which are excluded from Class 1 in accordance with 2.2.1.1.8.2.

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).

2.1.6 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 explosive or 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.

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 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 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 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 containing flash composition (see Note 2 of 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 or 0336, and assignment of articles to UN No. 0431 for those used for theatrical effects meeting the definition for article type and the 1.4G specification in the default fireworks classification table in 2.2.1.1.7.5, 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[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 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; or

(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:*

(a) for spherical and peanut shells the diameter of the sphere of the shell;

(b) for cylinder shells the length of the shell;

(c) for a shell in mortar, Roman candle, shot tube firework or mine the inside diameter of the tube comprising or containing the firework;

(d) for a bag mine or cylinder mine, the inside diameter of the mortar intended to contain the mine.

[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 ≤ 25 % flash composition, as loose powder and/or report effects	1.3G
			Colour shell: ≤ 50 mm, or ≤ 60 g pyrotechnic substance, with ≤ 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 ≤ 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) *(Reference to percentages for shell of shells are to the gross mass of the fireworks article)*	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	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: 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	> 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	Non-metallic case containing pressed or consolidated pyrotechnic substance producing sparks and flame ***NOTE:*** *Fountains intended to produce a vertical cascade or curtain of sparks are considered to be waterfalls (see row below).*	≥ 1 kg pyrotechnic substance	1.3G
			< 1 kg pyrotechnic substance	1.4G
Waterfall	Cascades, showers	Pyrotechnic fountain intended to produce a vertical cascade or curtain of sparks	Containing flash composition regardless of the results of Test Series 6 (see 2.2.1.1.7.1 (a))	1.1G
			Not containing flash composition	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

Type	Includes: / Synonym:	Definition	Specification	Classification
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
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 who may also recognize an approval granted by another competent authority provided that this approval has been granted in accordance with the procedures applicable according to this Code, 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. One such method is described in ISO 14451-2 using a heating rate of 80 K/min.*

(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 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
	0462	ARTICLES, EXPLOSIVE, N.O.S.
1.1D	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 propelling charge
	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 propelling charge
	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.
1.4G	0485	SUBSTANCES, EXPLOSIVE, N.O.S.
	0353	ARTICLES, EXPLOSIVE, N.O.S.
1.4S	0481	SUBSTANCES, EXPLOSIVE, N.O.S.
	0349	ARTICLES, EXPLOSIVE, N.O.S.
	0384	COMPONENTS, EXPLOSIVE TRAIN, N.O.S.
1.5D	0482	SUBSTANCES, EXPLOSIVE, VERY INSENSITIVE (SUBSTANCES, EVI) N.O.S.
1.6N	0486	ARTICLES, EXPLOSIVE, EXTREMELY INSENSITIVE (ARTICLES, EEI)
	0190	SAMPLES, EXPLOSIVE other than initiating explosive ***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.*

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 that predominantly contain 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, ELECTRONIC programmable for blasting: UN Nos. 0511, 0512, 0513

Detonators with enhanced safety and security features, utilizing electronic components to transmit a firing signal with validated commands and secure communications. Detonators of this type cannot be initiated by other means.

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, watergel.

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;

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 10156:2017).

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.

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 10156:2017.

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 hazard.*

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 LC_{50} 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:

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

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 LC_{50} value as found in packing instruction P200 of 4.1.4.1.

When no LC_{50} value is listed in packing instruction P200 of 4.1.4.1, a LC_{50} value available in scientific literature shall be used.

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

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 hazard.

A gas mixture that is considered to be toxic due to the combined effects of corrosivity and toxicity has a subsidiary hazard of corrosivity when the mixture is known by human experience to be destructive to the skin, eyes or mucous membranes or when the LC_{50} value of the corrosive components of the mixture is equal to or less than 5 000 ml/m³ (ppm) when the LC_{50} is calculated by the formula:

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

where fc_i = mole fraction of the i^{th} corrosive component substance of the mixture;

Tc_i = toxicity index of the i^{th} corrosive component substance of the mixture.

The Tci equals the LC_{50} value as found in packing instruction P200 of 4.1.4.1.

When no LC_{50} value is listed in packing instruction P200 of 4.1.4.1, a LC_{50} value available in scientific literature shall be used.

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

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:

(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 (f) below;

(b) Assignment to group O shall apply when the aerosol contains an oxidizing gas according to 2.2.2.1.5;

(c) 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, 1043, 2073 or 3318. For UN No. 1043, see special provision 642;;
- 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 (LC_{50} 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.**	**Name of the substance or article**
1A	1956	COMPRESSED GAS, N.O.S.
1O	3156	COMPRESSED GAS, OXIDIZING, N.O.S.
1F	1964	HYDROCARBON GAS MIXTURE, COMPRESSED, N.O.S.
	1954	COMPRESSED GAS, FLAMMABLE, N.O.S.
1T	1955	COMPRESSED GAS, TOXIC, N.O.S.
1TF	1953	COMPRESSED GAS, TOXIC, FLAMMABLE, N.O.S.
1TC	3304	COMPRESSED GAS, TOXIC, CORROSIVE, N.O.S.
1TO	3303	COMPRESSED GAS, TOXIC, OXIDIZING, N.O.S.
1TFC	3305	COMPRESSED GAS, TOXIC, FLAMMABLE, CORROSIVE, N.O.S.
1TOC	3306	COMPRESSED GAS, TOXIC, OXIDIZING, CORROSIVE, N.O.S.

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 dichlorofluoromethane (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); 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). ***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.*
	1968	INSECTICIDE GAS, N.O.S.
	3163	LIQUEFIED GAS, N.O.S.
2O	3157	LIQUEFIED GAS, OXIDIZING, N.O.S.
2F	1010	BUTADIENES, STABILIZED or BUTADIENES AND HYDROCARBON MIXTURE, STABILIZED, containing more than 40% butadienes.
	1060	METHYLACETYLENE AND PROPADIENE MIXTURE, STABILIZED ***such as mixtures of methylacetylene and propadiene with hydrocarbons, which as:*** 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 C_4- 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 C_4- saturated hydrocarbons being not less than 5 % by volume, as well as mixtures of propadiene with 1 to 4 % methylacetylene.

Liquefied gases *(cont'd)*		
Classification code	**UN No.**	**Name of the substance or article**
2F *(cont'd)*	1965	HYDROCARBON GAS MIXTURE, LIQUEFIED, N.O.S such as mixtures, which as: Mixture A, have 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; Mixture A01, have a vapour pressure at 70 °C not exceeding 1.6 MPa (16 bar) and a relative density at 50 °C not lower than 0.516 kg/l; Mixture A02, have a vapour pressure at 70 °C not exceeding 1.6 MPa (16 bar) and a relative density at 50 °C not lower than 0.505 kg/l; Mixture A0, have a vapour pressure at 70 °C not exceeding 1.6 MPa (16 bar) and a density at 50 °C not lower than 0.495 kg/l; Mixture A1, have a vapour pressure at 70 °C not exceeding 2.1 MPa (21 bar) and a density at 50 °C not lower than 0.485 kg/l; Mixture B1 have a vapour pressure at 70 °C not exceeding 2.6 MPa (26 bar) and a relative density at 50 °C not lower than 0.474 kg/l; Mixture B2 have a vapour pressure at 70 °C not exceeding 2.6 MPa (26 bar) and a relative density at 50 °C not lower than 0.463 kg/l; Mixture B, have a vapour pressure at 70 °C not exceeding 2.6 MPa (26 bar) and a density at 50 °C not lower than 0.450 kg/l; Mixture C, have a vapour pressure at 70 °C not exceeding 3.1 MPa (31 bar) and a 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 following names customary in the trade is permitted for describing these substances: for mixtures A, A01, A02 and A0: BUTANE; for mixture C: PROPANE.* ***NOTE 2:*** *UN No. 1075 PETROLEUM GASES, LIQUEFIED may be used as an alternative entry for UN No. 1965 HYDROCARBON GAS MIXTURE LIQUEFIED, N.O.S. for carriage prior to or following maritime or air carriage.*
	3354	INSECTICIDE GAS, FLAMMABLE, N.O.S.
	3161	LIQUEFIED GAS, FLAMMABLE, N.O.S.
2T	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.**	**Name of the substance or article**
4		Only substances listed in Table A of Chapter 3.2 are to be accepted for carriage.

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

Other articles containing gas under pressure		
Classification code	**UN No.**	**Name of the substance or article**
6A	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)
	3538	ARTICLES CONTAINING NON-FLAMMABLE, NON TOXIC GAS, N.O.S.
6F	3150	DEVICES, SMALL, HYDROCARBON GAS POWERED or
	3150	HYDROCARBON GAS REFILLS FOR SMALL DEVICES, with release device
	3358	REFRIGERATING MACHINES containing flammable, non-toxic, liquefied gas
	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
	3537	ARTICLES CONTAINING FLAMMABLE GAS, N.O.S.
6T	3539	ARTICLES CONTAINING TOXIC GAS, N.O.S.

Gas samples		
Classification code	**UN No.**	**Name of the substance or article**
7F	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	**UN No.**	**Name of the substance or article**
8A	3500	CHEMICAL UNDER PRESSURE, N.O.S.
8F	3501	CHEMICAL UNDER PRESSURE, FLAMMABLE, N.O.S.
8T	3502	CHEMICAL UNDER PRESSURE, TOXIC, N.O.S.
8C	3503	CHEMICAL UNDER PRESSURE, CORROSIVE, N.O.S.
8TF	3504	CHEMICAL UNDER PRESSURE, FLAMMABLE, TOXIC, N.O.S.
8FC	3505	CHEMICAL UNDER PRESSURE, FLAMMABLE, CORROSIVE, N.O.S.

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

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 hazard 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 hazard(s), the packing group determined in accordance with the table above and the packing group based on the severity of the subsidiary 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] and flash-point are in accordance with the following table:

Kinematic viscosity (extrapolated) ν (at near-zero shear rate) mm²/s at 23 °C	*Flow-time t in seconds*	*Jet diameter (mm)*	*Flash-point, closed-cup (°C)*
20 < ν ≤ 80	20 < t ≤ 60	4	above 17
80 < ν ≤ 135	60 < t ≤ 100	4	above 10
135 < ν ≤ 220	20 < t ≤ 32	6	above 5
220 < ν ≤ 300	32 < t ≤ 44	6	above -1
300 < ν ≤ 700	44 < t ≤ 100	6	above -5
700 < ν	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,*

[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.*

are substances of Class 1 (UN Nos. 0340 or 0342) or of Class 4.1 (UN Nos. 2555, 2556 or2557).

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 this Code, 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 this Code 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 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.*

2.2.3.1.7 On the basis of the test procedures specified in 2.3.3.1 and 2.3.4, and the criteria set out in 2.2.3.1.1, it may also be determined that a solution or a mixture mentioned by name or containing a substance mentioned by name 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 (H_2O_2), 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***

Flammable liquids and articles containing such substances

Without subsidiary hazard

F

F1

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)
1197 EXTRACTS, LIQUID, for flavour or aroma
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.

F2 elevated temperature

3256 ELEVATED TEMPERATURE LIQUID, FLAMMABLE, N.O.S., with flash-point above 60 °C, at or above its flash-point

F3 articles

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
3540 ARTICLES CONTAINING FLAMMABLE LIQUID, N.O.S.

(cont'd on next page)

2.2.3.3 ***List of collective entries (cont'd)***

Toxic FT	**FT1**	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.
	FT2 pesticide (f.p.<23 °C)	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 BIPYRIDILIUM 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 hazards it may exhibit.*
Corrosive	**FC**	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.
Toxic, corrosive	**FTC**	3286 FLAMMABLE LIQUID, TOXIC, CORROSIVE, N.O.S.
Liquid desensitised explosive	**D**	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.

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 hazard:

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

FO Flammable solids, oxidizing;

FT Flammable solids, toxic:

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

FC Flammable solids, corrosive:

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

D Solid desensitized explosives without subsidiary hazard;

DT Solid 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 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 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, 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 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 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, 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 this Code, *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-N_3);
diazonium salts (-CN_2^+ Z^-);
N-nitroso compounds (-N-N=O); and
aromatic sulphonylhydrazides (-SO_2-NH-NH_2).

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 hazards 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.

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

2.2.41.1.17 Self-reactive substances with an SADT not greater than 55 °C shall be subject to temperature control during carriage. See 7.1.7.

Solid desensitized explosives

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

2.2.41.1.19 Substances that:

(a) have been provisionally accepted into Class 1 according to Test Series 1 and 2 but exempted from Class 1 by Test Series 6;

(b) are not self-reactive substances of Class 4.1; and

(c) 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

2.2.41.1.20 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

2.2.41.1.21 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 white phosphorus;
- Solid desensitized 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 **F**	**without subsidiary hazard**	**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.
		organic molten	**F2**	3176	FLAMMABLE SOLID, ORGANIC, MOLTEN, N.O.S.
		inorganic	**F3**	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.
		articles	**F4**	3527	POLYESTER RESIN KIT, solid base material
				3541	ARTICLES CONTAINING FLAMMABLE SOLID, N.O.S.
	oxidizing		**FO**	3097	FLAMMABLE SOLID, OXIDIZING, N.O.S. (not allowed, see para. 2.2.41.2.2)
	FT toxic	**organic**	**FT1**	2926	FLAMMABLE SOLID, TOXIC, ORGANIC, N.O.S.
		inorganic	**FT2**	3179	FLAMMABLE SOLID, TOXIC, INORGANIC, N.O.S.
	FC corrosive	**organic**	**FC1**	2925	FLAMMABLE SOLID, CORROSIVE, ORGANIC, N.O.S.
		inorganic	**FC2**	3180	FLAMMABLE SOLID, CORROSIVE, INORGANIC, N.O.S.
Solid desensitized explosives	**without subsidiary hazard**		**D**	3319	NITROGLYCERIN MIXTURE, DESENSITIZED, SOLID, N.O.S. with more than 2 % but not more than 10 % nitroglycerin by mass
				3344	PENTAERYTHRITE 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.
	toxic		**DT**	Only substances listed in Table A of Chapter 3.2 are to be accepted for carriage as substances of Class 4.1	
Self-reactive substances **SR**	**Not requiring temperature control**		**SR1**		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 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 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 2.2.41.1.11
	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	

[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.*

(cont'd on next page)

2.2.41.3 ***List of collective entries (cont'd)***

Polymerizing substances **PM**	**not requiring temperature control**	**PM1**	3531 3532	POLYMERIZING SUBSTANCE, SOLID, STABILIZED, N.O.S. POLYMERIZING SUBSTANCE, LIQUID, STABILIZED, N.O.S.
	requiring temperature control	**PM2**	3533 3534	POLYMERIZING SUBSTANCE, SOLID, TEMPERATURE CONTROLLED, N.O.S. 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 not listed in this sub-section but 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	Concen-tration (%)	Packing method	Control tempera-ture (°C)	Emergency tempera-ture (°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	

SELF-REACTIVE SUBSTANCE	Concen-tration (%)	Packing method	Control tempera-ture (°C)	Emergency tempera-ture (°C)	UN generic entry	Remarks
2-DIAZO-1-NAPHTHOL-4-SULPHONYL CHLORIDE	100	OP5			3222	(2)
2-DIAZO-1-NAPHTHOL-5-SULPHONYL CHLORIDE	100	OP5			3222	(2)
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'-DINITROSOPENTAMETHYLENE-TETRAMINE	82	OP6			3224	(7)
DIPHENYLOXIDE-4,4'-DISULPHONYL HYDRAZIDE	100	OP7			3226	
4-DIPROPYLAMINOBENZENE- 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	
(7-METHOXY-5-METHYL-BENZOTHIOPHEN-2-YL) BORONIC ACID	88-100	OP7			3230	(11)
2-(N,N-METHYLAMINOETHYLCARBONYL)-4-(3,4-DIMETHYLPHENYLSULPHONYL) BENZENEDIAZONIUM HYDROGEN SULPHATE	96	OP7	+45	+50	3236	
4-METHYLBENZENESULPHONYLHYDRAZIDE	100	OP7			3226	

SELF-REACTIVE SUBSTANCE	Concen-tration (%)	Packing method	Control tempera-ture (°C)	Emergency tempera-ture (°C)	UN generic entry	Remarks
3-METHYL-4-(PYRROLIDIN-1-YL) BENZENEDIAZONIUM TETRAFLUOROBORATE	95	OP6	+45	+50	3234	
4-NITROSOPHENOL	100	OP7	+35	+40	3236	
PHOSPHOROTHIOIC ACID, O-[(CYANOPHENYL METHYLENE) AZANYL] O,O-DIETHYL ESTER	82-91 (Z isomer)	OP8			3227	(10)
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 7.1.7.3.1 to 7.1.7.3.6.

(2) "EXPLOSIVE" subsidiary 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 7.1.7.3.1 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 7.1.7.3.1 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) 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.

(11) The technical compound with the specified concentration limits may contain up to 12 % water and up to 1 % organic impurities.

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 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 33.4. 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 33.4; 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 33.4, 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 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 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 33.4 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 33.4, 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					
Without subsidiary hazard	**organic**	**liquid**	**S1**	2845	PYROPHORIC LIQUID, ORGANIC, N.O.S.
				3183	SELF-HEATING LIQUID, ORGANIC, N.O.S.
		solid	**S2**	1373	FIBRES or FABRICS, ANIMAL or
				1373	VEGETABLE or SYNTHETIC, N.O.S. with oil
				2006	PLASTICS, NITROCELLULOSE-BASED, SELF-HEATING, N.O.S.
				3313	ORGANIC PIGMENTS, SELF HEATING
				2846	PYROPHORIC SOLID, ORGANIC, N.O.S.
				3088	SELF-HEATING SOLID, ORGANIC, N.O.S.
S	**inorganic**	**liquid**	**S3**	3194	PYROPHORIC LIQUID, INORGANIC, N.O.S.
				3186	SELF-HEATING LIQUID, INORGANIC, N.O.S.
		solid	**S4**	1383	PYROPHORIC METAL, N.O.S. or
				1383	PYROPHORIC ALLOY, N.O.S.
				1378	METAL CATALYST, WETTED with a visible excess of liquid
				2881	METAL CATALYST, DRY
				3189[a]	METAL POWDER, SELF-HEATING, N.O.S.
				3205	ALKALINE EARTH METAL ALCOHOLATES, N.O.S.
				3200	PYROPHORIC SOLID, INORGANIC, N.O.S.
				3190	SELF-HEATING SOLID, INORGANIC, N.O.S.
	organometallic		**S5**	3392	ORGANOMETALLIC SUBSTANCE, LIQUID, PYROPHORIC
				3391	ORGANOMETALLIC SUBSTANCE, SOLID, PYROPHORIC
				3400	ORGANOMETALLIC SUBSTANCE, SOLID, SELF-HEATING
	articles		**S6**	3542	ARTICLES CONTAINING A SUBSTANCE LIABLE TO SPONTANEOUS COMBUSTION, N.O.S.
Water-reactive			**SW**	3394	ORGANOMETALLIC SUBSTANCE, LIQUID, PYROPHORIC, WATER-REACTIVE
				3393	ORGANOMETALLIC SUBSTANCE, SOLID, PYROPHORIC, WATER-REACTIVE
Oxidizing			**SO**	3127	SELF-HEATING SOLID, OXIDIZING, N.O.S. (not allowed, see 2.2.42.2)
Toxic	**organic**	**liquid**	**ST1**	3184	SELF-HEATING LIQUID, TOXIC, ORGANIC, N.O.S.
ST		**solid**	**ST2**	3128	SELF-HEATING SOLID, TOXIC, ORGANIC, N.O.S.
	inorganic	**liquid**	**ST3**	3187	SELF-HEATING LIQUID, TOXIC, INORGANIC, N.O.S.
		solid	**ST4**	3191	SELF-HEATING SOLID, TOXIC, INORGANIC, N.O.S.
Corrosive	**organic**	**liquid**	**SC1**	3185	SELF-HEATING LIQUID, CORROSIVE, ORGANIC, N.O.S.
SC		**solid**	**SC2**	3126	SELF-HEATING SOLID, CORROSIVE, ORGANIC, N.O.S.
	inorganic	**liquid**	**SC3**	3188	SELF-HEATING LIQUID, CORROSIVE, INORGANIC, N.O.S.
		solid	**SC4**	3206	ALKALI METAL ALCOHOLATES, SELF-HEATING, CORROSIVE, N.O.S.
				3192	SELF-HEATING SOLID, CORROSIVE, INORGANIC, N.O.S.

[a] *Dust and powder of metals, non toxic in a non-spontaneous combustible form which nevertheless, in contact with water, emit flammable gases, are substances of Class 4.3.*

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 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 33.5; 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 33.5, 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 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 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 33.5, 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 33.5, 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			
	liquid	**W1**	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.
Without subsidiary hazard **W**	**solid**	**W2** [a]	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.
	articles	**W3**	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
Liquid, flammable		**WF1**	3482 ALKALI METAL DISPERSION, FLAMMABLE or 3482 ALKALINE EARTH METAL DISPERSION, FLAMMABLE 3399 ORGANOMETALLIC SUBSTANCE, LIQUID, WATER-REACTIVE, FLAMMABLE
Solid, flammable		**WF2**	3396 ORGANOMETALLIC SUBSTANCE, SOLID, WATER-REACTIVE, FLAMMABLE 3132 WATER-REACTIVE SOLID, FLAMMABLE, N.O.S.
Solid, self-heating		**WS** [b]	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.
Solid, oxidizing		**WO**	3133 WATER-REACTIVE SOLID, OXIDIZING, N.O.S. (not allowed, see 2.2.43.2)
Toxic **WT**	**liquid**	**WT1**	3130 WATER-REACTIVE LIQUID, TOXIC, N.O.S.
	solid	**WT2**	3134 WATER-REACTIVE SOLID, TOXIC, N.O.S.
Corrosive **WC**	**liquid**	**WC1**	3129 WATER-REACTIVE LIQUID, CORROSIVE, N.O.S.
	solid	**WC2**	3131 WATER-REACTIVE SOLID, CORROSIVE, N.O.S.
Flammable, corrosive		**WFC** [c]	2988 CHLOROSILANES, WATER-REACTIVE, FLAMMABLE, CORROSIVE, NO.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 2.1.3.10.)

[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 this Code.*

[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 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 2.2.51.1.6-2.2.51.1.10 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 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 2.2.51.1.10 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

2.2.51.1.8 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

2.2.51.1.9 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

2.2.51.1.10 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, selfheating, assigned to UN No. 3100, oxidizing solids, -waterreactive-, 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;

- ammonium nitrate 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 based fertilizers with compositions that lead to exit boxes 20, 23 or 39 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 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;

- 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.

2.2.51.3 ***List of collective entries***

Oxidizing substances and articles containing such substances	**liquid**	**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.
Without subsidiary hazard **O**	**solid**	**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.
	articles	**O3**	3356 OXYGEN GENERATOR, CHEMICAL 3544 ARTICLES CONTAINING OXIDIZING SUBSTANCE, N.O.S.
Solid, flammable		**OF**	3137 OXIDIZING SOLID, FLAMMABLE, N.O.S. (not allowed, see 2.2.51.2)
Solid, self-heating		**OS**	3100 OXIDIZING SOLID, SELF-HEATING, N.O.S. (not allowed, see 2.2.51.2)
Solid, water reactive		**OW**	3121 OXIDIZING SOLID, WATER REACTIVE, N.O.S. (not allowed, see 2.2.51.2)
Toxic **OT**	**liquid**	**OT1**	3099 OXIDIZING LIQUID, TOXIC, N.O.S.
	solid	**OT2**	3087 OXIDIZING SOLID, TOXIC, N.O.S.
Corrosive **OC**	**liquid**	**OC1**	3098 OXIDIZING LIQUID, CORROSIVE, N.O.S.
	solid	**OC2**	3085 OXIDIZING SOLID, CORROSIVE, N.O.S.
Toxic, corrosive		**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 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 2.2.52.1.16.

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 7.1.7.3.6.

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.

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

2.2.52.1.15 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			
		ORGANIC PEROXIDE TYPE A, LIQUID	} Not accepted for carriage, see 2.2.52.2
		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	
Not requiring temperature control	**P1**	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.	
		ORGANIC PEROXIDE TYPE G, LIQUID	} Not subject to the provisions applicable to Class 5.2, see 2.2.52.1.6
		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	
Requiring temperature control	**P2**	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.	

2.2.52.4 ***List of currently assigned organic peroxides in packagings***

file:///C:/MadCap Flare Projects/ADG 2026/ADG 26/Content/ADG Code - Part 2/2 7 1 DELETED.htmIn 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 4.2.5.2.6, portable tank instruction T23. The formulations not listed in this sub-section but 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 hazards and remarks
ACETYL ACETONE PEROXIDE	≤ 42	≥ 48			≥8	OP7			3105	2)
"	≤ 35	≥ 57			≥8	OP8			3107	32)
"	≤ 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)

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 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	
"	≤ 62		≥ 38			OP7			3105	

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 hazards and remarks
1-(2-tert-BUTYLPEROXY ISOPROPYL)-3-ISOPROPENYLBENZENE	≤ 77	≥ 23				OP7			3105	
"	≤ 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	
"	≤ 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	
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	
"	≤ 77			≥ 6	≥ 17	OP7			3106	
CUMYL HYDROPEROXIDE	> 90 - 98	≤10				OP8			3107	13)
"	≤ 90	≥ 10				OP8			3109	13) 18)

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 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)
"	≤ 42 as a stable dispersion in water					OP8			3109	
"	≤ 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 hazards and remarks
DI-(4-tert-BUTYLCYCLOHEXYL) PEROXYDICARBONATE	≤ 100					OP6	+30	+35	3114	
"	≤ 42 as a stable dispersion in water					OP8	+30	+35	3119	
"	≤ 42 (as a paste)					OP8	+35	+40	3118	
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	
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 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			3103	
"	≤ 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	
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)
"	≤ 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	

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 hazards and remarks
DIDECANOYL PEROXIDE	≤ 100					OP6	+30	+35	3114	
2,2-DI-(4,4-DI (tert-BUTYLPEROXY) CYCLOHEXYL) PROPANE	≤ 42			≥ 58		OP7			3106	
"	≤ 22		≥ 78			OP8			3107	
DI-2,4-DICHLOROBENZOYL PEROXIDE	≤ 77				≥ 23	OP5			3102	3)
"	≤ 52 as a paste					OP8	+ 20	+ 25	3118	
"	≤ 52 as a paste with silicon oil					OP7			3106	
DI-(2-ETHOXYETHYL) PEROXYDICARBONATE	≤ 52		≥ 48			OP7	-10	0	3115	
DI-(2-ETHYLHEXYL) PEROXYDICARBONATE	> 77 – 100					OP5	-20	-10	3113	
"	≤ 77		≥ 23			OP7	-15	-5	3115	
"	≤ 62 as a stable dispersion in water					OP8	-15	-5	3119	
"	≤ 52 as a stable dispersion in water (frozen)					OP8	-15	-5	3120	
2,2-DIHYDROPEROXYPROPANE	≤ 27			≥ 73		OP5			3102	3)
DI-(1-HYDROXYCYCLOHEXYL) PEROXIDE	≤ 100					OP7			3106	
DIISOBUTYRYL PEROXIDE	> 32 – 52		≥ 48			OP5	-20	-10	3111	3)
"	≤ 32		≥ 68			OP7	-20	-10	3115	
"	≤ 42 (as a stable dispersion in water)					OP8	-20	-10	3119	
DIISOPROPYLBENZENE DIHYDROPEROXIDE	≤ 82	≥ 5			≥ 5	OP7			3106	24)
DIISOPROPYL PEROXYDICARBONATE	> 52-100					OP2	-15	-5	3112	3)
"	≤ 52		≥ 48			OP7	-20	-10	3115	
"	≤ 32	≥ 68				OP7	-15	-5	3115	
DILAUROYL PEROXIDE	≤ 100					OP7			3106	
"	≤ 42 as a stable dispersion in water					OP8			3109	

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 hazards and remarks
DI-(3-METHOXYBUTYL) PEROXYDICARBONATE	≤ 52		≥ 48			OP7	-5	+5	3115	
DI-(2-METHYLBENZOYL) PEROXIDE	≤ 87				≥ 13	OP5	+30	+35	3112	3)
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)
"	≤ 82			≥ 18		OP7			3106	
"	≤ 82				≥ 18	OP5			3104	
2,5-DIMETHYL-2,5-DI-(tert-BUTYLPEROXY)HEXANE	> 90 - 100					OP5			3103	
"	> 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)
"	>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	
"	≤ 42 as a stable dispersion in water					OP8	+20	+25	3119	

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 hazards and remarks
DI-(2-NEODECANOYLPEROXYISOPROPYL) BENZENE	≤ 52	≥ 48				OP7	-10	0	3115	
DI-n-NONANOYL PEROXIDE	≤ 100					OP7	0	+10	3116	
DI-n-OCTANOYL PEROXIDE	≤ 100					OP5	+10	+15	3114	
DI-(2-PHENOXYETHYL) PEROXYDICARBONATE	>85-100					OP5			3102	3)
"	≤ 85				≥ 15	OP7			3106	
DIPROPIONYL PEROXIDE	≤ 27		≥ 73			OP8	+15	+20	3117	
DI-n-PROPYL PEROXYDICARBONATE	≤ 100					OP3	-25	-15	3113	
"	≤ 77		≥ 23			OP5	-20	-10	3113	
DISUCCINIC ACID PEROXIDE	> 72-100					OP4			3102	3) 17)
"	≤ 72				≥ 28	OP7	+10	+15	3116	
DI-(3,5,5-TRIMETHYLHEXANOYL) PEROXIDE	> 52-82	≥ 18				OP7	0	+10	3115	
"	≤ 52 as a stable dispersion in water					OP8	+10	+15	3119	
"	> 38-52	≥ 48				OP8	+10	+15	3119	
"	≤ 38	≥ 62				OP8	+20	+25	3119	
ETHYL 3,3-DI-(tert-AMYLPEROXY)BUTYRATE	≤ 67	≥ 33				OP7			3105	
ETHYL 3,3-DI-(tert-BUTYLPEROXY)BUTYRATE	> 77 - 100					OP5			3103	
"	≤ 77	≥ 23				OP7			3105	
"	≤ 52			≥ 48		OP7			3106	
1-(2-ETHYLHEXANOYLPEROXY)-1,3-DIMETHYLBUTYL PEROXYPIVALATE	≤ 52	≥ 45	≥ 10			OP7	-20	-10	3115	
tert-HEXYL PEROXYNEODECANOATE	≤ 71	≥ 29				OP7	0	+10	3115	
tert-HEXYL PEROXYPIVALATE	≤ 72		≥ 28			OP7	+10	+15	3115	
"	≤ 52 as a stable dispersion in water					OP8	+15	+20	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 hazards and remarks
3-HYDROXY-1,1-DIMETHYLBUTYL PEROXYNEODECANOATE	≤ 77	≥ 23				OP 7	- 5	+ 5	3115	
"	≤ 52	≥ 48				OP 8	- 5	+ 5	3117	
"	≤ 52 as a stable dispersion in water					OP 8	- 5	+ 5	3119	
ISOPROPYL sec-BUTYL PEROXYDICARBONATE +DI-sec-BUTYL PEROXYDICARBONATE +DI-ISOPROPYL PEROXYDICARBONATE	≤ 32 + ≤ 15 – 18 ≤ 12 – 15	≥ 38				OP7	-20	-10	3115	
"	≤ 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	

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 hazards and remarks
1-PHENYLETHYL HYDROPEROXIDE	≤ 38		≥ 62			OP8			3109	
PINANYL HYDROPEROXIDE	> 56 – 100					OP7			3105	13)
"	≤ 56	≥ 44				OP8			3109	
POLYETHER POLY-tert-BUTYLPEROXY-CARBONATE	≤ 52		≥ 48			OP8			3107	
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)

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 ≤ 4.7 %.

3) "EXPLOSIVE" subsidiary hazard label required (Model No.1, see 5.2.2.2.2).

4) Diluent may be replaced by di-tert-butyl peroxide.

5) Available oxygen ≤ 9 %.

6) With ≤ 9 % hydrogen peroxide; available oxygen ≤ 10 %.

7) Only non-metallic packagings allowed.

8) Available oxygen > 10 % and ≤ 10.7 %, with or without water.

9) Available oxygen ≤ 10 % , with or without water.

10) Available oxygen ≤ 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 hazard 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 hazard 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 ≥ 25 % diluent type A by mass, and in addition ethylbenzene.

22) With ≥ 19 %, diluent type A by mass, and in addition methyl isobutyl ketone.

23) With < 6 % di-tert-butyl peroxide.

24) With ≤ 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 hazard label required (Model No.8, see 5.2.2.2.2).

28) Available active oxygen ≤ 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 this Code for Class 5.2.

30) Diluent type B with boiling point > 130 °C.

31) Active oxygen ≤ 6.7 %.

32) Active oxygen ≤ 4.15 %.

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;
- 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 this Code:

LD_{50} (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 LD_{50} value is expressed in terms of mass of test substance per mass of test animal (mg/kg);

LD_{50} 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;

LC_{50} 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/m³ 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/m³
Toxic	II	Where $V \geq LC_{50}$ and $LC_{50} \leq 3\ 000$ ml/m³ 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/m³ and the criteria for packing groups I and II are not met

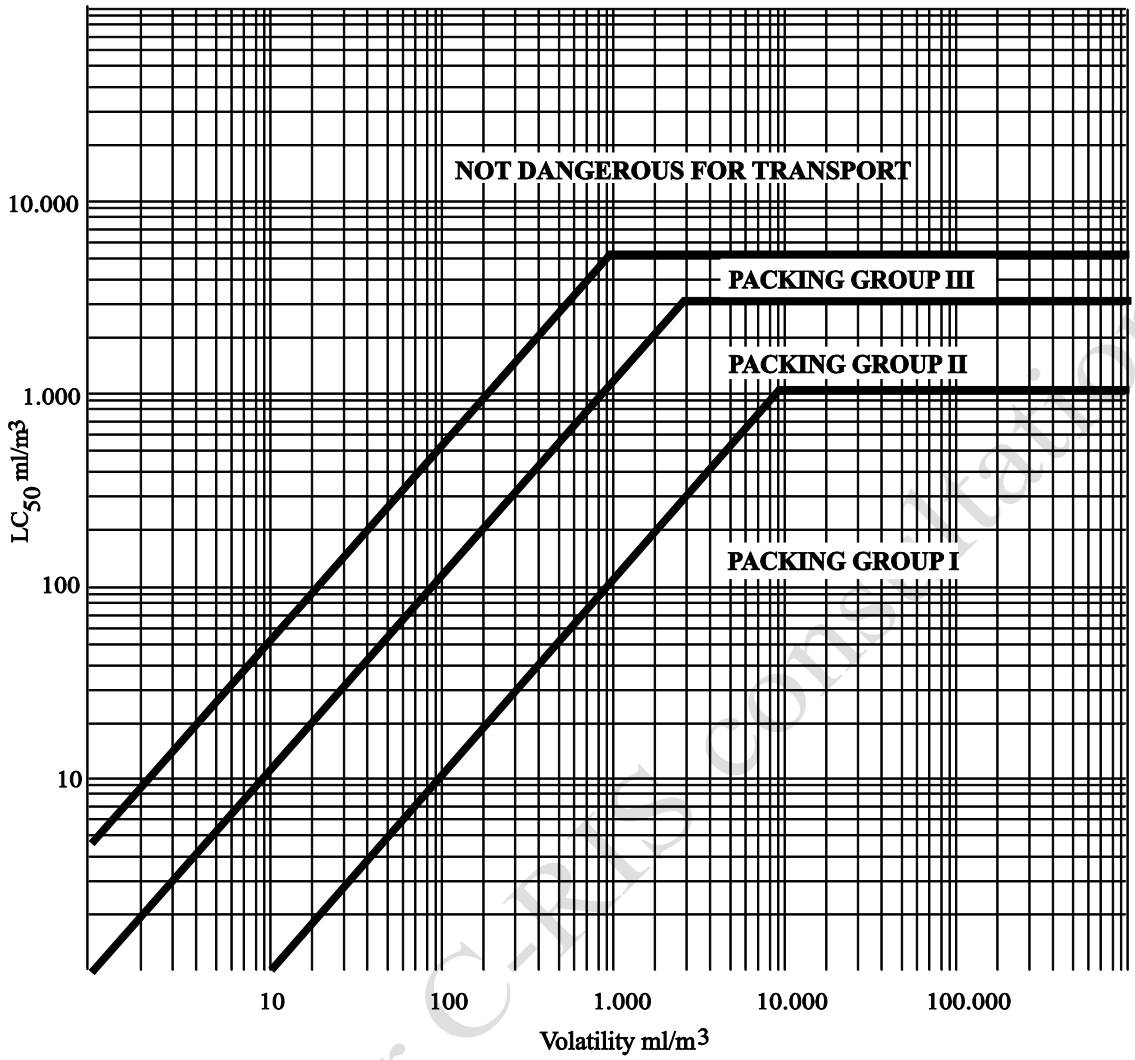
[a] *Tear gas substances shall be included in packing group II even if data concerning their toxicity correspond to packing group III criteria.*

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) × 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



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 LC_{50} is known for each of the toxic substances constituting the mixture, the packing group may be determined as follows:

(a) calculation of the LC_{50} of the mixture:

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

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:

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

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 LC_{50}:

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

(d) the values calculated for LC_{50} (mixture) and R are then used to determine the packing group of the mixture:

Packing group I — $R \geq 10$ and LC_{50} (mixture) $\leq 1\,000$ ml/m³;

Packing group II — $R \geq 1$ and LC_{50} (mixture) $\leq 3\,000$ ml/m³, if the mixture does not meet the criteria for packing group I;

Packing group III — $R \geq 1/5$ and LC_{50} (mixture) $\leq 5\,000$ ml/m³, if the mixture does not meet the criteria of packing groups I or II.

2.2.61.1.9.2 In the absence of LC_{50} 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 LC_{50} 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 LC_{50}.

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 LC_{50} 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 LC_{50}.

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 LC_{50} 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 LC_{50}.

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 LD_{50} of the mixture.

2.2.61.1.10.1 If a mixture contains only one active substance, and the LD_{50} 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 LD_{50} may be obtained by the following method:

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

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 LD_{50} 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:

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

where:

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

T = the oral LD_{50} values of constituent A, B, ... Z;

T_M = the oral LD_{50} 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 LC_{50} and/or LD_{50} 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 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 LD_{50} value for a pesticide preparation is not known, but the LD_{50} value of its active substance(s) is known, the LD_{50} value for the preparation may be obtained by applying the procedures in 2.2.61.1.10.

NOTE: *LD_{50} 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 LD_{50} 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 this Code.*

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 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 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, 3 or 4 according to the GHS, 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.

2.2.61.3 ***List of collective entries***

Toxic substances <u>without</u> subsidiary hazard(s)

Organic	**liquid** [a]	**T1**	1583	CHLOROPICRIN MIXTURE, N.O.S.
			1602	DYE, LIQUID, TOXIC, N.O.S., or
			1602	DYE INTERMEDIATE, LIQUID, TOXIC, N.O.S.
			1693	TEAR GAS SUBSTANCE, LIQUID, N.O.S.
			1851	MEDICINE, LIQUID, TOXIC, N.O.S.
			2206	ISOCYANATES, TOXIC, N.O.S. or
			2206	ISOCYANATE SOLUTION, TOXIC, N.O.S.
			3140	ALKALOIDS, LIQUID, N.O.S. or
			3140	ALKALOID SALTS, LIQUID, N.O.S.
			3142	DISINFECTANT, LIQUID, TOXIC, N.O.S.
			3144	NICOTINE COMPOUND, LIQUID, N.O.S. or
			3144	NICOTINE PREPARATION, LIQUID, N.O.S.
			3172	TOXINS, EXTRACTED FROM LIVING SOURCES, LIQUID, N.O.S.
			3276	NITRILES, LIQUID, TOXIC, N.O.S.
			3278	ORGANOPHOSPHORUS COMPOUND, LIQUID, TOXIC, N.O.S.
			3381	TOXIC BY INHALATION LIQUID, N.O.S. with an LC_{50} lower than or equal to 200 ml/m³ and saturated vapour concentration greater than or equal to 500 LC_{50}
			3382	TOXIC BY INHALATION LIQUID, N.O.S. with an LC_{50} lower than or equal to 1000 ml/m³ and saturated vapour concentration greater than or equal to 10 LC_{50}
			2810	TOXIC LIQUID, ORGANIC, N.O.S.
	solid [a, b]	**T2**	1544	ALKALOIDS, SOLID, N.O.S. or
			1544	ALKALOID SALTS, SOLID, N.O.S.
			1601	DISINFECTANT, SOLID, TOXIC, N.O.S.
			1655	NICOTINE COMPOUND, SOLID, N.O.S., or
			1655	NICOTINE PREPARATION, SOLID, N.O.S.
			3448	TEAR GAS SUBSTANCE, SOLID, N.O.S.
			3143	DYE, SOLID, TOXIC, N.O.S. or
			3143	DYE INTERMEDIATE, SOLID, TOXIC, N.O.S.
			3462	TOXINS, EXTRACTED FROM LIVING SOURCES, SOLID, N.O.S.
			3249	MEDICINE, SOLID, TOXIC, N.O.S.
			3464	ORGANOPHOSPHORUS COMPOUND, SOLID, TOXIC, N.O.S.
			3439	NITRILES, SOLID, TOXIC, N.O.S.
			2811	TOXIC SOLID, ORGANIC, N.O.S.
Organometallic [c, d]		**T3**	2026	PHENYLMERCURIC COMPOUND, N.O.S.
			2788	ORGANOTIN COMPOUND, LIQUID, N.O.S.
			3146	ORGANOTIN COMPOUND, SOLID, N.O.S.
			3280	ORGANOARSENIC COMPOUND, LIQUID, N.O.S.
			3465	ORGANOARSENIC COMPOUND, SOLID, N.O.S.
			3281	METAL CARBONYLS, LIQUID, N.O.S.
			3466	METAL CARBONYLS, SOLID, N.O.S.
			3282	ORGANOMETALLIC COMPOUND, LIQUID, TOXIC, N.O.S.
			3467	ORGANOMETALLIC COMPOUND, SOLID, TOXIC, N.O.S.

(cont'd on next page)

[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 <u>without</u> subsidiary hazard(s) ***(cont'd)***

Inorganic

liquid [e]	**T4**	1556 ARSENIC COMPOUND, LIQUID, N.O.S., inorganic including: Arsenates, n.o.s., Arsenites, n.o.s.; and Arsenic sulphides, n.o.s. 1935 CYANIDE SOLUTION, N.O.S. 2024 MERCURY COMPOUND, LIQUID, N.O.S. 3141 ANTIMONY COMPOUND, INORGANIC, LIQUID, N.O.S. 3440 SELENIUM COMPOUND, LIQUID, N.O.S. 3381 TOXIC BY INHALATION LIQUID, N.O.S. with an LC_{50} lower than or equal to 200 ml/m³ and saturated vapour concentration greater than or equal to 500 LC_{50} 3382 TOXIC BY INHALATION LIQUID, N.O.S. with an LC_{50} lower than or equal to 1000 ml/m³ and saturated vapour concentration greater than or equal to 10 LC_{50} 3287 TOXIC LIQUID, INORGANIC, N.O.S.
solids [f, g]	**T5**	1549 ANTIMONY COMPOUND, INORGANIC, SOLID, N.O.S 1557 ARSENIC COMPOUND, SOLID, N.O.S., including: Arsenates, n.o.s.; Arsenites, n.o.s.; and Arsenic sulphides, n.o.s. 1564 BARIUM COMPOUND, N.O.S. 1566 BERYLLIUM COMPOUND, N.O.S. 1588 CYANIDES, INORGANIC, SOLID, N.O.S. 1707 THALLIUM COMPOUND, N.O.S. 2025 MERCURY COMPOUND, SOLID, N.O.S. 2291 LEAD COMPOUND, SOLUBLE, N.O.S. 2570 CADMIUM COMPOUND 2630 SELENATES or 2630 SELENITES 2856 FLUOROSILICATES, N.O.S. 3283 SELENIUM COMPOUND, SOLID, N.O.S. 3284 TELLURIUM COMPOUND, N.O.S. 3285 VANADIUM COMPOUND, N.O.S. 3288 TOXIC SOLID, INORGANIC, N.O.S.

Pesticides

liquid[h]	**T6**	2992 CARBAMATE PESTICIDE, LIQUID, TOXIC 2994 ARSENICAL PESTICIDE, LIQUID, TOXIC 2996 ORGANOCHLORINE PESTICIDE, LIQUID, TOXIC 2998 TRIAZINE PESTICIDE, LIQUID, TOXIC 3006 THIOCARBAMATE PESTICIDE, LIQUID, TOXIC 3010 COPPER BASED PESTICIDE, LIQUID, TOXIC 3012 MERCURY BASED PESTICIDE, LIQUID, TOXIC 3014 SUBSTITUTED NITROPHENOL PESTICIDE, LIQUID, TOXIC 3016 BIPYRIDILIUM PESTICIDE, LIQUID, TOXIC 3018 ORGANOPHOSPHORUS PESTICIDE, LIQUID, TOXIC 3020 ORGANOTIN PESTICIDE, LIQUID, TOXIC 3026 COUMARIN DERIVATIVE PESTICIDE, LIQUID, TOXIC 3348 PHENOXYACETIC ACID DERIVATIVE PESTICIDE, LIQUID, TOXIC 3352 PYRETHROID PESTICIDE, LIQUID, TOXIC 2902 PESTICIDE, LIQUID, TOXIC, N.O.S.

(cont'd on next page)

[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 this Code.*

[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 °C ± 2 °C, exhibit a solubility of 5 % or less, are not subject to the provisions of this Code.*

[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 this Code.*

Toxic substances without subsidiary hazard(s) *(cont'd)*

Pesticides *(cont'd)*				
	Solid[h]	**T7**	2757	CARBAMATE PESTICIDE, SOLID, TOXIC
			2759	ARSENICAL PESTICIDE, SOLID, TOXIC
			2761	ORGANOCHLORINE PESTICIDE, SOLID, TOXIC
			2763	TRIAZINE PESTICIDE, SOLID, TOXIC
			2771	THIOCARBAMATE PESTICIDE, SOLID, TOXIC
			2775	COPPER BASED PESTICIDE, SOLID, TOXIC
			2777	MERCURY BASED PESTICIDE, SOLID, TOXIC
			2779	SUBSTITUTED NITROPHENOL PESTICIDE, SOLID, TOXIC
			2781	BIPYRIDILIUM PESTICIDE, SOLID, TOXIC
			2783	ORGANOPHOSPHORUS PESTICIDE, SOLID, TOXIC
			2786	ORGANOTIN PESTICIDE, SOLID, TOXIC
			3027	COUMARIN DERIVATIVE PESTICIDE, SOLID, TOXIC
			3048	ALUMINIUM PHOSPHIDE PESTICIDE
			3345	PHENOXYACETIC ACID DERIVATIVE PESTICIDE, SOLID, TOXIC
			3349	PYRETHROID PESTICIDE, SOLID, TOXIC
			2588	PESTICIDE, SOLID, TOXIC, N.O.S.
Samples		**T8**	3315	CHEMICAL SAMPLE, TOXIC
Other toxic substances [i]		**T9**	3243	SOLIDS CONTAINING TOXIC LIQUID, N.O.S.
Articles		**T10**	3546	ARTICLES CONTAINING TOXIC SUBSTANCE, N.O.S.

Toxic substances with subsidiary hazard(s)

Flammable TF	**Liquid** [j, k]	**TF1**	3071	MERCAPTANS, LIQUID, TOXIC, FLAMMABLE, N.O.S. or
			3071	MERCAPTAN MIXTURE, LIQUID, TOXIC, FLAMMABLE, N.O.S.
			3080	ISOCYANATES, TOXIC, FLAMMABLE, N.O.S. or
			3080	ISOCYANATE SOLUTION, TOXIC, FLAMMABLE, N.O.S.
			3275	NITRILES, TOXIC, FLAMMABLE, N.O.S.
			3279	ORGANOPHOSPHORUS COMPOUND, TOXIC, FLAMMABLE, N.O.S.
			3383	TOXIC BY INHALATION LIQUID, FLAMMABLE, N.O.S. with an LC_{50} lower than or equal to 200 ml/m³ and saturated vapour concentration greater than or equal to 500 LC_{50}
			3384	TOXIC BY INHALATION LIQUID, FLAMMABLE, N.O.S. with an LC_{50} lower than or equal to 1000 ml/m³ and saturated vapour concentration greater than or equal to 10 LC_{50}
			2929	TOXIC LIQUID, FLAMMABLE, ORGANIC, N.O.S.

(cont'd on next page)

[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 this Code.*

[i] *Mixtures of solids which are not subject to the provisions of this Code 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.*

Toxic substances <u>with</u> subsidiary hazard(s) (cont'd)

Flammable TF *(cont'd)*	**pesticides, liquid (flash-point not less than 23 °C)**	**TF2**	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.
	solid	**TF3**	1700	TEAR GAS CANDLES
			2930	TOXIC SOLID, FLAMMABLE, ORGANIC, N.O.S.
			3535	TOXIC SOLID, FLAMMABLE, INORGANIC, N.O.S.
Solid, self-heating [c] **TS**			3124	TOXIC SOLID, SELF-HEATING, N.O.S.
Water-reactive [d] **TW**	**liquid**	**TW1**	3385	TOXIC BY INHALATION LIQUID, WATER-REACTIVE, N.O.S. with an LC_{50} lower than or equal to 200 ml/m³ and saturated vapour concentration greater than or equal to 500 LC_{50}
			3386	TOXIC BY INHALATION LIQUID, WATER-REACTIVE, N.O.S. with an LC_{50} lower than or equal to 1000 ml/m³ and saturated vapour concentration greater than or equal to 10 LC_{50}
			3123	TOXIC LIQUID, WATER-REACTIVE, N.O.S.
	solid [n]	**TW2**	3125	TOXIC SOLID, WATER-REACTIVE, N.O.S.
Oxidizing [l] **TO**	**liquid**	**TO1**	3387	TOXIC BY INHALATION LIQUID, OXIDIZING, N.O.S. with an LC_{50} lower than or equal to 200 ml/m³ and saturated vapour concentration greater than or equal to 500 LC_{50}
			3388	TOXIC BY INHALATION LIQUID, OXIDIZING, N.O.S. with an LC_{50} lower than or equal to 1000 ml/m³ and saturated vapour concentration greater than or equal to 10 LC_{50}
			3122	TOXIC LIQUID, OXIDIZING, N.O.S.
	solid	**TO2**	3086	TOXIC SOLID, OXIDIZING, N.O.S.
Corro-sive [m] **TC** **organic**	**liquid**	**TC1**	3277	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/m³ 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/m³ and saturated vapour concentration greater than or equal to 10 LC_{50}
			2927	TOXIC LIQUID, CORROSIVE, ORGANIC, N.O.S.
	solid	**TC2**	2928	TOXIC SOLID, CORROSIVE, ORGANIC, N.O.S.

(cont'd on next page)

[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.*

[l] *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 <u>with</u> subsidiary hazard(s) (cont'd)

Corrosive [m]				
TC *(cont'd)*				
	inorganic	**liquid**	**TC3**	3389 TOXIC BY INHALATION LIQUID, CORROSIVE, N.O.S. with an LC_{50} lower than or equal to 200 ml/m³ 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/m³ and saturated vapour concentration greater than or equal to 10 LC_{50} 3289 TOXIC LIQUID, CORROSIVE, INORGANIC, N.O.S.
		solid	**TC4**	3290 TOXIC SOLID, CORROSIVE, INORGANIC, N.O.S.
Flammable, corrosive				
TFC				2742 CHLOROFORMATES, TOXIC, CORROSIVE, FLAMMABLE, N.O.S. 3362 CHLOROSILANES, TOXIC, CORROSIVE, FLAMMABLE, N.O.S. 3488 TOXIC BY INHALATION LIQUID, FLAMMABLE, CORROSIVE, N.O.S. with an LC_{50} lower than or equal to 200 ml/m³ and saturated vapour concentration greater than or equal to 500 LC_{50} 3489 TOXIC BY INHALATION LIQUID, FLAMMABLE, CORROSIVE, N.O.S. with an LC_{50} lower than or equal to 1000 ml/m³ and saturated vapour concentration greater than or equal to 10 LC_{50}
Flammable, water-reactive				
TFW				3490 TOXIC BY INHALATION LIQUID, WATER-REACTIVE, FLAMMABLE, N.O.S. with an LC_{50} lower than or equal to 200 ml/m³ and saturated vapour concentration greater than or equal to 500 LC_{50} 3491 TOXIC BY INHALATION LIQUID, WATER-REACTIVE, FLAMMABLE, N.O.S. with an LC_{50} lower than or equal to 1000 ml/m³ and saturated vapour concentration greater than or equal to 10 LC_{50}

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 this Code, infectious substances are substances which are known or are reasonably expected to contain pathogens. Pathogens are defined as microorganisms (including bacteria, viruses, 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 this Code,

"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 veterinary treatment of animals, the medical treatment of humans or from bio-research;

"Patient specimens" are those collected directly from humans or animals, including, but not limited to, excreta, secreta, blood and its components, tissue and tissue fluid swabs, and body parts being 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, 3373 or 3549, 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 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**
UN No. 2814 Infectious substances affecting humans	*Bacillus anthracis (cultures only)* *Brucella abortus (cultures only)* *Brucella melitensis (cultures only)* *Brucella suis (cultures only)* *Burkholderia mallei - Pseudomonas mallei* – Glanders *(cultures only)* *Burkholderia pseudomallei – Pseudomonas pseudomallei (cultures only)* *Chlamydia psittaci* - avian strains (cultures only) *Clostridium botulinum (cultures only)* *Coccidioides immitis (cultures only)* *Coxiella burnetii (cultures only)* Crimean-Congo haemorrhagic fever virus Dengue virus (cultures only) Eastern equine encephalitis virus (cultures only) *Escherichia coli*, verotoxigenic (cultures only) [a] Ebola virus Flexal virus *Francisella tularensis (cultures only)* Guanarito virus Hantaan virus Hantavirus causing haemorrhagic fever with renal syndrome Hendra virus Hepatitis 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 virus Kyasanur Forest disease virus Lassa virus Machupo virus Marburg virus Monkeypox virus *Mycobacterium tuberculosis (cultures only)* [a] Nipah virus Omsk haemorrhagic fever virus Poliovirus (cultures only) Rabies virus (cultures only) *Rickettsia prowazekii (cultures only)* *Rickettsia rickettsii* (cultures only) Rift Valley fever virus (cultures only) Russian spring-summer encephalitis virus (cultures only) Sabia virus *Shigella dysenteriae type 1 (cultures only)* [a] Tick-borne encephalitis virus (cultures only) Variola virus Venezuelan equine encephalitis virus (cultures only) West Nile virus (cultures only) Yellow fever virus (cultures only) *Yersinia pestis* (cultures only)

[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)

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 this Code 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 this Code 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 this Code 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 this Code.*

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 this Code 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 this Code.

2.2.62.1.5.6 Faecal occult blood screening samples are not subject to this Code.

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 this Code.

2.2.62.1.5.8 Human or animal specimens for which there is minimal likelihood that pathogens are present are not subject to this Code 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 Nos. 3291 and 3549);

(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 this Code 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 this Code, 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 this Code;

(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

(a) Category A infectious substances shall be assigned to UN No. 2814, UN No. 2900 or UN No. 3549, as appropriate. Solid medical waste containing Category A infectious substances generated from the medical treatment of humans or veterinary treatment of animals may be assigned to UN No. 3549. The UN No. 3549 entry shall not be used for waste from bio-research or liquid waste;

(b) Category B infectious substances shall be assigned to UN No. 3291.

NOTE 1: *The proper shipping name for UN No. 3549 is "MEDICAL WASTE, CATEGORY A, AFFECTING HUMANS, solid" or "MEDICAL WASTE, CATEGORY A, AFFECTING ANIMALS only, solid".*

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.".*

2.2.62.1.11.3 Decontaminated medical or clinical wastes which previously contained infectious substances are not subject to the provisions of this Code unless they meet the criteria for inclusion in another class.

2.2.62.1.11.4 *(Deleted)*

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.*

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
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. 3549 MEDICAL WASTE, CATEGORY A, AFFECTING HUMANS, solid or 3549 MEDICAL WASTE, CATEGORY A, AFFECTING ANIMALS only, solid
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 this Code.

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 this Code.

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.	Proper shipping name and description[a]
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]
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	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), non fissile or fissile-excepted[b]
UN 3322	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), non fissile or fissile-excepted[b]
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, SCO-II or SCO-III), 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
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^{3} (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-135m	2×10^{1}	6×10^{-1}	1×10^{2}	1×10^{6}
Ba-140 (a)	5×10^{-1}	3×10^{-1}	1×10^{1} (b)	1×10^{5} (b)
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)	A_1 (TBq)	A_2 (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-69	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
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}

Radionuclide (atomic number)	A_1 (TBq)	A_2 (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Hf-182	Unlimited	Unlimited	1×10^{2}	1×10^{6}
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-193m	4×10^{1}	4×10^{0}	1×10^{4}	1×10^{7}
Ir-194	3×10^{-1}	3×10^{-1}	1×10^{2}	1×10^{5}
Potassium (19)				

Radionuclide (atomic number)	A_1 (TBq)	A_2 (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
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}
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}

Radionuclide (atomic number)	A_1 (TBq)	A_2 (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Niobium (41)				
Nb-93m	4×10^{1}	3×10^{1}	1×10^{4}	1×10^{7}
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-57	6×10^{-1}	6×10^{-1}	1×10^{1}	1×10^{6}
Ni-59	Unlimited	Unlimited	1×10^{4}	1×10^{8}
Ni-63	4×10^{1}	3×10^{1}	1×10^{5}	1×10^{8}
Ni-65	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{6}
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)				

Radionuclide (atomic number)	A_1 (TBq)	A_2 (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
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}
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}

Radionuclide (atomic number)	A_1 (TBq)	A_2 (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
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}
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}

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

Radionuclide (atomic number)	A_1 (TBq)	A_2 (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
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}
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-83	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Sr-85	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Sr-85m	5×10^{0}	5×10^{0}	1×10^{2}	1×10^{7}
Sr-87m	3×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Sr-89	6×10^{-1}	6×10^{-1}	1×10^{3}	1×10^{6}
Sr-90 (a)	3×10^{-1}	3×10^{-1}	1×10^{2} (b)	1×10^{4} (b)
Sr-91 (a)	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
Sr-92 (a)	1×10^{0}	3×10^{-1}	1×10^{1}	1×10^{6}
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-149	8×10^{-1}	8×10^{-1}	1×10^{1}	1×10^{6}
Tb-157	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{7}
Tb-158	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Tb-160	1×10^{0}	6×10^{-1}	1×10^{1}	1×10^{6}
Tb-161	3×10^{1}	7×10^{-1}	1×10^{3}	1×10^{6}
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}

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

Radionuclide (atomic number)	A_1 (TBq)	A_2 (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
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}
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}

Radionuclide (atomic number)	A_1 (TBq)	A_2 (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
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}
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) A_1 and/or A_2 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 (the activity to be taken into account is that of the parent nuclide only):

Sr-90	Y-90
Zr-93	Nb-93m
Zr-97	Nb-97
Ru-106	Rh-106
Ag-108m	Ag-108
Cs-137	Ba-137m
Ce-144	Pr-144
Ba-140	La-140
Bi-212	Tl-208 (0.36), Po-212 (0.64)
Pb-210	Bi-210, Po-210
Pb-212	Bi-212, Tl-208 (0.36), Po-212 (0.64)
Rn-222	Po-218, Pb-214, Bi-214, Po-214
Ra-223	Rn-219, Po-215, Pb-211, Bi-211, Tl-207
Ra-224	Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Ra-226	Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
Ra-228	Ac-228
Th-228	Ra-224, Rn-220, Po-216, Pb212, Bi-212, Tl208 (0.36), Po-212 (0.64)
Th-229	Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213, Pb-209
Th-nat[5]	Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, l208 (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[5]	Th-234, Pa-234m, U-234, Th-230, Ra-226, Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
Np-237	Pa-233
Am-242m	Am-242
Am-243	Np-239

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

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

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

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

concentration limits for exempt material and activity limits for exempt consignments shall be calculated in accordance with the principles established in "Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards", IAEA Safety Standards Series No. GSR Part 3, IAEA, Vienna (2014). It is permissible to use an A_2 value calculated using a dose coefficient for the appropriate lung absorption type as recommended by the International Commission on Radiological Protection, if the chemical forms of each radionuclide under both normal and accident conditions of 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 GSR Part 3.

Table 2.2.7.2.2.2: Basic radionuclide values for unknown radionuclides or mixtures

Radioactive contents	A_1 (TBq)	A_2 (TBq)	Activity concentration limit for exempt material (Bq/g)	Activity limit for exempt consignments (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 A_1 and A_2 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 progeny 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 A_1 or A_2 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 progeny nuclide has a half-life either longer than 10 days or greater than that of the parent nuclide, the parent and such progeny 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:

$$X_m = \frac{1}{\Sigma_i \frac{f(i)}{X(i)}}$$

where,

f(i) is the fraction of activity or activity concentration of radionuclide i in the mixture;

X(i) is the appropriate value of A_1 or A_2, 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 A_1 or A_2, 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, 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 estimated average specific activity of the solid, excluding any shielding material, does not exceed 2×10^{-3} A_2/g.

2.2.7.2.3.1.3 to 2.2.7.2.3.1.5 *(Deleted)*

2.2.7.2.3.2 Surface contaminated object (SCO)

SCO is classified in one of three 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 4×10^4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 4×10^3 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

4×10^4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 4×10^3 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 8×10^5 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 8×10^4 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 8×10^5 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 8×10^4 Bq/cm² for all other alpha emitters;

(c) SCO-III: A large solid object which, because of its size, cannot be carried in a type of package described in this Code and for which:

(i) All openings are sealed to prevent release of radioactive material during conditions defined in 4.1.9.2.4 (e);

(ii) The inside of the object is as dry as practicable;

(iii) The non-fixed contamination on the external surfaces does not exceed the limits specified in 4.1.9.1.2; and

(iv) The non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm² does not exceed 8×10^5 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 8×10^4 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 from a height of 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 from a height of 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 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 and the 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 and 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 then 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 dose rate at 3 m from the unshielded radioactive material does not exceed 10 mSv/h;

(b) If subjected to the tests specified in 6.4.20.3 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 A_2. A separate specimen may be used for each test; and

(c) If subjected to the test specified in 2.2.7.2.3.4.3 the activity in the water would not exceed 100 A_2. In the application of this test, the damaging effects of the tests specified in (b) above 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 2.2.7.2.3.4.3 After each test it shall be determined if the applicable requirements of 2.2.7.2.3.4.1 have been met.

2.2.4.2.3.4.3 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.

2.2.7.2.3.4.4 Demonstration of compliance with the performance standards in 2.2.7.2.3.4.1, 2.2.7.2.3.4.2 and 2.2.7.2.3.4.3 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 sub-paragraphs (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 the requirements of 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 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 dose rate at any point on its external surface does not exceed 5 μSv/h.

Table 2.2.7.2.4.1.2: Activity limits for excepted packages

Physical state of contents	Instruments or articles		Materials
	Item limits [a]	Package limits [a]	Package limits [a]
(1)	(2)	(3)	(4)
Solids			
special form	10^{-2} A_1	A_1	10^{-3} A_1
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			
tritium	2×10^{-2} A_2	2×10^{-1} A_2	2×10^{-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

[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 dose rate at 10 cm from any point on the external surface of any unpackaged instrument or article is not greater than 0.1 mSv/h;

(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);

(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;

(e) *(Reserved)*;

(f) If the package contains fissile material, one of the provisions of 2.2.7.2.3.5 (a) to (f) applies.

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;

(b) The package bears the mark "RADIOACTIVE" on either:

(i) An internal surface in such a manner that a warning of the presence of radioactive material is visible on opening the package; or

(ii) The outside of the package, where it is impractical to mark an internal surface; and

(c) If the package contains fissile material, one of the provisions of 2.2.7.2.3.5 (a) to (f) applies.

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:

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

(b) 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:

(a) It is in a well-maintained condition and securely closed;

(b) The outer surface of any uranium or thorium in its structure is covered with an inactive sheath made of metal or some other substantial material;

(c) The level of internal non-fixed contamination, when averaged over any 300 cm², does not exceed:

(i) 400 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters; and

(ii) 40 Bq/cm² for all other alpha emitters;

(d) Any labels which may have been displayed on it in conformity with 5.2.2.1.11.1 are no longer visible; and

(e) If the packaging has contained fissile material, one of the provisions of 2.2.7.2.3.5 (a) to (f) or one of the provisions for exclusion in 2.2.7.1.3 applies.

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:

(a) For special form radioactive material - A_1;

(b) For all other radioactive material - A_2.

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:

$$\Sigma_i \frac{B(i)}{A_1(i)} + \Sigma_j \frac{C(j)}{A_2(j)} \leq 1$$

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.

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.

2.2.8 Class 8 Corrosive substances

2.2.8.1 *Definition, general provisions and criteria*

2.2.8.1.1 Corrosive substances are substances which, by chemical action, will cause irreversible damage to the skin, or, in the case of leakage, will materially damage, or even destroy, other goods or the means of transport. The heading of this class also covers other substances which form a corrosive liquid only in the presence of water, or which produce corrosive vapour or mist in the presence of natural moisture of the air.

2.2.8.1.2 For substances and mixtures that are corrosive to skin, general classification provisions are provided in 2.2.8.1.4. Skin corrosion refers to the production of irreversible damage to the skin, namely, visible necrosis through the epidermis and into the dermis occurring after exposure to a substance or mixture.

2.2.8.1.3 Liquids and solids which may become liquid during carriage, which are judged not to be skin corrosive shall still be considered for their potential to cause corrosion to certain metal surfaces in accordance with the criteria in 2.2.8.1.5.3 (c) (ii).

2.2.8.1.4 *General classification provisions*

2.2.8.1.4.1 Substances and articles of Class 8 are subdivided as follows:

C1-C11 Corrosive substances without subsidiary risk and articles containing such substances:

C1-C4 Acid substances:

- C1 Inorganic, liquid;
- C2 Inorganic, solid;
- C3 Organic, liquid;
- C4 Organic, solid;

C5-C8 Basic substances:

- C5 Inorganic, liquid;
- C6 Inorganic, solid;
- C7 Organic, liquid;
- C8 Organic, solid;

C9-C10 Other corrosive substances:

- C9 Liquid;
- C10 Solid;

C11 Articles;

CF Corrosive substances, flammable:

- CF1 Liquid;
- CF2 Solid;

CS Corrosive substances, self-heating:

- CS1 Liquid;
- CS2 Solid;

CW Corrosive substances which, in contact with water, emit flammable gases:

- CW1 Liquid;
- CW2 Solid;

CO Corrosive substances, oxidizing:

- CO1 Liquid;
- CO2 Solid;

CT Corrosive substances, toxic and articles containing such substances:

CT1 Liquid;
CT2 Solid;
CT3 Articles;

CFT Corrosive substances, flammable, liquid, toxic;

COT Corrosive substances, oxidizing, toxic.

2.2.8.1.4.2 Substances and mixtures of Class 8 are divided among the three packing groups according to their degree of danger in carriage:

(a) Packing group I: very dangerous substances and mixtures;

(b) Packing group II: substances and mixtures presenting medium danger;

(c) Packing group III: substances and mixtures that present minor danger.

2.2.8.1.4.3 Allocation of substances listed in Table A of Chapter 3.2 to the packing groups in Class 8 has been made on the basis of experience taking into account such additional factors as inhalation risk (see 2.2.8.1.4.5) and reactivity with water (including the formation of dangerous decomposition products).

2.2.8.1.4.4 New substances and mixtures can be assigned to packing groups on the basis of the length of time of contact necessary to produce irreversible damage of intact skin tissue in accordance with the criteria in 2.2.8.1.5. Alternatively, for mixtures, the criteria in 2.2.8.1.6 can be used.

2.2.8.1.4.5 A substance or mixture meeting the criteria of Class 8 having an inhalation toxicity of dusts and mists (LC_{50}) in the range of packing group I, but toxicity through oral ingestion or dermal contact only in the range of packing group III or less, shall be allocated to Class 8 (see 2.2.61.1.7.2).

2.2.8.1.5 *Packing group assignment for substances and mixtures*

2.2.8.1.5.1 Existing human and animal data including information from single or repeated exposure shall be the first line of evaluation, as they give information directly relevant to effects on the skin.

2.2.8.1.5.2 In assigning the packing group in accordance with 2.2.8.1.4.4, account shall be taken of human experience in instances of accidental exposure. In the absence of human experience classification shall be based on data obtained from experiments in accordance with OECD Test Guidelines Nos. 404[1], 435[2], 431[3] or 430[9]. A substance or mixture which is determined not to be corrosive in accordance with one of these or non-classified in accordance with OECD Test Guideline No. 439[4] may be considered not to be corrosive to skin for the purposes of this Code without further testing. If the test results indicate that the substance or mixture is corrosive and not assigned to packing group I, but the test method does not allow discrimination between packing groups II and III, it shall be considered to be packing group II. If the test results indicate that the substance or mixture is corrosive, but the test method does not allow discrimination between packing groups, it shall be assigned to packing group I if no other test results indicate a different packing group.

[1] *OECD Guideline for the testing of chemicals No. 404 "Acute Dermal Irritation/Corrosion" 2015.*

[2] *OECD Guideline for the testing of chemicals No. 435 "In Vitro Membrane Barrier Test Method for Skin Corrosion" 2015.*

[3] *OECD Guideline for the testing of chemicals No. 431 "In Vitro Skin Corrosion: reconstructed human epidermis (RHE) test method" 2016.*

[9] *OECD Guideline for the testing of chemicals No. 430 "In Vitro Skin Corrosion: Transcutaneous Electrical Resistance Test Method (TER)" 2015.*

[4] *OECD Guideline for the testing of chemicals No. 439 "In Vitro Skin Irritation: Reconstructed Human Epidermis Test Method" 2015.*

2.2.8.1.5.3 Packing groups are assigned to corrosive substances in accordance with the following criteria (see table 2.2.8.1.5.3):

(a) Packing group I is assigned to substances that cause irreversible damage of intact skin tissue within an observation period up to 60 minutes starting after the exposure time of three minutes or less;

(b) Packing group II is assigned to substances that cause irreversible damage of intact skin tissue within an observation period up to 14 days starting after the exposure time of more than three minutes but not more than 60 minutes;

(c) Packing group III is assigned to substances that:

(i) Cause irreversible damage of intact skin tissue within an observation period up to 14 days starting after the exposure time of more than 60 minutes but not more than 4 hours; or

(ii) Are judged not to cause irreversible damage of intact skin tissue but which exhibit a corrosion rate on either steel or aluminium surfaces exceeding 6.25 mm a year at a test temperature of 55 °C when tested on both materials. For the purposes of testing steel, type S235JR+CR (1.0037 resp. St 37-2), S275J2G3+CR (1.0144 resp. St 44-3), ISO 3574, Unified Numbering System (UNS) G10200 or SAE 1020, and for testing aluminium, non-clad, types 7075–T6 or AZ5GU-T6 shall be used. An acceptable test is prescribed in the Manual of Tests and Criteria, Part III, Section 37.

NOTE: *Where an initial test on either steel or aluminium indicates the substance being tested is corrosive the follow up test on the other metal is not required.*

Table 2.2.8.1.5.3: Table summarizing the criteria in 2.2.8.1.5.3

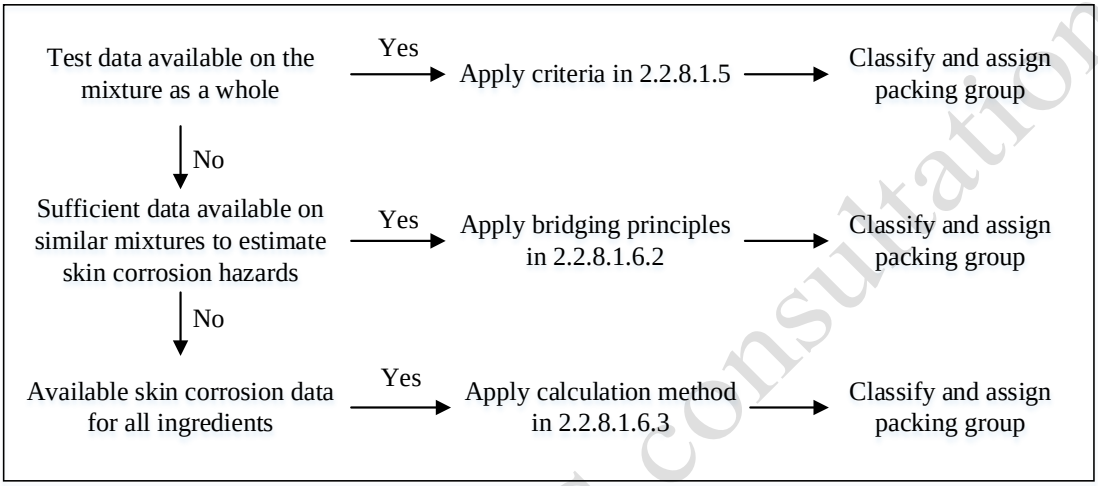
Packing Group	Exposure Time	Observation Period	Effect
I	≤ 3 min	≤ 60 min	Irreversible damage of intact skin
II	> 3 min ≤ 1 h	≤ 14 d	Irreversible damage of intact skin
III	> 1 h ≤ 4 h	≤ 14 d	Irreversible damage of intact skin
III	-	-	Corrosion rate on either steel or aluminium surfaces exceeding 6.25 mm a year at a test temperature of 55 °C when tested on both materials

2.2.8.1.6 *Alternative packing group assignment methods for mixtures: Step-wise approach*

2.2.8.1.6.1 General provisions

For mixtures it is necessary to obtain or derive information that allows the criteria to be applied to the mixture for the purpose of classification and assignment of packing groups. The approach to classification and assignment of packing groups is tiered, and is dependent upon the amount of information available for the mixture itself, for similar mixtures and/or for its ingredients. The flow chart of Figure 2.2.8.1.6.1 below outlines the process to be followed:

Figure 2.2.8.1.6.1: Step-wise approach to classify and assign packing group of corrosive mixtures



2.2.8.1.6.2 Bridging principles

Where a mixture has not been tested to determine its skin corrosion potential, but there are sufficient data on both the individual ingredients and similar tested mixtures to adequately classify and assign a packing group for the mixture, these data will be used in accordance with the following bridging principles. This ensures that the classification process uses the available data to the greatest extent possible in characterizing the hazards of the mixture.

(a) Dilution: If a tested mixture is diluted with a diluent which does not meet the criteria for Class 8 and does not affect the packing group of other ingredients, then the new diluted mixture may be assigned to the same packing group as the original tested mixture.

NOTE: *In certain cases, diluting a mixture or substance may lead to an increase in the corrosive properties. If this is the case, this bridging principle cannot be used.*

(b) Batching: The skin corrosion potential of a tested production batch of a mixture can be assumed to be substantially equivalent to that of another untested production batch of the same commercial product when produced by or under the control of the same manufacturer, unless there is reason to believe there is significant variation such that the skin corrosion potential of the untested batch has changed. If the latter occurs, a new classification is necessary.

(c) Concentration of mixtures of packing group I: If a tested mixture meeting the criteria for inclusion in packing group I is concentrated, the more concentrated untested mixture may be assigned to packing group I without additional testing.

(d) Interpolation within one packing group: For three mixtures (A, B and C) with identical ingredients, where mixtures A and B have been tested and are in the same skin corrosion packing group, and where untested mixture C has the same Class 8 ingredients as mixtures A and B but has concentrations of Class 8 ingredients intermediate to the concentrations in mixtures A and B, then mixture C is assumed to be in the same skin corrosion packing group as A and B.

(e) Substantially similar mixtures: Given the following:

(i) Two mixtures: (A+B) and (C+B);

(ii) The concentration of ingredient B is the same in both mixtures;

(iii) The concentration of ingredient A in mixture (A+B) equals the concentration of ingredient C in mixture (C+B);

(iv) Data on skin corrosion for ingredients A and C are available and substantially equivalent, i.e. they are the same skin corrosion packing group and do not affect the skin corrosion potential of B.

If mixture (A+B) or (C+B) is already classified based on test data, then the other mixture may be assigned to the same packing group.

2.2.8.1.6.3 Calculation method based on the classification of the substances

2.2.8.1.6.3.1 Where a mixture has not been tested to determine its skin corrosion potential, nor is sufficient data available on similar mixtures, the corrosive properties of the substances in the mixture shall be considered to classify and assign a packing group.

Applying the calculation method is only allowed if there are no synergistic effects that make the mixture more corrosive than the sum of its substances. This restriction applies only if packing group II or III would be assigned to the mixture.

2.2.8.1.6.3.2 When using the calculation method, all Class 8 ingredients present at a concentration of ≥ 1 % shall be taken into account, or < 1 % if these ingredients are still relevant for classifying the mixture to be corrosive to skin.

2.2.8.1.6.3.3 To determine whether a mixture containing corrosive substances shall be considered a corrosive mixture and to assign a packing group, the calculation method in the flow chart in Figure 2.2.8.1.6.3 shall be applied. For this calculation method, generic concentration limits apply where 1 % is used in the first step for the assessment of the packing group I substances, and where 5 % is used for the other steps respectively.

2.2.8.1.6.3.4 When a specific concentration limit (SCL) is assigned to a substance following its entry in Table A of Chapter 3.2 or in a special provision, this limit shall be used instead of the generic concentration limits (GCL).

2.2.8.1.6.3.5 For this purpose, the summation formula for each step of the calculation method shall be adapted. This means that, where applicable, the generic concentration limit shall be substituted by the specific concentration limit assigned to the substance(s) (SCL_i), and the adapted formula is a weighted average of the different concentration limits assigned to the different substances in the mixture:

$$\frac{PGx_1}{GCL} + \frac{PGx_2}{SCL_2} + \cdots + \frac{PGx_i}{SCL_i} \geq 1$$

Where:

PG x_i = concentration of substance 1, 2 …i in the mixture, assigned to packing group x (I, II or III)

GCL = generic concentration limit

SCL_i = specific concentration limit assigned to substance i

The criterion for a packing group is fulfilled when the result of the calculation is ≥ 1. The generic concentration limits to be used for the evaluation in each step of the calculation method are those found in Figure 2.2.8.1.6.3.

Examples for the application of the above formula can be found in the note below.

NOTE: *Examples for the application of the above formula*

Example 1: A mixture contains one corrosive substance in a concentration of 5 % assigned to packing group I without a specific concentration limit:

Calculation for packing group I: $\frac{5}{5\ (GCL)} = 1$ ➔ *assign to Class 8, packing group I.*

Example 2: A mixture contains three substances corrosive to skin; two of them (A and B) have specific concentration limits; for the third one (C) the generic concentration limit applies. The rest of the mixture needs not to be taken into consideration:

Substance X in the mixture and its packing group assignment within Class 8	Concentration (conc) in the mixture in %	Specific concentration limit (SCL) for packing group I	Specific concentration limit (SCL) for packing group II	Specific concentration limit (SCL) for packing group III
A, assigned to packing group I	3	30 %	none	none
B, assigned to packing group I	2	20 %	10 %	none
C, assigned to packing group III	10	none	none	none

Calculation for packing group I: $\frac{3\ (conc\ A)}{30\ (SCL\ PGI)} + \frac{2\ (conc\ B)}{20\ (SCL\ PGI)} = 0.2 < 1$

The criterion for packing group I is not fulfilled.

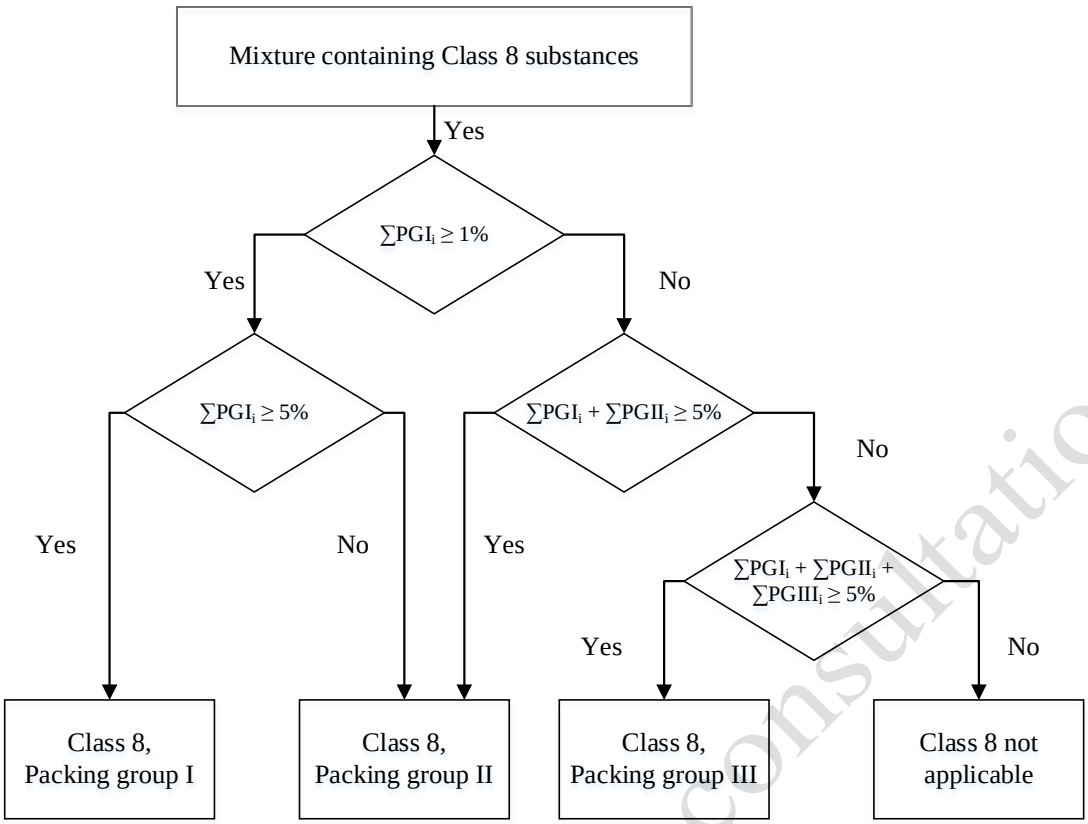
Calculation for packing group II: $\frac{3\ (conc\ A)}{5\ (GCL\ PG\ II)} + \frac{2\ (conc\ B)}{10\ (SCL\ PG\ II)} = 0.8 < 1$

The criterion for packing group II is not fulfilled.

Calculation for packing group III: $\frac{3\ (conc\ A)}{5\ (GCL\ PGIII)} + \frac{2\ (conc\ B)}{5\ (GCL\ PG\ III)} + \frac{10\ (conc\ C)}{5\ GCL\ PG\ III)} = 3 \geq 1$

The criterion for packing group III is fulfilled, the mixture shall be assigned to Class 8, packing group III.

Figure 2.2.8.1.6.3: Calculation method



2.2.8.1.7 If substances of Class 8, as a result of admixtures, come into categories of risk 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.*

2.2.8.1.8 On the basis of the criteria set out in paragraph 2.2.8.1.6, 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 provisions for this class.

NOTE: *UN No. 1910 calcium oxide and UN No. 2812 sodium aluminate, listed in the UN Model Regulations, are not subject to the provisions of this Code.*

2.2.8.2 ***Substances not accepted for carriage***

2.2.8.2.1 Chemically unstable substances of Class 8 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.

2.2.8.2.2 The following substances shall not be accepted for carriage:

- UN No. 1798 NITROHYDROCHLORIC ACID;
- chemically unstable mixtures of spent sulphuric acid;
- chemically unstable mixtures of nitrating acid or mixtures of residual sulphuric and nitric acids, not denitrated;
- perchloric acid aqueous solution with more than 72 % pure acid, by mass, or mixtures of perchloric acid with any liquid other than water.

2.2.8.3 List of collective entries

Corrosive substances without subsidiary risk and articles containing such substances

Acid	**inorganic**	**liquid**	**C1**	2584 ALKYLSULPHONIC ACIDS, LIQUID with more than 5 % free sulphuric acid or 2584 ARYLSULPHONIC ACIDS, LIQUID with more than 5 % free sulphuric acid 2693 BISULPHITES, AQUEOUS SOLUTION, N.O.S. 2837 BISULPHATES, AQUEOUS SOLUTION 3264 CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S.
		solid	**C2**	1740 HYDROGENDIFLUORIDES, SOLID, N.O.S. 2583 ALKYLSULPHONIC ACIDS, SOLID with more than 5 % free sulphuric acid or 2583 ARYLSULPHONIC ACIDS, SOLID with more than 5 % free sulphuric acid 3260 CORROSIVE SOLID, ACIDIC, INORGANIC, N.O.S.
C1-C4	**organic**	**liquid**	**C3**	2586 ALKYLSULPHONIC ACIDS, LIQUID with not more than 5 % free sulphuric acid or 2586 ARYLSULPHONIC ACIDS, LIQUID with not more than 5 % free sulphuric acid 2987 CHLOROSILANES, CORROSIVE, N.O.S. 3145 ALKYLPHENOLS, LIQUID, N.O.S. (including C_2-C_{12} homologues) 3265 CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S
		solid	**C4**	2430 ALKYLPHENOLS, SOLID, N.O.S. (including C_2-C_{12} homologues) 2585 ALKYLSULPHONIC ACIDS, SOLID with not more than 5 % free sulphuric acid or 2585 ARYLSULPHONIC ACIDS, SOLID with not more than 5 % free sulphuric acid 3261 CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S.
Basic	**inorganic**	**liquid**	**C5**	1719 CAUSTIC ALKALI LIQUID, N.O.S. 2797 BATTERY FLUID, ALKALI 3266 CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S.
		solid	**C6**	3262 CORROSIVE SOLID, BASIC, INORGANIC, N.O.S.
C5-C8	**organic**	**liquid**	**C7**	2735 AMINES, LIQUID, CORROSIVE, N.O.S. or 2735 POLYAMINES, LIQUID, CORROSIVE, N.O.S. 3267 CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S.
		solid	**C8**	3259 AMINES, SOLID, CORROSIVE, N.O.S., or 3259 POLYAMINES, SOLID, CORROSIVE, N.O.S. 3263 CORROSIVE SOLID, BASIC, ORGANIC, N.O.S.
Other corrosive substances		**liquid**	**C9**	1903 DISINFECTANT, LIQUID, CORROSIVE, N.O.S 2801 DYE, LIQUID, CORROSIVE, N.O.S. or 2801 DYE INTERMEDIATE, LIQUID, CORROSIVE, N.O.S. 3066 PAINT (including paint, enamel, stain, shellac, varnish, polish, liquid filler and lacquer base) or 3066 PAINT RELATED MATERIAL (including paint thinning or reducing compound) 1760 CORROSIVE LIQUID, N.O.S.
C9-C10		**solid**[a]	**C10**	3147 DYE, SOLID, CORROSIVE, N.O.S. or 3147 DYE INTERMEDIATE, SOLID, CORROSIVE, N.O.S. 3244 SOLIDS CONTAINING CORROSIVE LIQUID, N.O.S. 1759 CORROSIVE SOLID, N.O.S.
Articles			**C11**	2794 BATTERIES, WET, FILLED WITH ACID, electric storage 2795 BATTERIES, WET, FILLED WITH ALKALI, electric storage 2800 BATTERIES, WET, NON-SPILLABLE, electric storage 3028 BATTERIES, DRY, CONTAINING POTASSIUM HYDROXIDE SOLID, electric storage 1774 FIRE EXTINGUISHER CHARGES, corrosive liquid 2028 BOMBS, SMOKE, NON-EXPLOSIVE with corrosive liquid, without initiating device 3477 FUEL CELL CARTRIDGES containing corrosive substances, or 3477 FUEL CELL CARTRIDGES CONTAINED IN EQUIPMENT, containing corrosive substances, or 3477 FUEL CELL CARTRIDGES PACKED WITH EQUIPMENT, containing corrosive substances 3547 ARTICLES CONTAINING CORROSIVE SUBSTANCE, N.O.S.

(cont'd on next page)

[a] *Mixtures of solids which are not subject to the provisions of this Code and of corrosive liquids may be carried under UN No. 3244 without being subject to the classification criteria of Class 8, 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 which has passed the leakproofness test for Packing group II level.*

Corrosive substances with subsidiary risk(s) and articles containing such substances

(cont'd)			3470 PAINT, CORROSIVE, FLAMMABLE (including paint, enamel, stain, shellac, varnish, polish, liquid filler and lacquer base) or 3470 PAINT RELATED MATERIAL, CORROSIVE, FLAMMABLE (including paint thinning or reducing compound) 2734 AMINES, LIQUID, CORROSIVE, FLAMMABLE, N.O.S. or 2734 POLYAMINES, LIQUID, CORROSIVE, FLAMMABLE, N.O.S. 2986 CHLOROSILANES, CORROSIVE, FLAMMABLE, N.O.S. 2920 CORROSIVE LIQUID, FLAMMABLE, N.O.S.
Flammable [b]	**liquid**	**CF1**	
CF	**solid**	**CF2**	2921 CORROSIVE SOLID, FLAMMABLE, N.O.S.
Self-heating	**liquid**	**CS1**	3301 CORROSIVE LIQUID, SELF-HEATING, N.O.S.
CS	**solid**	CS2	3095 CORROSIVE SOLID, SELF-HEATING, N.O.S.
Water-reactive	**liquid** [b]	**CW1**	3094 CORROSIVE LIQUID, WATER-REACTIVE, N.O.S.
CW	**solid**	**CW2**	3096 CORROSIVE SOLID, WATER-REACTIVE, N.O.S.
Oxidizing	**liquid**	**CO1**	3093 CORROSIVE LIQUID, OXIDIZING, N.O.S.
CO	**solid**	**CO2**	3084 CORROSIVE SOLID, OXIDIZING, N.O.S.
Toxic [d]	**liquid** [c]	**CT1**	3471 HYDROGENDIFLUORIDES SOLUTION, N.O.S. 2922 CORROSIVE LIQUID, TOXIC, N.O.S.
CT	**solid** [e]	**CT2**	2923 CORROSIVE SOLID, TOXIC, N.O.S.
	articles	**CT3**	3506 MERCURY CONTAINED IN MANUFACTURED ARTICLES
Flammable, liquid, toxic [d]		**CFT**	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 table of precedence of hazard in 2.1.3.10.
Oxidizing, toxic [d, e]		**COT**	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 table of precedence of hazard in 2.1.3.10.

[b] *Chlorosilanes which, in contact with water or moist air, emit flammable gases, are substances of Class 4.3.*

[c] *Chloroformates having predominantly toxic properties are substances of Class 6.1.*

[d] *Corrosive substances which are highly toxic by inhalation, as defined in 2.2.61.1.4 to 2.2.61.1.9 are substances of Class 6.1.*

[e] *UN No. 2505 AMMONIUM FLUORIDE, UN No. 1812 POTASSIUM FLUORIDE, SOLID, UN No. 1690 SODIUM FLUORIDE, SOLID, UN No. 2674 SODIUM FLUOROSILICATE, UN No. 2856 FLUOROSILICATES, N.O.S., UN No. 3415 SODIUM FLUORIDE SOLUTION and UN No. 3422 POTASSIUM FLUORIDE SOLUTION are substances of Class 6.1.*

2.2.9 Class 9 Miscellaneous dangerous substances and articles

2.2.9.1 *Criteria*

2.2.9.1.1 The heading of Class 9 covers substances and articles which, during carriage, present a danger not covered by the heading of other classes.

2.2.9.1.2 The substances and articles of Class 9 are subdivided as follows:

M1 Substances which, on inhalation as fine dust, may endanger health;

M2 Substances and articles which, in the event of fire, may form dioxins;

M3 Substances evolving flammable vapour;

M4 Lithium batteries;

M5 Life-saving appliances;

M6-M8 Environmentally hazardous substances:

- M6 Pollutant to the aquatic environment, liquid;
- M7 Pollutant to the aquatic environment, solid;
- M8 Genetically modified microorganisms and organisms;

M9-M10 Elevated temperature substances:

- M9 Liquid;
- M10 Solid;

M11 Other substances and articles presenting a danger during carriage, but not meeting the definitions of another class.

Definitions and classification

2.2.9.1.3 Substances and articles classified in Class 9 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 that Table or of sub-section 2.2.9.3 shall be done in accordance with 2.2.9.1.4 to 2.2.9.1.8, 2.2.9.1.10, 2.2.9.1.11, 2.2.9.1.13 and 2.2.9.1.14 below.

Substances which, on inhalation as fine dust, may endanger health

2.2.9.1.4 Substances which, on inhalation as fine dust, may endanger health include asbestos and mixtures containing asbestos.

Substances and articles which, in the event of fire, may form dioxins

2.2.9.1.5 Substances and articles which, in the event of fire, may form dioxins include polychlorinated biphenyls (PCBs) and terphenyls (PCTs) and polyhalogenated biphenyls and terphenyls and mixtures containing these substances, as well as articles such as transformers, condensers and articles containing those substances or mixtures.

NOTE: *Mixtures with a PCB or PCT content of not more than 50 mg/kg are not subject to the provisions of this Code.*

Substances evolving flammable vapour

2.2.9.1.6 Substances evolving flammable vapour include polymers containing flammable liquids with a flash-point not exceeding 55 °C.

Lithium batteries

2.2.9.1.7 Lithium batteries shall meet the following requirements, except when otherwise provided for in this Code (e.g. for prototype batteries and small production runs under special provision 310 or damaged batteries under special provision 376).

NOTE: *For UN 3536 LITHIUM BATTERIES INSTALLED IN CARGO TRANSPORT UNIT, see special provision 389 in Chapter 3.3.*

Cells and batteries, cells and batteries contained in equipment, or cells and batteries packed with equipment, containing lithium in any form shall be assigned to UN Nos. 3090, 3091, 3480 or 3481 as appropriate. They may be carried under these entries if they meet the following provisions:

(a) Each cell or battery is of the type proved to meet the requirements of each test of the Manual of Tests and Criteria, Part III, sub-section 38.3;

NOTE: *Batteries shall be of a type proved to meet the testing requirements of the Manual of Tests and Criteria, part III, sub-section 38.3, irrespective of whether the cells of which they are composed are of a tested type.*

(b) Each cell and battery incorporates a safety venting device or is designed to preclude a violent rupture under normal conditions of carriage;

(c) Each cell and battery is equipped with an effective means of preventing external short circuits;

(d) Each battery containing cells or series of cells connected in parallel is equipped with effective means as necessary to prevent dangerous reverse current flow (e.g., diodes, fuses, etc.);

(e) Cells and batteries shall be manufactured under a quality management programme that includes:

(i) A description of the organizational structure and responsibilities of personnel with regard to design and product quality;

(ii) The relevant inspection and test, quality control, quality assurance, and process operation instructions that will be used;

(iii) Process controls that should include relevant activities to prevent and detect internal short circuit failure during manufacture of cells;

(iv) Quality records, such as inspection reports, test data, calibration data and certificates. Test data shall be kept and made available to the competent authority upon request;

(v) Management reviews to ensure the effective operation of the quality management programme;

(vi) A process for control of documents and their revision;

(vii) A means for control of cells or batteries that are not conforming to the type tested as mentioned in (a) above;

(viii) Training programmes and qualification procedures for relevant personnel; and

(ix) Procedures to ensure that there is no damage to the final product.

NOTE: *In house quality management programmes may be accepted. Third party certification is not required, but the procedures listed in (i) to (ix) above shall be properly recorded and traceable. A copy of the quality management programme shall be made available to the competent authority upon request.*

(f) Lithium batteries, containing both primary lithium metal cells and rechargeable lithium ion cells, that are not designed to be externally charged (see special provision 387 of Chapter 3.3) shall meet the following conditions:

(i) The rechargeable lithium ion cells can only be charged from the primary lithium metal cells;

(ii) Overcharge of the rechargeable lithium ion cells is precluded by design;

(iii) The battery has been tested as a lithium primary battery;

(iv) Component cells of the battery shall be of a type proved to meet the respective testing requirements of the Manual of Tests and Criteria, part III, sub-section 38.3;

(g) Except for button cells installed in equipment (including circuit boards), manufacturers and subsequent distributors of cells or batteries manufactured after 30 June 2003 shall make available the test summary as specified in the Manual of Tests and Criteria, Part III, sub-section 38.3, paragraph 38.3.5.

Lithium batteries are not subject to the provisions of this Code if they meet the requirements of special provision 188 of Chapter 3.3.

Life-saving appliances

2.2.9.1.8 Life-saving appliances include life-saving appliances and motor vehicle components which meet the descriptions of special provisions 235 or 296 of Chapter 3.3.

Environmentally hazardous substances

2.2.9.1.9 *(Deleted)*

Pollutants to the aquatic environment

2.2.9.1.10 *Environmentally hazardous substances (aquatic environment)*

2.2.9.1.10.1 General definitions

2.2.9.1.10.1.1 Environmentally hazardous substances include, inter alia, liquid or solid substances pollutant to the aquatic environment and solutions and mixtures of such substances (such as preparations and wastes).

For the purposes of 2.2.9.1.10, "*substance*" means chemical elements and their compounds in the natural state or obtained by any production process, including any additive necessary to preserve the stability of the product and any impurities deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition.

2.2.9.1.10.1.2 The aquatic environment may be considered in terms of the aquatic organisms that live in the water, and the aquatic ecosystem of which they are part[10]. The basis, therefore, of the identification of hazard is the aquatic toxicity of the substance or mixture, although this may be modified by further information on the degradation and bioaccumulation behaviour.

2.2.9.1.10.1.3 While the following classification procedure is intended to apply to all substances and mixtures, it is recognised that in some cases, e.g. metals or poorly soluble inorganic compounds, special guidance will be necessary[11].

2.2.9.1.10.1.4 The following definitions apply for acronyms or terms used in this section:

- BCF: Bioconcentration Factor;
- BOD: Biochemical Oxygen Demand;
- COD: Chemical Oxygen Demand;
- GLP: Good Laboratory Practices;
- EC_x: the concentration associated with x % response;
- EC_{50}: the effective concentration of substance that causes 50 % of the maximum response;
- ErC_{50}: EC_{50} in terms of reduction of growth;

[10] *This does not address aquatic pollutants for which there may be a need to consider effects beyond the aquatic environment such as the impacts on human health etc.*

[11] *This can be found in Annex 10 of the GHS.*

- Kow: octanol/water partition coefficient;

- LC_{50} (50 % lethal concentration): the concentration of a substance in water which causes the death of 50 % (one half) in a group of test animals;

- $L(E)C_{50}$: LC_{50} or EC_{50};

- NOEC (No Observed Effect Concentration): the test concentration immediately below the lowest tested concentration with statistically significant adverse effect. The NOEC has no statistically significant adverse effect compared to the control;

- OECD Test Guidelines: Test guidelines published by the Organization for Economic Cooperation and Development (OECD).

2.2.9.1.10.2 Definitions and data requirements

2.2.9.1.10.2.1 The basic elements for classification of environmentally hazardous substances (aquatic environment) are:

(a) Acute aquatic toxicity;

(b) Chronic aquatic toxicity;

(c) Potential for or actual bioaccumulation; and

(d) Degradation (biotic or abiotic) for organic chemicals.

2.2.9.1.10.2.2 While data from internationally harmonised test methods are preferred, in practice, data from national methods may also be used where they are considered as equivalent. In general, it has been agreed that freshwater and marine species toxicity data can be considered as equivalent data and are preferably to be derived using OECD Test Guidelines or equivalent according to the principles of Good Laboratory Practices (GLP). Where such data are not available, classification shall be based on the best available data.

2.2.9.1.10.2.3 *Acute aquatic toxicity* means the intrinsic property of a substance to be injurious to an organism in a short-term aquatic exposure to that substance.

Acute (short-term) hazard, for classification purposes, means the hazard of a chemical caused by its acute toxicity to an organism during short-term aquatic exposure to that chemical.

Acute aquatic toxicity shall normally be determined using a fish 96 hour LC_{50} (OECD Test Guideline 203 or equivalent), a crustacea species 48 hour EC_{50} (OECD Test Guideline 202 or equivalent) and/or an algal species 72 or 96 hour EC_{50} (OECD Test Guideline 201 or equivalent). These species are considered as surrogate for all aquatic organisms and data on other species such as Lemna may also be considered if the test methodology is suitable.

2.2.9.1.10.2.4 *Chronic aquatic toxicity* means the intrinsic property of a substance to cause adverse effects to aquatic organisms during aquatic exposures which are determined in relation to the life-cycle of the organism.

Long-term hazard, for classification purposes, means the hazard of a chemical caused by its chronic toxicity following long-term exposure in the aquatic environment.

Chronic toxicity data are less available than acute data and the range of testing procedures less standardised. Data generated according to the OECD Test Guidelines 210 (Fish Early Life Stage) or 211 (Daphnia Reproduction) and 201 (Algal Growth Inhibition) may be accepted. Other validated and internationally accepted tests may also be used. The NOECs or other equivalent EC_x shall be used.

2.2.9.1.10.2.5 *Bioaccumulation* means net result of uptake, transformation and elimination of a substance in an organism due to all routes of exposure (i.e. air, water, sediment/soil and food).

The potential for bioaccumulation shall normally be determined by using the octanol/water partition coefficient, usually reported as a log K_{ow} determined according to OECD Test Guideline 107 or 117. While this represents a potential to bioaccumulate, an experimentally determined Bioconcentration Factor (BCF) provides a better measure and shall be used in preference when available. A BCF shall be determined according to OECD Test Guideline 107, 117 or 123.

2.2.9.1.10.2.6 *Degradation* means the decomposition of organic molecules to smaller molecules and eventually to carbon dioxide, water and salts.

Environmental degradation may be biotic or abiotic (e.g. hydrolysis) and the criteria used reflect this fact. Ready biodegradation is most easily defined using the biodegradability tests (A-F) of OECD Test Guideline 301. A pass level in these tests may be considered as indicative of rapid degradation in most environments. These are freshwater tests and thus the use of the results from OECD Test Guideline 306, which is more suitable for marine environments, has also been included. Where such data are not available, a BOD_5(5 days)/COD ratio ≥ 0.5 is considered as indicative of rapid degradation.

Abiotic degradation such as hydrolysis, primary degradation, both abiotic and biotic, degradation in non-aquatic media and proven rapid degradation in the environment may all be considered in defining rapid degradability[12].

Substances are considered rapidly degradable in the environment if the following criteria are met:

(a) In 28-day ready biodegradation studies, the following levels of degradation are achieved:

(i) Tests based on dissolved organic carbon: 70 %;

(ii) Tests based on oxygen depletion or carbon dioxide generation: 60 % of theoretical maxima;

These levels of biodegradation shall be achieved within 10 days of the start of degradation which point is taken as the time when 10 % of the substance has been degraded ", unless the substance is identified as a complex, multi-component substance with structurally similar constituents. In this case, and where there is sufficient justification, the 10-day window condition may be waived and the pass level applied at 28 days[13]; or

(b) In those cases where only BOD and COD data are available, when the ratio of BOD_5/COD is ≥ 0.5; or

(c) If other convincing scientific evidence is available to demonstrate that the substance can be degraded (biotically and/or abiotically) in the aquatic environment to a level above 70 % within a 28 day period.

2.2.9.1.10.3 Substance classification categories and criteria

2.2.9.1.10.3.1 Substances shall be classified as "environmentally hazardous substances (aquatic environment)", if they satisfy the criteria for Acute 1, Chronic 1 or Chronic 2, according to Table 2.2.9.1.10.3.1. These criteria describe in detail the classification categories. They are diagrammatically summarized in Table 2.2.9.1.10.3.2.

[12] *Special guidance on data interpretation is provided in Chapter 4.1 and Annex 9 of the GHS.*

[13] *See Chapter 4.1 and Annex 9, paragraph A9.4.2.2.3 of the GHS.*

Table 2.2.9.1.10.3.1: Categories for substances hazardous to the aquatic environment *(see Note 1)*

(a) Acute (short-term) aquatic hazard

Category Acute 1: *(see Note 2)*	
96 h LC_{50} (for fish)	≤ 1 mg/l and/or
48 h EC_{50} (for crustacea)	≤ 1 mg/l and/or
72 or 96 h ErC_{50} (for algae or other aquatic plants)	≤ 1 mg/l *(see Note 3)*

(b) Long-term aquatic hazard *(see also Figure 2.2.9.1.10.3.1)*

(i) Non-rapidly degradable substances (see Note 4) for which there are adequate chronic toxicity data available

Category Chronic 1: (see *Note 2*)	
Chronic NOEC or EC_x (for fish)	≤ 0.1 mg/l and/or
Chronic NOEC or EC_x (for crustacea)	≤ 0.1 mg/l and/or
Chronic NOEC or EC_x (for algae or other aquatic plants)	≤ 0.1 mg/l
Category Chronic 2:	
Chronic NOEC or EC_x (for fish)	≤ 1 mg/l and/or
Chronic NOEC or EC_x (for crustacea)	≤ 1 mg/l and/or
Chronic NOEC or EC_x (for algae or other aquatic plants)	≤ 1 mg/l

(ii) Rapidly degradable substances for which there are adequate chronic toxicity data available

Category Chronic 1: *(see Note 2)*	
Chronic NOEC or EC_x (for fish)	≤ 0.01 mg/l and/or
Chronic NOEC or EC_x (for crustacea)	≤ 0.01 mg/l and/or
Chronic NOEC or EC_x (for algae or other aquatic plants)	≤ 0.01 mg/l
Category Chronic 2:	
Chronic NOEC or EC_x (for fish)	≤ 0.1 mg/l and/or
Chronic NOEC or EC_x (for crustacea)	≤ 0.1 mg/l and/or
Chronic NOEC or EC_x (for algae or other aquatic plants)	≤ 0.1 mg/l

(iii) Substances for which adequate chronic toxicity data are not available

Category Chronic 1: *(see Note 2)*	
96 h LC_{50} (for fish)	≤ 1 mg/l and/or
48 h EC_{50} (for crustacea)	≤ 1 mg/l and/or
72 or 96 h ErC_{50} (for algae or other aquatic plants)	≤ 1 mg/l *(see Note 3)*
and the substance is not rapidly degradable and/or the experimentally determined BCF is ≥ 500 (or, if absent the log K_{ow} ≥ 4) *(see Notes 4 and 5).*	
Category Chronic 2:	
96 h LC_{50} (for fish)	>1 but ≤ 10 mg/l and/or
48 h EC_{50} (for crustacea)	>1 but ≤ 10 mg/l and/or
72 or 96 h ErC_{50} (for algae or other aquatic plants)	>1 but ≤ 10 mg/l *(see Note 3)*
and the substance is not rapidly degradable and/or the experimentally determined BCF is ≥ 500 (or, if absent the log K_{ow} ≥ 4 *(see Notes 4 and 5).*	

NOTE 1: *The organisms fish, crustacea and algae are tested as surrogate species covering a range of trophic levels and taxa, and the test methods are highly standardized. Data on other organisms may also be considered, however, provided they represent equivalent species and test endpoints.*

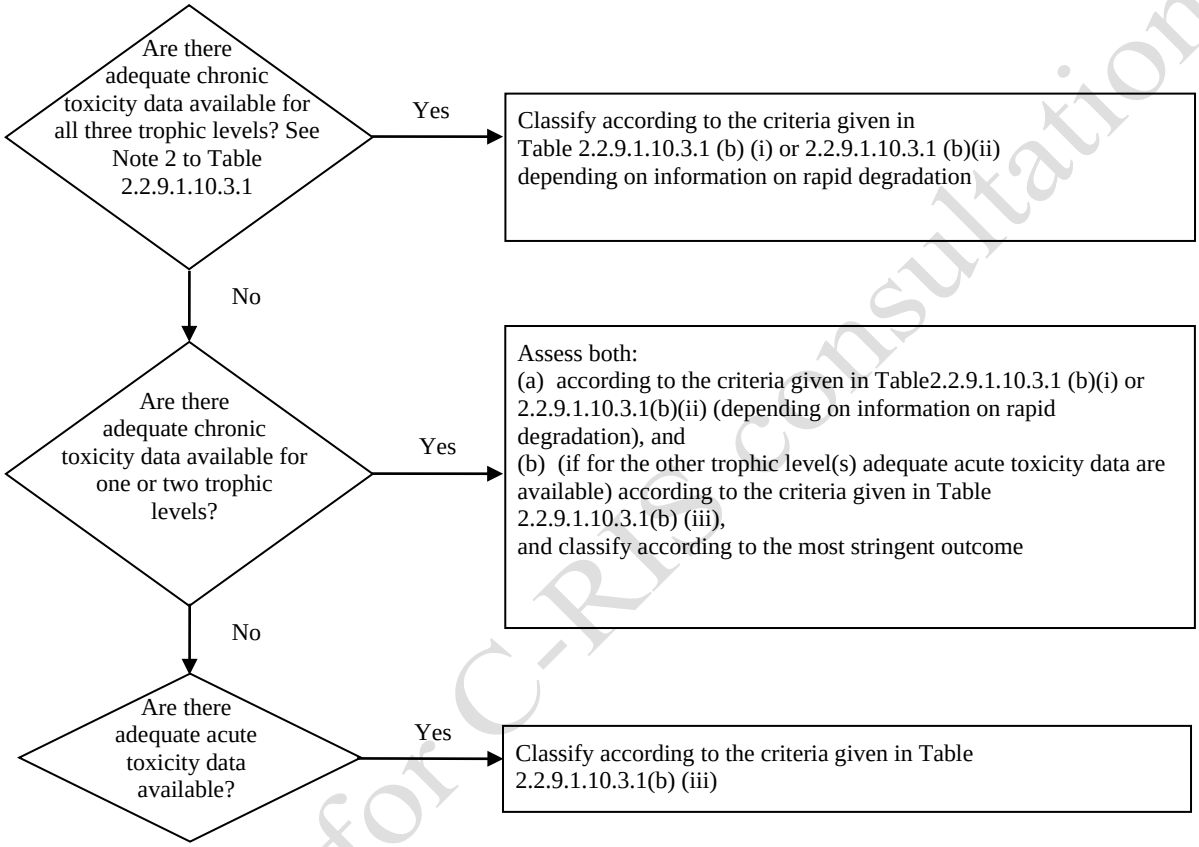
NOTE 2: *When classifying substances as Acute 1 and/or Chronic 1 it is necessary at the same time to indicate an appropriate M factor (see 2.2.9.1.10.4.6.4) to apply the summation method.*

NOTE 3: *Where the algal toxicity ErC_{50} (= EC_{50} (growth rate)) falls more than 100 times below the next most sensitive species and results in a classification based solely on this effect, consideration shall be given to whether this toxicity is representative of the toxicity to aquatic plants. Where it can be shown that this is not the case, professional judgment shall be used in deciding if classification shall be applied. Classification shall be based on the ErC_{50}. In circumstances where the basis of the EC_{50} is not specified and no ErC_{50} is recorded, classification shall be based on the lowest EC_{50} available.*

NOTE 4: *Lack of rapid degradability is based on either a lack of ready biodegradability or other evidence of lack of rapid degradation. When no useful data on degradability are available, either experimentally determined or estimated data, the substance shall be regarded as not rapidly degradable.*

NOTE 5: *Potential to bioaccumulate, based on an experimentally derived BCF ≥ 500 or, if absent, a log K_{ow} ≥ 4 provided log K_{ow} is an appropriate descriptor for the bioaccumulation potential of the substance. Measured log K_{ow} values take precedence over estimated values and measured BCF values take precedence over log K_{ow} values.*

Figure 2.2.9.1.10.3.1: Categories for substances long-term hazardous to the aquatic environment



2.2.9.1.10.3.2 The classification scheme in Table 2.2.9.1.10.3.2 below summarizes the classification criteria for substances.

Table 2.2.9.1.10.3.2: Classification scheme for substances hazardous to the aquatic environment

Classification categories			
Acute hazard (*see Note 1*)	**Long-term hazard** (*see Note 2*)		
	Adequate chronic toxicity data available		**Adequate chronic toxicity data not available** (*see Note 1*)
	Non-rapidly degradable substances (*see Note 3*)	**Rapidly degradable substances** (*see Note 3*)	
Category: Acute 1	**Category: Chronic 1**	**Category: Chronic 1**	**Category: Chronic 1**
$L(E)C_{50} \leq 1.00$	NOEC or $EC_x \leq 0.1$	NOEC or $EC_x \leq 0.01$	$L(E)C_{50} \leq 1.00$ and lack of rapid degradability and/or BCF ≥ 500 or, if absent log $K_{ow} \geq 4$
	Category: Chronic 2	**Category: Chronic 2**	**Category: Chronic 2**
	$0.1 < \text{NOEC or } EC_x \leq 1$	$0.01 < \text{NOEC or } EC_x \leq 0.1$	$1.00 < L(E)C_{50} \leq 10.0$ and lack of rapid degradability and/or BCF ≥ 500 or, if absent log $K_{ow} \geq 4$

NOTE 1: *Acute toxicity band based on $L(E)C_{50}$ values in mg/l for fish, crustacea and/or algae or other aquatic plants (or Quantitative Structure Activity Relationships (QSAR) estimation if no experimental data[14]).*

NOTE 2: *Substances are classified in the various chronic categories unless there are adequate chronic toxicity data available for all three trophic levels above the water solubility or above 1 mg/l. ("Adequate" means that the data sufficiently cover the endpoint of concern. Generally this would mean measured test data, but in order to avoid unnecessary testing it can on a case by case basis also be estimated data, e.g. (Q)SAR, or for obvious cases expert judgment).*

NOTE 3: *Chronic toxicity band based on NOEC or equivalent EC_x values in mg/l for fish or crustacea or other recognized measures for chronic toxicity.*

2.2.9.1.10.4 Mixtures classification categories and criteria

2.2.9.1.10.4.1 The classification system for mixtures covers the classification categories which are used for substances, meaning categories Acute 1 and Chronic 1 and 2. In order to make use of all available data for purposes of classifying the aquatic environmental hazards of the mixture, the following assumption is made and is applied where appropriate:

The "relevant ingredients" of a mixture are those which are present in a concentration equal to or greater than 0.1 % (by mass) for ingredients classified as Acute and/or Chronic 1 and equal to or greater than 1 % for other ingredients, unless there is a presumption (e.g. in the case of highly toxic ingredients) that an ingredient present at less than 0.1 % can still be relevant for classifying the mixture for aquatic environmental hazards.

2.2.9.1.10.4.2 The approach for classification of aquatic environmental hazards is tiered, and is dependent upon the type of information available for the mixture itself and for its ingredients. Elements of the tiered approach include:

(a) Classification based on tested mixtures;

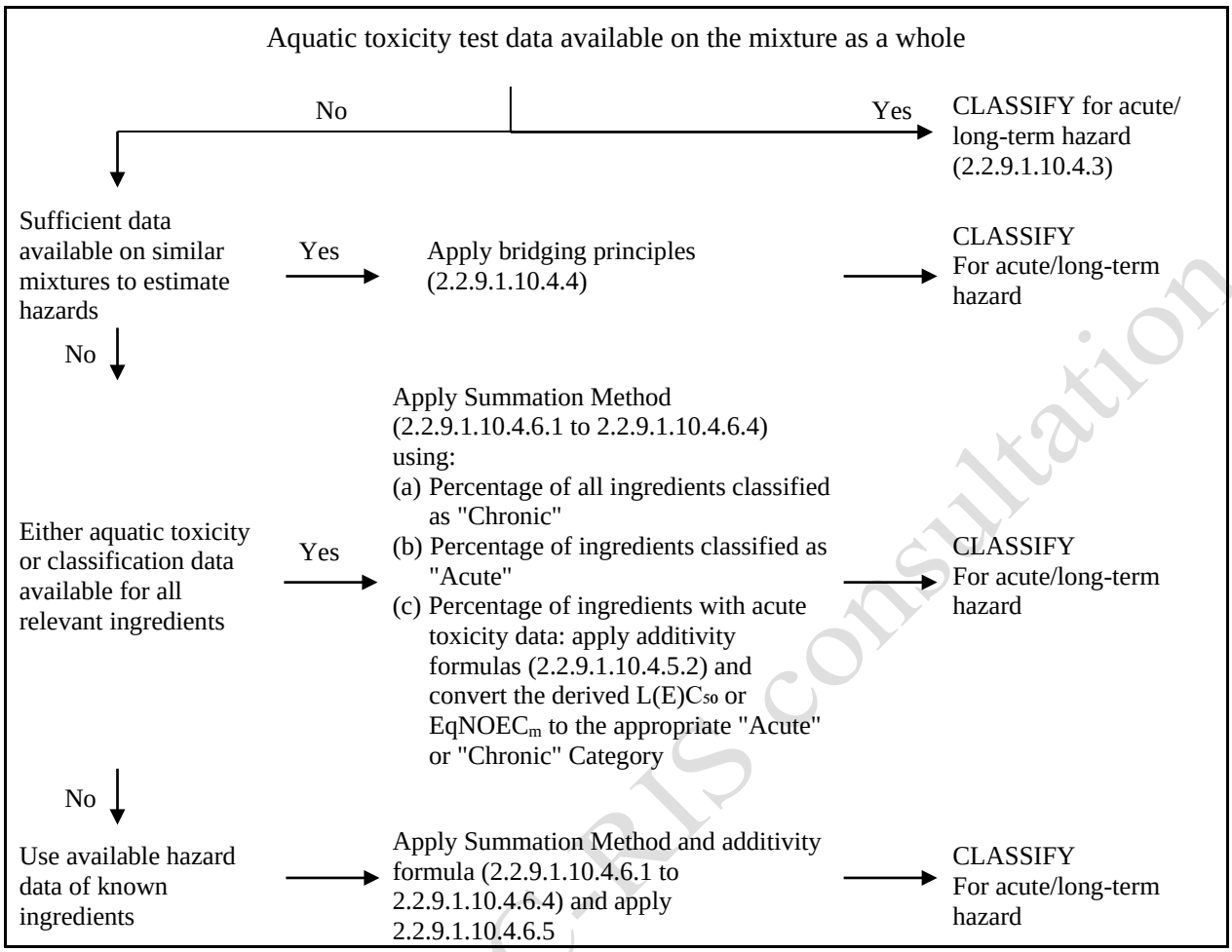
(b) Classification based on bridging principles;

(c) The use of "summation of classified ingredients" and/or an "additivity formula".

Figure 2.2.9.1.10.4.2 below outlines the process to be followed.

[14] *Special guidance is provided in Chapter 4.1, paragraph 4.1.2.13 and Annex 9, Section A9.6 of the GHS.*

Figure 2.2.9.1.10.4.2: Tiered approach to classification of mixtures for acute and long-term aquatic environmental hazards



2.2.9.1.10.4.3 Classification of mixtures when toxicity data are available for the complete mixture

2.2.9.1.10.4.3.1 When the mixture as a whole has been tested to determine its aquatic toxicity, this information shall be used for classifying the mixture according to the criteria that have been agreed for substances. The classification is normally based on the data for fish, crustacea and algae/plants (see 2.2.9.1.10.2.3 and 2.2.9.1.10.2.4). When adequate acute or chronic data for the mixture as a whole are lacking, "bridging principles" or "summation method" shall be applied (see 2.2.9.1.10.4.4 to 2.2.9.1.10.4.6).

2.2.9.1.10.4.3.2 The long-term hazard classification of mixtures requires additional information on degradability and in certain cases bioaccumulation. There are no degradability and bioaccumulation data for mixtures as a whole. Degradability and bioaccumulation tests for mixtures are not used as they are usually difficult to interpret, and such tests may be meaningful only for single substances.

2.2.9.1.10.4.3.3 Classification for category Acute 1

(a) When there are adequate acute toxicity test data (LC_{50} or EC_{50}) available for the mixture as a whole showing $L(E)C_{50} \leq 1$ mg/l:

Classify the mixture as Acute 1 in accordance with Table 2.2.9.1.10.3.1 (a);

(b) When there are acute toxicity test data ($LC_{50}(s)$ or $EC_{50}(s)$ available for the mixture as a whole showing $L(E)C_{50}(s) > 1$ mg/l, or above the water solubility:

No need to classify for acute hazard under this Code.

2.2.9.1.10.4.3.4 Classification for categories Chronic 1 and 2

(a) When there are adequate chronic toxicity data (EC_x or NOEC) available for the mixture as a whole showing EC_x or NOEC of the tested mixture ≤ 1mg/l:

(i) classify the mixture as Chronic 1 or 2 in accordance with Table 2.2.9.1.10.3.1 (b) (ii) (rapidly degradable) if the available information allows the conclusion that all relevant ingredients of the mixture are rapidly degradable;

NOTE: *In this situation, when EC_x or NOEC of the tested mixture > 0.1 mg/l, there is no need to classify for long-term hazard under this Code.*

(ii) classify the mixture as Chronic 1 or 2 in all other cases in accordance with Table 2.2.9.1.10.3.1 (b) (i) (non-rapidly degradable);

(b) When there are adequate chronic toxicity data (EC_x or NOEC) available for the mixture as a whole showing EC_x(s) or NOEC(s) of the tested mixture > 1mg/l or above the water solubility:

No need to classify for long-term hazard under this Code.

2.2.9.1.10.4.4 Classification of mixtures when toxicity data are not available for the complete mixture: bridging principles

2.2.9.1.10.4.4.1 Where the mixture itself has not been tested to determine its aquatic environmental hazard, but there are sufficient data on the individual ingredients and similar tested mixtures to adequately characterise the hazards of the mixture, these data shall be used in accordance with the following agreed bridging rules. This ensures that the classification process uses the available data to the greatest extent possible in characterising the hazards of the mixture without the necessity for additional testing in animals.

2.2.9.1.10.4.4.2 Dilution

Where a new mixture is formed by diluting a tested mixture or a substance with a diluent which has an equivalent or lower aquatic hazard classification than the least toxic original ingredient and which is not expected to affect the aquatic hazards of other ingredients, then the resulting mixture shall be classified as equivalent to the original tested mixture or substance. Alternatively, the method explained in 2.2.9.1.10.4.5 may be applied.

2.2.9.1.10.4.4.3 Batching

The aquatic hazard classification of a tested production batch of a mixture shall be assumed to be substantially equivalent to that of another untested production batch of the same commercial product when produced by or under the control of the same manufacturer, unless there is reason to believe there is significant variation such that the aquatic hazard classification of the untested batch has changed. If the latter occurs, new classification is necessary.

2.2.9.1.10.4.4.4 Concentration of mixtures which are classified with the most severe classification categories (Chronic 1 and Acute 1)

If a tested mixture is classified as Chronic 1 and/or Acute 1, and the ingredients of the mixture which are classified as Chronic 1 and/or Acute 1 are further concentrated, the more concentrated untested mixture shall be classified with the same classification category as the original tested mixture without additional testing.

2.2.9.1.10.4.4.5 Interpolation within one toxicity category

For three mixtures (A, B and C) with identical ingredients, where mixtures A and B have been tested and are in the same toxicity category, and where untested mixture C has the same toxicologically active ingredients as mixtures A and B but has concentrations of toxicologically active ingredients intermediate to the concentrations in mixtures A and B, then mixture C is assumed to be in the same category as A and B.

2.2.9.1.10.4.4.6 Substantially similar mixtures

Given the following:

(a) Two mixtures:

(i) A + B;

(ii) C + B;

(b) The concentration of ingredient B is essentially the same in both mixtures;

(c) The concentration of ingredient A in mixture (i) equals that of ingredient C in mixture (ii);

(d) Data on aquatic hazards for A and C are available and are substantially equivalent, i.e. they are in the same hazard category and are not expected to affect the aquatic toxicity of B.

If mixture (i) or (ii) is already classified based on test data, then the other mixture can be assigned the same hazard category.

2.2.9.1.10.4.5 Classification of mixtures when toxicity data are available for all ingredients or only for some ingredients of the mixture

2.2.9.1.10.4.5.1 The classification of a mixture shall be based on summation of the concentrations of its classified ingredients. The percentage of ingredients classified as "Acute" or "Chronic" will feed straight into the summation method. Details of the summation method are described in 2.2.9.1.10.4.6.1 to 2.2.9.1.10.4.6.4.

2.2.9.1.10.4.5.2 Mixtures may be made of a combination of both ingredients that are classified (as Acute 1 and/or Chronic 1, 2) and those for which adequate toxicity test data are available. When adequate toxicity data are available for more than one ingredient in the mixture, the combined toxicity of those ingredients shall be calculated using the following additivity formulas (a) or (b), depending on the nature of the toxicity data:

(a) Based on acute aquatic toxicity:

$$\frac{\sum C_i}{L(E)C_{50m}} = \sum_n \frac{C_i}{L(E)C_{50i}}$$

where:

C_i = concentration of ingredient i (mass percentage);

$L(E)C_{50i}$ = LC_{50} or EC_{50} for ingredient i (mg/l);

n = number of ingredients, and i is running from 1 to n;

$L(E)C_{50m}$ = $L(E)C_{50}$ of the part of the mixture with test data;

The calculated toxicity shall be used to assign that portion of the mixture an acute hazard category which is then subsequently used in applying the summation method;

(b) Based on chronic aquatic toxicity:

$$\frac{\sum C_i + \sum C_j}{EqNOEC_m} = \sum_n \frac{C_i}{NOEC_i} + \sum_n \frac{C_j}{0.1 \cdot NOEC_j}$$

where:

C_i = concentration of ingredient i (mass percentage) covering the rapidly degradable ingredients;

C_j = concentration of ingredient j (mass percentage) covering the non rapidly degradable ingredients;

$NOEC_i$ = NOEC (or other recognized measures for chronic toxicity) for ingredient i covering the rapidly degradable ingredients, in mg/l;

$NOEC_j$ = NOEC (or other recognized measures for chronic toxicity) for ingredient j covering the non-rapidly degradable ingredients, in mg/l;

n = number of ingredients, and i and j are running from 1 to n;

$EqNOEC_m$ = equivalent NOEC of the part of the mixture with test data;

The equivalent toxicity thus reflects the fact that non-rapidly degrading substances are classified one hazard category level more "severe" than rapidly degrading substances.

The calculated equivalent toxicity shall be used to assign that portion of the mixture a long-term hazard category, in accordance with the criteria for rapidly degradable substances (Table 2.2.9.1.10.3.1 (b) (ii)), which is then subsequently used in applying the summation method.

2.2.9.1.10.4.5.3 When applying the additivity formula for part of the mixture, it is preferable to calculate the toxicity of this part of the mixture using for each ingredient toxicity values that relate to the same taxonomic group (i.e. fish, crustacea or algae) and then to use the highest toxicity (lowest value) obtained (i.e. use the most sensitive of the three groups). However, when toxicity data for each ingredient are not available in the same taxonomic group, the toxicity value of each ingredient shall be selected in the same manner that toxicity values are selected for the classification of substances, i.e. the higher toxicity (from the most sensitive test organism) is used. The calculated acute and chronic toxicity shall then be used to classify this part of the mixture as Acute 1 and/or Chronic 1 or 2 using the same criteria described for substances.

2.2.9.1.10.4.5.4 If a mixture is classified in more than one way, the method yielding the more conservative result shall be used.

2.2.9.1.10.4.6 Summation method

2.2.9.1.10.4.6.1 Classification procedure

In general a more severe classification for mixtures overrides a less severe classification, e.g. a classification with Chronic 1 overrides a classification with Chronic 2. As a consequence the classification procedure is already completed if the results of the classification is Chronic 1. A more severe classification than Chronic 1 is not possible; therefore, it is not necessary to pursue the classification procedure further.

2.2.9.1.10.4.6.2 Classification for category Acute 1

2.2.9.1.10.4.6.2.1 First, all ingredients classified as Acute 1 are considered. If the sum of the concentrations (in %) of these ingredients is greater than or equal to 25 % the whole mixture shall be classified as Acute 1. If the result of the calculation is a classification of the mixture as Acute 1, the classification process is completed.

2.2.9.1.10.4.6.2.2 The classification of mixtures for acute hazards based on this summation of the concentrations of classified ingredients is summarized in Table 2.2.9.1.10.4.6.2.2 below.

Table 2.2.9.1.10.4.6.2.2: Classification of a mixture for acute hazards based on summation of the concentrations of classified ingredients

Sum of the concentrations (in %) of ingredients classified as:	Mixture classified as:
Acute 1 × M [a] ≥ 25 %	Acute 1

[a] *For explanation of the M factor, see 2.2.9.1.10.4.6.4.*

2.2.9.1.10.4.6.3 Classification for categories Chronic 1 and 2

2.2.9.1.10.4.6.3.1 First, all ingredients classified as Chronic 1 are considered. If the sum of the concentrations (in %) of these ingredients is greater than or equal to 25 % the mixture shall be classified as Chronic 1. If the result of the calculation is a classification of the mixture as Chronic 1 the classification procedure is completed.

2.2.9.1.10.4.6.3.2 In cases where the mixture is not classified as Chronic 1, classification of the mixture as Chronic 2 is considered. A mixture shall be classified as Chronic 2 if 10 times the sum of the concentrations (in %) of all ingredients classified as Chronic 1 plus the sum of the concentrations (in %) of all ingredients classified as Chronic 2 is greater than or equal to 25 %. If the result of the calculation is classification of the mixture as Chronic 2, the classification process is completed.

2.2.9.1.10.4.6.3.3 The classification of mixtures for long-term hazards based on this summation of the concentrations of classified ingredients is summarized in Table 2.2.9.1.10.4.6.3.3 below.

Table 2.2.9.1.10.4.6.3.3: Classification of a mixture for long-term hazards based on summation of the concentrations of classified ingredients

Sum of the concentrations (in %) of ingredients classified as:		Mixture classified as:
Chronic 1 × M [a]	≥ 25 %	Chronic 1
(M × 10 × Chronic 1) + Chronic 2	≥ 25 %	Chronic 2

[a] *For explanation of the M factor, see 2.2.9.1.10.4.6.4.*

2.2.9.1.10.4.6.4 Mixtures with highly toxic ingredients

Acute 1 or Chronic 1 ingredients with acute toxicities well below 1 mg/l and/or chronic toxicities well below 0.1 mg/l (if non-rapidly degradable) and 0.01 mg/l (if rapidly degradable) may influence the toxicity of the mixture and are given increased weight in applying the summation method. When a mixture contains ingredients classified as acute or Chronic 1, the tiered approach described in 2.2.9.1.10.4.6.2 and 2.2.9.1.10.4.6.3 shall be applied using a weighted sum by multiplying the concentrations of Acute 1 and Chronic 1 ingredients by a factor, instead of merely adding up the percentages. This means that the concentration of "Acute 1" in the left column of Table 2.2.9.1.10.4.6.2.2 and the concentration of "Chronic 1" in the left column of Table 2.2.9.1.10.4.6.3.3 are multiplied by the appropriate multiplying factor. The multiplying factors to be applied to these ingredients are defined using the toxicity value, as summarised in Table 2.2.9.1.10.4.6.4 below. Therefore, in order to classify a mixture containing Acute 1 and/or Chronic 1 ingredients, the classifier needs to be informed of the value of the M factor in order to apply the summation method. Alternatively, the additivity formula (see 2.2.9.1.10.4.5.2) may be used when toxicity data are available for all highly toxic ingredients in the mixture and there is convincing evidence that all other ingredients, including those for which specific acute and/or chronic toxicity data are not available, are of low or no toxicity and do not significantly contribute to the environmental hazard of the mixture.

Table 2.2.9.1.10.4.6.4: Multiplying factors for highly toxic ingredients of mixtures

Acute toxicity	**M factor**	**Chronic toxicity**	**M factor**	
L(E)C_{50} value		**NOEC value**	**NRD [a] ingredients**	**RD [b] ingredients**
0.1 < L(E)C_{50} ≤ 1	1	0.01 < NOEC ≤ 0.1	1	–
0.01 < L(E)C_{50} ≤ 0.1	10	0.001 < NOEC ≤ 0.01	10	1
0.001 < L(E)C_{50} ≤ 0.01	100	0.0001 < NOEC ≤ 0.001	100	10
0.0001 < L(E)C_{50} ≤ 0.001	1 000	0.00001 < NOEC ≤ 0.0001	1 000	100
0.00001 < L(E)C_{50} ≤ 0.0001	10 000	0.000001 < NOEC ≤ 0.00001	10 000	1 000
(continue in factor 10 intervals)		(continue in factor 10 intervals)		

[a] *Non-rapidly degradable.*
[b] *Rapidly degradable.*

2.2.9.1.10.4.6.5 Classification of mixtures with ingredients without any useable information

In the event that no useable information on acute and/or chronic aquatic toxicity is available for one or more relevant ingredients, it is concluded that the mixture cannot be attributed (a) definitive hazard category(ies). In this situation the mixture shall be classified based on the known ingredients only.

2.2.9.1.10.5 (Reserved)

2.2.9.1.10.6 Assignment of substances or mixtures classified as environmentally hazardous substances (aquatic environment) according to the provisions in 2.2.9.1.10.3, 2.2.9.1.10.4 or 2.2.9.1.10.5

Substances or mixtures classified as environmentally hazardous substances (aquatic environment) that do not meet the classification criteria of any other class or another substance within Class 9 shall be designated:

UN No. 3077 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.; or

UN No. 3082 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.

They shall be assigned to packing group III.

Genetically modified microorganisms or organisms

2.2.9.1.11 Genetically modified microorganisms (GMMOs) and genetically modified organisms (GMOs) are microorganisms and organisms in which genetic material has been purposely altered through genetic engineering in a way that does not occur naturally. They are assigned to Class 9 (UN No. 3245) if they do not meet the definition of toxic substances or of infectious substances, but are capable of altering animals, plants or microbiological substances in a way not normally the result of natural reproduction.

NOTE 1: *GMMOs and GMOs which are infectious are substances of Class 6.2, UN Nos. 2814, 2900 or 3373.*

NOTE 2: *GMMOs or GMOs are not subject to the provisions of this Code when authorized for use by the competent authorities of the countries of origin, transit and destination*[15].

NOTE 3: *Pharmaceutical products (such as vaccines) that are packed in a form ready to be administered, including those in clinical trials, and that contain GMMOs or GMOs are not subject to this Code.*

NOTE 4: *Genetically modified live animals which, in accordance with the current state of scientific knowledge, have no known pathogenic effect on humans, animals and plants and are carried in receptacles that are suitable for safely preventing both the escape of the animals and unauthorized access to them, are not subject to the provisions of this Code. The provisions specified by the International Air Transport Association (IATA) for air transport "Live Animals Regulations, LAR" can be drawn on as guidelines for suitable receptacles for the transport of live animals.*

NOTE 5: *Live animals shall not be used to carry genetically modified microorganisms classified in Class 9 unless the substance can be carried no other way. Genetically modified live animals shall be carried under terms and conditions of the competent authorities of the countries of origin and destination.*

2.2.9.1.12 *(Deleted)*

Elevated temperature substances

2.2.9.1.13 Elevated temperature substances include substances which are carried or handed over for carriage in the liquid state at or above 100 °C and, in the case of those with a flash-point, below their flash-point. They also include solids which are carried or handed over for carriage at or above 240 °C.

NOTE: *Elevated temperature substances may be assigned to Class 9 only if they do not meet the criteria of any other class.*

Other substances and articles presenting a danger during carriage but not meeting the definitions of another class

[15] GMMOs and GMOs are authorized in Australia if they are:
(a) *licensed by the Office of the Gene Technology Regulator (OGTR); or*
(b) *approved by Food Standards Australia New Zealand (FSANZ); or*
(c) *exempt from such licences and approvals under the Gene Technology Act 2000.*

2.2.9.1.14 The following other miscellaneous substances not meeting the definitions of another class are assigned to Class 9:

Solid ammonia compounds having a flash-point below 60 °C;

Low hazard dithionites;

Highly volatile liquids;

Substances emitting noxious fumes;

Substances containing allergens;

Chemical kits and first aid kits;

Electric double layer capacitors (with an energy storage capacity greater than 0.3 Wh);

Vehicles, engines and machinery, internal combustion;

Articles containing miscellaneous dangerous goods.

NOTE: *UN No. 1845 carbon dioxide, solid (dry ice)*[16]*, UN No. 2216 fish meal (fish scrap), stabilized, UN No. 2807 magnetized material, UN No. 3334 aviation regulated liquid, n.o.s. and UN No. 3335 aviation regulated solid, n.o.s. listed in the UN Model Regulations, are not subject to the provisions of this Code.*

Assignment of the packing groups

2.2.9.1.15 When indicated in column (4) of Table A of Chapter 3.2, substances and articles of Class 9 are assigned to one of the following packing groups according to their degree of danger:

Packing group II: substances presenting medium danger;

Packing group III: substances presenting low danger.

2.2.9.2 ***Substances and articles not accepted for carriage***

The following substances and articles shall not be accepted for carriage:

- Lithium batteries which do not meet the relevant conditions of special provisions 188, 230, 310, 636 or 670 of Chapter 3.3;
- Uncleaned empty containment vessels for apparatus such as transformers, condensers and hydraulic apparatus containing substances assigned to UN Nos. 2315, 3151, 3152 or 3432.

[16] *For UN No. 1845 carbon dioxide, solid (dry ice), see 5.5.3.*

2.2.9.3 List of entries

Substances which, on inhalation as fine dust, may endanger health		**M1**	2212 ASBESTOS, AMPHIBOLE (amosite, tremolite, actinolite, anthophyllite, crocidolite) 2590 ASBESTOS, CHRYSOTILE
Substances and articles which, in the event of fire, may form dioxins		**M2**	2315 POLYCHLORINATED BIPHENYLS, LIQUID 3432 POLYCHLORINATED BIPHENYLS, SOLID 3151 POLYHALOGENATED BIPHENYLS, LIQUID or 3151 HALOGENATED MONOMETHYLDIPHENYLMETHANES, LIQUID or 3151 POLYHALOGENATED TERPHENYLS, LIQUID 3152 POLYHALOGENATED BIPHENYLS, SOLID or 3152 HALOGENATED MONOMETHYLDIPHENYLMETHANES, SOLID or 3152 POLYHALOGENATED TERPHENYLS, SOLID
Substances evolving flammable vapour		**M3**	2211 POLYMERIC BEADS, EXPANDABLE, evolving flammable vapour 3314 PLASTICS MOULDING COMPOUND in dough, sheet or extruded rope form evolving flammable vapour
Lithium batteries		**M4**	3090 LITHIUM METAL BATTERIES (including lithium alloy batteries) 3091 LITHIUM METAL BATTERIES CONTAINED IN EQUIPMENT (including lithium alloy batteries) or 3091 LITHIUM METAL BATTERIES PACKED WITH EQUIPMENT (including lithium alloy batteries) 3480 LITHIUM ION BATTERIES (including lithium ion polymer batteries) 3481 LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT (including lithium ion polymer batteries) or 3481 LITHIUM ION BATTERIES PACKED WITH EQUIPMENT (including lithium ion polymer batteries) 3536 LITHIUM BATTERIES INSTALLED IN CARGO TRANSPORT UNIT lithium ion batteries or lithium metal batteries
Live-saving appliances		**M5**	2990 LIFE-SAVING APPLIANCES, SELF-INFLATING 3072 LIFE-SAVING APPLIANCES NOT SELF-INFLATING containing dangerous goods as equipment 3268 SAFETY DEVICES, electrically initiated
Environmentally hazardous substances	**pollutant to the aquatic environment, liquid**	**M6**	3082 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
	pollutant to the aquatic environment, solid	**M7**	3077 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
	genetically modified micro-organisms and organisms	**M8**	3245 GENETICALLY MODIFIED MICROORGANISMS or 3245 GENETICALLY MODIFIED ORGANISMS
Elevated temperature substances	**liquid**	**M9**	3257 ELEVATED TEMPERATURE LIQUID, N.O.S., at or above 100 °C and below its flash-point (including molten metal, molten salts, etc.)
	solid	**M10**	3258 ELEVATED TEMPERATURE SOLID, N.O.S., at or above 240 °C

(cont'd on next page)

2.2.9.3 ***List of entries (cont'd)***

Other substances and articles presenting a danger during carriage, but not meeting the definitions of another class	**M11**	Only substances and articles listed in Table A of Chapter 3.2 are subject to the provisions for Class 9 under this classification code, as follows: 1841 ACETALDEHYDE AMMONIA 1931 ZINC DITHIONITE (ZINC HYDROSULPHITE) 1941 DIBROMODIFLUOROMETHANE 1990 BENZALDEHYDE 2071 AMMONIUM NITRATE BASED FERTILIZER 2969 CASTOR BEANS, or 2969 CASTOR MEAL, or 2969 CASTOR POMACE, or 2969 CASTOR FLAKE 3166 VEHICLE, FLAMMABLE GAS POWERED or 3166 VEHICLE, FLAMMABLE LIQUID POWERED or 3166 VEHICLE, FUEL CELL, FLAMMABLE GAS POWERED or 3166 VEHICLE, FUEL CELL, FLAMMABLE LIQUID POWERED 3171 BATTERY POWERED VEHICLE or 3171 BATTERY POWERED EQUIPMENT 3316 CHEMICAL KIT, or 3316 FIRST AID KIT 3359 FUMIGATED CARGO TRANSPORT UNIT 3363 DANGEROUS GOODS IN ARTICLES or 3363 DANGEROUS GOODS IN MACHINERY or 3363 DANGEROUS GOODS IN APPARATUS 3499 CAPACITOR, ELECTRIC DOUBLE LAYER (with an energy storage capacity greater than 0.3Wh) 3508 CAPACITOR, ASYMMETRIC (with an energy storage capacity greater than 0.3Wh) 3509 PACKAGINGS, DISCARDED, EMPTY, UNCLEANED 3530 ENGINE, INTERNAL COMBUSTION or 3530 MACHINERY, INTERNAL COMBUSTION 3548 ARTICLES CONTAINING MISCELLANEOUS DANGEROUS GOODS N.O.S.

CHAPTER 2.3

TEST METHODS

2.3.0 General

Unless otherwise provided for in Chapter 2.2 or in this Chapter, the test methods to be used for the classification of dangerous goods are those described in the Manual of Tests and Criteria.

2.3.1 Exudation test for blasting explosives of Type A

2.3.1.1 Blasting explosives of type A (UN No. 0081) shall, if they contain more than 40 % liquid nitric ester, in addition to the testing specified in the Manual of Tests and Criteria, satisfy the following exudation test.

2.3.1.2 The apparatus for testing blasting explosive for exudation (figs. 1 to 3) consists of a hollow bronze cylinder. This cylinder, which is closed at one end by a plate of the same metal, has an internal diameter of 15.7 mm and a depth of 40 mm. It is pierced by 20 holes 0.5 mm in diameter (four sets of five holes) on the circumference. A bronze piston, cylindrically fashioned over a length of 48 mm and having a total length of 52 mm, slides into the vertically placed cylinder. The piston, whose diameter is 15.6 mm, is loaded with a mass of 2 220 g so that a pressure of 120 kPa (1.20 bar) is exerted on the base of the cylinder.

2.3.1.3 A small plug of blasting explosive weighing 5 to 8 g, 30 mm long and 15 mm in diameter, is wrapped in very fine gauze and placed in the cylinder; the piston and its loading mass are then placed on it so that the blasting explosive is subjected to a pressure of 120 kPa (1.20 bar). The time taken for the appearance of the first signs of oily droplets (nitroglycerine) at the outer orifices of the cylinder holes is noted.

2.3.1.4 The blasting explosive is considered satisfactory if the time elapsing before the appearance of the liquid exudations is more than five minutes, the test having been carried out at a temperature of 15 °C to 25 °C.

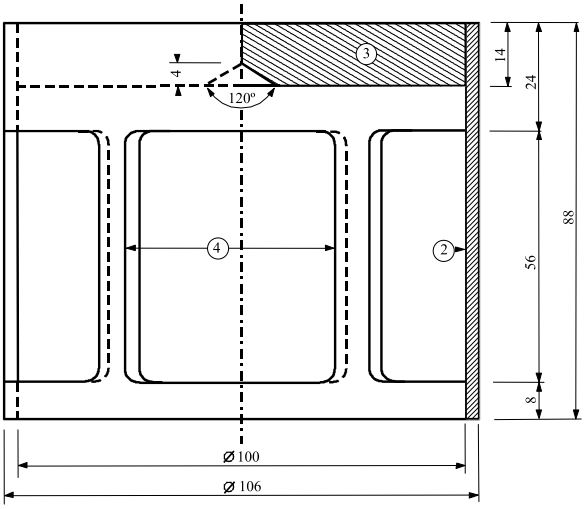


Fig.1: Bell-form charge, mass 2220 g, capable of being suspended from a bronze piston

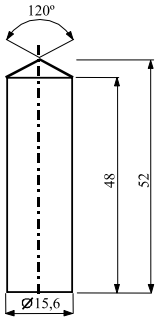


Fig.2: Cylindrical bronze piston, dimensions in mm

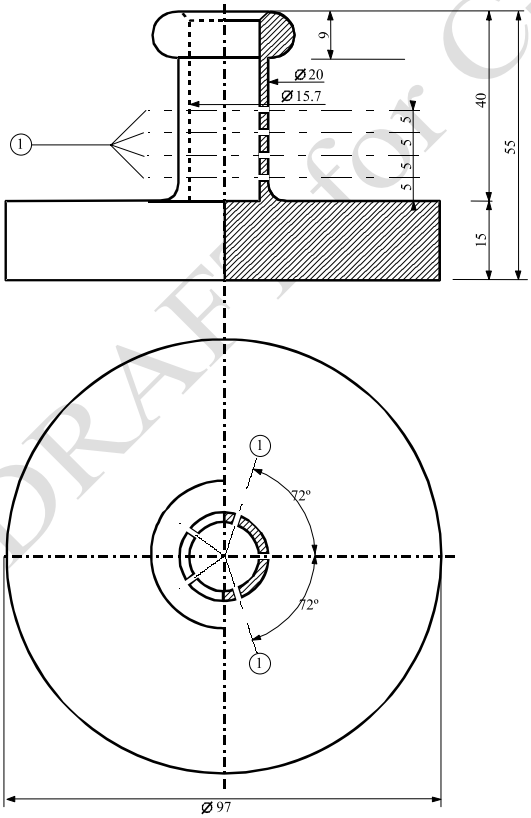


Fig.3: Hollow bronze cylinder, closed at one end; Plan and cut, dimensions in mm

Figs. 1 to 3

(1) 4 series of 5 holes at ⌀ 0.5
(2) copper
(3) lead plate with centre cone at the inferior face
(4) 4 openings, approximately 46×56, set at even intervals on the periphery

2.3.2 Tests relating to nitrated cellulose mixtures of Class 1 and Class 4.1

2.3.2.1 In order to determine the criteria of the nitrocellulose, the Bergmann-Junk test or the methyl violet paper test in the Manual of Tests and Criteria Appendix 10 shall be performed (see Chapter 3.3, special provisions 393 and 394). If there is doubt that the ignition temperature of the nitrocellulose is considerably higher than 132 °C in the case of the Bergmann-Junk test or higher than 134.5 °C in the case of the methyl violet paper test, the ignition temperature test described in 2.3.2.5 should be carried out before these tests are performed. If the ignition temperature of nitrocellulose mixtures is higher than 180 °C or the ignition temperature of plasticized nitrocellulose is higher than 170 °C, the Bergmann-Junk test or the methyl violet paper test can be carried out safely.

2.3.2.2 Before undergoing the tests in 2.3.2.5, the samples shall be dried for not less than 15 hours at the ambient temperature in a vacuum desiccator containing fused and granulated calcium chloride, the sample substance being spread in a thin layer; for this purpose, substances which are neither in powder form nor fibrous shall be ground, or grated, or cut into small pieces. The pressure in the desiccator shall be brought below 6.5 kPa (0.065 bar).

2.3.2.3 Before being dried as prescribed in 2.3.2.2 above, plasticized nitrocellulose shall undergo preliminary drying in a well-ventilated oven, with its temperature set at 70 °C, until the loss of mass per quarter-hour is less than 0.3 % of the original mass.

2.3.2.4 Weakly nitrated nitrocellulose shall first undergo preliminary drying as prescribed in 2.3.2.3 above; drying shall then be completed by keeping the nitrocellulose for at least 15 hours over concentrated sulphuric acid in a desiccator.

2.3.2.5 ***Ignition temperature (see 2.3.2.1)***

(a) The ignition temperature is determined by heating 0.2 g of substance enclosed in a glass test tube immersed in a Wood's alloy bath. The test tube is placed in the bath when the latter has reached 100 °C. The temperature of the bath is then progressively increased by 5 °C per minute;

(b) The test tubes must have the following dimensions:

length	125 mm
internal diameter	15 mm
thickness of wall	0.5 mm

and shall be immersed to a depth of 20 mm;

(c) The test shall be repeated three times, the temperature at which ignition of the substance occurs, i.e., slow or rapid combustion, deflagration or detonation, being noted each time;

(d) The lowest temperature recorded in the three tests is the ignition temperature.

2.3.3 Tests relating to flammable liquids of Classes 3, 6.1 and 8

2.3.3.1 ***Determination of flash-point***

2.3.3.1.1 The following methods for determining the flash-point of flammable liquids may be used:

<u>International standards:</u>

ISO 1516 (Determination of flash/no flash – Closed cup equilibrium method)

ISO 1523 (Determination of flash point – Closed cup equilibrium method)

ISO 2719 (Determination of flash point – Pensky-Martens closed cup method)

ISO 13736 (Determination of flash point – Abel closed-cup method)

ISO 3679 (Determination of flash point – Rapid equilibrium closed cup method)

ISO 3680 (Determination of flash/no flash – Rapid equilibrium closed cup method)

<u>National standards:</u>

American Society for Testing Materials International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, Pennsylvania, USA 19428-2959:

ASTM D3828-07a, Standard Test Methods for Flash Point by Small Scale Closed-Cup Tester

ASTM D56-05, Standard Test Method for Flash Point by Tag Closed-Cup Tester

ASTM D3278-96(2004)e1, Standard Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus

ASTM D93-08, Standard Test Methods for Flash Point by Pensky-Martens Closed-Cup Tester

Association française de normalisation, AFNOR, 11, rue de Pressensé, F-93571 La Plaine Saint-Denis Cedex:

French standard NF M 07 - 019

French standards NF M 07 - 011 / NF T 30 - 050 / NF T 66 - 009

French standard NF M 07 - 036

Deutsches Institut für Normung, Burggrafenstr. 6, D-10787 Berlin:

Standard DIN 51755 (flash-points below 65 °C)

State Committee of the Council of Ministers for Standardization, RUS-113813, GSP, Moscow, M-49 Leninsky Prospect, 9:

GOST 12.1.044-84

2.3.3.1.2 To determine the flash-point of paints, gums and similar viscous products containing solvents, only apparatus and test methods suitable for determining the flash-point for viscous liquids shall be used, in accordance with the following standards:

(a) International Standard ISO 3679: 1983;

(b) International Standard ISO 3680: 1983;

(c) International Standard ISO 1523: 1983;

(d) International standards EN ISO 13736 and EN ISO 2719, Method B.

2.3.3.1.3 The standards listed in 2.3.3.1.1 shall only be used for flash-point ranges which are specified therein. The possibility of chemical reactions between the substance and the sample holder shall be considered when selecting the standard to be used. The apparatus shall, as far as is consistent with safety, be placed in a draught-free position. For safety, a method utilizing a small sample size, around 2 ml, shall be used for organic peroxides and self-reactive substances (also known as "energetic" substances), or for toxic substances.

2.3.3.1.4 When the flash-point, determined by a non-equilibrium method is found to be 23 ± 2 °C or 60 ± 2 °C, it shall be confirmed for each temperature range by an equilibrium method.

2.3.3.1.5 In the event of a dispute as to the classification of a flammable liquid, the classification proposed by the consignor shall be accepted if a check-test of the flash-point, yields a result not differing by more than 2 °C from the limits (23 °C and 60 °C respectively) stated in 2.3.3.1. If the difference is more than 2 °C, a second check-test shall be carried out, and the lowest figure of the flash-points obtained in either check-test shall be adopted.

2.3.3.2 ***Determination of initial boiling point***

The following methods for determining the initial boiling point of flammable liquids may be used:

International standards:

ISO 3924 (Petroleum products – Determination of boiling range distribution – Gas chromatography method)

ISO 4626 (Volatile organic liquids – Determination of boiling range of organic solvents used as raw materials)

ISO 3405 (Petroleum products – Determination of distillation characteristics at atmospheric pressure)

National standards:

American Society for Testing Materials International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, Pennsylvania, USA 19428-2959:

ASTM D86-07a, Standard Test Method for Distillation of Petroleum Products at Atmospheric Pressure

ASTM D1078-05, Standard Test Method for Distillation Range of Volatile Organic Liquids

Further acceptable methods:

Method A.2 as described in Part A of the Annex to Commission Regulation (EC) No 440/2008[1].

[1] *Commission Regulation (EC) No 440/2008 of 30 May 2008 laying down test methods pursuant to Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) (Official Journal of the European Union, No. L 142 of 31.05.2008, p.1-739).*

2.3.3.3 ***Test for determining peroxide content***

To determine the peroxide content of a liquid, the procedure is as follows:

A quantity p (about 5 g, weighed to the nearest 0.01 g) of the liquid to be titrated is placed in an Erlenmeyer flask; 20 cm^3 of acetic anhydride and about 1 g of powdered solid potassium iodide are added; the flask is shaken and, after 10 minutes, heated for 3 minutes to about 60 °C. When it has been left to cool for 5 minutes, 25 cm^3 of water are added. After this, it is left standing for half an hour, then the liberated iodine is titrated with a decinormal solution of sodium thiosulphate, no indicator being added; complete discoloration indicates the end of the reaction. If n is the number of cm^3 of thiosulphate solution required, the percentage of peroxide (calculated as H_2O_2) present in the sample is obtained by the formula:

$$\frac{17n}{100p}$$

2.3.4 **Test for determining fluidity**

To determine the fluidity of liquid, viscous or pasty substances and mixtures, the following test method shall be used.

2.3.4.1 ***Test apparatus***

Commercial penetrometer conforming to ISO 2137:1985, with a guide rod of 47.5 g ± 0.05 g; sieve disc of duralumin with conical bores and a mass of 102.5 g ± 0.05 g (see Figure 1); penetration vessel with an inside diameter of 72 mm to 80 mm for reception of the sample.

2.3.4.2 ***Test procedure***

The sample is poured into the penetration vessel not less than half an hour before the measurement. The vessel is then hermetically closed and left standing until the measurement. The sample in the hermetically closed penetration vessel is heated to 35 °C ± 0.5 °C and is placed on the penetrometer table immediately prior to measurement (not more than two minutes). The point S of the sieve disc is then brought into contact with the surface of the liquid and the rate of penetration is measured.

2.3.4.3 ***Evaluation of test results***

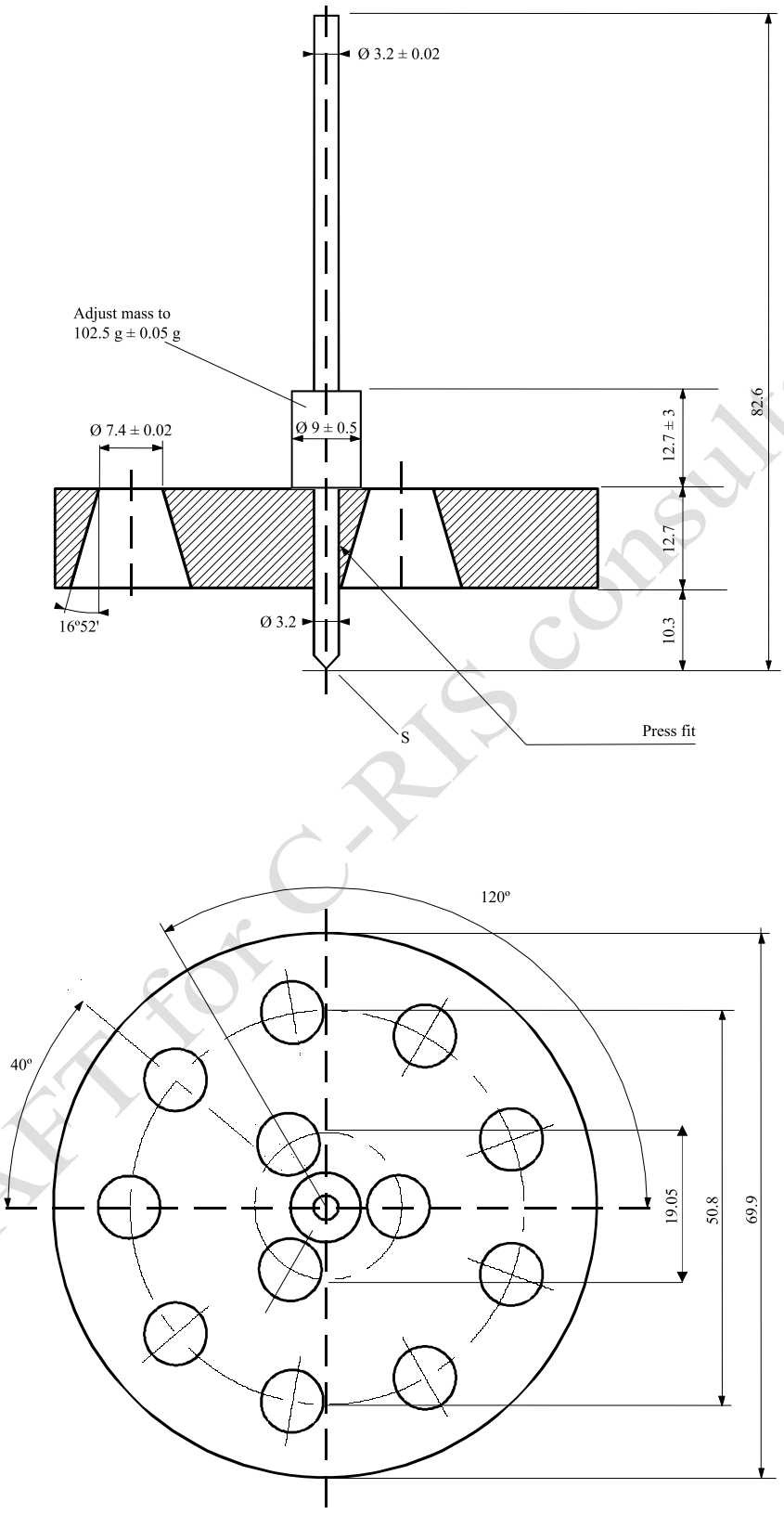
A substance is pasty if, after the centre S has been brought into contact with the surface of the sample, the penetration indicated by the dial gauge:

(a) after a loading time of 5 s ± 0.1 s, is less than 15.0 mm ± 0.3 mm; or

(b) after a loading time of 5 s ± 0.1 s, is greater than 15.0 mm ± 0.3 mm, but the additional penetration after another 55 s ± 0.5 s is less than 5.0 mm ± 0.5 mm.

NOTE: *In the case of samples having a flow point, it is often impossible to produce a steady level surface in the penetration vessel and, hence, to establish satisfactory initial measuring conditions for the contact of the point S. Furthermore, with some samples, the impact of the sieve disc can cause an elastic deformation of the surface and, in the first few seconds, simulate a deeper penetration. In all these cases, it may be appropriate to make the evaluation in paragraph (b) above.*

Figure 1 – Penetrometer



Tolerances not specified are ± 0.1 mm.

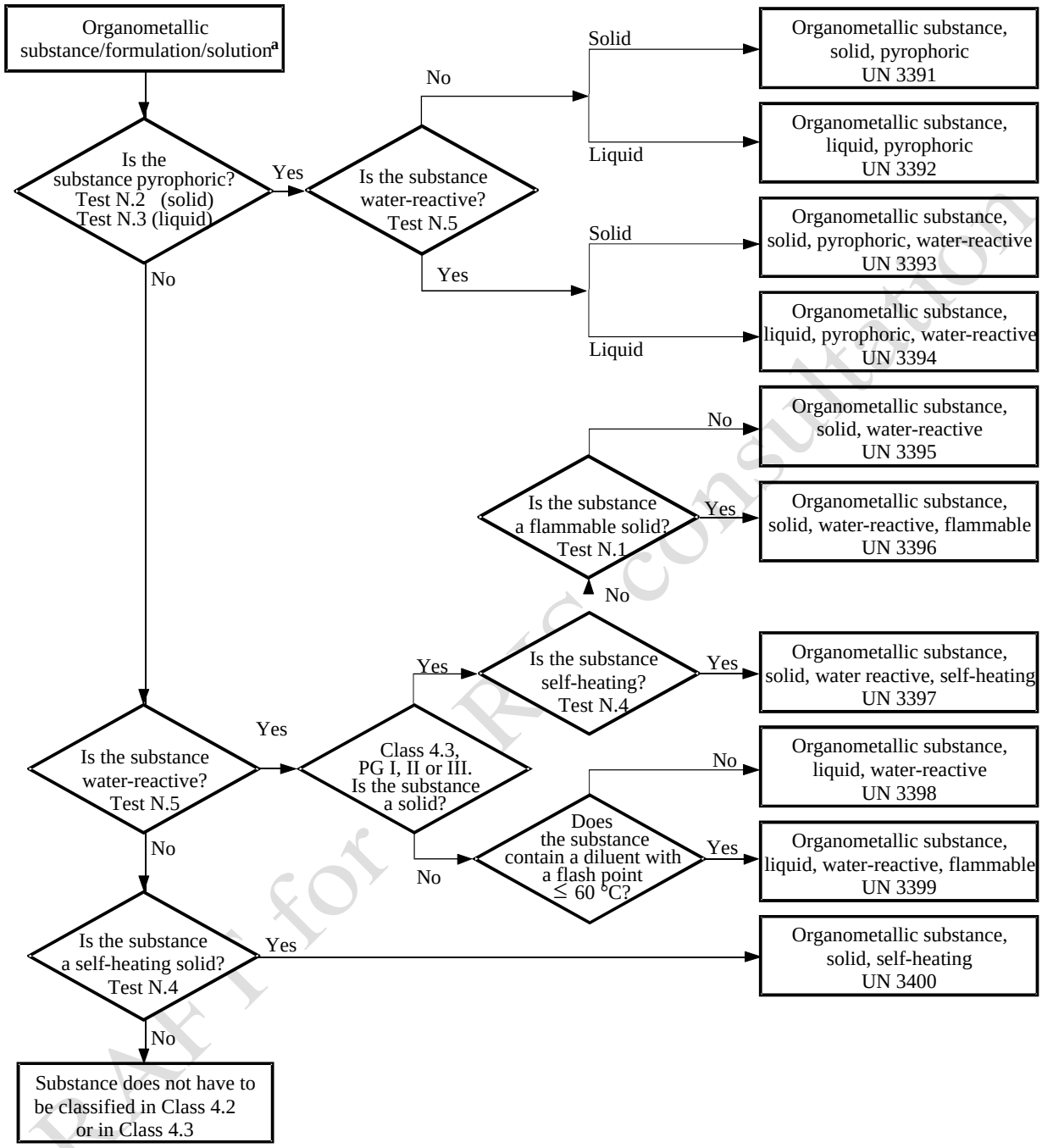
2.3.5 Classification of organometallic substances in Classes 4.2 and 4.3

Depending on their properties as determined in accordance with tests N.1 to N.5 of the Manual of Tests end Criteria, Part III, section 33, organometallic substances may be classified in Class 4.2 or 4.3, as appropriate, in accordance with the flowchart scheme given in Figure 2.3.5.

NOTE 1: *Depending on their other properties and on the precedence of hazard table (see 2.1.3.10), organometallic substances may have to be classified in other classes as appropriate.*

NOTE 2: *Flammable solutions with organometallic compounds in concentrations which are not liable to spontaneous combustion or, in contact with water, do not emit flammable gases in dangerous quantities, are substances of Class 3.*

Figure 2.3.5: Flowchart scheme for the classification of organometallic substances in Classes 4.2 and 4.3 [b]



[a] *If applicable and testing is relevant, taking into account reactivity properties, class 6.1 and 8 properties should be considered according to the precedence of hazard table of 2.1.3.10.*

[b] *Test methods N.1 to N.5 can be found in the Manual of Tests and Criteria, Part III, Section 33.*

PART 3

Dangerous goods list, special provisions and exemptions related to limited and excepted quantities

CHAPTER 3.1

GENERAL

3.1.1 Introduction

In addition to the provisions referred to or given in the tables of this Part, the general requirements of each Part, Chapter and/or Section are to be observed. These general requirements are not given in the tables. When a general requirement is contradictory to a special provision, the special provision prevails.

3.1.2 Proper shipping name

NOTE: *For proper shipping names used for the carriage of samples, see 2.1.4.1.*

3.1.2.1 The proper shipping name is that portion of the entry most accurately describing the goods in Table A in Chapter 3.2, which is shown in upper case characters (plus any numbers, Greek letters, "sec", "tert", and the letters "m", "n", "o", "p", which form an integral part of the name). An alternative proper shipping name may be shown in brackets following the main proper shipping name [e.g., ETHANOL (ETHYL ALCOHOL)]. Portions of an entry appearing in lower case need not be considered as part of the proper shipping name.

3.1.2.2 When a combination of several distinct proper shipping names are listed under a single UN number, and these are separated by "and" or "or" in lower case or are punctuated by commas, only the most appropriate shall be shown in the transport document and package marks. Examples illustrating the selection of the proper shipping name for such entries are:

(a) UN 1057 LIGHTERS or LIGHTER REFILLS - The proper shipping name is the most appropriate of the following combinations:

LIGHTERS
LIGHTER REFILLS;

(b) UN 2793 FERROUS METAL BORINGS, SHAVINGS, TURNINGS or CUTTINGS in a form liable to self-heating. The proper shipping name is the most appropriate of the following combinations:

FERROUS METAL BORINGS
FERROUS METAL SHAVINGS
FERROUS METAL TURNINGS
FERROUS METAL CUTTINGS.

3.1.2.3 Proper shipping names may be used in the singular or plural as appropriate. In addition, when qualifying words are used as part of the proper shipping name, their sequence on documentation or package marks is optional. For instance, "DIMETHYLAMINE AQUEOUS SOLUTION" may alternatively be shown "AQUEOUS SOLUTION OF DIMETHYLAMINE". Commercial or military names for goods of Class 1 which contain the proper shipping name supplemented by additional descriptive text may be used.

3.1.2.4 Many substances have an entry for both the liquid and solid state (see definitions for liquid and solid in 1.2.1), or for the solid and solution. These are allocated separate UN numbers which are not necessarily adjacent to each other. Details are provided in the alphabetical index (Table B of Chapter 3.2), e.g.:

NITROXYLENES, LIQUID	6.1	1665;
NITROXYLENES, SOLID	6.1	3447.

3.1.2.5 Unless it is already included in capital letters in the name indicated in Table A in Chapter 3.2, the qualifying word "MOLTEN" shall be added as part of the proper shipping name when a substance, which is a solid in accordance with the definition in 1.2.1, is offered for carriage in the molten state (e.g. ALKYLPHENOL, SOLID, N.O.S., MOLTEN).

3.1.2.6 Except for self-reactive substances and organic peroxides and unless it is already included in capital letters in the name indicated in Column (2) of Table A of Chapter 3.2, the word "STABILIZED" shall

be added as part of the proper shipping name of a substance which without stabilization would be forbidden from carriage in accordance with paragraphs 2.2.X.2 due to it being liable to dangerously react under conditions normally encountered in carriage (e.g.: "TOXIC LIQUID, ORGANIC, N.O.S., STABILIZED").

When temperature control is used to stabilize such substances to prevent the development of any dangerous excess pressure, or the evolution of excessive heat, or when chemical stabilization is used in combination with temperature control, then:

(a) For liquids and solids where the SAPT[2] (measured without or with inhibitor, when chemical stabilization is applied) is less than or equal to that prescribed in 2.2.41.1.21, the provisions of 2.2.41.1.17, special provision 386 of Chapter 3.3, 7.1.7, special provision V8 of Chapter 7.2, special provision S4 of Chapter 8.5 and the requirements of Chapter 9.6 apply except that the term "SADT" as used in these paragraphs is understood to include also "SAPT" when the substance concerned reacts by polymerization;

(b) Unless it is already included in capital letters in the name indicated in Column (2) of Table A in Chapter 3.2, the words "TEMPERATURE CONTROLLED" shall be added as part of the proper shipping name;

(c) For gases: the conditions of carriage shall be approved by the competent authority.

3.1.2.7 Hydrates may be carried under the proper shipping name for the anhydrous substance.

3.1.2.8 ***Generic or "not otherwise specified" (N.O.S.) names***

3.1.2.8.1 Generic and "not otherwise specified" proper shipping names that are assigned to special provision 274 or 318 in Column (6) of Table A in Chapter 3.2 shall be supplemented with the technical name of the goods unless a national law or international convention prohibits its disclosure if it is a controlled substance. For explosives of Class 1, the dangerous goods description may be supplemented by additional descriptive text to indicate commercial or military names. Technical names shall be entered in brackets immediately following the proper shipping name. An appropriate modifier, such as "contains" or "containing" or other qualifying words such as "mixture", "solution", etc. and the percentage of the technical constituent may also be used. For example: "UN 1993 FLAMMABLE LIQUID, N.O.S. (CONTAINS XYLENE AND BENZENE), 3, II".

3.1.2.8.1.1 The technical name shall be a recognized chemical name or biological name, or other name currently used in scientific and technical handbooks, journals and texts. Trade names shall not be used for this purpose. In the case of pesticides, only ISO common name(s), other name(s) in the World Health Organization (WHO) Recommended Classification of Pesticides by Hazard and Guidelines to Classification, or the name(s) of the active substance(s) may be used.

3.1.2.8.1.2 When a mixture of dangerous goods or articles containing dangerous goods are described by one of the "N.O.S." or "generic" entries to which special provision 274 has been allocated in Column (6) of Table A in Chapter 3.2, not more than the two constituents which most predominantly contribute to the hazard or hazards of the mixture or of the articles need to be shown, excluding controlled substances when their disclosure is prohibited by national law or international convention. If a package containing a mixture is labelled with any subsidiary hazard label, one of the two technical names shown in parentheses shall be the name of the constituent which compels the use of the subsidiary hazard label.

NOTE: *See 5.4.1.2.2.*

3.1.2.8.1.3 Examples illustrating the selection of the proper shipping name supplemented with the technical name of goods for such N.O.S. entries are:

UN 2902 PESTICIDE, LIQUID, TOXIC, N.O.S. (drazoxolon);
UN 3394 ORGANOMETALLIC SUBSTANCE, LIQUID, PYROPHORIC, WATER-REACTIVE (trimethylgallium).
UN 3540 ARTICLES CONTAINING FLAMMABLE LIQUID, N.O.S. (pyrrolidine)

3.1.2.8.1.4 For UN Nos. 3077 and 3082 only, the technical name may be a name shown in capital letters in column 2 of Table A of Chapter 3.2, provided that this name does not include “N.O.S.” and that special provision

[2] *For the definition of self-accelerating polymerization temperature (SAPT), see 1.2.1.*

274 is not assigned. The name which most appropriately describes the substance or mixture shall be used, e.g.:

UN 3082 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (PAINT)
UN 3082 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (PERFUMERY PRODUCTS)

3.1.3 Solutions or mixtures

NOTE: *Where a substance is specifically mentioned by name in Table A of Chapter 3.2, it shall be identified in carriage by the proper shipping name in Column (2) of Table A of Chapter 3.2. Such substances may contain technical impurities (for example those deriving from the production process) or additives for stability or other purposes that do not affect its classification. However, a substance mentioned by name 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).*

3.1.3.1 A solution or mixture is not subject to this Code if the characteristics, properties, form or physical state of the solution or mixture are such that it does not meet the criteria, including human experience criteria, for inclusion in any class.

3.1.3.2 A solution or mixture meeting the classification criteria of this Code composed of a single predominant substance mentioned by name in Table A of Chapter 3.2 and one or more substances not subject to this Code 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.

Qualifying words such as "SOLUTION" or "MIXTURE", as appropriate, shall be added as part of the proper shipping name, for example, "ACETONE SOLUTION". In addition, the concentration of the mixture or solution may also be indicated after the basic description of the mixture or solution, for example, "ACETONE 75 % SOLUTION".

3.1.3.3 A solution or mixture meeting the classification criteria of this Code that is not mentioned by name in Table A of Chapter 3.2 and that is composed of two or more dangerous goods shall be assigned to an entry that has the proper shipping name, description, class, classification code and packing group that most precisely describe the solution or mixture.

CHAPTER 3.2

DANGEROUS GOODS LIST

3.2.1 Table A: Dangerous Goods List

Explanations

As a rule, each row of Table A of this Chapter deals with the substance(s) or article(s) covered by a specific UN number. However, when substances or articles belonging to the same UN number have different chemical properties, physical properties and/or carriage conditions, several consecutive rows may be used for that UN number.

Each column of Table A is dedicated to a specific subject as indicated in the explanatory notes below. The intersection of columns and rows (cell) contains information concerning the subject treated in that column, for the substance(s) or article(s) of that row:

- The first four cells identify the substance(s) or article(s) belonging to that row (additional information in that respect may be given by the special provisions referred to in Column (6);

- The following cells give the applicable special provisions, either in the form of complete information or in coded form. The codes cross-refer to detailed information that is to be found in the Part, Chapter, Section and/or Sub-section indicated in the explanatory notes below. An empty cell means either that there is no special provision and that only the general requirements apply, or that the carriage restriction indicated in the explanatory notes is in force. When used in this table, an alphanumeric code starting with the letters "SP" designates a special provision of Chapter 3.3.

The applicable general requirements are not referred to in the corresponding cells. The explanatory notes below indicate for every column the Part(s), Chapter(s), Section(s) and/or Sub-section(s) where these are to be found.

Explanatory notes for each column:

Column (1) "UN No."

Contains the UN number:

- of the dangerous substance or article if the substance or article has been assigned its own specific UN number; or

- of the generic or n.o.s. entry to which the dangerous substances or articles not mentioned by name shall be assigned in accordance with the criteria ("decision trees") of Part 2.

Column (2) "Name and description"

Contains, in upper case characters, the name of the substance or article, if the substance or article has been assigned its own specific UN number, or of the generic or n.o.s. entry to which it has been assigned in accordance with the criteria ("decision trees") of Part 2. This name shall be used as the proper shipping name or, when applicable, as part of the proper shipping name (see 3.1.2 for further details on the proper shipping name).

A descriptive text in lower case characters is added after the proper shipping name to clarify the scope of the entry if the classification and/or carriage conditions of the substance or article may be different under certain conditions.

Column (3a) "Class"

Contains the number of the class, whose heading covers the dangerous substance or article. This class number is assigned in accordance with the procedures and criteria of Part 2.

Column (3b) "Classification code"

Contains the classification code of the dangerous substance or article.

- For dangerous substances or articles of Class 1, the code consists of a division number and compatibility group letter, which are assigned in accordance with the procedures and criteria of 2.2.1.1.4;

- For dangerous substances or articles of Class 2, the code consists of a number and hazardous property group, which are explained in 2.2.2.1.2 and 2.2.2.1.3;

- For dangerous substances or articles of Classes 3, 4.1, 4.2, 4.3, 5.1, 5.2, 6.1, 6.2 and 9, the codes are explained in 2.2.x.1.2[1];

- For dangerous substances or articles of Class 8, the codes are explained in 2.2.8.1.4.1;

- Dangerous substances or articles of Class 7 do not have a classification code.

Column (4) "Packing group"

Contains the packing group number(s) (I, II or III) assigned to the dangerous substance. These packing group numbers are assigned on the basis of the procedures and criteria of Part 2. Certain articles and substances are not assigned to packing groups.

Column (5) "Labels"

Contains the model number of the labels/placards (see 5.2.2.2 and 5.3.1.7) that have to be affixed to packages, containers, tank-containers, portable tanks, MEGCs and vehicles. However, for substances or articles of Class 7, 7X means label model No.7A, 7B or 7C as appropriate according to the category (see 5.1.5.3.4 and 5.2.2.1.11.1) or placard No. 7D (see 5.3.1.1.3 and 5.3.1.7.2).

The general provisions on labelling/placarding (e.g. number of labels, their location) are to be found in 5.2.2.1 for packages, and in 5.3.1, for containers, tank-containers, MEGCs, portable tanks and vehicles.

NOTE: *Special provisions, indicated in Column (6), may change the above labelling provisions.*

Column (6) "Special provisions"

Contains the numeric codes of special provisions that have to be met. These provisions concern a wide array of subjects, mainly connected with the contents of Columns (1) to (5) (e.g. carriage prohibitions, exemptions from requirements, explanations concerning the classification of certain forms of the dangerous goods concerned and additional labelling or marking provisions), and are listed in Chapter 3.3 in numerical order. If Column (6) is empty, no special provisions apply to the contents of Columns (1) to (5) for the dangerous goods concerned.

Column (7a) "Limited Quantities"

Provides the maximum quantity per inner packaging or article for carrying dangerous goods as limited quantities in accordance with Chapter 3.4.

Column (7b) "Excepted Quantities"

Contains an alphanumeric code with the following meaning:

- "E0" signifies that no exemption from the provisions of this Code exists for the dangerous goods packed in excepted quantities;

[1] *x = the class number of the dangerous substance or article, without dividing point if applicable.*

- All the other alphanumerical codes starting with the letter "E" signify that the provisions of this Code are not applicable if the conditions indicated in Chapter 3.5 are fulfilled.

Column (8) "Packing instructions"

Contains the alphanumeric codes of the applicable packing instructions:

- Alphanumeric codes starting with the letter "P", which refers to packing instructions for packagings and receptacles (except IBCs and large packagings), or "R", which refers to packing instructions for light gauge metal packagings. These are listed in 4.1.4.1 in numerical order, and specify the packagings and receptacles that are authorized. They also indicate which of the general packing provisions of 4.1.1, 4.1.2 and 4.1.3, and which of the special packing provisions of 4.1.5, 4.1.6, 4.1.7, 4.1.8 and 4.1.9 have to be met. If Column (8) does not contain a code starting with the letters "P" or "R", the dangerous goods concerned may not be carried in packagings;

- Alphanumeric codes starting with the letters "IBC" refer to packing instructions for IBCs. These are listed in 4.1.4.2 in numerical order, and specify the IBCs that are authorized. They also indicate which of the general packing provisions of 4.1.1, 4.1.2 and 4.1.3, and which of the special packing provisions of 4.1.5, 4.1.6, 4.1.7, 4.1.8 and 4.1.9 have to be met. If Column (8) does not contain a code starting with the letters "IBC", the dangerous goods concerned may not be carried in IBCs;

- Alphanumeric codes starting with the letters "LP" refer to packing instructions for large packagings. These are listed in 4.1.4.3 in numerical order, and specify the large packagings that are authorized. They also indicate which of the general packing provisions of 4.1.1, 4.1.2 and 4.1.3, and which of the special packing provisions of 4.1.5, 4.1.6, 4.1.7, 4.1.8 and 4.1.9 have to be met. If Column (8) does not contain a code starting with the letters "LP", the dangerous goods concerned cannot be carried in large packagings;

NOTE: *Special packing provisions, indicated in Column (9a), may change the above packing instructions.*

Column (9) "Special packing provisions"

Contains the alphanumeric codes of the applicable special packing provisions:

- Alphanumeric codes starting with the letters "PP" or "RR" refer to special packing provisions for packagings and receptacles (except IBCs and large packagings) that have additionally to be met. These are to be found in 4.1.4.1, at the end of the relevant packing instruction (with the letter "P" or "R") referred to in Column (8). If Column (9a) does not contain a code starting with the letters "PP" or "RR", none of the special packing provisions listed at the end of the relevant packing instruction apply;

- Alphanumeric codes starting with the letter "B" or the letters "BB" refer to special packing provisions for IBCs that have additionally to be met. These are to be found in 4.1.4.2, at the end of the relevant packing instruction (with the letters "IBC") referred to in Column (8). If Column (9a) does not contain a code starting with the letter "B" or the letters "BB", none of the special packing provisions listed at the end of the relevant packing instruction apply;

- Alphanumeric codes starting with the letter "L" or the letters "LL" refer to special packing provisions for large packagings that have additionally to be met. These are to be found in 4.1.4.3, at the end of the relevant packing instruction (with the letters "LP") referred to in Column (8). If Column (9a) does not contain a code starting with the letter "L" or the letters "LL", none of the special packing provisions listed at the end of the relevant packing instruction apply.

Column (10) "Portable tank and bulk container instructions"

Contains an alphanumeric code assigned to a portable tank instruction, in accordance with 4.2.5.2.1 to 4.2.5.2.4 and 4.2.5.2.6. This portable tank instruction corresponds to the least stringent provisions that are acceptable for the carriage of the substance in portable tanks conforming to UN requirements. The codes identifying the other portable tank instructions that are also permitted for the carriage of the substance are to be found in 4.2.5.2.5. If no code is given, carriage in portable tanks is not permitted unless a competent authority approval is granted as detailed in 6.7.1.3.

The general requirements for the design, construction, equipment, type approval, testing and marking of portable tanks are to be found in Chapter 6.7. The general requirements for the use (e.g. filling) are to be found in 4.2.1 to 4.2.4.

For fibre-reinforced plastic portable tanks, see Chapter 6.9.

The indication of a "(M)" means that the substance may be carried in UN MEGCs.

NOTE: *Special provisions, indicated in Column (11), may change the above requirements.*

May also contain alphanumeric codes starting with the letters "BK" referring to types of bulk containers described in Chapter 6.11 which may be used for the carriage of bulk goods in accordance with 7.3.1.1 (a) and 7.3.2.

Column (11) "Portable tank and bulk container special provisions"

Contains the alphanumeric codes of the portable tank special provisions that have additionally to be met. These codes, starting with the letters "TP" refer to special provisions for the construction or use of these portable tanks. They are to be found in 4.2.5.3.

NOTE: *If technically relevant, these special provisions are not only applicable to the portable tanks specified in column (10), but also to the portable tanks that may be used according to the table in 4.2.5.2.5.*

Column (12) "Tank codes for Non-UN tanks"

Contains an alphanumeric code describing a tank type for non-UN tanks, in accordance with 4.3.3.1.1 (for gases of Class 2) or 4.3.4.1.1 (for substances of Classes 3 to 9). This tank type corresponds to the least stringent tank provisions that are acceptable for the carriage of the relevant substance in a tank designed according to ADR, in accordance with 6.8.2 to 6.8.5.

For tanks designed according to Australian standards, in accordance with 6.8.6 or 6.8.7, the presence of a code indicates that the goods may be transported in a non-UN tank, provided that the tank is properly designed and approved to carry the substance.

If no code is given, carriage in non-UN tanks is not permitted.

If in this column a tank code for solids (S) and for liquids (L) is indicated, this means that this substance may be offered for carriage in tanks in the solid or the liquid (molten) state. In general this provision is applicable to substances having melting points from 20 °C to 180 °C.

If for a solid, only a tank code for liquids (L) is indicated in this column, this means that this substance is only offered for carriage in tanks in the liquid (molten) state.

The general requirements for the construction, equipment, type approval, testing and marking that are not indicated in the tank code are to be found in 6.8.1, 6.8.2, 6.8.3 and 6.8.5. The general requirements for the use (e.g. maximum degree of filling, minimum test pressure) are to be found in 4.3.1 to 4.3.4.

NOTE: *6.8.2 to 6.8.5 only apply to tanks designed according to ADR, in accordance with 6.8.2 to 6.8.5.*

The indication of a "(M)" after the tank code means that the substance can also be carried in battery-vehicles or MEGCs.

The indication of a (+) after the tank code means that the alternative use of the tanks is permitted only where this is specified in the certificate of type approval.

NOTE: *the (+) indication is only applicable to tanks designed according to ADR, in accordance with 6.8.2 to 6.8.5.*

For fibre-reinforced plastic tanks, see 4.4.1 and Chapter 6.13; for vacuum operated waste tanks, see 4.5.1 and Chapter 6.10.

NOTE: *Special provisions, indicated in Column (13), may change the above requirements.*

Column (13) "Special provisions for non-UN tanks "

Contains the alphanumeric codes of the special provisions for non-UN tanks that have additionally to be met:

- Alphanumeric codes starting with the letters "TU" refer to special provisions for the use of these tanks. These are to be found in 4.3.5;

NOTE 1: *ADR contains additional codes for the construction (TC), equipment (TE), approval (TA), testing (TT) and marking (TM) of tanks. Tanks designed according to ADR need to comply with these requirements, and information on complying with these provisions is to be provided to owners and purchasers of such tanks.*

NOTE 2: *If technically relevant, these special provisions are not only applicable to the tanks specified in column (12), but also to the tanks that may be used according to the hierarchies found in in 4.3.3 and 4.3.4 of ADR.*

Column (14) "Vehicle for tank carriage"

Contains a code designating the vehicle (including the drawing vehicle of trailers or semi-trailers) (see 9.1.1) to be used for the carriage of the substance in tank in accordance with 7.4.2. The requirements concerning the construction and approval of vehicles are to be found in Chapters 9.1 and 9.2.

Column (15) "Transport category"

Contains a figure indicating the transport category to which the substance or article is assigned for the purposes of exemption related to quantities carried per transport unit (see 1.1.3.6). When no transport category has been assigned, this is indicated by the mention "-".

Column (16) "Special provisions for carriage - Packages"

Contains the alphanumeric code(s), starting with letter "V", of the applicable special provisions (if any) for carriage in packages. These are listed in 7.2.4. General provisions concerning the carriage in packages are to be found in Chapters 7.1 and 7.2.

NOTE: *In addition, special provisions indicated in Column (18), concerning loading, unloading and handling, shall be observed*.

Column (17) "Special provisions for carriage - Bulk"

Contains the alphanumeric code(s), starting with letters "VC", as well as the alphanumeric code(s) starting with letters "AP", of the applicable provisions for carriage in bulk. These are listed in 7.3.3. If no special provision, identified by the

code "VC" or a reference to a specific paragraph, explicitly authorizing this mode of carriage is indicated in this column, and no special provision, identified by the code "BK" or a reference to a specific paragraph, explicitly authorizing this mode of carriage is indicated in column (10), carriage in bulk is not permitted. General and additional provisions concerning carriage in bulk are to be found in Chapters 7.1 and 7.3.

NOTE: *In addition, special provisions indicated in Column (18), concerning loading, unloading and handling, shall be observed.*

Column (18) "Special provisions for carriage – Loading, unloading and handling"

Contains the alphanumeric code(s), starting with letters "CV", of the applicable special provisions for loading, unloading and handling. These are listed in 7.5.11. If no code is given, only the general provisions apply (see 7.5.1 to 7.5.10).

Column (19) "Special provisions for carriage - Operation"

Contains the alphanumeric code(s), starting with letter "S", of the applicable special provisions for operation which are listed in Chapter 8.5. These provisions shall be applied in addition to the requirements of Chapters 8.1 to 8.4 but in the event of conflict with the requirements of Chapters 8.1 to 8.4, the special provisions shall take precedence.

TABLE A

DANGEROUS GOODS LIST

[INSERT DANGEROUS GOODS LIST]

3.2.2 Table B: Alphabetic index of substances and articles of this Code

This index is an alphabetical list of the substances and articles which are listed in the UN numerical order in Table A of 3.2.1. It does not form an integral part of this Code. It has been prepared, with all necessary care by the Secretariat of the United Nations Economic Commission for Europe, in order to facilitate the consultation of this Code, but it cannot be relied upon as a substitute for the careful study and observance of the actual provisions of this Code which, in case of conflict, are deemed to be authoritative.

NOTE 1: *For the purpose of determining the alphabetical order the following information has been ignored, even when it forms part of the proper shipping name: numbers; Greek letters; the abbreviations "sec" and "tert"; the prefixes "cis" and "trans"; and the letters "N" (nitrogen), "n" (normal), "o" (ortho), "m" (meta), "p" (para) and "N.O.S." (not otherwise specified).*

NOTE 2: *The name of a substance or article in block capital letters indicates a proper shipping name (see 3.1.2).*

NOTE 3: *The name of a substance or article in block capital letters followed by the word "see" indicates an alternative proper shipping name or part of a proper shipping name (except for PCBs) (see 3.1.2.1).*

NOTE 4: *An entry in lower case letters followed by the word "see" indicates that the entry is not a proper shipping name; it is a synonym.*

NOTE 5: *Where an entry is partly in block capital letters and partly in lower case letters, the latter part is considered not to be part of the proper shipping name (see 3.1.2.1).*

NOTE 6: *A proper shipping name may be used in the singular or plural, as appropriate, for the purposes of documentation and package marking (see 3.1.2.3).*

NOTE 7: *For the exact determination of a proper shipping name, see 3.1.2.*

Name and description	UN	Class	Remarks
Accumulators, electric, see	2794	8	
	2795	8	
	2800	8	
	3028	8	
	3292	4.3	
ACETAL	1088	3	
ACETALDEHYDE	1089	3	
ACETALDEHYDE AMMONIA	1841	9	
ACETALDEHYDE OXIME	2332	3	
ACETIC ACID, GLACIAL	2789	8	
ACETIC ACID SOLUTION, more than 10 % but not more than 80 % acid, by mass	2790	8	
ACETIC ACID SOLUTION, more than 80 % acid, by mass	2789	8	
ACETIC ANHYDRIDE	1715	8	
Acetoin, see	2621	3	
ACETONE	1090	3	
ACETONE CYANOHYDRIN, STABILIZED	1541	6.1	
ACETONE OILS	1091	3	
ACETONITRILE	1648	3	
ACETYL BROMIDE	1716	8	
ACETYL CHLORIDE	1717	3	
ACETYLENE, DISSOLVED	1001	2	
ACETYLENE, SOLVENT FREE	3374	2	
Acetylene tetrabromide, see	2504	6.1	
Acetylene tetrachloride, see	1702	6.1	
ACETYL IODIDE	1898	8	
ACETYL METHYL CARBINOL	2621	3	
Acid butyl phosphate, see	1718	8	
Acid mixture, hydrofluoric and sulphuric, see	1786	8	
Acid mixture, nitrating acid, see	1796	8	
Acid mixture, spent, nitrating acid, see	1826	8	
Acraldehyde, inhibited, see	1092	6.1	
ACRIDINE	2713	6.1	
ACROLEIN DIMER, STABILIZED	2607	3	
ACROLEIN, STABILIZED	1092	6.1	
ACRYLAMIDE, SOLID	2074	6.1	
ACRYLAMIDE, SOLUTION	3426	6.1	
ACRYLIC ACID, STABILIZED	2218	8	
ACRYLONITRILE, STABILIZED	1093	3	
Actinolite, see	2212	9	
Activated carbon, see	1362	4.2	

Name and description	UN No.	Class	Remarks
Activated charcoal, see	1362	4.2	
ADHESIVES containing flammable liquid	1133	3	
ADIPONITRILE	2205	6.1	
ADSORBED GAS, FLAMMABLE, N.O.S.	3510	2	
ADSORBED GAS, N.O.S.	3511	2	
ADSORBED GAS, OXIDIZING, N.O.S.	3513	2	
ADSORBED GAS, TOXIC, CORROSIVE, N.O.S.	3516	2	
ADSORBED GAS, TOXIC, FLAMMABLE, CORROSIVE, N.O.S.	3517	2	
ADSORBED GAS, TOXIC, FLAMMABLE, N.O.S.	3514	2	
ADSORBED GAS, TOXIC, N.O.S.	3512	2	
ADSORBED GAS, TOXIC, OXIDIZING, CORROSIVE, N.O.S.	3518	2	
ADSORBED GAS, TOXIC, OXIDIZING, N.O.S.	3515	2	
Aeroplane flares, see	0093	1	
	0403	1	
	0404	1	
	0420	1	
	0421	1	
AEROSOLS	1950	2	
AGENT, BLASTING, TYPE B	0331	1	
AGENT, BLASTING, TYPE E	0332	1	
Air bag inflators, see	0503	1	
	3268	9	
Air bag modules, see	0503	1	
	3268	9	
AIR, COMPRESSED	1002	2	
Aircraft evacuation slides, see	2990	9	
AIRCRAFT HYDRAULIC POWER UNIT FUEL TANK (containing a mixture of anhydrous hydrazine and methylhydrazine) (M86 fuel)	3165	3	
Aircraft survival kits, see	2990	9	
AIR, REFRIGERATED LIQUID	1003	2	
ALCOHOLATES SOLUTION, N.O.S., in alcohol	3274	3	
Alcohol, denaturated, see	1986	3	
	1987	3	
Alcohol, industrial, see	1986	3	
	1987	3	
ALCOHOLS, N.O.S.	1987	3	
ALCOHOLS, FLAMMABLE, TOXIC, N.O.S.	1986	3	

Name and description	UN	Class	Remarks
ALCOHOLIC BEVERAGES, with more than 24 % but not more than 70 % alcohol by volume	3065	3	
ALCOHOLIC BEVERAGES, with more than 70 % alcohol by volume	3065	3	
Aldehyde, see	1989	3	
ALDEHYDES, N.O.S.	1989	3	
ALDEHYDES, FLAMMABLE, TOXIC, N.O.S.	1988	3	
ALDOL	2839	6.1	
ALKALI METAL ALCOHOLATES, SELF-HEATING, CORROSIVE, N.O.S.	3206	4.2	
ALKALI METAL ALLOY, LIQUID, N.O.S.	1421	4.3	
ALKALI METAL AMALGAM, LIQUID	1389	4.3	
ALKALI METAL AMALGAM, SOLID	3401	4.3	
ALKALI METAL AMIDES	1390	4.3	
ALKALI METAL DISPERSION	1391	4.3	
ALKALI METAL DISPERSION, FLAMMABLE	3482	4.3	
Alkaline corrosive battery fluid, see	2797	8	
ALKALINE EARTH METAL ALCOHOLATES, N.O.S.	3205	4.2	
ALKALINE EARTH METAL ALLOY, N.O.S.	1393	4.3	
ALKALINE EARTH METAL AMALGAM, LIQUID	1392	4.3	
ALKALINE EARTH METAL AMALGAM, SOLID	3402	4.3	
ALKALINE EARTH METAL DISPERSION	1391	4.3	
ALKALINE EARTH METAL DISPERSION, FLAMMABLE	1391	4.3	
ALKALOIDS, LIQUID, N.O.S.	3140	6.1	
ALKALOIDS, SOLID, N.O.S.	1544	6.1	
ALKALOID SALTS, LIQUID, N.O.S.	3140	6.1	
ALKALOID SALTS, SOLID, N.O.S.	1544	6.1	
Alkyl aluminium halides, see	3394	4.2	
ALKYLPHENOLS, LIQUID, N.O.S. (including C_2-C_{12} homologues)	3145	8	
ALKYLPHENOLS, SOLID, N.O.S. (including C_2-C_{12} homologues)	2430	8	
ALKYLSULPHONIC ACIDS, LIQUID with more than 5 % free sulphuric acid	2584	8	
ALKYLSULPHONIC ACIDS, LIQUID with not more than 5 % free sulphuric acid	2586	8	
ALKYLSULPHONIC ACIDS, SOLID with more than 5 % free sulphuric acid	2583	8	
ALKYLSULPHONIC ACIDS, SOLID with not more than 5 % free sulphuric acid	2585	8	
ALKYLSULPHURIC ACIDS	2571	8	
Allene, see	2200	2	
ALLYL ACETATE	2333	3	
ALLYL ALCOHOL	1098	6.1	
ALLYLAMINE	2334	6.1	
ALLYL BROMIDE	1099	3	
ALLYL CHLORIDE	1100	3	
Allyl chlorocarbonate, see	1722	6.1	
ALLYL CHLOROFORMATE	1722	6.1	
ALLYL ETHYL ETHER	2335	3	
ALLYL FORMATE	2336	3	
ALLYL GLYCIDYL ETHER	2219	3	
ALLYL IODIDE	1723	3	
ALLYL ISOTHIOCYANATE, STABILIZED	1545	6.1	
ALLYLTRICHLOROSILANE, STABILIZED	1724	8	
Aluminium alkyls, see	3394	4.2	
Aluminium alkyl halides, liquid, see	3394	4.2	
Aluminium alkyl halides, solid, see	3393	4.2	
Aluminium alkyl hydrides, see	3394	4.2	
ALUMINIUM BOROHYDRIDE	2870	4.2	
ALUMINIUM BOROHYDRIDE IN DEVICES	2870	4.2	
ALUMINIUM BROMIDE, ANHYDROUS	1725	8	
ALUMINIUM BROMIDE SOLUTION	2580	8	
ALUMINIUM CARBIDE	1394	4.3	
ALUMINIUM CHLORIDE, ANHYDROUS	1726	8	
ALUMINIUM CHLORIDE SOLUTION	2581	8	
Aluminium dross, see	3170	4.3	
ALUMINIUM FERROSILICON POWDER	1395	4.3	
ALUMINIUM HYDRIDE	2463	4.3	
ALUMINIUM NITRATE	1438	5.1	

Name and description	UN	Class	Remarks
ALUMINIUM PHOSPHIDE	1397	4.3	
ALUMINIUM PHOSPHIDE PESTICIDE	3048	6.1	
ALUMINIUM POWDER, COATED	1309	4.1	
ALUMINIUM POWDER, UNCOATED	1396	4.3	
ALUMINIUM REMELTING BY-PRODUCTS	3170	4.3	
ALUMINIUM RESINATE	2715	4.1	
ALUMINIUM SILICON POWDER, UNCOATED	1398	4.3	
ALUMINIUM SMELTING BY-PRODUCTS	3170	4.3	
Amatols, see	0082	1	
AMINES, FLAMMABLE, CORROSIVE, N.O.S.	2733	3	
AMINES, LIQUID, CORROSIVE, N.O.S.	2735	8	
AMINES, LIQUID, CORROSIVE, FLAMMABLE, N.O.S.	2734	8	
AMINES, SOLID, CORROSIVE, N.O.S.	3259	8	
Aminobenzene, see	1547	6.1	
2-Aminobenzotrifluoruride, see	2942	6.1	
3-Aminobenzotrifluoruride, see	2948	6.1	
Aminobutane, see	1125	3	
2-AMINO-4-CHLOROPHENOL	2673	6.1	
2-AMINO-5-DIETHYL-AMINOPENTANE	2946	6.1	
2-AMINO-4,6-DINITROPHENOL, WETTED with not less than 20 % water, by mass	3317	4.1	
2-(2-AMINOETHOXY) ETHANOL	3055	8	
N-AMINOETHYLPIPERAZINE	2815	8	
1-Amino-2-nitrobenzene, see	1661	6.1	
1-Amino-3-nitrobenzene, see	1661	6.1	
1-Amino-4-nitrobenzene, see	1661	6.1	
AMINOPHENOLS (o-, m-, p-)	2512	6.1	
AMINOPYRIDINES (o-, m-, p-)	2671	6.1	
AMMONIA, ANHYDROUS	1005	2	
AMMONIA SOLUTION relative density between 0.880 and 0.957 at 15 °C in water, with more than 10 % but not more than 35 % ammonia	2672	8	

Name and description	UN No.	Class	Remarks
AMMONIA SOLUTION, relative density less than 0.880 at 15 °C in water, with more than 35 % but not more than 50 % ammonia	2073	2	
AMMONIA SOLUTION, relative density less than 0.880 at 15 °C in water, with more than 50 % ammonia	3318	2	
AMMONIUM ARSENATE	1546	6.1	
Ammonium bichromate, see	1439	5.1	
Ammonium bifluoride solid, see	1727	8	
Ammonium bifluoride solution, see	2817	8	
Ammonium bisulphate, see	2506	8	
Ammonium bisulphite solution, see	2693	8	
AMMONIUM DICHROMATE	1439	5.1	
AMMONIUM DINITRO-o-CRESOLATE, SOLID	1843	6.1	
AMMONIUM DINITRO-o-CRESOLATE, SOLUTION	3424	6.1	
AMMONIUM FLUORIDE	2505	6.1	
AMMONIUM FLUORO-SILICATE	2854	6.1	
Ammonium hexafluorosilicate, see	2854	6.1	
AMMONIUM HYDROGENDIFLUORIDE, SOLID	1727	8	
AMMONIUM HYDROGENDIFLUORIDE SOLUTION	2817	8	
AMMONIUM HYDROGEN SULPHATE	2506	8	
Ammonium hydrosulphide solution (treat as ammonium sulphide solution), see	2683	8	
AMMONIUM METAVANADATE	2859	6.1	
AMMONIUM NITRATE	0222	1	
AMMONIUM NITRATE with not more than 0.2 % combustible substances, including any organic substance calculated as carbon, to the exclusion of any other added substance	1942	5.1	
AMMONIUM NITRATE EMULSION, intermediate for blasting explosives, liquid	3375	5.1	
AMMONIUM NITRATE EMULSION, intermediate for blasting explosives, solid	3375	5.1	
Ammonium nitrate explosive, see	0082 0331	1 1	
AMMONIUM NITRATE BASED FERTILIZER	2067	5.1	

Name and description	UN	Class	Remarks
AMMONIUM NITRATE BASED FERTILIZER	2071	9	
AMMONIUM NITRATE GEL, intermediate for blasting explosives, liquid	3375	5.1	
AMMONIUM NITRATE GEL, intermediate for blasting explosives, solid	3375	5.1	
AMMONIUM NITRATE, LIQUID (hot concentrated solution)	2426	5.1	
AMMONIUM NITRATE SUSPENSION, intermediate for blasting explosives, liquid	3375	5.1	
AMMONIUM NITRATE SUSPENSION, intermediate for blasting explosives, solid	3375	5.1	
AMMONIUM PERCHLORATE	0402	1	
	1442	5.1	
Ammonium permanganate, see	1482	5.1	
AMMONIUM PERSULPHATE	1444	5.1	
AMMONIUM PICRATE dry or wetted with less than 10 % water, by mass	0004	1	
AMMONIUM PICRATE, WETTED with not less than 10 % water, by mass	1310	4.1	
AMMONIUM POLYSULPHIDE SOLUTION	2818	8	
AMMONIUM POLYVANADATE	2861	6.1	
Ammonium silicofluoride, see	2854	6.1	
AMMONIUM SULPHIDE SOLUTION	2683	8	
Ammunition, blank, see	0014	1	
	0326	1	
	0327	1	
	0338	1	
	0413	1	
Ammunition, fixed	0005	1	
Ammunition, semi-fixed	0006	1	
Ammunition, separate loading, see	0007	1	
	0321	1	
	0348	1	
	0412	1	
AMMUNITION, ILLUMINATING with or without burster, expelling charge or propelling charge	0171	1	
	0254	1	
	0297	1	
AMMUNITION, INCENDIARY, liquid or gel, with burster, expelling charge or propelling charge	0247	1	
AMMUNITION, INCENDIARY with or without burster, expelling charge or propelling charge	0009	1	
	0010	1	
	0300	1	

Name and description	UN No.	Class	Remarks
Ammunition, incendiary (water-activated contrivances) with burster, expelling charge or propelling charge, see	0248	1	
	0249	1	
AMMUNITION, INCENDIARY, WHITE PHOSPHORUS with burster, expelling charge or propelling charge	0243	1	
	0244	1	
Ammunition, industrial, see	0275	1	
	0276	1	
	0277	1	
	0278	1	
	0323	1	
	0381	1	
Ammunition, lachrymatory, see	0018	1	
	0019	1	
	0301	1	
	2017	1	
AMMUNITION, PRACTICE	0362	1	
	0488	1	
AMMUNITION, PROOF	0363	1	
AMMUNITION, SMOKE with or without burster, expelling charge or propelling charge	0015	1	
	0016	1	
	0303	1	
Ammunition, smoke (water-activated contrivances), white phosphorus with burster, expelling charge or propelling charge, see	0248	1	
Ammunition, smoke (water-activated contrivances), without white phosphorus or phosphides with burster, expelling charge or propelling charge, see	0249	1	
AMMUNITION, SMOKE, WHITE PHOSPHORUS with burster, expelling charge or propelling charge	0245	1	
	0246	1	
Ammunition, sporting, see	0012	1	
	0328	1	
	0339	1	
	0417	1	
AMMUNITION, TEAR-PRODUCING, NON-EXPLOSIVE without burster or expelling charge, non-fuzed	2017	6.1	
AMMUNITION, TEAR-PRODUCING with burster, expelling charge or propelling charge	0018	1	
	0019	1	
	0301	1	
AMMUNITION, TOXIC with burster, expelling charge or propelling charge	0020	1	Carriage prohibited

Name and description	UN	Class	Remarks
AMMUNITION, TOXIC with burster, expelling charge or propelling charge	0021	1	Carriage prohibited
Ammunition, toxic (water-activated contrivances) with burster, expelling charge or propelling charge, see	0248 0249	1 1	
AMMUNITION, TOXIC, NON-EXPLOSIVE without burster or expelling charge, non-fuzed	2016	6.1	
Amosite, see	2212	9	
Amphibole asbestos, see	2212	9	
AMYL ACETATES	1104	3	
AMYL ACID PHOSPHATE	2819	8	
Amyl aldehyde, see	2058	3	
AMYLAMINE	1106	3	
AMYL BUTYRATES	2620	3	
AMYL CHLORIDE	1107	3	
n-AMYLENE, see	1108	3	
AMYL FORMATES	1109	3	
AMYL MERCAPTAN	1111	3	
n-AMYL METHYL KETONE	1110	3	
AMYL NITRATE	1112	3	
AMYL NITRITE	1113	3	
AMYLTRICHLOROSILANE	1728	8	
Anaesthetic ether, see	1155	3	
ANILINE	1547	6.1	
Aniline chloride, see	1548	6.1	
ANILINE HYDROCHLORIDE	1548	6.1	
Aniline oil, see	1547	6.1	
Aniline salt, see	1548	6.1	
ANISIDINES	2431	6.1	
ANISOLE	2222	3	
ANISOYL CHLORIDE	1729	8	
Anthophyllite, see	2212	9	
Antimonous chloride, see	1733	8	
ANTIMONY COMPOUND, INORGANIC, LIQUID, N.O.S.	3141	6.1	
ANTIMONY COMPOUND, INORGANIC, SOLID, N.O.S.	1549	6.1	
Antimony hydride, see	2676	2	
ANTIMONY LACTATE	1550	6.1	
Antimony (III) lactate, see	1550	6.1	
ANTIMONY PENTACHLORIDE, LIQUID	1730	8	

Name and description	UN No.	Class	Remarks
ANTIMONY PENTACHLORIDE SOLUTION	1731	8	
ANTIMONY PENTAFLUORIDE	1732	8	
Antimony perchloride, liquid, see	1730	8	
ANTIMONY POTASSIUM TARTRATE	1551	6.1	
ANTIMONY POWDER	2871	6.1	
ANTIMONY TRICHLORIDE	1733	8	
A.n.t.u., see	1651	6.1	
ARGON, COMPRESSED	1006	2	
ARGON, REFRIGERATED LIQUID	1951	2	
Arsenates, n.o.s., see	1556 1557	6.1 6.1	
ARSENIC	1558	6.1	
ARSENIC ACID, LIQUID	1553	6.1	
ARSENIC ACID, SOLID	1554	6.1	
ARSENICAL DUST	1562	6.1	
Arsenical flue dust, see	1562	6.1	
ARSENICAL PESTICIDE, LIQUID, FLAMMABLE, TOXIC, flash-point less than 23 °C	2760	3	
ARSENICAL PESTICIDE, LIQUID, TOXIC	2994	6.1	
ARSENICAL PESTICIDE, LIQUID, TOXIC, FLAMMABLE, flash-point not less than 23 °C	2993	6.1	
ARSENICAL PESTICIDE, SOLID, TOXIC	2759	6.1	
ARSENIC BROMIDE	1555	6.1	
Arsenic (III) bromide, see	1555	6.1	
Arsenic chloride, see	1560	6.1	
ARSENIC COMPOUND, LIQUID, N.O.S., inorganic, including: Arsenates, n.o.s., Arsenites, n.o.s.; and Arsenic sulphides, n.o.s.	1556	6.1	
ARSENIC COMPOUND, SOLID, N.O.S., inorganic, including: Arsenates, n.o.s.; Arsenites, n.o.s.; and Arsenic sulphides, n.o.s.	1557	6.1	
Arsenic (III) oxide, see	1561	6.1	
Arsenic (V) oxide, see	1559	6.1	
ARSENIC PENTOXIDE	1559	6.1	
Arsenic sulphides, see	1556 1557	6.1 6.1	
ARSENIC TRICHLORIDE	1560	6.1	
ARSENIC TRIOXIDE	1561	6.1	
Arsenious chloride, see	1560	6.1	

Name and description	UN	Class	Remarks
Arsenites, n.o.s., see	1556	6.1	
	1557	6.1	
Arsenous chloride, see	1560	6.1	
ARSINE	2188	2	
ARSINE, ADSORBED	3522	2	
ARTICLES CONTAINING A SUBSTANCE LIABLE TO SPONTANEOUS COMBUSTION, N.O.S.	3542	4.2	
ARTICLES CONTAINING A SUBSTANCE WHICH IN CONTACT WITH WATER EMITS FLAMMABLE GASES, N.O.S.	3543	4.3	
ARTICLES CONTAINING CORROSIVE SUBSTANCE, N.O.S.	3547	8	
ARTICLES CONTAINING FLAMMABLE GAS, N.O.S.	3537	2	
ARTICLES CONTAINING FLAMMABLE LIQUID, N.O.S.	3540	3	
ARTICLES CONTAINING FLAMMABLE SOLID, N.O.S.	3541	4.1	
ARTICLES CONTAINING MISCELLANEOUS DANGEROUS GOODS, N.O.S.	3548	9	
ARTICLES CONTAINING NON-FLAMMABLE, NON TOXIC GAS, N.O.S.	3538	2	
ARTICLES CONTAINING ORGANIC PEROXIDE, N.O.S.	3545	5.2	
ARTICLES CONTAINING OXIDIZING SUBSTANCE, N.O.S.	3544	5.1	
ARTICLES CONTAINING TOXIC GAS, N.O.S.	3539	2	
ARTICLES CONTAINING TOXIC SUBSTANCE, N.O.S.	3546	6.1	
ARTICLES, EEI, see	0486	1	
ARTICLES, EXPLOSIVE, EXTREMELY INSENSITIVE	0486	1	

Name and description	UN No.	Class	Remarks
ARTICLES, EXPLOSIVE, N.O.S.	0349	1	
	0350	1	
	0351	1	
	0352	1	
	0353	1	
	0354	1	
	0355	1	
	0356	1	
	0462	1	
	0463	1	
	0464	1	
	0465	1	
	0466	1	
	0467	1	
	0468	1	
	0469	1	
	0470	1	
	0471	1	
	0472	1	
ARTICLES, PRESSURIZED, HYDRAULIC (containing non-flammable gas)	3164	2	
ARTICLES, PRESSURIZED, PNEUMATIC (containing non-flammable gas)	3164	2	
ARTICLES, PYROPHORIC	0380	1	
ARTICLES, PYROTECHNIC for technical purposes	0428	1	
	0429	1	
	0430	1	
	0431	1	
	0432	1	
ARYLSULPHONIC ACIDS, LIQUID with more than 5 % free sulphuric acid	2584	8	
ARYLSULPHONIC ACIDS, LIQUID with not more than 5 % free sulphuric acid	2586	8	
ARYLSULPHONIC ACIDS, SOLID with more than 5 % free sulphuric acid	2583	8	
ARYLSULPHONIC ACIDS, SOLID with not more than 5 % free sulphuric acid	2585	8	
ASBESTOS, AMPHIBOLE	2212	9	
ASBESTOS, CHRYSOTILE	2590	9	
Asphalt, with a flash-point above 60 °C, at or above its flash-point, see	3256	3	
Asphalt, at or above 100 °C and below its flash-point, see	3257	9	
Aviation regulated liquid, n.o.s.	3334	9	Not subject to the Code
Aviation regulated solid, n.o.s.	3335	9	Not subject to the Code
AZODICARBONAMIDE	3242	4.1	

Name and description	UN	Class	Remarks
Bag charges, see	0242	1	
	0279	1	
	0414	1	
Ballistite, see	0160	1	
	0161	1	
Bangalore torpedoes, see	0136	1	
	0137	1	
	0138	1	
	0294	1	
BARIUM	1400	4.3	
BARIUM ALLOYS, PYROPHORIC	1854	4.2	
BARIUM AZIDE, dry or wetted with less than 50 % water, by mass	0224	1	
BARIUM AZIDE, WETTED with not less than 50 % water, by mass	1571	4.1	
Barium binoxide, see	1449	5.1	
BARIUM BROMATE	2719	5.1	
BARIUM CHLORATE, SOLID	1445	5.1	
BARIUM CHLORATE, SOLUTION	3405	5.1	
BARIUM COMPOUND, N.O.S.	1564	6.1	
BARIUM CYANIDE	1565	6.1	
Barium dioxide, see	1449	5.1	
BARIUM HYPOCHLORITE with more than 22 % available chlorine	2741	5.1	
BARIUM NITRATE	1446	5.1	
BARIUM OXIDE	1884	6.1	
BARIUM PERCHLORATE, SOLID	1447	5.1	
BARIUM PERCHLORATE, SOLUTION	3406	5.1	
BARIUM PERMANGANATE	1448	5.1	
BARIUM PEROXIDE	1449	5.1	
Barium selenate, see	2630	6.1	
Barium selenite, see	2630	6.1	
Barium superoxide, see	1449	5.1	
BATTERIES, CONTAINING SODIUM	3292	4.3	
BATTERIES, DRY, CONTAINING POTASSIUM HYDROXIDE SOLID, electric storage	3028	8	
Batteries, nickel-metal hydride	3496	9	Not subject to the Code
BATTERIES, WET, FILLED WITH ACID, electric storage	2794	8	
BATTERIES, WET, FILLED WITH ALKALI, electric storage	2795	8	
BATTERIES, WET, NON-SPILLABLE, electric storage	2800	8	
BATTERY FLUID, ACID	2796	8	
BATTERY FLUID, ALKALI	2797	8	
BATTERY POWERED EQUIPMENT	3171	9	
BATTERY POWERED VEHICLE	3171	9	
BENZALDEHYDE	1990	9	
BENZENE	1114	3	
BENZENESULPHONYL CHLORIDE	2225	8	
Benzenethiol, see	2337	6.1	
BENZIDINE	1885	6.1	
Benzol, see	1114	3	
Benzolene, see	1268	3	
BENZONITRILE	2224	6.1	
BENZOQUINONE	2587	6.1	
Benzosulphochloride, see	2225	8	
BENZOTRICHLORIDE	2226	8	
BENZOTRIFLUORIDE	2338	3	
BENZOYL CHLORIDE	1736	8	
BENZYL BROMIDE	1737	6.1	
BENZYL CHLORIDE	1738	6.1	
Benzyl chlorocarbonate, see	1739	8	
BENZYL CHLOROFORMATE	1739	8	
Benzyl cyanide, see	2470	6.1	
BENZYLDIMETHYLAMINE	2619	8	
BENZYLIDENE CHLORIDE	1886	6.1	
BENZYL IODIDE	2653	6.1	
BERYLLIUM COMPOUND, N.O.S.	1566	6.1	
BERYLLIUM NITRATE	2464	5.1	
BERYLLIUM POWDER	1567	6.1	
Bhusa	1327	4.1	Not subject to the Code
BICYCLO[2.2.1]HEPTA-2,5-DIENE, STABILIZED	2251	3	
Bifluorides, n.o.s., see	1740	8	
BIOLOGICAL SUBSTANCE, CATEGORY B	3373	6.2	
(BIO) MEDICAL WASTE, N.O.S.	3291	6.2	
BIPYRIDILIUM PESTICIDE, LIQUID, FLAMMABLE, TOXIC, flash-point less than 23 °C	2782	3	
BIPYRIDILIUM PESTICIDE, LIQUID, TOXIC	3016	6.1	
BIPYRIDILIUM PESTICIDE, LIQUID, TOXIC, FLAMMABLE, flash-point not less than 23 °C	3015	6.1	

Name and description	UN	Class	Remarks
BIPYRIDILIUM PESTICIDE, SOLID, TOXIC	2781	6.1	
BISULPHATES, AQUEOUS SOLUTION	2837	8	
BISULPHITES, AQUEOUS SOLUTION, N.O.S.	2693	8	
Bitumen, with a flash-point above 60 °C, at or above its flash-point, see	3256	3	
Bitumen, at or above 100 °C and below its flash-point, see	3257	9	
BLACK POWDER, COMPRESSED	0028	1	
BLACK POWDER, granular or as a meal	0027	1	
BLACK POWDER, IN PELLETS	0028	1	
Blasting cap assemblies, see	0360 0361	1 1	
Blasting caps, electric, see	0030 0255 0456	1 1 1	
Blasting caps, non electric, see	0029 0267 0455	1 1 1	
Bleaching powder, see	2208	5.1	
BOMBS with bursting charge	0033 0034 0035 0291	1 1 1 1	
Bombs, illuminating, see	0254	1	
BOMBS, PHOTO-FLASH	0037 0038 0039 0299	1 1 1 1	
BOMBS, SMOKE, NON-EXPLOSIVE with corrosive liquid, without initiating device	2028	8	
Bombs, target identification, see	0171 0254 0297	1 1 1	
BOMBS WITH FLAMMABLE LIQUID with bursting charge	0399 0400	1 1	
BOOSTERS WITH DETONATOR	0225 0268	1 1	
BOOSTERS without detonator	0042 0283	1 1	
Borate and chlorate mixture, see	1458	5.1	
BORNEOL	1312	4.1	
BORON TRIBROMIDE	2692	8	
BORON TRICHLORIDE	1741	2	
BORON TRIFLUORIDE ACETIC ACID COMPLEX, LIQUID	1742	8	

Name and description	UN No.	Class	Remarks
BORON TRIFLUORIDE ACETIC ACID COMPLEX, SOLID	3419	8	
BORON TRIFLUORIDE	1008	2	
BORON TRIFLUORIDE, ADSORBED	3519	2	
BORON TRIFLUORIDE DIETHYL ETHERATE	2604	8	
BORON TRIFLUORIDE DIHYDRATE	2851	8	
BORON TRIFLUORIDE DIMETHYL ETHERATE	2965	4.3	
BORON TRIFLUORIDE PROPIONIC ACID COMPLEX, LIQUID	1743	8	
BORON TRIFLUORIDE PROPIONIC ACID COMPLEX, SOLID	3420	8	
BROMATES, INORGANIC, N.O.S.	1450	5.1	
BROMATES, INORGANIC, AQUEOUS SOLUTION, N.O.S	3213	5.1	
BROMINE	1744	8	
BROMINE CHLORIDE	2901	2	
BROMINE PENTAFLUORIDE	1745	5.1	
BROMINE SOLUTION	1744	8	
BROMINE TRIFLUORIDE	1746	5.1	
BROMOACETIC ACID, SOLID	3425	8	
BROMOACETIC ACID, SOLUTION	1938	8	
BROMOACETONE	1569	6.1	
omega-Bromoacetone, see	2645	6.4	
BROMOACETYL BROMIDE	2513	8	
BROMOBENZENE	2514	3	
BROMOBENZYL CYANIDES, LIQUID	1694	6.1	
BROMOBENZYL CYANIDES, SOLID	3449	6.1	
1-BROMOBUTANE	1126	3	
2-BROMOBUTANE	2339	3	
BROMOCHLOROMETHANE	1887	6.1	
1-BROMO-3-CHLOROPROPANE	2688	6.1	
1-Bromo-2,3-epoxypropane, see	2558	6.1	
Bromoethane, see	1891	3	
2-BROMOETHYL ETHYL ETHER	2340	3	
BROMOFORM	2515	6.1	
Bromomethane, see	1062	2	
1-BROMO-3-METHYLBUTANE	2341	3	
BROMOMETHYLPROPANES	2342	3	

Name and description	UN	Class	Remarks
2-BROMO-2-NITROPROPANE-1,3-DIOL	3241	4.1	
2-BROMOPENTANE	2343	3	
BROMOPROPANES	2344	3	
3-BROMOPROPYNE	2345	3	
BROMOTRIFLUOROETHYLENE	2419	2	
BROMOTRIFLUOROMETHANE	1009	2	
BRUCINE	1570	6.1	
BURSTERS, explosive	0043	1	
BUTADIENES AND HYDROCARBON MIXTURE, STABILIZED, containing more than 40% butadienes	1010	2	
BUTADIENES, STABILIZED, (1,2-butadiene)	1010	2	
BUTADIENES, STABILIZED, (1,3-butadiene)	1010	2	
BUTANE	1011	2	
BUTANEDIONE	2346	3	
Butane-1-thiol, see	2347	3	
BUTANOLS	1120	3	
1-Butanol, see	1120	3	
Butan-2-ol, see	1120	3	
Butanol, secondary, see	1120	3	
Butanol, tertiary, see	1120	3	
Butanone, see	1193	3	
2-Butenal, see	1143	6.1	
Butene, see	1012	2	
Bute-1-ene-3-one, see	1251	3	
1,2-Buteneoxide, see	3022	3	
2-Buten-1-ol, see	2614	3	
BUTYL ACETATES	1123	3	
Butyl acetate, secondary, see	1123	3	
BUTYL ACID PHOSPHATE	1718	8	
BUTYL ACRYLATES, STABILIZED	2348	3	
Butyl alcohols, see	1120	3	
n-BUTYLAMINE	1125	3	
N-BUTYLANILINE	2738	6.1	
sec-Butyl benzene, see	2709	3	
BUTYLBENZENES	2709	3	
n-Butyl bromide, see	1126	3	
n-Butyl chloride, see	1127	3	
n-BUTYL CHLOROFORMATE	2743	6.1	
tert-BUTYLCYCLOHEXYL CHLOROFORMATE	2747	6.1	
BUTYLENE	1012	2	
1-butylene, see	1012	2	
cis-2-butylene, see	1012	2	
trans-2-butylene, see	1012	2	
Butylenes mixture, see	1012	2	
1,2-BUTYLENE OXIDE, STABILIZED	3022	3	
Butyl ethers, see	1149	3	
Butyl ethyl ether, see	1179	3	
n-BUTYL FORMATE	1128	3	
tert-BUTYL HYPOCHLORITE	3255	4.2	Carriage prohibited
N,n-BUTYLIMIDAZOLE	2690	6.1	
N,n-Butyliminazole, see	2690	6.1	
n-BUTYL ISOCYANATE	2485	6.1	
tert-BUTYL ISOCYANATE	2484	6.1	
Butyl lithium, see	3394	4.2	
BUTYL MERCAPTAN	2347	3	
n-BUTYL METHACRYLATE, STABILIZED	2227	3	
BUTYL METHYL ETHER	2350	3	
BUTYL NITRITES	2351	3	
Butylphenols, liquid, see	3145	8	
Butylphenols, solid, see	2430	8	
BUTYL PROPIONATES	1914	3	
p-tert-Butyltoluene, see	2667	6.1	
BUTYLTOLUENES	2667	6.1	
BUTYLTRICHLOROSILANE	1747	8	
5-tert-BUTYL-2,4,6-TRINITRO-m-XYLENE	2956	4.1	
BUTYL VINYL ETHER, STABILIZED	2352	3	
But-1-yne, see	2452	2	
1,4-BUTYNEDIOL	2716	6.1	
2-Butyne-1,4-diol, see	2716	6.1	
BUTYRALDEHYDE	1129	3	
BUTYRALDOXIME	2840	3	
BUTYRIC ACID	2820	8	
BUTYRIC ANHYDRIDE	2739	8	
Butyrone, see	2710	3	
BUTYRONITRILE	2411	3	
Butyroyl chloride, see	2353	3	
BUTYRYL CHLORIDE	2353	3	

Name and description	UN	Class	Remarks
Cable cutters, explosive, see	0070	1	
CACODYLIC ACID	1572	6.1	
CADMIUM COMPOUND	2570	6.1	
CAESIUM	1407	4.3	
CAESIUM HYDROXIDE	2682	8	
CAESIUM HYDROXIDE SOLUTION	2681	8	
CAESIUM NITRATE	1451	5.1	
Caffeine, see	1544	6.1	
Cajeputene, see	2052	3	
CALCIUM	1401	4.3	
CALCIUM ALLOYS, PYROPHORIC	1855	4.2	
CALCIUM ARSENATE	1573	6.1	
CALCIUM ARSENATE AND CALCIUM ARSENITE MIXTURE, SOLID	1574	6.1	
Calcium bisulphite solution, see	2693	8	
CALCIUM CARBIDE	1402	4.3	
CALCIUM CHLORATE	1452	5.1	
CALCIUM CHLORATE, AQUEOUS SOLUTION	2429	5.1	
CALCIUM CHLORITE	1453	5.1	
CALCIUM CYANAMIDE with more than 0.1 % calcium carbide	1403	4.3	
CALCIUM CYANIDE	1575	6.1	
CALCIUM DITHIONITE	1923	4.2	
CALCIUM HYDRIDE	1404	4.3	
CALCIUM HYDROSULPHITE, see	1923	4.2	
CALCIUM HYPOCHLORITE, DRY with more than 39 % available chlorine (8.8 % available oxygen)	1748	5.1	
CALCIUM HYPOCHLORITE, DRY, CORROSIVE with more than 39 % available chlorine (8.8 % available oxygen)	3485	5.1	
CALCIUM HYPOCHLORITE, HYDRATED with not less than 5.5 % but not more than 16 % water	2880	5.1	
CALCIUM HYPOCHLORITE, HYDRATED MIXTURE with not less than 5.5 % but not more than 16 % water	2880	5.1	
CALCIUM HYPOCHLORITE, HYDRATED, CORROSIVE with not less than 5.5 % but not more than 16 % water	3487	5.1	
CALCIUM HYPOCHLORITE, HYDRATED MIXTURE, CORROSIVE with not less than 5.5 % but not more than 16 % water	3487	5.1	
CALCIUM HYPOCHLORITE MIXTURE, DRY with more than 10 % but not more than 39 % available chlorine	2208	5.1	
CALCIUM HYPOCHLORITE MIXTURE, DRY with more than 39 % available chlorine (8.8 % available oxygen)	1748	5.1	
CALCIUM HYPOCHLORITE MIXTURE, DRY, CORROSIVE with more than 10 % but not more than 39 % available chlorine	3486	5.1	
CALCIUM HYPOCHLORITE MIXTURE, DRY, CORROSIVE with more than 39 % available chlorine (8.8 % available oxygen)	3485	5.1	
CALCIUM MANGANESE SILICON	2844	4.3	
CALCIUM NITRATE	1454	5.1	
Calcium oxide	1910	8	Not subject to the Code
CALCIUM PERCHLORATE	1455	5.1	
CALCIUM PERMANGANATE	1456	5.1	
CALCIUM PEROXIDE	1457	5.1	
CALCIUM PHOSPHIDE	1360	4.3	
CALCIUM, PYROPHORIC	1855	4.2	
CALCIUM RESINATE	1313	4.1	
CALCIUM RESINATE, FUSED	1314	4.1	
Calcium selenate, see	2630	6.1	
CALCIUM SILICIDE	1405	4.3	
Calcium silicon, see	1405	4.3	
Calcium superoxide, see	1457	5.1	
CAPACITOR, ASYMMETRIC, (with an energy storage capacity greater than 0.3Wh)	3508	9	
CAPACITOR, ELECTRIC DOUBLE LAYER (with an energy storage capacity greater than 0.3 Wh)	3499	9	
Camphanone, see	2717	4.1	
CAMPHOR OIL	1130	3	
CAMPHOR, synthetic	2717	4.1	
CAPROIC ACID	2829	8	
CARBAMATE PESTICIDE, LIQUID, FLAMMABLE, TOXIC, flash-point less than 23 °C	2758	3	

Name and description	UN	Class	Remarks
CARBAMATE PESTICIDE, LIQUID, TOXIC	2992	6.1	
CARBAMATE PESTICIDE, LIQUID, TOXIC, FLAMMABLE, flash-point not less than 23 °C	2991	6.1	
CARBAMATE PESTICIDE, SOLID, TOXIC	2757	6.1	
Carbolic acid, see	1671 2312 2821	6.1 6.1 6.1	
CARBON, animal or vegetable origin	1361	4.2	
CARBON, ACTIVATED	1362	4.2	
Carbon bisulphide, see	1131	3	
Carbon black (animal or vegetable origin), see	1361	4.2	
CARBON DIOXIDE	1013	2	
Carbon dioxide and ethylene oxide mixture, see	1041 1952 3300	2 2 2	
CARBON DIOXIDE, REFRIGERATED LIQUID	2187	2	
Carbon dioxide, solid	1845	9	Not subject to the Code except for 5.5.3
CARBON DISULPHIDE	1131	3	
Carbonic anhydride, see	1013 1845 2187	2 9 2	
CARBON MONOXIDE, COMPRESSED	1016	2	
Carbon oxysulphide, see	2204	2.3	
CARBON TETRABROMIDE	2516	6.1	
CARBON TETRACHLORIDE	1846	6.1	
Carbonyl chloride, see	1076	2	
CARBONYL FLUORIDE	2417	2	
CARBONYL SULPHIDE	2204	2	
Cartridge cases, empty, primed, see	0055 0379	1 1	
Cartridges, actuating, for fire extinguisher or apparatus valve, see	0275 0276 0323 0381	1 1 1 1	
Cartridges, explosive, see	0048	1	
CARTRIDGES, FLASH	0049 0050	1 1	
CARTRIDGES FOR TOOLS, BLANK	0014	1	

Name and description	UN No.	Class	Remarks
CARTRIDGES FOR WEAPONS with bursting charge	0005 0006 0007 0321 0348 0412	1 1 1 1 1 1	
CARTRIDGES FOR WEAPONS, BLANK	0014 0326 0327 0338 0413	1 1 1 1 1	
CARTRIDGES FOR WEAPONS, INERT PROJECTILE	0012 0328 0339 0417	1 1 1 1	
Cartridges, illuminating, see	0171 0254 0297	1 1 1	
CARTRIDGES, OIL WELL	0277 0278	1 1	
CARTRIDGES, POWER DEVICE	0275 0276 0323 0381	1 1 1 1	
CARTRIDGES, SIGNAL	0054 0312 0405	1 1 1	
CARTRIDGES, SMALL ARMS	0012 0339 0417	1 1 1	
CARTRIDGES, SMALL ARMS, BLANK	0014 0327 0338	1 1 1	
Cartridges, starter, jet engine, see	0275 0276 0323 0381	1 1 1 1	
CASES, CARTRIDGE, EMPTY, WITH PRIMER	0055 0379	1 1	
CASES, COMBUSTIBLE, EMPTY, WITHOUT PRIMER	0446 0447	1 1	
Casinghead gasoline, see	1203	3	
CASTOR BEANS	2969	9	
CASTOR FLAKE	2969	9	
CASTOR MEAL	2969	9	
CASTOR POMACE	2969	9	
CAUSTIC ALKALI LIQUID, N.O.S.	1719	8	
Caustic potash, see	1814	8	
Caustic soda, see	1824	8	
Caustic soda liquor, see	1824	8	
CELLS, CONTAINING SODIUM	3292	4.3	

Name and description	UN	Class	Remarks
CELLULOID in block, rods, rolls, sheets, tubes, etc., except scrap	2000	4.1	
CELLULOID, SCRAP	2002	4.2	
Cement, see	1133	3	
CERIUM, slabs, ingots or rods	1333	4.1	
CERIUM, turnings or gritty powder	3078	4.3	
Cer mishmetall, see	1323	4.1	
Charcoal, activated, see	1362	4.1	
Charcoal, non-activated, see	1361	4.2	
CHARGES, BURSTING, PLASTICS BONDED	0457 0458 0459 0460	1 1 1 1	
CHARGES, DEMOLITION	0048	1	
CHARGES, DEPTH	0056	1	
Charges, expelling, explosive, for fire extinguishers, see	0275 0276 0323 0381	1 1 1 1	
CHARGES, EXPLOSIVE, COMMERCIAL without detonator	0442 0443 0444 0445	1 1 1 1	
CHARGES, PROPELLING	0271 0272 0415 0491	1 1 1 1	
CHARGES, PROPELLING, FOR CANNON	0242 0279 0414	1 1 1	
CHARGES, SHAPED, FLEXIBLE, LINEAR	0237 0288	1 1	
CHARGES, SHAPED, without detonator	0059 0439 0440 0441	1 1 1 1	
CHARGES, SUPPLEMENTARY, EXPLOSIVE	0060	1	
CHEMICAL KIT	3316	9	
CHEMICAL SAMPLE, TOXIC	3315	6.1	
CHEMICAL UNDER PRESSURE, N.O.S.	3500	2	
CHEMICAL UNDER PRESSURE, CORROSIVE, N.O.S.	3503	2	
CHEMICAL UNDER PRESSURE, FLAMMABLE, N.O.S.	3501	2	
CHEMICAL UNDER PRESSURE, FLAMMABLE, CORROSIVE, N.O.S.	3505	2	
CHEMICAL UNDER PRESSURE, FLAMMABLE, TOXIC, N.O.S.	3504	2	

Name and description	UN No.	Class	Remarks
CHEMICAL UNDER PRESSURE, TOXIC, N.O.S.	3502	2	
Chile saltpetre, see	1498	5.1	
CHLORAL, ANHYDROUS, STABILIZED	2075	6.1	
CHLORATE AND BORATE MIXTURE	1458	5.1	
CHLORATE AND MAGNESIUM CHLORIDE MIXTURE, SOLID	1459	5.1	
CHLORATE AND MAGNESIUM CHLORIDE MIXTURE, SOLUTION	3407	5.1	
CHLORATES, INORGANIC, N.O.S.	1461	5.1	
CHLORATES, INORGANIC, AQUEOUS SOLUTION, N.O.S.	3210	5.1	
CHLORIC ACID, AQUEOUS SOLUTION with not more than 10 % chloric acid	2626	5.1	
CHLORINE	1017	2	
CHLORINE, ADSORBED	3520	2	
CHLORINE PENTAFLUORIDE	2548	2	
CHLORINE TRIFLUORIDE	1749	2	
CHLORITES, INORGANIC, N.O.S.	1462	5.1	
CHLORITE SOLUTION	1908	8	
Chloroacetaldehyde, see	2232	6.1	
CHLOROACETIC ACID, MOLTEN	3250	6.1	
CHLOROACETIC ACID, SOLID	1751	6.1	
CHLOROACETIC ACID SOLUTION	1750	6.1	
CHLOROACETONE, STABILIZED	1695	6.1	
CHLOROACETONITRILE	2668	6.1	
CHLOROACETOPHENONE, LIQUID	3416	6.1	
CHLOROACETOPHENONE, SOLID	1697	6.1	
CHLOROACETYL CHLORIDE	1752	6.1	
CHLOROANILINES, LIQUID	2019	6.1	
CHLOROANILINES, SOLID	2018	6.1	
CHLOROANISIDINES	2233	6.1	
CHLOROBENZENE	1134	3	
CHLOROBENZO-TRIFLUORIDES	2234	3	
CHLOROBENZYL CHLORIDES, LIQUID	2235	6.1	
CHLOROBENZYL CHLORIDES, SOLID	3427	6.1	
1-Chloro-3-bromopropane, see	2688	6.1	
1-Chlorobutane, see	1127	3	

Name and description	UN	Class	Remarks
2-Chlorobutane, see	1127	3	
CHLOROBUTANES	1127	3	
CHLOROCRESOLS, SOLUTION	2669	6.1	
CHLOROCRESOLS, SOLID	3437	6.1	
CHLORODIFLUORO-BROMOMETHANE	1974	2	
1-CHLORO-1,1-DIFLUORO-ETHANE	2517	2	
CHLORODIFLUOROMETHANE	1018	2	
CHLORODIFLUOROMETHANE AND CHLORO-PENTAFLUOROETHANE MIXTURE with fixed boiling point, with approximately 49 % chlorodifluoromethane	1973	2	
3-Chloro-1,2-dihydroxypropane, see	2689	6.1	
Chlorodimethyl ether, see	1239	6.1	
CHLORODINITROBENZENES, LIQUID	1577	6.1	
CHLORODINITROBENZENES, SOLID	3441	6.1	
2-CHLOROETHANAL	2232	6.1	
Chloroethane, see	1037	2	
Chloroethane nitrile, see	2668	6.1	
2-Chloroethanol, see	1135	6.1	
CHLOROFORM	1888	6.1	
CHLOROFORMATES, TOXIC, CORROSIVE, N.O.S.	3277	6.1	
CHLOROFORMATES, TOXIC, CORROSIVE, FLAMMABLE, N.O.S.	2742	6.1	
Chloromethane, see	1063	2	
1-Chloro-3-methylbutane, see	1107	3	
2-Chloro-2-methylbutane, see	1107	3	
CHLOROMETHYL CHLOROFORMATE	2745	6.1	
Chloromethyl cyanide, see	2668	6.1	
CHLOROMETHYL ETHYL ETHER	2354	3	
Chloromethyl methyl ether, see	1239	6.1	
3-CHLORO-4-METHYLPHENYL ISOCYANATE, LIQUID	2236	6.1	
3-CHLORO-4-METHYLPHENYL ISOCYANATE, SOLID	3428	6.1	
3-Chloro-2-methylprop-1-ene, see	2554	3	
CHLORONITROANILINES	2237	6.1	
CHLORONITROBENZENES LIQUID	3409	6.1	

Name and description	UN No.	Class	Remarks
CHLORONITROBENZENES SOLID	1578	6.1	
CHLORONITROTOLUENES, LIQUID	2433	6.1	
CHLORONITROTOLUENES, SOLID	3457	6.1	
CHLOROPENTAFLUORO-ETHANE	1020	2	
CHLOROPHENOLATES, LIQUID	2904	8	
CHLOROPHENOLATES, SOLID	2905	8	
CHLOROPHENOLS, LIQUID	2021	6.1	
CHLOROPHENOLS, SOLID	2020	6.1	
CHLOROPHENYL-TRICHLOROSILANE	1753	8	
CHLOROPICRIN	1580	6.1	
CHLOROPICRIN AND METHYL BROMIDE MIXTURE, with more than 2 % chloropicrin	1581	2	
CHLOROPICRIN AND METHYL CHLORIDE MIXTURE	1582	2	
CHLOROPICRIN MIXTURE, N.O.S.	1583	6.1	
CHLOROPLATINIC ACID, SOLID	2507	8	
CHLOROPRENE, STABILIZED	1991	3	
1-CHLOROPROPANE	1278	3	
2-CHLOROPROPANE	2356	3	
3-Chloro-propanediol-1,2, see	2689	6.1	
3-CHLOROPROPANOL-1	2849	6.1	
2-CHLOROPROPENE	2456	3	
3-Chloropropene, see	1100	3	
3-Chloroprop-1-ene, see	1100	3	
2-CHLOROPROPIONIC ACID	2511	8	
2-CHLOROPYRIDINE	2822	6.1	
CHLOROSILANES, CORROSIVE, N.O.S.	2987	8	
CHLOROSILANES, CORROSIVE, FLAMMABLE, N.O.S.	2986	8	
CHLOROSILANES, FLAMMABLE, CORROSIVE, N.O.S.	2985	3	
CHLOROSILANES, TOXIC, CORROSIVE, N.O.S.	3361	6.1	
CHLOROSILANES, TOXIC, CORROSIVE, FLAMMABLE, N.O.S.	3362	6.1	

Name and description	UN	Class	Remarks
CHLOROSILANES, WATER-REACTIVE, FLAMMABLE, CORROSIVE, N.O.S.	2988	4.3	
CHLOROSULPHONIC ACID (with or without sulphur trioxide)	1754	8	
1-CHLORO-1,2,2,2-TETRA-FLUOROETHANE	1021	2	
CHLOROTOLUENES	2238	3	
4-CHLORO-o-TOLUIDINE HYDROCHLORIDE, SOLID	1579	6.1	
4-CHLORO-o-TOLUIDINE HYDROCHLORIDE, SOLUTION	3410	6.1	
CHLOROTOLUIDINES LIQUID	3429	6.1	
CHLOROTOLUIDINES SOLID	3429	6.1	
1-CHLORO-2,2,2-TRIFLUORO-ETHANE	1983	2	
Chlorotrifluoroethylene, see	1082	2	
CHLOROTRIFLUOROMETHANE	1022	2	
CHLOROTRIFLUOROMETHANE AND TRIFLUOROMETHANE AZEOTROPIC MIXTURE with approximately 60 % chlorotrifluoromethane	2599	2	
Chromic acid, solid, see	1463	5.1	
CHROMIC ACID SOLUTION	1755	8	
Chromic anhydride, solid, see	1463	5.1	
CHROMIC FLUORIDE, SOLID	1756	8	
CHROMIC FLUORIDE SOLUTION	1757	8	
Chromic nitrate, see	2720	5.1	
Chromium (VI) dichloride dioxide, see	1758	8	
Chromium (III) fluoride, solid, see	1756	8	
CHROMIUM NITRATE	2720	5.1	
Chromium (III) nitrate, see	2720	5.1	
CHROMIUM OXYCHLORIDE	1758	8	
CHROMIUM TRIOXIDE, ANHYDROUS	1463	5.1	
CHROMOSULPHURIC ACID	2240	8	
Chrysotile, see	2590	9	
Cinene, see	2052	3	
Cinnamene, see	2055	3	
Cinnamol, see	2055	3	
CLINICAL WASTE, UNSPECIFIED, N.O.S.	3291	6.2	
COAL GAS, COMPRESSED	1023	2	
COAL TAR DISTILLATES, FLAMMABLE	1136	3	
Coal tar naphtha, see	1268	3	
Coal tar oil, see	1136	3	
COATING SOLUTION (includes surface treatments or coatings used for industrial or other purposes such as vehicle under coating, drum or barrel lining)	1139	3	
COBALT DIHYDROXIDE POWDER, containing not less than 10 % respirable particles	3550	6.1	
COBALT NAPHTHENATES, POWDER	2001	4.1	
COBALT RESINATE, PRECIPITATED	1318	4.1	
Cocculus, see	3172	6.1	
	3462	6.1	
Collodion cottons, see	0340	1	
	0341	1	
	0342	1	
	2059	3	
	2555	4.1	
	2556	4.1	
	2557	4.1	
COMPONENTS, EXPLOSIVE TRAIN, N.O.S.	0382	1	
	0383	1	
	0384	1	
	0461	1	
Composition B, see	0118	1	
COMPRESSED GAS, N.O.S.	1956	2	
COMPRESSED GAS, FLAMMABLE, N.O.S.	1954	2	
COMPRESSED GAS, OXIDIZING, N.O.S.	3156	2	
COMPRESSED GAS, TOXIC, N.O.S.	1955	2	
COMPRESSED GAS, TOXIC, CORROSIVE, N.O.S.	3304	2	
COMPRESSED GAS, TOXIC, FLAMMABLE, N.O.S.	1953	2	
COMPRESSED GAS, TOXIC, FLAMMABLE, CORROSIVE, N.O.S.	3305	2	
COMPRESSED GAS, TOXIC, OXIDIZING, N.O.S.	3303	2	
COMPRESSED GAS, TOXIC, OXIDIZING, CORROSIVE, N.O.S.	3306	2	
CONTRIVANCES, WATER-ACTIVATED with burster, expelling charge or propelling charge	0248	1	
	0249	1	
COPPER ACETOARSENITE	1585	6.1	
COPPER ARSENITE	1586	6.1	
Copper (II) arsenite, see	1586	6.1	

Name and description	UN	Class	Remarks
COPPER BASED PESTICIDE, LIQUID, FLAMMABLE, TOXIC, flash-point less than 23 °C	2776	3	
COPPER BASED PESTICIDE, LIQUID, TOXIC	3010	6.1	
COPPER BASED PESTICIDE, LIQUID, TOXIC, FLAMMABLE, flash-point not less than 23 °C	3009	6.1	
COPPER BASED PESTICIDE, SOLID, TOXIC	2775	6.1	
COPPER CHLORATE	2721	5.1	
Copper (II) chlorate, see	2721	5.1	
COPPER CHLORIDE	2802	8	
COPPER CYANIDE	1587	6.1	
Copper selenate, see	2630	6.1	
Copper selenite, see	2630	6.1	
COPRA	1363	4.2	
CORD, DETONATING, flexible	0065 0289	1 1	
CORD, DETONATING, metal clad	0102 0290	1 1	
CORD, DETONATING, MILD EFFECT, metal clad	0104	1	
CORD, IGNITER	0066	1	
Cordite, see	0160 0161	1 1	
CORROSIVE LIQUID, N.O.S.	1760	8	
CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S.	3264	8	
CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S.	3265	8	
CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S.	3266	8	
CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S.	3267	8	
CORROSIVE LIQUID, FLAMMABLE, N.O.S.	2920	8	
CORROSIVE LIQUID, OXIDIZING, N.O.S.	3093	8	
CORROSIVE LIQUID, SELF-HEATING, N.O.S.	3301	8	
CORROSIVE LIQUID, TOXIC, N.O.S.	2922	8	
CORROSIVE LIQUID, WATER-REACTIVE, N.O.S.	3094	8	
CORROSIVE SOLID, N.O.S.	1759	8	
CORROSIVE SOLID, ACIDIC, INORGANIC, N.O.S.	3260	8	
CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S.	3261	8	
CORROSIVE SOLID, BASIC, INORGANIC, N.O.S.	3262	8	
CORROSIVE SOLID, BASIC, ORGANIC, N.O.S.	3263	8	
CORROSIVE SOLID, FLAMMABLE, N.O.S.	2921	8	
CORROSIVE SOLID, OXIDIZING, N.O.S.	3084	8	
CORROSIVE SOLID, SELF-HEATING, N.O.S.	3095	8	
CORROSIVE SOLID, TOXIC, N.O.S.	2923	8	
CORROSIVE SOLID, WATER-REACTIVE, N.O.S.	3096	8	
COTTON WASTE, OILY	1364	4.2	
COTTON, WET	1365	4.2	
COUMARIN DERIVATIVE PESTICIDE, LIQUID, FLAMMABLE, TOXIC, flash-point less than 23 °C	3024	3	
COUMARIN DERIVATIVE PESTICIDE, LIQUID, TOXIC	3026	6.1	
COUMARIN DERIVATIVE PESTICIDE, LIQUID, TOXIC, FLAMMABLE, flash-point not less than 23 °C	3025	6.1	
COUMARIN DERIVATIVE PESTICIDE, SOLID, TOXIC	3027	6.1	
Creosote, see	2810	6.1	
Creosote salts, see	1334	4.1	
CRESOLS, LIQUID	2076	6.1	
CRESOLS, SOLID	3455	6.1	
CRESYLIC ACID	2022	6.1	
Crocidolite, see	2212	9	
CROTONALDEHYDE or CROTONALDEHYDE, STABILIZED	1143	6.1	
CROTONIC ACID, LIQUID	3472	8	
CROTONIC ACID, SOLID	2823	8	
Crotonic aldehyde / Crotonic aldehyde, stabilized, see	1143	6.1	
CROTONYLENE	1144	3	
Crude naphtha, see	1268	3	
Cumene, see	1918	3	
Cupric chlorate, see	2721	5.1	
CUPRIETHYLENEDIAMINE SOLUTION	1761	8	
Cutback bitumen, with a flash-point not greater than 60 °C, see	1999	3	

Name and description	UN	Class	Remarks
Cutback bitumen, with a flash-point above 60 °C, at or above its flash-point, see	3256	3	
Cutback bitumen, at or above 100 °C and below its flash-point, see	3257	9	
CUTTERS, CABLE, EXPLOSIVE	0070	1	
CYANIDE SOLUTION, N.O.S.	1935	6.1	
CYANIDES, INORGANIC, SOLID, N.O.S.	1588	6.1	
Cyanides, organic, flammable, toxic, n.o.s., see	3273	3	
Cyanides, organic, toxic, n.o.s., see	3276 3439	6.1	
Cyanides, organic, toxic, flammable, n.o.s., see	3275	6.1	
Cyanoacetonitrile, see	2647	6.1	
CYANOGEN	1026	2	
CYANOGEN BROMIDE	1889	6.1	
CYANOGEN CHLORIDE, STABILIZED	1589	2	
CYANURIC CHLORIDE	2670	8	
CYCLOBUTANE	2601	2	
CYCLOBUTYL CHLOROFORMATE	2744	6.1	
1,5,9-CYCLODODECATRIENE	2518	6.1	
CYCLOHEPTANE	2241	3	
CYCLOHEPTATRIENE	2603	3	
1,3,5-Cycloheptatriene, see	2603	3	
CYCLOHEPTENE	2242	3	
1,4-Cyclohexadienedione, see	2587	6.1	
CYCLOHEXANE	1145	3	
Cyclehexanethiol, see	3054	3	
CYCLOHEXANONE	1915	3	
CYCLOHEXENE	2256	3	
CYCLOHEXENYLTRI-CHLOROSILANE	1762	8	
CYCLOHEXYL ACETATE	2243	3	
CYCLOHEXYLAMINE	2357	8	
CYCLOHEXYL ISOCYANATE	2488	6.1	
CYCLOHEXYL MERCAPTAN	3054	3	
CYCLOHEXYLTRICHLORO-SILANE	1763	8	

Name and description	UN No.	Class	Remarks
CYCLONITE AND CYCLOTETRAMETHYLENE-TETRANITRAMINE MIXTURE, WETTED with not less than 15 % water, by mass or DESENSITIZED with not less than 10 % phlegmatiser by mass, see	0391	1	
CYCLONITE, DESENSITIZED, see	0483	1	
CYCLONITE, WETTED with not less than 15 % water, by mass, see	0072	1	
CYCLOOCTADIENES	2520	3	
CYCLOOCTADIENE PHOSPHINES, see	2940	4.2	
CYCLOOCTATETRAENE	2358	3	
CYCLOPENTANE	1146	3	
CYCLOPENTANOL	2244	3	
CYCLOPENTANONE	2245	3	
CYCLOPENTENE	2246	3	
CYCLOPROPANE	1027	2	
CYCLOTETRAMETHYLENE-TETRANITRAMINE, DESENSITIZED	0484	1	
CYCLOTETRAMETHYLENE-TETRANITRAMINE, WETTED with not less than 15 % water, by mass	0226	1	
CYCLOTRIMETHYLENE-TRINITRAMINE AND CYCLOTETRAMETHYLENE-TETRANITRAMINE MIXTURE, DESENSITIZED with not less than 10 % phlegmatiser by mass	0391	1	
CYCLOTRIMETHYLENE-TRINITRAMINE AND CYCLOTETRAMETHYLENE-TETRANITRAMINE MIXTURE, WETTED with not less than 15 % water, by mass	0391	1	
CYCLOTRIMETHYLENE-TRINITRAMINE, DESENSITIZED	0483	1	
CYCLOTRIMETHYLENE-TRINITRAMINE, WETTED with not less than 15 % water, by mass	0072	1	
CYMENES	2046	3	
Cymol, see	2046	3	
Deanol, see	2051	8	
DANGEROUS GOODS IN APPARATUS	3363	9	
DANGEROUS GOODS IN ARTICLES	3363	9	
DANGEROUS GOODS IN MACHINERY	3363	9	

Name and description	UN	Class	Remarks
DECABORANE	1868	4.1	
DECAHYDRONAPHTHALENE	1147	3	
Decalin, see	1147	3	
n-DECANE	2247	3	
DEFLAGRATING METAL SALTS OF AROMATIC NITRODERIVATIVES, N.O.S.	0132	1	
Depth charge, see	0056	1	
DESENSITIZED EXPLOSIVE, LIQUID, N.O.S.	3379	3	
DESENSITIZED EXPLOSIVE, SOLID, N.O.S.	3380	4.1	
Detonating relays, see	0029	1	
	0267	1	
	0360	1	
	0361	1	
	0455	1	
	0500	1	
DETONATOR ASSEMBLIES, NON-ELECTRIC for blasting	0360	1	
	0361	1	
	0500	1	
DETONATORS FOR AMMUNITION	0073	1	
	0364	1	
	0365	1	
	0366	1	
DETONATORS, ELECTRIC for blasting	0030	1	
	0255	1	
	0456	1	
DETONATORS, ELECTRONIC programmable for blasting	0511	1	
	0512	1	
	0513	1	
DETONATORS, NON-ELECTRIC for blasting	0029	1	
	0267	1	
	0455	1	
DEUTERIUM, COMPRESSED	1957	2	
DEVICES, SMALL, HYDROCARBON GAS POWERED with release device	3150	2	
DIACETONE ALCOHOL	1148	3	
DIALLYLAMINE	2359	3	
DIALLYL ETHER	2360	3	
4,4'-DIAMINODIPHENYL-METHANE	2651	6.1	
1,2-Diaminoethane, see	1604	8	
Diaminopropylamine, see	2269	8	
DI-n-AMYLAMINE	2841	3	
DIAZODINITROPHENOL, WETTED with not less than 40 % water, or mixture of alcohol and water, by mass	0074	1	
Dibenzopyridine, see	2713	6.1	

Name and description	UN No.	Class	Remarks
DIBENZYLDICHLORO-SILANE	2434	8	
DIBORANE	1911	2	
1,2-DIBROMOBUTAN-3-ONE	2648	6.1	
DIBROMOCHLOROPROPANES	2872	6.1	
1,2-Dibromo-3-chloropropane, see	2872	6.1	
DIBROMODIFLUOROMETHANE	1941	9	
DIBROMOMETHANE	2664	6.1	
DI-n-BUTYLAMINE	2248	8	
DIBUTYLAMINOETHANOL	2873	6.1	
2-Dibutylaminoethanol, see	2873	6.1	
N,N-Di-n-butylaminoethanol, see	2873	6.1	
DIBUTYL ETHERS	1149	3	
DICHLOROACETIC ACID	1764	8	
1,3-DICHLOROACETONE	2649	6.1	
DICHLOROACETYL CHLORIDE	1765	8	
DICHLOROANILINES, LIQUID	1590	6.1	
DICHLOROANILINES, SOLID	3442	6.1	
o-DICHLOROBENZENE	1591	6.1	
2,2'-DICHLORODIETHYL ETHER	1916	6.1	
DICHLORODIFLUORO-METHANE	1028	2	
DICHLORODIFLUORO-METHANE AND DIFLUOROETHANE AZEOTROPIC MIXTURE with approximately 74 % dichlorodifluoromethane	2602	2	
Dichlorodifluoromethane and ethylene oxide mixture, see	3070	2	
DICHLORODIMETHYL ETHER, SYMMETRICAL	2249	6.1	Carriage prohibited
1,1-DICHLOROETHANE	2362	3	
1,2-Dichloroethane, see	1184	3	
1,2-DICHLOROETHYLENE	1150	3	
Di(2-chloroethyl) ether, see	1916	6.1	
DICHLOROFLUOROMETHANE	1029	2	
alpha-Dichlorohydrin, see	2750	6.1	
DICHLOROISOCYANURIC ACID, DRY	2465	5.1	
DICHLOROISOCYANURIC ACID SALTS	2465	5.1	
DICHLOROISOPROPYL ETHER	2490	6.1	
DICHLOROMETHANE	1593	6.1	
1,1-DICHLORO-1-NITROETHANE	2650	6.1	
DICHLOROPENTANES	1152	3	

Name and description	UN	Class	Remarks
Dichlorophenol, see	2020	6.1	
	2021	6.1	
DICHLOROPHENYL ISOCYANATES	2250	6.1	
DICHLOROPHENYLTRI-CHLOROSILANE	1766	8	
1,2-DICHLOROPROPANE	1279	3	
1,3-DICHLOROPROPANOL-2	2750	6.1	
1,3-Dichloro-2-propanone, see	2649	6.1	
DICHLOROPROPENES	2047	3	
DICHLOROSILANE	2189	2	
1,2-DICHLORO-1,1,2,2-TETRAFLUOROETHANE	1958	2	
Dichloro-s-triazine-2,4,6-trione, see	2465	5.1	
1,4-Dicyanobutane, see	2205	6.1	
Dicycloheptadiene, see	2251	3	
DICYCLOHEXYLAMINE	2565	8	
Dicyclohexylamine nitrite, see	2687	4.1	
DICYCLOHEXYL-AMMONIUM NITRITE	2687	4.1	
DICYCLOPENTADIENE	2048	3	
1,2-DI-(DIMETHYLAMINO) ETHANE	2372	3	
DIDYMIUM NITRATE	1465	5.1	
DIESEL FUEL	1202	3	
1,1-Diethoxyethane, see	1088	3	
1,2-Diethoxyethane, see	1153	3	
DIETHOXYMETHANE	2373	3	
3,3-DIETHOXYPROPENE	2374	3	
DIETHYLAMINE	1154	3	
2-DIETHYLAMINOETHANOL	2686	8	
3-DIETHYLAMINO-PROPYLAMINE	2684	3	
N,N-DIETHYLANILINE	2432	6.1	
DIETHYLBENZENE	2049	3	
Diethylcarbinol, see	1105	3	
DIETHYL CARBONATE	2366	3	
DIETHYLDICHLOROSILANE	1767	8	
Diethylenediamine, see	2579	8	
DIETHYLENEGLYCOL DINITRATE, DESENSITIZED with not less than 25 % non-volatile, water-insoluble phlegmatizer, by mass	0075	1	
DIETHYLENETRIAMINE	2079	8	
N,N-Diethylethanolamine, see	2686	3	

Name and description	UN No.	Class	Remarks
DIETHYL ETHER	1155	3	
N,N-DIETHYLETHYLENE-DIAMINE	2685	8	
Di-(2-ethylhexyl) phosphoric acid, see	1902	8	
DIETHYL KETONE	1156	3	
DIETHYL SULPHATE	1594	6.1	
DIETHYL SULPHIDE	2375	3	
DIETHYLTHIOPHOSPHORYL CHLORIDE	2751	8	
Diethylzinc, see	3394	4.2	
2,4-Difluoroaniline, see	2941	6.1	
Difluorochloroethane, see	2517	2	
1,1-DIFLUOROETHANE	1030	2	
1,1-DIFLUOROETHYLENE	1959	2	
DIFLUOROMETHANE	3252	2	
Difluoromethane, pentafluoroethane, and 1,1,1,2-tetrafluoroethane zeotropic mixture with approximately 10 % difluoromethane and 70 % pentafluoroethane, see	3339	2	
Difluoromethane, pentafluoroethane, and 1,1,1,2-tetrafluoroethane zeotropic mixture with approximately 20 % difluoromethane and 40 % pentafluoroethane, see	3338	2	
Difluoromethane, pentafluoroethane, and 1,1,1,2-tetrafluoroethane zeotropic mixture with approximately 23 % difluoromethane and 25 % pentafluoroethane, see	3340	2	
DIFLUOROPHOSPHORIC ACID, ANHYDROUS	1768	8	
2,3-DIHYDROPYRAN	2376	3	
DIISOBUTYLAMINE	2361	3	
DIISOBUTYLENE, ISOMERIC COMPOUNDS	2050	3	
alpha-Diisobutylene, see	2050	3	
beta-Diisobutylene, see	2050	3	
DIISOBUTYL KETONE	1157	3	
DIISOOCTYL ACID PHOSPHATE	1902	8	
DIISOPROPYLAMINE	1158	3	
DIISOPROPYL ETHER	1159	3	
DIKETENE, STABILIZED	2521	6.1	
1,1-DIMETHOXYETHANE	2377	3	
1,2-DIMETHOXYETHANE	2252	3	

Name and description	UN	Class	Remarks
Dimethoxystrychnine, see	1570	6.1	
DIMETHYLAMINE, ANHYDROUS	1032	2	
DIMETHYLAMINE AQUEOUS SOLUTION	1160	3	
2-DIMETHYLAMINO-ACETONITRILE	2378	3	
2-DIMETHYLAMINOETHANOL	2051	8	
2-DIMETHYLAMINOETHYL ACRYLATE, STABILIZED	3302	6.1	
2-DIMETHYLAMINOETHYL METHACRYLATE, STABILIZED	2522	6.1	
N,N-DIMETHYLANILINE	2253	6.1	
Dimethylarsenic acid, see	1572	6.1	
N,N-Dimethylbenzylamine, see	2619	8	
2,3-DIMETHYLBUTANE	2457	3	
1,3-DIMETHYLBUTYLAMINE	2379	3	
DIMETHYLCARBAMOYL CHLORIDE	2262	8	
DIMETHYL CARBONATE	1161	3	
DIMETHYLCYCLOHEXANES	2263	3	
N,N-DIMETHYLCYCLO-HEXYLAMINE	2264	8	
DIMETHYLDICHLOROSILANE	1162	3	
DIMETHYLDIETHOXYSILANE	2380	3	
DIMETHYLDIOXANES	2707	3	
DIMETHYL DISULPHIDE	2381	3	
Dimethylethanolamine, see	2051	8	
DIMETHYL ETHER	1033	2	
N,N-DIMETHYLFORMAMIDE	2265	3	
DIMETHYLHYDRAZINE, SYMMETRICAL	2382	6.1	
DIMETHYLHYDRAZINE, UNSYMMETRICAL	1163	6.1	
1,1-Dimethylhydrazine, see	1163	6.1	
N,N-Dimethyl-4-nitrosoaniline, see	1369	4.2	
2,2-DIMETHYLPROPANE	2044	2	
DIMETHYL-N-PROPYLAMINE	2266	3	
DIMETHYL SULPHATE	1595	6.1	
DIMETHYL SULPHIDE	1164	3	
DIMETHYL THIOPHOSPHORYL CHLORIDE	2267	6.1	
Dimethylzinc, see	3394	4.2	
DINGU, see	0489	1	
DINITROANILINES	1596	6.1	
DINITROBENZENES, LIQUID	1597	6.1	

Name and description	UN No.	Class	Remarks
DINITROBENZENES, SOLID	3443	6.1	
Dinitrochlorobenzene, see	1577 3441	6.1 6.1	
DINITRO-o-CRESOL	1598	6.1	
DINITROGEN TETROXIDE	1067	2	
DINITROGLYCOLURIL	0489	1	
DINITROPHENOL, dry or wetted with less than 15 % water, by mass	0076	1	
DINITROPHENOL SOLUTION	1599	6.1	
DINITROPHENOL, WETTED with not less than 15 % water, by mass	1320	4.1	
DINITROPHENOLATES, alkali metals, dry or wetted with less than 15 % water, by mass	0077	1	
DINITROPHENOLATES, WETTED with not less than 15 % water, by mass	1321	4.1	
DINITRORESORCINOL, dry or wetted with less than 15 % water, by mass	0078	1	
DINITRORESORCINOL, WETTED with not less than 15 % water, by mass	1322	4.1	
DINITROSOBENZENE	0406	1	
Dinitrotoluene mixed with sodium chlorate, see	0083	1	
DINITROTOLUENES, LIQUID	2038	6.1	
DINITROTOLUENES, MOLTEN	1600	6.1	
DINITROTOLUENES, SOLID	3454	6.1	
DIOXANE	1165	3	
DIOXOLANE	1166	3	
DIPENTENE	2052	3	
DIPHENYLAMINE CHLOROARSINE	1698	6.1	
DIPHENYLCHLOROARSINE, LIQUID	1699	6.1	
DIPHENYLCHLOROARSINE, SOLID	3450	6.1	
DIPHENYLDICHLOROSILANE	1769	8	
DIPHENYLMETHYL BROMIDE	1770	8	
DIPICRYLAMINE, see	0079	1	
DIPICRYL SULPHIDE, dry or wetted with less than 10 % water, by mass	0401	1	
DIPICRYL SULPHIDE, WETTED with not less than 10 % water, by mass	2852	4.1	
DIPROPYLAMINE	2383	3	
Dipropylene triamine, see	2269	8	

Name and description	UN	Class	Remarks
DI-n-PROPYL ETHER	2384	3	
DIPROPYL KETONE	2710	3	
DISINFECTANT, LIQUID, CORROSIVE, N.O.S.	1903	8	
DISINFECTANT, LIQUID, TOXIC, N.O.S.	3142	6.1	
DISINFECTANT, SOLID, TOXIC, N.O.S.	1601	6.1	
DISODIUM TRIOXOSILICATE	3253	8	
DIVINYL ETHER, STABILIZED	1167	3	
DODECYLTRICHLOROSILANE	1771	8	
Dry ice, see	1845	9	Not subject to the Code except for 5.5.3
DYE INTERMEDIATE, LIQUID, CORROSIVE, N.O.S.	2801	8	
DYE INTERMEDIATE, LIQUID, TOXIC, N.O.S.	1602	6.1	
DYE INTERMEDIATE, SOLID, CORROSIVE, N.O.S.	3147	8	
DYE INTERMEDIATE, SOLID, TOXIC, N.O.S.	3143	6.1	
DYE, LIQUID, CORROSIVE, N.O.S.	2801	8	
DYE, LIQUID, TOXIC, N.O.S.	1602	6.1	
DYE, SOLID, CORROSIVE, N.O.S.	3147	8	
DYE, SOLID, TOXIC, N.O.S.	3143	6.1	
Dynamite, see	0081	1	
Electric storage batteries, see	2794 2795 2800 3028	8 8 8 8	
Electrolyte (acid or alkaline) for batteries, see	2796 2797	8 8	
ELEVATED TEMPERATURE LIQUID, N.O.S., at or above 100 °C and below its flash-point (including molten metals, molten salts, etc.)	3257	9	
ELEVATED TEMPERATURE LIQUID, FLAMMABLE, N.O.S. with flashpoint above 60 °C, at or above its flashpoint and at or above 100 °C	3256	3	
ELEVATED TEMPERATURE LIQUID, FLAMMABLE, N.O.S. with flashpoint above 60 °C, at or above its flashpoint and below 100 °C	3256	3	
ELEVATED TEMPERATURE SOLID, N.O.S., at or above 240 °C	3258	9	

Name and description	UN No.	Class	Remarks
Empty battery-vehicle, uncleaned			See 4.3.2.4, 5.1.3 and 5.4.1.1.6
Empty IBC, uncleaned			See 4.1.1.11, 5.1.3 and 5.4.1.1.6
Empty large packaging, uncleaned			See 4.1.1.11, 5.1.3 and 5.4.1.1.6
Empty MEGC, uncleaned			See 4.3.2.4, 5.1.3 and 5.4.1.1.6
Empty packaging, uncleaned			See 4.1.1.11, 5.1.3 and 5.4.1.1.6
Empty receptacle, uncleaned			See 5.1.3 and 5.4.1.1.6
Empty tank, uncleaned			See 4.3.2.4, 5.1.3 and 5.4.1.1.6
Empty vehicle, uncleaned			See 5.1.3 and 5.4.1.1.6
Enamel, see	1263 3066 3469 3470	3 8 3 8	
ENGINE, FUEL CELL, FLAMMABLE GAS POWERED	3529	2.1	
ENGINE, FUEL CELL, FLAMMABLE LIQUID POWERED	3528	3	
ENGINE, INTERNAL COMBUSTION	3530	9	
ENGINE, INTERNAL COMBUSTION, FLAMMABLE GAS POWERED	3529	2	
ENGINE, INTERNAL COMBUSTION, FLAMMABLE LIQUID POWERED	3528	3	
Engines, rocket, see	0250 0322	1 1	
ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.	3082	9	
ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.	3077	9	
EPIBROMOHYDRIN	2558	6.1	
EPICHLOROHYDRIN	2023	6.1	
1,2-Epoxybutane, stabilized, see	3022	3	
Epoxyethane, see	1040	2	
1,2-EPOXY-3-ETHOXYPROPANE	2752	3	
2,3-Epoxy-1-propanal, see	2622	3	
2,3-Epoxypropyl ethyl ether, see	2752	3	

Name and description	UN	Class	Remarks
ESTERS, N.O.S.	3272	3	
ETHANE	1035	2	
ETHANE, REFRIGERATED LIQUID	1961	2	
Ethanethiol, see	2363	3	
ETHANOL	1170	3	
ETHANOL AND GASOLINE MIXTURE or ETHANOL AND MOTOR SPIRIT MIXTURE or ETHANOL AND PETROL MIXTURE, with more than 10 % ethanol	3475	3	
ETHANOL SOLUTION	1170	3	
ETHANOLAMINE	2491	8	
ETHANOLAMINE SOLUTION	2491	8	
Ether, see	1155	3	
ETHERS, N.O.S.	3271	3	
2-Ethoxyethanol, see	1171	3	
2-Ethoxyethyl acetate, see	1172	3	
Ethoxy propane-1, see	2615	3	
ETHYL ACETATE	1173	3	
ETHYLACETYLENE, STABILIZED	2452	2	
ETHYL ACRYLATE, STABILIZED	1917	3	
ETHYL ALCOHOL, see	1170	3	
ETHYL ALCOHOL SOLUTION, see	1170	3	
ETHYLAMINE	1036	2	
ETHYLAMINE, AQUEOUS SOLUTION with not less than 50 % but not more than 70 % ethylamine	2270	3	
ETHYL AMYL KETONE	2271	3	
N-ETHYLANILINE	2272	6.1	
2-ETHYLANILINE	2273	6.1	
ETHYLBENZENE	1175	3	
N-ETHYL-N-BENZYLANILINE	2274	6.1	
N-ETHYLBENZYLTOLUIDINES, LIQUID	2753	6.1	
N-ETHYLBENZYLTOLUIDINES, SOLID	3460	6.1	
ETHYL BORATE	1176	3	
ETHYL BROMIDE	1891	3	
ETHYL BROMOACETATE	1603	6.1	
2-ETHYLBUTANOL	2275	3	
2-ETHYLBUTYL ACETATE	1177	3	
ETHYL BUTYL ETHER	1179	3	
2-ETHYLBUTYRALDEHYDE	1178	3	

Name and description	UN No.	Class	Remarks
ETHYL BUTYRATE	1180	3	
ETHYL CHLORIDE	1037	2	
ETHYL CHLOROACETATE	1181	6.1	
Ethyl chlorocarbonate, see	1182	6.1	
ETHYL CHLOROFORMATE	1182	6.1	
ETHYL 2-CHLOROPROPIONATE	2935	3	
Ethyl-alpha-chloropropionate, see	2935	3	
ETHYL CHLOROTHIOFORMATE	2826	8	
ETHYL CROTONATE	1862	3	
ETHYLDICHLOROARSINE	1892	6.1	
ETHYLDICHLOROSILANE	1183	4.3	
ETHYLENE, ACETYLENE AND PROPYLENE MIXTURE, REFRIGERATED LIQUID containing at least 71.5 % ethylene with not more than 22.5 % acetylene and not more than 6 % propylene	3138	2	
ETHYLENE CHLOROHYDRIN	1135	6.1	
ETHYLENE	1962	2	
ETHYLENEDIAMINE	1604	8	
ETHYLENE DIBROMIDE	1605	6.1	
Ethylene dibromide and methyl bromide, liquid mixture, see	1647	6.1	
ETHYLENE DICHLORIDE	1184	3	
ETHYLENE GLYCOL DIETHYL ETHER	1153	3	
ETHYLENE GLYCOL MONOETHYL ETHER	1171	3	
ETHYLENE GLYCOL MONOETHYL ETHER ACETATE	1172	3	
ETHYLENE GLYCOL MONOMETHYL ETHER	1188	3	
ETHYLENE GLYCOL MONOMETHYL ETHER ACETATE	1189	3	
ETHYLENEIMINE, STABILIZED	1185	6.1	
ETHYLENE OXIDE	1040	2	
ETHYLENE OXIDE AND CARBON DIOXIDE MIXTURE with more than 87 % ethylene oxide	3300	2	
ETHYLENE OXIDE AND CARBON DIOXIDE MIXTURE with more than 9 % but not more than 87 % ethylene oxide	1041	2	
ETHYLENE OXIDE AND CARBON DIOXIDE MIXTURE with not more than 9 % ethylene oxide	1952	2	

Name and description	UN	Class	Remarks
ETHYLENE OXIDE AND CHLOROTETRAFLUORO-ETHANE MIXTURE with not more than 8.8 % ethylene oxide	3297	2	
ETHYLENE OXIDE AND DICHLORODIFLUORO-METHANE MIXTURE with not more than 12.5 % ethylene oxide	3070	2	
ETHYLENE OXIDE AND PENTAFLUOROETHANE MIXTURE with not more than 7.9 % ethylene oxide	3298	2	
ETHYLENE OXIDE AND PROPYLENE OXIDE MIXTURE, not more than 30 % ethylene oxide	2983	3	
ETHYLENE OXIDE AND TETRAFLUOROETHANE MIXTURE with not more than 5.6 % ethylene oxide	3299	2	
ETHYLENE OXIDE WITH NITROGEN up to a total pressure of 1 MPa (10 bar) at 50 °C	1040	2	
ETHYLENE, REFRIGERATED LIQUID	1038	2	
ETHYL ETHER, see	1155	3	
ETHYL FLUORIDE	2453	2	
ETHYL FORMATE	1190	3	
2-ETHYLHEXYLAMINE	2276	3	
2-ETHYLHEXYL CHLOROFORMATE	2748	6.1	
Ethylidene chloride, see	2362	3	
ETHYL ISOBUTYRATE	2385	3	
ETHYL ISOCYANATE	2481	6.1	
ETHYL LACTATE	1192	3	
ETHYL MERCAPTAN	2363	3	
ETHYL METHACRYLATE, STABILIZED	2277	3	
ETHYL METHYL ETHER	1039	2	
ETHYL METHYL KETONE	1193	3	
ETHYL NITRITE SOLUTION	1194	3	
ETHYL ORTHOFORMATE	2524	3	
ETHYL OXALATE	2525	6.1	
ETHYLPHENYL-DICHLOROSILANE	2435	8	
1-ETHYLPIPERIDINE	2386	3	
ETHYL PROPIONATE	1195	3	
ETHYL PROPYL ETHER	2615	3	
Ethyl silicate, see	1292	3	
Ethyl sulphate, see	1594	6.1	

Name and description	UN No.	Class	Remarks
N-ETHYLTOLUIDINES	2754	6.1	
ETHYLTRICHLOROSILANE	1196	3	
EXPLOSIVE, BLASTING, TYPE A	0081	1	
EXPLOSIVE, BLASTING, TYPE B	0082 0331	1 1	
EXPLOSIVE, BLASTING, TYPE C	0083	1	
EXPLOSIVE, BLASTING, TYPE D	0084	1	
EXPLOSIVE, BLASTING, TYPE E	0241 0332	1 1	
Explosives, emulsion, see	0241 0332	1 1	
Explosive, seismic, see	0081 0082 0083 0331	1 1 1 1	
Explosive, slurry, see	0241 0332	1 1	
Explosive, water gel, see	0241 0332	1 1	
Extracts, aromatic, liquid, see	1197	3	
Extracts, flavouring, liquid, see	1197	3	
EXTRACTS, LIQUID, for flavour or aroma	1197	3	
FABRICS, ANIMAL, N.O.S. with oil	1373	4.2	
FABRICS IMPREGNATED WITH WEAKLY NITRATED NITROCELLULOSE, N.O.S.	1353	4.1	
FABRICS, SYNTHETIC, N.O.S. with oil	1373	4.2	
FABRICS, VEGETABLE, N.O.S. with oil	1373	4.2	
FERRIC ARSENATE	1606	6.1	
FERRIC ARSENITE	1607	6.1	
FERRIC CHLORIDE, ANHYDROUS	1773	8	
FERRIC CHLORIDE SOLUTION	2582	8	
FERRIC NITRATE	1466	5.1	
FERROCERIUM	1323	4.1	
FERROSILICON with 30 % or more but less than 90 % silicon	1408	4.3	
FERROUS ARSENATE	1608	6.1	
FERROUS METAL BORINGS in a form liable to self-heating	2793	4.2	
FERROUS METAL CUTTINGS in a form liable to self-heating	2793	4.2	
FERROUS METAL SHAVINGS in a form liable to self-heating	2793	4.2	

Name and description	UN	Class	Remarks
FERROUS METAL TURNINGS in a form liable to self-heating	2793	4.2	
FERTILIZER AMMONIATING SOLUTION with free ammonia	1043	2	
Fertilizer with ammonium nitrate, n.o.s., see	2067 2071	5.1 9	
Fibres, animal, burnt wet or damp	1372	4.2	Not subject to the Code
FIBRES, ANIMAL, N.O.S. with oil	1373	4.2	
FIBRES IMPREGNATED WITH WEAKLY NITRATED NITROCELLULOSE, N.O.S.	1353	4.1	
FIBRES, SYNTHETIC, N.O.S. with oil	1373	4.2	
Fibres, vegetable, burnt wet or damp	1372	4.2	Not subject to the Code
Fibres, vegetable, dry	3360	4.1	Not subject to the Code
FIBRES, VEGETABLE, N.O.S. with oil	1373	4.2	
Films, nitrocellulose base, from which gelatine has been removed; film scrap, see	2002	4.2	
FILMS, NITROCELLULOSE BASE, gelatin coated, except scrap	1324	4.1	
Filler, liquid, see	1263 3066 3469 3470	3 8 3 8	
FIRE EXTINGUISHER CHARGES, corrosive liquid	1774	8	
Fire extinguisher charges, expelling, explosive, see	0275 0276 0323 0381	1 1 1 1	
FIRE EXTINGUISHERS with compressed or liquefied gas	1044	2	
FIRELIGHTERS, SOLID with flammable liquid	2623	4.1	
FIREWORKS	0333 0334 0335 0336 0337	1 1 1 1 1	See 2.2.1.1.7
FIRST AID KIT	3316	9	
Fish meal, stabilized	2216	9	Not subject to the Code
FISH MEAL, UNSTABILIZED	1374	4.2	
Fish scrap, stabilized, see	2216	9	Not subject to the Code
FISH SCRAP, UNSTABILIZED, see	1374	4.2	
Flammable gas in lighters, see	1057	2	

Name and description	UN No.	Class	Remarks
FLAMMABLE LIQUID, N.O.S.	1993	3	
FLAMMABLE LIQUID, CORROSIVE, N.O.S.	2924	3	
FLAMMABLE LIQUID, TOXIC, N.O.S.	1992	3	
FLAMMABLE LIQUID, TOXIC, CORROSIVE, N.O.S.	3286	3	
FLAMMABLE SOLID, CORROSIVE, INORGANIC, N.O.S.	3180	4.1	
FLAMMABLE SOLID, CORROSIVE, ORGANIC, N.O.S.	2925	4.1	
FLAMMABLE SOLID, INORGANIC, N.O.S.	3178	4.1	
FLAMMABLE SOLID, ORGANIC, N.O.S.	1325	4.1	
FLAMMABLE SOLID, ORGANIC, MOLTEN, N.O.S.	3176	4.1	
FLAMMABLE SOLID, OXIDIZING, N.O.S.	3097	4.1	Carriage prohibited
FLAMMABLE SOLID, TOXIC, INORGANIC, N.O.S.	3179	4.1	
FLAMMABLE SOLID, TOXIC, ORGANIC, N.O.S.	2926	4.1	
FLARES, AERIAL	0093 0403 0404 0420 0421	1 1 1 1 1	
Flares, aeroplane, see	0093 0403 0404 0420 0421	1 1 1 1 1	
Flares, highway, Flares, distress, small, Flares, railway or highway, see	0191 0373	1 1	
FLARES, SURFACE	0092 0418 0419	1 1 1	
Flares, water-activated, see	0248 0249	1 1	
FLASH POWDER	0094 0305	1 1	
Flue dusts, toxic, see	1562	6.1	
Fluoric acid, see	1790	8	
FLUORINE, COMPRESSED	1045	2	
FLUOROACETIC ACID	2642	6.1	
FLUOROANILINES	2941	6.1	
2-Fluoroaniline, see	2941	6.1	
4-Fluoroaniline, see	2941	6.1	

Name and description	UN	Class	Remarks
o-Fluoroaniline, see	2941	6.1	
p-Fluoroaniline, see	2941	6.1	
FLUOROBENZENE	2387	3	
FLUOROBORIC ACID	1775	8	
Fluoroethane, see	2453	2	
Fluoroform, see	1984	2	
Fluoromethane, see	2454	2	
FLUOROPHOSPHORIC ACID, ANHYDROUS	1776	8	
FLUOROSILICATES, N.O.S.	2856	6.1	
FLUOROSILICIC ACID	1778	8	
FLUOROSULPHONIC ACID	1777	8	
FLUOROTOLUENES	2388	3	
FORMALDEHYDE SOLUTION with not less than 25 % formaldehyde	2209	8	
FORMALDEHYDE SOLUTION, FLAMMABLE	1198	3	
Formalin, see	1198	3	
	2209	8	
Formamidine sulphinic acid, see	3341	4.2	
FORMIC ACID with more than 85 % acid by mass	1779	8	
FORMIC ACID with not more than 85 % acid by mass	3412	8	
Formic aldehyde, see	1198	3	
	2209	8	
2-Formyl-3,4-dihydro-2H-pyran, see	2607	3	
FRACTURING DEVICES, EXPLOSIVE without detonator, for oil wells	0099	1	
FUEL, AVIATION, TURBINE ENGINE	1863	3	
FUEL CELL CARTRIDGES	3478	2	
	3479	2	
	3473	3	
	3476	4.3	
	3477	8	
FUEL CELL CARTRIDGES CONTAINED IN EQUIPMENT	3478	2	
	3479	2	
	3473	3	
	3476	4.3	
	3477	8	
FUEL CELL CARTRIDGES PACKED WITH EQUIPMENT	3478	2	
	3479	2	
	3473	3	
	3476	4.3	
	3477	8	
Fumaroyl dichloride, see	1780	3	
FUMARYL CHLORIDE	1780	8	

Name and description	UN No.	Class	Remarks
FUMIGATED CARGO TRANSPORT UNIT	3359	9	
FURALDEHYDES	1199	6.1	
FURAN	2389	3	
FURFURYL ALCOHOL	2874	6.1	
FURFURYLAMINE	2526	3	
Furyl carbinol, see	2874	6.1	
FUSE, DETONATING, metal clad	0102	1	
	0290	1	
FUSE, DETONATING, MILD EFFECT, metal clad	0104	1	
FUSE, IGNITER, tubular, metal clad	0103	1	
FUSE, NON-DETONATING	0101	1	
FUSEL OIL	1201	3	
FUSE, SAFETY	0105	1	
Fuze, combination, percussion or time, see	0106	1	
	0107	1	
	0257	1	
	0316	1	
	0317	1	
	0367	1	
	0368	1	
FUZES, DETONATING	0106	1	
	0107	1	
	0257	1	
	0367	1	
FUZES, DETONATING with protective features	0408	1	
	0409	1	
	0410	1	
FUZES, IGNITING	0316	1	
	0317	1	
	0368	1	
GALLIUM	2803	8	
GAS CARTRIDGES without a release device, non-refillable, see	2037	2	
Gas drips, hydrocarbon, see	3295	3	
GAS OIL	1202	3	
GASOLINE	1203	3	
Gasoline and ethanol mixture, with more than 10 % ethanol, see	3475	3	
Gasoline, casinghead, see	1203	3	
GAS, REFRIGERATED LIQUID, N.O.S.	3158	2	
GAS, REFRIGERATED LIQUID, FLAMMABLE, N.O.S.	3312	2	
GAS, REFRIGERATED LIQUID, OXIDIZING, N.O.S.	3311	2	
GAS SAMPLE, NON-PRESSURIZED, FLAMMABLE, N.O.S., not refrigerated liquid	3167	2	

Name and description	UN	Class	Remarks
GAS SAMPLE, NON-PRESSURIZED, TOXIC, N.O.S., not refrigerated liquid	3169	2	
GAS SAMPLE, NON-PRESSURIZED, TOXIC, FLAMMABLE, N.O.S., not refrigerated liquid	3168	2	
Gelatin, blasting, see	0081	1	
Gelatin, dynamites, see	0081	1	
GENETICALLY MODIFIED MICROORGANISMS	3245	9	
GENETICALLY MODIFIED ORGANISMS	3245	9	
GERMANE	2192	2	
GERMANE, ADSORBED	3523	2	
Germanium hydride, see	2192	2	
Glycer-1,3-dichlorohydrin, see	2750	6.1	
GLYCEROL alpha-MONOCHLOROHYDRIN	2689	6.1	
Glyceryl trinitrate, see	0143	1	
	0144	1	
	1204	3	
	3064	3	
GLYCIDALDEHYDE	2622	3	
GRENADES, hand or rifle, with bursting charge	0284	1	
	0285	1	
	0292	1	
	0293	1	
Grenades, illuminating, see	0171	1	
	0254	1	
	0297	1	
GRENADES, PRACTICE, hand or rifle	0110	1	
	0318	1	
	0372	1	
	0452	1	
Grenades, smoke, see	0015	1	
	0016	1	
	0245	1	
	0246	1	
	0303	1	
GUANIDINE NITRATE	1467	5.1	
GUANYLNITROSAMINO-GUANYLIDENE HYDRAZINE, WETTED with not less than 30 % water, by mass	0113	1	
GUANYLNITROSAMINO-GUANYLTETRAZENE, WETTED with not less than 30 % water, or mixture of alcohol and water, by mass	0114	1	
GUNPOWDER, COMPRESSED, see	0028	1	
GUNPOWDER, granular or as a meal, see	0027	1	
GUNPOWDER, IN PELLETS, see	0028	1	
Gutta percha solution, see	1287	3	
HAFNIUM POWDER, DRY	2545	4.2	
HAFNIUM POWDER, WETTED with not less than 25 % water	1326	4.1	
HALOGENATED MONOMETHYLDIPHENYL-METHANES, LIQUID	3151	9	
HALOGENATED MONOMETHYLDIPHENYL-METHANES, SOLID	3152	9	
Hay	1327	4.1	Not subject to the Code
HEATING OIL, LIGHT	1202	3	
Heavy hydrogen, see	1957	2	
HELIUM, COMPRESSED	1046	2	
HELIUM, REFRIGERATED LIQUID	1963	2	
HEPTAFLUOROPROPANE	3296	2	
n-HEPTALDEHYDE	3056	3	
n-Heptanal, see	3056	3	
HEPTANES	1206	3	
4-Heptanone, see	2710	3	
n-HEPTENE	2278	3	
HEXACHLOROACETONE	2661	6.1	
HEXACHLOROBENZENE	2729	6.1	
HEXACHLOROBUTADIENE	2279	6.1	
Hexachloro-1,3-butadiene, see	2279	6.1	
HEXACHLOROCYCLO-PENTADIENE	2646	6.1	
HEXACHLOROPHENE	2875	6.1	
Hexachloro-2-propanone, see	2661	6.1	
HEXADECYLTRICHLORO-SILANE	1781	8	
HEXADIENES	2458	3	
HEXAETHYL TETRAPHOSPHATE	1611	6.1	
HEXAETHYL TETRAPHOSPHATE AND COMPRESSED GAS MIXTURE	1612	2	
HEXAFLUOROACETONE	2420	2	
HEXAFLUOROACETONE HYDRATE, LIQUID	2552	6.1	
HEXAFLUOROACETONE HYDRATE, SOLID	3436	6.1	
HEXAFLUOROETHANE	2193	2	
HEXAFLUOROPHOSPHORIC ACID	1782	8	

Name and description	UN	Class	Remarks
HEXAFLUOROPROPYLENE	1858	2	
Hexahydrocresol, see	2617	3	
Hexahydromethyl phenol, see	2617	3	
HEXALDEHYDE	1207	3	
HEXAMETHYLENEDIAMINE, SOLID	2280	8	
HEXAMETHYLENEDIAMINE SOLUTION	1783	8	
HEXAMETHYLENE DIISOCYANATE	2281	6.1	
HEXAMETHYLENEIMINE	2493	3	
HEXAMETHYLENETETRAMINE	1328	4.1	
Hexamine, see	1328	4.1	
HEXANES	1208	3	
HEXANITRODIPHENYLAMINE	0079	1	
HEXANITROSTILBENE	0392	1	
Hexanoic acid, see	2829	8	
HEXANOLS	2282	3	
1-HEXENE	2370	3	
HEXOGEN AND CYCLOTETRAMETHYLENE-TETRANITRAMINE MIXTURE, WETTED with not less than 15 % water, by mass or DESENSITIZED with not less than 10 % phlegmatiser by mass, see	0391	1	
HEXOGEN, DESENSITIZED, see	0483	1	
HEXOGEN, WETTED with not less than 15 % water, by mass, see	0072	1	
HEXOLITE, dry or wetted with less than 15 % water, by mass	0118	1	
HEXOTOL, dry or wetted with less than 15 % water, by mass, see	0118	1	
HEXOTONAL	0393	1	
HEXOTONAL, cast, see	0393	1	
HEXYL, see	0079	1	
HEXYLTRICHLOROSILANE	1784	8	
HMX, see	0391	1	
HMX, DESENSITIZED, see	0484	1	
HMX, WETTED with not less than 15 % water, by mass, see	0226	1	
HYDRAZINE, ANHYDROUS	2029	8	
HYDRAZINE AQUEOUS SOLUTION, with more than 37 % hydrazine by mass	2030	8	
HYDRAZINE, AQUEOUS SOLUTION with not more than 37 % hydrazine, by mass	3293	6.1	
HYDRAZINE AQUEOUS SOLUTION, FLAMMABLE with more than 37 % hydrazine, by mass	3484	8	
Hydrides, metal, water-reactive, n.o.s., see	1409	4.3	
Hydriodic acid, anhydrous, see	2197	2	
HYDRIODIC ACID	1787	8	
HYDROBROMIC ACID	1788	8	
HYDROCARBON GAS MIXTURE, COMPRESSED, N.O.S.	1964	2	
HYDROCARBON GAS MIXTURE, LIQUEFIED, N.O.S. such as mixtures A, A01, A02, A0, A1, B1, B2, B or C	1965	2	
HYDROCARBON GAS REFILLS FOR SMALL DEVICES with release device	3150	2	
HYDROCARBONS, LIQUID, N.O.S.	3295	3	
HYDROCHLORIC ACID	1789	8	
HYDROCYANIC ACID, AQUEOUS SOLUTION with not more than 20 % hydrogen cyanide	1613	6.1	
HYDROFLUORIC ACID with more than 60 % but not more than 85 % hydrogen fluoride	1790	8	
HYDROFLUORIC ACID with more than 85 % hydrogen fluoride	1790	8	
HYDROFLUORIC ACID with not more than 60 % hydrogen fluoride	1790	8	
HYDROFLUORIC ACID AND SULPHURIC ACID MIXTURE	1786	8	
Hydrofluoroboric acid, see	1775	8	
Hydrofluorosilicic acid, see	1778	8	
HYDROGEN AND METHANE MIXTURE, COMPRESSED	2034	2	
Hydrogen arsenide, see	2188	2	
HYDROGEN BROMIDE, ANHYDROUS	1048	2	
Hydrogen bromide solution, see	1788	8	
HYDROGEN CHLORIDE, ANHYDROUS	1050	2	
HYDROGEN CHLORIDE, REFRIGERATED LIQUID	2186	2	Carriage prohibited
HYDROGEN, COMPRESSED	1049	2	
HYDROGEN CYANIDE, AQUEOUS SOLUTION with not more than 20 % hydrogen cyanide, see	1613	6.1	

Name and description	UN	Class	Remarks
HYDROGEN CYANIDE, SOLUTION IN ALCOHOL with not more than 45 % hydrogen cyanide	3294	6.1	
HYDROGEN CYANIDE, STABILIZED containing less than 3 % water	1051	6.1	
HYDROGEN CYANIDE, STABILIZED, containing less than 3 % water and absorbed in a porous inert material	1614	6.1	
HYDROGENDIFLUORIDES, SOLID, N.O.S.	1740	8	
HYDROGENDIFLUORIDES SOLUTION, N.O.S.	3471	8	
HYDROGEN FLUORIDE, ANHYDROUS	1052	8	
Hydrogen fluoride solution, see	1790	8	
HYDROGEN IN A METAL HYDRIDE STORAGE SYSTEM	3468	2	
HYDROGEN IN A METAL HYDRIDE STORAGE SYSTEM CONTAINED IN EQUIPMENT	3468	2	
HYDROGEN IN A METAL HYDRIDE STORAGE SYSTEM PACKED WITH EQUIPMENT	3468	2	
HYDROGEN IODIDE, ANHYDROUS	2197	2	
Hydrogen iodide solution, see	1787	8	
HYDROGEN PEROXIDE AND PEROXYACETIC ACID MIXTURE with acid(s), water and not more than 5 % peroxyacetic acid, STABILIZED	3149	5.1	
HYDROGEN PEROXIDE, AQUEOUS SOLUTION with not less than 8 % but less than 20 % hydrogen peroxide (stabilized as necessary)	2984	5.1	
HYDROGEN PEROXIDE, AQUEOUS SOLUTION with not less than 20 % but not more than 60 % hydrogen peroxide (stabilized as necessary)	2014	5.1	
HYDROGEN PEROXIDE, AQUEOUS SOLUTION, STABILIZED with more than 60 % hydrogen peroxide and not more than 70 % hydrogen peroxide	2015	5.1	
HYDROGEN PEROXIDE, AQUEOUS SOLUTION, STABILIZED with more than 70 % hydrogen peroxide	2015	5.1	
HYDROGEN PEROXIDE, STABILIZED	2015	5.1	

Name and description	UN No.	Class	Remarks
HYDROGEN, REFRIGERATED LIQUID	1966	2	
HYDROGEN SELENIDE, ADSORBED	3526	2	
HYDROGEN SELENIDE, ANHYDROUS	2202	2	
Hydrogen silicide, see	2203	2	
HYDROGEN SULPHIDE	1053	2	
Hydroselenic acid, see	2202	2	
Hydrosilicofluoric acid, see	1778	8	
1-HYDROXYBENZOTRIAZOLE, ANHYDROUS, dry or wetted with less than 20 % water, by mass	0508	1	
1-HYDROXYBENZOTRIAZOLE MONOHYDRATE	3474	4.1	
3-Hydroxybutan-2-one, see	2621	3	
HYDROXYLAMINE SULPHATE	2865	8	
1-Hydroxy-3-methyl-2-penten-4-yne, see	2705	8	
3-Hydroxyphenol, see	2876	6.1	
HYPOCHLORITES, INORGANIC, N.O.S.	3212	5.1	
HYPOCHLORITE SOLUTION	1791	8	
IGNITERS	0121 0314 0315 0325 0454	1 1 1 1 1	
3,3'-IMINODIPROPYLAMINE	2269	8	
Indiarubber, see	1287	3	
INFECTIOUS SUBSTANCE, AFFECTING ANIMALS only	2900	6.2	
INFECTIOUS SUBSTANCE, AFFECTING HUMANS	2814	6.2	
Ink, printer's, flammable, see	1210	3	
INSECTICIDE GAS, N.O.S.	1968	2	
INSECTICIDE GAS, FLAMMABLE, N.O.S.	3354	2	
INSECTICIDE GAS, TOXIC, N.O.S.	1967	2	
INSECTICIDE GAS, TOXIC, FLAMMABLE, N.O.S.	3355	2	
IODINE	3495	8	
IODINE MONOCHLORIDE, LIQUID	3498	8	
IODINE MONOCHLORIDE, SOLID	1792	8	
IODINE PENTAFLUORIDE	2495	5.1	
2-IODOBUTANE	2390	3	

Name and description	UN	Class	Remarks
Iodomethane, see	2644	6.1	
IODOMETHYLPROPANES	2391	3	
IODOPROPANES	2392	3	
alpha-Iodotoluene, see	2653	6.1	
I.p.d.i., see	2290	6.1	
Iron chloride, anhydrous, see	1773	8	
Iron (III) chloride, anhydrous, see	1773	8	
Iron chloride solution, see	2582	8	
IRON OXIDE, SPENT obtained from coal gas purification	1376	4.2	
IRON PENTACARBONYL	1994	6.1	
Iron perchloride, anhydrous, see	1773	8	
Iron powder, pyrophoric, see	1383	4.2	
Iron sesquichloride, anhydrous, see	1773	8	
IRON SPONGE, SPENT obtained from coal gas purification	1376	4.2	
Iron swarf, see	2793	4.2	
ISOBUTANE	1969	2	
ISOBUTANOL	1212	3	
Isobutene, see	1055	2	
ISOBUTYL ACETATE	1213	3	
ISOBUTYL ACRYLATE, STABILIZED	2527	3	
ISOBUTYL ALCOHOL, see	1212	3	
ISOBUTYL ALDEHYDE, see	2045	3	
ISOBUTYLAMINE	1214	3	
ISOBUTYLENE	1055	2	
ISOBUTYL FORMATE	2393	3	
ISOBUTYL ISOBUTYRATE	2528	3	
ISOBUTYL ISOCYANATE	2486	6.1	
ISOBUTYL METHACRYLATE, STABILIZED	2283	3	
ISOBUTYL PROPIONATE	2394	3	
ISOBUTYRALDEHYDE	2045	3	
ISOBUTYRIC ACID	2529	3	
ISOBUTYRONITRILE	2284	3	
ISOBUTYRYL CHLORIDE	2395	3	
ISOCYANATES, FLAMMABLE, TOXIC, N.O.S.	2478	3	
ISOCYANATES, TOXIC, N.O.S.	2206	6.1	
ISOCYANATES, TOXIC, FLAMMABLE, N.O.S.	3080	6.1	
ISOCYANATE SOLUTION, FLAMMABLE, TOXIC, N.O.S.	2478	3	
ISOCYANATE SOLUTION, TOXIC, N.O.S.	2206	6.1	
ISOCYANATE SOLUTION, TOXIC, FLAMMABLE, N.O.S.	3080	6.1	
ISOCYANATO-BENZOTRIFLUORIDES	2285	6.1	
3-Isocyanatomethyl-3,5,5-tri-methylcyclohexyl isocyanate, see	2290	6.1	
Isododecane, see	2286	3	
ISOHEPTENE	2287	3	
ISOHEXENE	2288	3	
Isooctane, see	1262	3	
ISOOCTENE	1216	3	
Isopentane, see	1265	3	
ISOPENTENES	2371	3	
Isopentylamine, see	1106	3	
Isopentyl nitrite, see	1113	3	
ISOPHORONEDIAMINE	2289	8	
ISOPHORONE DIISOCYANATE	2290	6.1	
ISOPRENE, STABILIZED	1218	3	
ISOPROPANOL	1219	3	
ISOPROPENYL ACETATE	2403	3	
ISOPROPENYLBENZENE	2303	3	
ISOPROPYL ACETATE	1220	3	
ISOPROPYL ACID PHOSPHATE	1793	8	
ISOPROPYL ALCOHOL, see	1219	3	
ISOPROPYLAMINE	1221	3	
ISOPROPYLBENZENE	1918	3	
ISOPROPYL BUTYRATE	2405	3	
Isopropyl chloride, see	2356	3	
ISOPROPYL CHLOROACETATE	2947	3	
ISOPROPYL CHLOROFORMATE	2407	6.1	
ISOPROPYL 2-CHLORO-PROPIONATE	2934	3	
Isopropyl-alpha-chloropropionate, see	2934	3	
Isopropyl ether, see	1159	3	
Isopropylethylene, see	2561	3	
Isopropyl formate, see	1281	3	
ISOPROPYL ISOBUTYRATE	2406	3	
ISOPROPYL ISOCYANATE	2483	6.1	
Isopropyl mercaptan, see	2402	3	
ISOPROPYL NITRATE	1222	3	
ISOPROPYL PROPIONATE	2409	3	

Name and description	UN	Class	Remarks
Isolpropyltoluene, see	2046	3	
Isopropyltoluol, see	2046	3	
ISOSORBIDE DINITRATE MIXTURE with not less than 60 % lactose, mannose, starch or calcium hydrogen phosphate	2907	4.1	
ISOSORBIDE-5-MONONITRATE	3251	4.1	
Isovaleraldehyde, see	2058	3	
JET PERFORATING GUNS, CHARGED, oil well, without detonator	0124 0494	1 1	
Jet tappers, without detonator, see	0059	1	
KEROSENE	1223	3	
KETONES, LIQUID, N.O.S.	1224	3	
KRILL MEAL	3497	4.2	
KRYPTON, COMPRESSED	1056	2	
KRYPTON, REFRIGERATED LIQUID	1970	2	
Lacquer, see	1263 3066 3469 3470	3 8 3 8	
Lacquer base, liquid, see	1263 3066 3469 3470	3 8 3 8	
Lacquer base or lacquer chips, nitrocellulose, dry, see	2557	4.1	
Lacquer base or lacquer chips, plastic, wet with alcohol or solvent, see	1263 2059 2555 2556	3 3 4.1 4.1	
LEAD ACETATE	1616	6.1	
Lead (II) acetate, see	1616	6.1	
LEAD ARSENATES	1617	6.1	
LEAD ARSENITES	1618	6.1	
LEAD AZIDE, WETTED with not less than 20 % water, or mixture of alcohol and water, by mass	0129	1	
Lead chloride, solid, see	2291	6.1	
LEAD COMPOUND, SOLUBLE, N.O.S.	2291	6.1	
LEAD CYANIDE	1620	6.1	
Lead (II) cyanide	1620	6.1	
LEAD DIOXIDE	1872	5.1	
LEAD NITRATE	1469	5.1	
Lead (II) nitrate	1469	5.1	
LEAD PERCHLORATE, SOLID	1470	5.1	
LEAD PERCHLORATE, SOLUTION	3408	5.1	
Lead (II) perchlorate	1470 3408	5.1 5.1	
Lead peroxide, see	1872	5.1	
LEAD PHOSPHITE, DIBASIC	2989	4.1	
LEAD STYPHNATE, WETTED with not less than 20 % water, or mixture of alcohol and water, by mass	0130	1	
LEAD SULPHATE with more than 3 % free acid	1794	8	
Lead tetraethyl, see	1649	6.1	
Lead tetramethyl, see	1649	6.1	
LEAD TRINITRORESORCINATE, WETTED with not less than 20 % water, or mixture of alcohol and water, by mass, see	0130	1	
LIFE-SAVING APPLIANCES NOT SELF-INFLATING containing dangerous goods as equipment	3072	9	
LIFE-SAVING APPLIANCES, SELF-INFLATING	2990	9	
LIGHTER REFILLS containing flammable gas	1057	2	
LIGHTERS containing flammable gas	1057	2	
LIGHTERS, FUSE	0131	1	
Limonene, inactive, see	2052	3	
LIQUEFIED GAS, N.O.S.	3163	2	
LIQUEFIED GAS, FLAMMABLE, N.O.S.	3161	2	
LIQUEFIED GASES, non-flammable, charged with nitrogen, carbon dioxide or air	1058	2	
LIQUEFIED GAS, OXIDIZING, N.O.S.	3157	2	
LIQUEFIED GAS, TOXIC, N.O.S.	3162	2	
LIQUEFIED GAS, TOXIC, CORROSIVE, N.O.S.	3308	2	
LIQUEFIED GAS, TOXIC, FLAMMABLE, N.O.S.	3160	2	
LIQUEFIED GAS, TOXIC, FLAMMABLE, CORROSIVE, N.O.S.	3309	2	
LIQUEFIED GAS, TOXIC, OXIDIZING, N.O.S.	3307	2	
LIQUEFIED GAS, TOXIC, OXIDIZING, CORROSIVE, N.O.S.	3310	2	
Liquefied petroleum gas, see	1075	2	

Name and description	UN	Class	Remarks
Liquid filler, see	1263	3	
	3066	8	
	3469	3	
	3470	8	
Liquid lacquer base, see	1263	3	
	3066	8	
	3469	3	
	3470	8	
LITHIUM	1415	4.3	
Lithium alkyls, liquid, see	3394	4.2	
Lithium alkyls, solid, see	3393	4.2	
LITHIUM ALUMINIUM HYDRIDE	1410	4.3	
LITHIUM ALUMINIUM HYDRIDE, ETHEREAL	1411	4.3	
LITHIUM BATTERIES INSTALLED IN CARGO TRANSPORT UNIT lithium ion batteries or lithium metal batteries	3536	9	
LITHIUM BOROHYDRIDE	1413	4.3	
LITHIUM FERROSILICON	2830	4.3	
LITHIUM HYDRIDE	1414	4.3	
LITHIUM HYDRIDE, FUSED SOLID	2805	4.3	
LITHIUM HYDROXIDE	2680	8	
LITHIUM HYDROXIDE SOLUTION	2679	8	
LITHIUM HYPOCHLORITE, DRY	1471	5.1	
LITHIUM HYPOCHLORITE MIXTURE	1471	5.1	
Lithium in cartouches, see	1415	4.3	
LITHIUM ION BATTERIES (including lithium ion polymer batteries)	3480	9	
LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT (including lithium ion polymer batteries)	3481	9	
LITHIUM ION BATTERIES PACKED WITH EQUIPMENT (including lithium ion polymer batteries)	3481	9	
LITHIUM METAL BATTERIES (including lithium alloy batteries)	3090	9	
LITHIUM METAL BATTERIES CONTAINED IN EQUIPMENT (including lithium alloy batteries)	3091	9	
LITHIUM METAL BATTERIES PACKED WITH EQUIPMENT (including lithium alloy batteries)	3091	9	
LITHIUM NITRATE	2722	5.1	
LITHIUM NITRIDE	2806	4.3	

Name and description	UN No.	Class	Remarks
LITHIUM PEROXIDE	1472	5.1	
Lithium silicide, see	1417	4.3	
LITHIUM SILICON	1417	4.3	
L.n.g., see	1972	2	
LONDON PURPLE	1621	6.1	
L.p.g., see	1075	2	
Lye, see	1823	8	
Lythene, see	1268	3	
MACHINERY, FUEL CELL, FLAMMABLE GAS POWERED	3529	2	
MACHINERY, FUEL CELL, FLAMMABLE LIQUID POWERED	3528	3	
MACHINERY, INTERNAL COMBUSTION,	3530	9	
MACHINERY, INTERNAL COMBUSTION, FLAMMABLE GAS POWERED	3529	2	
MACHINERY, INTERNAL COMBUSTION, FLAMMABLE LIQUID POWERED	3528	3	
MAGNESIUM in pellets, turnings or ribbons	1869	4.1	
Magnesium alkyls, see	3394	4.2	
MAGNESIUM ALLOYS with more than 50 % magnesium in pellets, turnings or ribbons	1869	4.1	
MAGNESIUM ALLOYS POWDER	1418	4.3	
MAGNESIUM ALUMINIUM PHOSPHIDE	1419	4.3	
MAGNESIUM ARSENATE	1622	6.1	
Magnesium bisulphite solution, see	2693	8	
MAGNESIUM BROMATE	1473	5.1	
MAGNESIUM CHLORATE	2723	5.1	
Magnesium chloride and chlorate mixture, see	1459	5.1	
	3407	5.1	
MAGNESIUM DIAMIDE	2004	4.2	
Magnesium diphenyl, see	3393	4.2	
MAGNESIUM FLUORO-SILICATE	2853	6.1	
MAGNESIUM GRANULES, COATED, particle size not less than 149 microns	2950	4.3	
MAGNESIUM HYDRIDE	2010	4.3	
MAGNESIUM NITRATE	1474	5.1	
MAGNESIUM PERCHLORATE	1475	5.1	
MAGNESIUM PEROXIDE	1476	5.1	

Name and description	UN	Class	Remarks
MAGNESIUM PHOSPHIDE	2011	4.3	
MAGNESIUM POWDER	1418	4.3	
Magnesium scrap, see	1869	4.1	
MAGNESIUM SILICIDE	2624	4.3	
Magnesium silicofluoride, see	2853	6.1	
Magnetized material	2807	9	Not subject to the Code
MALEIC ANHYDRIDE	2215	8	
MALEIC ANHYDRIDE, MOLTEN	2215	8	
Malonic dinitrile, see	2647	6.1	
Malonodinitrile, see	2647	6.1	
MALONONITRILE	2647	6.1	
MANEB	2210	4.2	
MANEB PREPARATION with not less than 60 % maneb	2210	4.2	
MANEB PREPARATION, STABILIZED against self-heating	2968	4.3	
MANEB, STABILIZED against self-heating	2968	4.3	
Manganese ethylene-di-dithiocarbamate, see	2210	4.2	
Manganese ethylene-1,2-dithiocarbamate, see	2210	4.2	
MANGANESE NITRATE	2724	5.1	
Manganese (II) nitrate, see	2724	5.1	
MANGANESE RESINATE	1330	4.1	
Manganous nitrate, see	2724	5.1	
MANNITOL HEXANITRATE, WETTED with not less than 40 % water, or mixture of alcohol and water, by mass	0133	1	
MATCHES, FUSEE	2254	4.1	
MATCHES, SAFETY (book, card or strike on box)	1944	4.1	
MATCHES, "STRIKE ANYWHERE"	1331	4.1	
MATCHES, WAX "VESTA"	1945	4.1	
MEDICAL WASTE, N.O.S.	3291	6.2	
MEDICAL WASTE, CATEGORY A, AFFECTING HUMANS, solid	3549	6.2	
MEDICAL WASTE, CATEGORY A, AFFECTING ANIMALS only, solid	3549	6.2	
MEDICINE, LIQUID, FLAMMABLE, TOXIC, N.O.S.	3248	3	
MEDICINE, LIQUID, TOXIC, N.O.S.	1851	6.1	
MEDICINE, SOLID, TOXIC, N.O.S.	3249	6.1	

Name and description	UN No.	Class	Remarks
p-Mentha-1,8-diene, see	2052	8	
MERCAPTANS, LIQUID, FLAMMABLE, N.O.S.	3336	3	
MERCAPTANS, LIQUID, FLAMMABLE, TOXIC, N.O.S.	1228	3	
MERCAPTANS, LIQUID, TOXIC, FLAMMABLE, N.O.S.	3071	6.1	
MERCAPTAN MIXTURE, LIQUID, FLAMMABLE, N.O.S.	3336	3	
MERCAPTAN MIXTURE, LIQUID, FLAMMABLE, TOXIC, N.O.S.	1228	3	
MERCAPTAN MIXTURE, LIQUID, TOXIC, FLAMMABLE, N.O.S.	3071	6.1	
2-Mercaptoethanol, see	2966	6.1	
2-Mercaptopropionic acid, see	2936	6.1	
5-MERCAPTOTETRAZOL-1-ACETIC ACID	0448	1	
MERCURIC ARSENATE	1623	6.1	
MERCURIC CHLORIDE	1624	6.1	
MERCURIC NITRATE	1625	6.1	
MERCURIC POTASSIUM CYANIDE	1626	6.1	
Mercuric sulphate, see	1645	6.1	
Mercurol, see	1639	6.1	
Mercurous bisulphate, see	1645	6.1	
Mercurous chloride, see	2025	6.1	
MERCUROUS NITRATE	1627	6.1	
Mercurous sulphate, see	1645	6.1	
MERCURY	2809	8	
MERCURY ACETATE	1629	6.1	
MERCURY AMMONIUM CHLORIDE	1630	6.1	
MERCURY BASED PESTICIDE, LIQUID, FLAMMABLE, TOXIC, flash-point less than 23 °C	2778	3	
MERCURY BASED PESTICIDE, LIQUID, TOXIC	3012	6.1	
MERCURY BASED PESTICIDE, LIQUID, TOXIC, FLAMMABLE, flash-point not less than 23 °C	3011	6.1	
MERCURY BASED PESTICIDE, SOLID, TOXIC	2777	6.1	
MERCURY BENZOATE	1631	6.1	
Mercury bichloride, see	1624	6.1	
MERCURY BROMIDES	1634	6.1	
MERCURY COMPOUND, LIQUID, N.O.S.	2024	6.1	

Name and description	UN	Class	Remarks
MERCURY COMPOUND, SOLID, N.O.S.	2025	6.1	
MERCURY CONTAINED IN MANUFACTURED ARTICLES	3506	8	
MERCURY CYANIDE	1636	6.1	
MERCURY FULMINATE, WETTED with not less than 20 % water, or mixture of alcohol and water, by mass	0135	1	
MERCURY GLUCONATE	1637	6.1	
MERCURY IODIDE	1638	6.1	
MERCURY NUCLEATE	1639	6.1	
MERCURY OLEATE	1640	6.1	
MERCURY OXIDE	1641	6.1	
MERCURY OXYCYANIDE, DESENSITIZED	1642	6.1	
MERCURY POTASSIUM IODIDE	1643	6.1	
MERCURY SALICYLATE	1644	6.1	
MERCURY SULPHATE	1645	6.1	
MERCURY THIOCYANATE	1646	6.1	
Mesitylene, see	2325	3	
MESITYL OXIDE	1229	3	
Metal alkyl halides, water-reactive, n.o.s. / Metal aryl halides, water-reactive, n.o.s., see	3394	4.2	
Metal alkyl hydrides, water-reactive, n.o.s. / Metal aryl hydrides, water-reactive, n.o.s., see	3394	4.2	
Metal alkyls, water-reactive, n.o.s. / Metal aryls, water-reactive, n.o.s., see	3393	4.2	
METAL CARBONYLS, LIQUID, N.O.S.	3281	6.1	
METAL CARBONYLS, SOLID, N.O.S.	3466	6.1	
METAL CATALYST, DRY	2881	4.2	
METAL CATALYST, WETTED with a visible excess of liquid	1378	4.2	
METALDEHYDE	1332	4.1	
METAL HYDRIDES, FLAMMABLE, N.O.S.	3182	4.1	
METAL HYDRIDES, WATER-REACTIVE, N.O.S.	1409	4.3	
METALLIC SUBSTANCE, WATER-REACTIVE, N.O.S.	3208	4.3	
METALLIC SUBSTANCE, WATER-REACTIVE, SELF-HEATING, N.O.S.	3209	4.3	
METAL POWDER, FLAMMABLE, N.O.S.	3089	4.1	
METAL POWDER, SELF-HEATING, N.O.S.	3189	4.2	
METAL SALTS OF ORGANIC COMPOUNDS, FLAMMABLE, N.O.S.	3181	4.1	
METHACRYLALDEHYDE, STABILIZED	2396	3	
METHACRYLIC ACID, STABILIZED	2531	8	
METHACRYLONITRILE, STABILIZED	3079	6.1	
METHALLYL ALCOHOL	2614	3	
Methanal, see	1198 2209	3 8	
Methane and hydrogen mixture, see	2034	2	
METHANE, COMPRESSED	1971	2	
METHANE, REFRIGERATED LIQUID	1972	2	
METHANESULPHONYL CHLORIDE	3246	6.1	
METHANOL	1230	3	
2-Methoxyethyl acetate, see	1189	3	
METHOXYMETHYL ISOCYANATE	2605	6.1	
4-METHOXY-4-METHYLPENTAN-2-ONE	2293	3	
1-Methoxy-2-nitrobenzene, see	2730 3458	6.1 6.1	
1-Methoxy-3-nitrobenzene, see	2730 3458	6.1 6.1	
1-Methoxy-4-nitrobenzene, see	2730 3458	6.1 6.1	
1-METHOXY-2-PROPANOL	3092	3	
METHYL ACETATE	1231	3	
METHYLACETYLENE AND PROPADIENE MIXTURE, STABILIZED such as mixture P1 or mixture P2	1060	2	
beta-Methyl acrolein, see	1143	6.1	
METHYL ACRYLATE, STABILIZED	1919	3	
METHYLAL	1234	3	
Methyl alcohol, see	1230	3	
Methyl allyl alcohol, see	2614	3	
METHYLALLYL CHLORIDE	2554	3	
METHYLAMINE, ANHYDROUS	1061	2	
METHYLAMINE, AQUEOUS SOLUTION	1235	3	
METHYLAMYL ACETATE	1233	3	

Name and description	UN	Class	Remarks
Methyl amyl alcohol, see	2053	3	
Methyl amyl ketone, see	1110	3	
N-METHYLANILINE	2294	6.1	
Methylated spirit, see	1986 1987	3 3	
alpha-METHYLBENZYL ALCOHOL, LIQUID	2937	6.1	
alpha-METHYLBENZYL ALCOHOL, SOLID	3438	6.1	
METHYL BROMIDE with not more than 2 % chloropicrin	1062	2	
Methyl bromide and chloropicrin mixture, with more than 2 % chloropicrin, see	1581	2	
METHYL BROMIDE AND ETHYLENE DIBROMIDE MIXTURE, LIQUID	1647	6.1	
METHYL BROMOACETATE	2643	6.1	
2-METHYLBUTANAL	3371	3	
3-METHYLBUTAN-2-ONE	2397	3	
2-METHYL-1-BUTENE	2459	3	
2-METHYL-2-BUTENE	2460	3	
3-METHYL-1-BUTENE	2561	3	
N-METHYLBUTYLAMINE	2945	3	
METHYL tert-BUTYL ETHER	2398	3	
METHYL BUTYRATE	1237	3	
METHYL CHLORIDE	1063	2	
Methyl chloride and chloropicrin mixture, see	1582	2	
METHYL CHLORIDE AND METHYLENE CHLORIDE MIXTURE	1912	2	
METHYL CHLOROACETATE	2295	6.1	
Methyl chlorocarbonate, see	1238	6.1	
Methyl chloroform, see	2831	6.1	
METHYL CHLOROFORMATE	1238	6.1	
METHYL CHLOROMETHYL ETHER	1239	6.1	
METHYL 2-CHLORO-PROPIONATE	2933	3	
Methyl alpha-chloropropionate, see	2933	3	
METHYLCHLOROSILANE	2534	2	
Methyl cyanide, see	1648	3	
METHYLCYCLOHEXANE	2296	3	
METHYLCYCLOHEXANOLS, flammable	2617	3	
METHYLCYCLOHEXANONE	2297	3	

Name and description	UN No.	Class	Remarks
METHYLCYCLOPENTANE	2298	3	
METHYL DICHLOROACETATE	2299	6.1	
METHYLDICHLOROSILANE	1242	4.3	
Methylene bromide, see	2664	6.1	
Methylene chloride, see	1593	6.1	
Methylene chloride and methyl chloride mixture, see	1912	2	
Methylene cyanide, see	2647	6.1	
p,p'-Methylene dianiline, see	2651	6.1	
Methylene dibromide, see	2664	6.1	
2,2'-Methylene-di-(3,4,6-trichlorophenol), see	2875	6.1	
Methyl ethyl ether, see	1039	2	
METHYL ETHYL KETONE, see	1193	3	
2-METHYL-5-ETHYLPYRIDINE	2300	6.1	
METHYL FLUORIDE	2454	2	
METHYL FORMATE	1243	3	
2-METHYLFURAN	2301	3	
Methyl glycol, see	1188	3	
Methyl glycol acetate, see	1189	3	
2-METHYL-2-HEPTANETHIOL	3023	6.1	
5-METHYLHEXAN-2-ONE	2302	3	
METHYLHYDRAZINE	1244	6.1	
METHYL IODIDE	2644	6.1	
METHYL ISOBUTYL CARBINOL	2053	3	
METHYL ISOBUTYL KETONE	1245	3	
METHYL ISOCYANATE	2480	6.1	
METHYL ISOPROPENYL KETONE, STABILIZED	1246	3	
METHYL ISOTHIOCYANATE	2477	6.1	
METHYL ISOVALERATE	2400	3	
METHYL MAGNESIUM BROMIDE IN ETHYL ETHER	1928	4.3	
METHYL MERCAPTAN	1064	2	
Methyl mercapto-propionaldehyde, see	2785	6.1	
METHYL METHACRYLATE MONOMER, STABILIZED	1247	3	
4-METHYLMORPHOLINE	2535	3	
N-METHYLMORPHOLINE, see	2535	3	
METHYL NITRITE	2455	2	Carriage prohibited
METHYL ORTHOSILICATE	2606	6.1	
METHYLPENTADIENE	2461	3	
Methylpentanes, see	1208	3	

Name and description	UN	Class	Remarks
2-METHYLPENTAN-2-OL	2560	3	
4-Methylpentan-2-ol, see	2053	3	
3-Methyl-2-penten-4ynol, see	2705	8	
METHYLPHENYL-DICHLOROSILANE	2437	8	
2-Methyl-2-phenylpropane, see	2709	3	
1-METHYLPIPERIDINE	2399	3	
METHYL PROPIONATE	1248	3	
Methylpropylbenzene, see	2046	3	
METHYL PROPYL ETHER	2612	3	
METHYL PROPYL KETONE	1249	3	
Methyl pyridines, see	2313	3	
Methylstyrene, inhibited, see	2618	3	
alpha-Methylstyrene, see	2303	3	
Methyl sulphate, see	1595	6.1	
Methyl sulphide, see	1164	3	
METHYLTETRAHYDROFURAN	2536	3	
METHYL TRICHLOROACETATE	2533	6.1	
METHYLTRICHLOROSILANE	1250	3	
alpha-METHYLVALERAL-DEHYDE	2367	3	
Methyl vinyl benzene, inhibited, see	2618	3	
METHYL VINYL KETONE, STABILIZED	1251	6.1	
M.i.b.c., see	2053	3	
MINES with bursting charge	0136	1	
	0137	1	
	0138	1	
	0294	1	
Mirbane oil, see	1662	6.1	
Missiles, guided, see	0180	1	
	0181	1	
	0182	1	
	0183	1	
	0295	1	
	0397	1	
	0398	1	
	0436	1	
	0437	1	
	0438	1	
Mixtures A, A01, A02, A0, A1, B1, B2, B or C, see	1965	2	
Mixture F1, mixture F2 or mixture F3, see	1078	2	
MIXTURES OF 1,3-BUTADIENE AND HYDROCARBONS, STABILIZED, containing more than 40% butadienes	1010	2	
Mixture P1 or mixture P2, see	1060	2	

Name and description	UN No.	Class	Remarks
MOLYBDENUM PENTACHLORIDE	2508	8	
Monochloroacetic acid, see	1750	6.1	
	1751	6.1	
Monochlorobenzene, see	1134	3	
Monochlorodifluoromethane, see	1018	2	
Monochlorodifluoromethane and monochloropentafluoroethane mixture, see	1973	2	
Monochlorodifluoromonobromo-methane, see	1974	2	
Monochloropentafluoroethane and monochlorodifluoromethane mixture, see	1973	2	
Monoethylamine, see	1036	2	
MONONITROTOLUIDINES, see	2660	6.1	
Monopropylamine, see	1277	3	
MORPHOLINE	2054	8	
MOTOR FUEL ANTI-KNOCK MIXTURE	1649	6.1	
MOTOR FUEL ANTI-KNOCK MIXTURE, FLAMMABLE	3483	6.1	
MOTOR SPIRIT	1203	3	
Motor spirit and ethanol mixture, with more than 10 % ethanol, see	3475	3	
Muriatic acid, see	1789	8	
MUSK XYLENE, see	2956	4.1	
Mysorite, see	2212	9	
Naphta, see	1268	3	
Naphta, petroleum, see	1268	3	
Naphta, solvent, see	1268	3	
NAPHTHALENE, CRUDE	1334	4.1	
NAPHTHALENE, MOLTEN	2304	4.1	
NAPHTHALENE, REFINED	1334	4.1	
alpha-NAPHTHYLAMINE	2077	6.1	
beta-NAPHTHYLAMINE, SOLID	1650	6.1	
beta-NAPHTHYLAMINE, SOLUTION	3411	6.1	
NAPHTHYLTHIOUREA	1651	6.1	
1-Naphthylthiourea, see	1651	6.1	
NAPHTHYLUREA	1652	6.1	
NATURAL GAS, COMPRESSED with high methane content	1971	2	
NATURAL GAS, REFRIGERATED LIQUID with high methane content	1972	2	
Natural gasoline, see	1203	3	
Neohexane, see	1208	3	

Name and description	UN	Class	Remarks
NEON, COMPRESSED	1065	2	
NEON, REFRIGERATED LIQUID	1913	2	
Neothyl, see	2612	3	
NICKEL CARBONYL	1259	6.1	
NICKEL CYANIDE	1653	6.1	
Nickel (II) cyanide, see	1653	6.1	
NICKEL NITRATE	2725	5.1	
Nickel (II) nitrate, see	2725	5.1	
NICKEL NITRITE	2726	5.1	
Nickel (II) nitrite, see	2726	5.1	
Nickelous nitrate, see	2725	5.1	
Nickelous nitrite, see	2726	5.1	
Nickel tetracarbonyl, see	1259	6.1	
NICOTINE	1654	6.1	
NICOTINE COMPOUND, LIQUID, N.O.S	3144	6.1	
NICOTINE COMPOUND, SOLID, N.O.S.	1655	6.1	
NICOTINE HYDROCHLORIDE, LIQUID	1656	6.1	
NICOTINE HYDROCHLORIDE, SOLID	3444	6.1	
NICOTINE HYDROCHLORIDE, SOLUTION	1656	6.1	
NICOTINE PREPARATION, LIQUID, N.O.S.	3144	6.1	
NICOTINE PREPARATION, SOLID, N.O.S.	1655	6.1	
NICOTINE SALICYLATE	1657	6.1	
NICOTINE SULPHATE, SOLID	3445	6.1	
NICOTINE SULPHATE, SOLUTION	1658	6.1	
NICOTINE TARTRATE	1659	6.1	
NITRATES, INORGANIC, N.O.S.	1477	5.1	
NITRATES, INORGANIC, AQUEOUS SOLUTION, N.O.S.	3218	5.1	
NITRATING ACID MIXTURE with more than 50 % nitric acid	1796	8	
NITRATING ACID MIXTURE with not more than 50 % nitric acid	1796	8	
NITRATING ACID MIXTURE, SPENT, with more than 50 % nitric acid	1826	8	
NITRATING ACID MIXTURE, SPENT, with not more than 50 % nitric acid	1826	8	

Name and description	UN No.	Class	Remarks
NITRIC ACID, other than red fuming, with at least 65 % but not more than 70 % nitric acid	2031	8	
NITRIC ACID, other than red fuming, with less than 65 % nitric acid	2031	8	
NITRIC ACID, other than red fuming, with more than 70 % nitric acid	2031	8	
NITRIC ACID, RED FUMING	2032	8	
NITRIC OXIDE, COMPRESSED	1660	2	
NITRIC OXIDE AND DINITROGEN TETROXIDE MIXTURE	1975	2	
NITRIC OXIDE AND NITROGEN DIOXIDE MIXTURE, see	1975	2	
NITRILES, FLAMMABLE, TOXIC, N.O.S.	3273	3	
NITRILES, LIQUID, TOXIC, N.O.S.	3276	6.1	
NITRILES, SOLID, TOXIC, N.O.S.	3439	6.1	
NITRILES, TOXIC, FLAMMABLE, N.O.S.	3275	6.1	
NITRITES, INORGANIC, N.O.S.	2627	5.1	
NITRITES, INORGANIC, AQUEOUS SOLUTION, N.O.S.	3219	5.1	
NITROANILINES (o-, m-, p-)	1661	6.1	
NITROANISOLES, LIQUID	2730	6.1	
NITROANISOLES, SOLID	3458	6.1	
NITROBENZENE	1662	6.1	
Nitrobenzene bromide, see	2732	6.1	
NITROBENZENESULPHONIC ACID	2305	8	
Nitrobenzol, see	1662	6.1	
5-NITROBENZOTRIAZOL	0385	1	
NITROBENZOTRIFLUORIDES, LIQUID	2306	6.1	
NITROBENZOTRIFLUORIDES, SOLID	3431	6.1	
NITROBROMOBENZENES, LIQUID	2732	6.1	
NITROBROMOBENZENES, SOLID	3459	6.1	
NITROCELLULOSE, dry or wetted with less than 25 % water (or alcohol), by mass	0340	1	
NITROCELLULOSE, unmodified or plasticized with less than 18 % plasticizing substance, by mass	0341	1	

Name and description	UN	Class	Remarks
NITROCELLULOSE MEMBRANE FILTERS, with not more than 12.6 % nitrogen, by dry mass	3270	4.1	
NITROCELLULOSE, with not more than 12.6 % nitrogen, by dry mass, MIXTURE WITH PLASTICIZER, WITH PIGMENT	2557	4.1	
NITROCELLULOSE, with not more than 12.6 % nitrogen, by dry mass, MIXTURE WITH PLASTICIZER, WITHOUT PIGMENT	2557	4.1	
NITROCELLULOSE, with not more than 12.6 % nitrogen, by dry mass, MIXTURE WITHOUT PLASTICIZER, WITH PIGMENT	2557	4.1	
NITROCELLULOSE, with not more than 12.6 % nitrogen, by dry mass, MIXTURE WITHOUT PLASTICIZER, WITHOUT PIGMENT	2557	4.1	
NITROCELLULOSE, PLASTICIZED with not less than 18 % plasticizing substance, by mass	0343	1	
NITROCELLULOSE SOLUTION, FLAMMABLE with not more than 12.6 % nitrogen, by dry mass, and not more than 55 % nitrocellulose	2059	3	
NITROCELLULOSE, WETTED with not less than 25 % alcohol, by mass	0342	1	
NITROCELLULOSE WITH ALCOHOL (not less than 25 % alcohol, by mass, and not more than 12.6 % nitrogen, by dry mass)	2556	4.1	
NITROCELLULOSE WITH WATER (not less than 25 % water, by mass)	2555	4.1	
Nitrochlorobenzenes, see	1578 3409	6.1	
3-NITRO-4-CHLOROBENZO-TRIFLUORIDE	2307	6.1	
NITROCRESOLS, LIQUID	3434	6.1	
NITROCRESOLS, SOLID	2446	6.1	
NITROETHANE	2842	3	
NITROGEN, COMPRESSED	1066	2	
NITROGEN DIOXIDE, see	1067	2	
NITROGEN, REFRIGERATED LIQUID	1977	2	
NITROGEN TRIFLUORIDE	2451	2	
NITROGEN TRIOXIDE	2421	2	Carriage prohibited

Name and description	UN No.	Class	Remarks
NITROGLYCERIN, DESENSITIZED with not less than 40 % non-volatile water-insoluble phlegmatizer, by mass	0143	1	
NITROGLYCERIN MIXTURE, DESENSITIZED, LIQUID, N.O.S. with not more than 30 % nitroglycerin, by mass	3357	3	
NITROGLYCERIN MIXTURE, DESENSITIZED, LIQUID, FLAMMABLE, N.O.S. with not more than 30 % nitroglycerin, by mass	3343	3	
NITROGLYCERIN MIXTURE, DESENSITIZED, SOLID, N.O.S. with more than 2 % but not more than 10 % nitroglycerin, by mass	3319	4.1	
NITROGLYCERIN, SOLUTION IN ALCOHOL with more than 1 % but not more than 5 % nitroglycerin	3064	3	
NITROGLYCERIN SOLUTION IN ALCOHOL with more than 1 % but not more than 10 % nitroglycerin	0144	1	
NITROGLYCERIN SOLUTION IN ALCOHOL with not more than 1 % nitroglycerin	1204	3	
NITROGUANIDINE, dry or wetted with less than 20 % water, by mass	0282	1	
NITROGUANIDINE, WETTED with not less than 20 % water, by mass	1336	4.1	
NITROHYDROCHLORIC ACID	1798	8	Carriage prohibited
NITROMANNITE, WETTED, see	0133	1	
NITROMETHANE	1261	3	
Nitromuriatic acid, see	1798	8	
NITRONAPHTHALENE	2538	4.1	
NITROPHENOLS (o-, m-, p-)	1663	6.1	
4-NITROPHENYL-HYDRAZINE, with not less than 30 % water, by mass	3376	4.1	
NITROPROPANES	2608	3	
p-NITROSODIMETHYLANILINE	1369	4.2	
NITROSTARCH, dry or wetted with less than 20 % water, by mass	0146	1	
NITROSTARCH, WETTED with not less than 20 % water, by mass	1337	4.1	
NITROSYL CHLORIDE	1069	2	
NITROSYLSULPHURIC ACID, LIQUID	2308	8	
NITROSYLSULPHURIC ACID, SOLID	3456	8	
NITROTOLUENES, LIQUID	1664	6.1	

Name and description	UN	Class	Remarks
NITROTOLUENES, SOLID	3446	6.1	
NITROTOLUIDINES	2660	6.1	
NITROTRIAZOLONE	0490	1	
NITRO UREA	0147	1	
NITROUS OXIDE	1070	2	
NITROUS OXIDE, REFRIGERATED LIQUID	2201	2	
NITROXYLENES, LIQUID	1665	6.1	
NITROXYLENES, SOLID	3447	6.1	
Non-activated carbon, see	1361	4.2	
Non-activated charcoal, see	1361	4.2	
NONANES	1920	3	
NONYLTRICHLOROSILANE	1799	8	
2,5-NORBORNADIENE, STABILIZED, see	2251	3	
Normal propyl alcohol, see	1274	3	
NTO, see	0490	1	
OCTADECYLTRICHLORO-SILANE	1800	8	
OCTADIENE	2309	3	
OCTAFLUOROBUT-2-ENE	2422	2	
OCTAFLUOROCYCLOBUTANE	1976	2	
OCTAFLUOROPROPANE	2424	2	
OCTANES	1262	3	
OCTOGEN, see	0226 0391 0484	1 1 1	
OCTOL, dry or wetted with less than 15 % water, by mass, see	0266	1	
OCTOLITE, dry or wetted with less than 15 % water, by mass	0266	1	
OCTONAL	0496	1	
OCTYL ALDEHYDES	1191	3	
tert-Octyl mercaptan, see	3023	6.1	
OCTYLTRICHLOROSILANE	1801	8	
Oenanthol, see	3056	3	
OIL GAS, COMPRESSED	1071	2	
Oleum, see	1831	8	
ORGANIC PEROXIDE TYPE B, LIQUID	3101	5.2	
ORGANIC PEROXIDE TYPE B, LIQUID, TEMPERATURE CONTROLLED	3111	5.2	
ORGANIC PEROXIDE TYPE B, SOLID	3102	5.2	
ORGANIC PEROXIDE TYPE B, SOLID, TEMPERATURE CONTROLLED	3112	5.2	
ORGANIC PEROXIDE TYPE C, LIQUID	3103	5.2	
ORGANIC PEROXIDE TYPE C, LIQUID, TEMPERATURE CONTROLLED	3113	5.2	
ORGANIC PEROXIDE TYPE C, SOLID	3104	5.2	
ORGANIC PEROXIDE TYPE C, SOLID, TEMPERATURE CONTROLLED	3114	5.2	
ORGANIC PEROXIDE TYPE D, LIQUID	3105	5.2	
ORGANIC PEROXIDE TYPE D, LIQUID, TEMPERATURE CONTROLLED	3115	5.2	
ORGANIC PEROXIDE TYPE D, SOLID	3106	5.2	
ORGANIC PEROXIDE TYPE D, SOLID, TEMPERATURE CONTROLLED	3116	5.2	
ORGANIC PEROXIDE TYPE E, LIQUID	3107	5.2	
ORGANIC PEROXIDE TYPE E, LIQUID, TEMPERATURE CONTROLLED	3117	5.2	
ORGANIC PEROXIDE TYPE E, SOLID	3108	5.2	
ORGANIC PEROXIDE TYPE E, SOLID, TEMPERATURE CONTROLLED	3118	5.2	
ORGANIC PEROXIDE TYPE F, LIQUID	3109	5.2	
ORGANIC PEROXIDE TYPE F, LIQUID, TEMPERATURE CONTROLLED	3119	5.2	
ORGANIC PEROXIDE TYPE F, SOLID	3110	5.2	
ORGANIC PEROXIDE TYPE F, SOLID, TEMPERATURE CONTROLLED	3120	5.2	
Organic peroxides, see 2.2.52.4 for an alphabetic list of currently assigned organic peroxides and see	3101 to 3120	5.2	
ORGANIC PIGMENTS, SELF-HEATING	3313	4.2	
ORGANOARSENIC COMPOUND, LIQUID, N.O.S.	3280	6.1	
ORGANOARSENIC COMPOUND, SOLID, N.O.S.	3465	6.1	

Name and description	UN	Class	Remarks
ORGANOCHLORINE PESTICIDE, LIQUID, FLAMMABLE, TOXIC, flash-point less than 23 °C	2762	3	
ORGANOCHLORINE PESTICIDE, LIQUID, TOXIC	2996	6.1	
ORGANOCHLORINE PESTICIDE, LIQUID, TOXIC, FLAMMABLE, flash-point not less than 23 °C	2995	6.1	
ORGANOCHLORINE PESTICIDE, SOLID, TOXIC	2761	6.1	
ORGANOMETALLIC COMPOUND, LIQUID, TOXIC, N.O.S.	3282	6.1	
ORGANOMETALLIC COMPOUND, SOLID, TOXIC, N.O.S.	3467	6.1	
Organometallic compound, solid, water-reactive, flammable, n.o.s., see	3396	4.3	
Organometallic compound or Organometallic compound solution or Organometallic compound dispersion, water-reactive, flammable, n.o.s., see	3399	4.3	
ORGANOMETALLIC SUBSTANCE, LIQUID, PYROPHORIC	3392	4.2	
ORGANOMETALLIC SUBSTANCE, SOLID, PYROPHORIC	3391	4.2	
ORGANOMETALLIC SUBSTANCE, SOLID, SELF-HEATING	3400	4.2	
ORGANOMETALLIC SUBSTANCE, LIQUID, PYROPHORIC, WATER-REACTIVE	3394	4.2	
ORGANOMETALLIC SUBSTANCE, SOLID, PYROPHORIC, WATER-REACTIVE	3393	4.2	
ORGANOMETALLIC SUBSTANCE, LIQUID, WATER-REACTIVE	3398	4.3	
ORGANOMETALLIC SUBSTANCE, SOLID, WATER-REACTIVE	3395	4.3	
ORGANOMETALLIC SUBSTANCE, LIQUID, WATER-REACTIVE, FLAMMABLE	3399	4.3	
ORGANOMETALLIC SUBSTANCE, SOLID, WATER-REACTIVE, FLAMMABLE	3396	4.3	
ORGANOMETALLIC SUBSTANCE, SOLID, WATER-REACTIVE, SELF-HEATING	3397	4.3	

Name and description	UN No.	Class	Remarks
ORGANOPHOSPHORUS COMPOUND, LIQUID, TOXIC, N.O.S.	3278	6.1	
ORGANOPHOSPHORUS COMPOUND, SOLID, TOXIC, N.O.S.	3464	6.1	
ORGANOPHOSPHORUS COMPOUND, TOXIC, FLAMMABLE, N.O.S.	3279	6.1	
ORGANOPHOSPHORUS PESTICIDE, LIQUID, FLAMMABLE, TOXIC, flash-point less than 23 °C	2784	3	
ORGANOPHOSPHORUS PESTICIDE, LIQUID, TOXIC	3018	6.1	
ORGANOPHOSPHORUS PESTICIDE, LIQUID, TOXIC, FLAMMABLE, flash-point not less than 23 °C	3017	6.1	
ORGANOPHOSPHORUS PESTICIDE, SOLID, TOXIC	2783	6.1	
ORGANOTIN COMPOUND, LIQUID, N.O.S.	2788	6.1	
ORGANOTIN COMPOUND, SOLID, N.O.S.	3146	6.1	
ORGANOTIN PESTICIDE, LIQUID, FLAMMABLE, TOXIC, flash-point less than 23 °C	2787	3	
ORGANOTIN PESTICIDE, LIQUID, TOXIC	3020	6.1	
ORGANOTIN PESTICIDE, LIQUID, TOXIC, FLAMMABLE, flash-point not less than 23 °C	3019	6.1	
ORGANOTIN PESTICIDE, SOLID, TOXIC	2786	6.1	
Orthophospohoric acid, see	1805	8	
OSMIUM TETROXIDE	2471	6.1	
OXIDIZING LIQUID, N.O.S.	3139	5.1	
OXIDIZING LIQUID, CORROSIVE, N.O.S.	3098	5.1	
OXIDIZING LIQUID, TOXIC, N.O.S.	3099	5.1	
OXIDIZING SOLID, N.O.S.	1479	5.1	
OXIDIZING SOLID, CORROSIVE, N.O.S.	3085	5.1	
OXIDIZING SOLID, FLAMMABLE, N.O.S.	3137	5.1	Carriage prohibited
OXIDIZING SOLID, SELF-HEATING, N.O.S.	3100	5.1	Carriage prohibited
OXIDIZING SOLID, TOXIC, N.O.S.	3087	5.1	
OXIDIZING SOLID, WATER-REACTIVE, N.O.S.	3121	5.1	Carriage prohibited

Name and description	UN	Class	Remarks
Oxirane, see	1040	2	
OXYGEN, COMPRESSED	1072	2	
OXYGEN DIFLUORIDE, COMPRESSED	2190	2	
OXYGEN GENERATOR, CHEMICAL	3356	5.1	
OXYGEN, REFRIGERATED LIQUID	1073	2	
1-Oxy-4-nitrobenzene, see	1663	6.1	
PACKAGINGS, DISCARDED, EMPTY, UNCLEANED	3509	9	
PAINT (including paint, lacquer, enamel, stain, shellac, varnish, polish, liquid filler and liquid lacquer base)	1263 3066 3469 3470	3 8 3 8	
PAINT RELATED MATERIAL (including paint thinning and reducing compound)	1263 3066 3469 3470	3 8 3 8	
Paint thinning and reducing compound, see	1263 3066 3469 3470	3 8 3 8	
PAPER, UNSATURATED OIL TREATED, incompletely dried (including carbon paper)	1379	4.2	
Paraffin, see	1223	3	
PARAFORMALDEHYDE	2213	4.1	
PARALDEHYDE	1264	3	
PCBs, see	2315 3432	9 9	
PENTABORANE	1380	4.2	
PENTACHLOROETHANE	1669	6.1	
PENTACHLOROPHENOL	3155	6.1	
PENTAERYTHRITE TETRANITRATE with not less than 7 % wax, by mass	0411	1	
PENTAERYTHRITE TETRANITRATE, DESENSITIZED with not less than 15 % phlegmatizer, by mass	0150	1	
PENTAERYTHRITE TETRANITRATE MIXTURE, DESENSITIZED, SOLID, N.O.S. with more than 10 % but not more than 20 % PETN, by mass	3344	4.1	
PENTAERYTHRITE TETRANITRATE, WETTED with not less than 25 % water, by mass	0150	1	
PENTAERYTHRITOL TETRANITRATE, see	0150 0411 3344	1 1 4.1	
PENTAFLUOROETHANE	3220	2	
Pentafluoroethane, 1,1,1-trifluoroethane, and 1,1,1,2-tetrafluoroethane zeotropic mixture with approximately 44 % pentafluoroethane and 52 % 1,1,1-trifluoroethane, see	3337	2	
PENTAMETHYLHEPTANE	2286	3	
Pentanal, see	2058	3	
PENTANE-2,4-DIONE	2310	3	
PENTANES, liquid	1265	3	
n-Pentane, see	1265	3	
PENTANOLS	1105	3	
3-Pentanol, see	1105	3	
1-PENTENE	1108	3	
1-PENTOL	2705	8	
PENTOLITE, dry or wetted with less than 15 % water, by mass	0151	1	
Pentyl nitrite, see	1113	3	
PERCHLORATES, INORGANIC, N.O.S.	1481	5.1	
PERCHLORATES, INORGANIC, AQUEOUS SOLUTION, N.O.S.	3211	5.1	
PERCHLORIC ACID with more than 50 % but not more than 72 % acid, by mass	1873	5.1	
PERCHLORIC ACID with not more than 50 % acid, by mass	1802	8	
Perchlorobenzene, see	2729	6.1	
Perchlorocyclopentadiene, see	2646	6.1	
Perchloroethylene, see	1897	6.1	
PERCHLOROMETHYL MERCAPTAN	1670	6.1	
PERCHLORYL FLUORIDE	3083	2	
Perfluoroacetylchloride, see	3057	2	
PERFLUORO (ETHYL VINYL ETHER)	3154	2	
PERFLUORO (METHYL VINYL ETHER)	3153	2	
Perfluoropropane, see	2424	2	
PERFUMERY PRODUCTS with flammable solvents	1266	3	
PERMANGANATES, INORGANIC, N.O.S.	1482	5.1	
PERMANGANATES, INORGANIC, AQUEOUS SOLUTION, N.O.S.	3214	5.1	
PEROXIDES, INORGANIC, N.O.S.	1483	5.1	
PERSULPHATES, INORGANIC, N.O.S.	3215	5.1	

Name and description	UN	Class	Remarks
PERSULPHATES, INORGANIC, AQUEOUS SOLUTION, N.O.S.	3216	5.1	
PESTICIDE, LIQUID, FLAMMABLE, TOXIC, N.O.S., flash-point less than 23 °C	3021	3	
PESTICIDE, LIQUID, TOXIC, N.O.S.	2902	6.1	
PESTICIDE, LIQUID, TOXIC, FLAMMABLE, N.O.S., flash-point not less than 23 °C	2903	6.1	
PESTICIDE, SOLID, TOXIC, N.O.S.	2588	6.1	
Pesticide, toxic, under compressed gas, n.o.s, see	1950	2	
PETN, see	0150 0411 3344	1 1 4.1	
PETN/TNT, see	0151	1	
PETROL	1203	3	
Petrol and ethanol mixture, with more than 10 % ethanol, see	3475	3	
PETROLEUM CRUDE OIL	1267	3	
PETROLEUM DISTILLATES, N.O.S.	1268	3	
Petroleum ether, see	1268	3	
PETROLEUM GASES, LIQUEFIED	1075	2	
Petroleum naphtha, see	1268	3	
Petroleum oil, see	1268	3	
PETROLEUM PRODUCTS, N.O.S.	1268	3	
Petroleum raffinate, see	1268	3	
PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC	3494	3	
Petroleum spirit, see	1268	3	
PHENACYL BROMIDE	2645	6.1	
PHENETIDINES	2311	6.1	
PHENOLATES, LIQUID	2904	8	
PHENOLATES, SOLID	2905	8	
PHENOL, MOLTEN	2312	6.1	
PHENOL, SOLID	1671	6.1	
PHENOL SOLUTION	2821	6.1	
PHENOLSULPHONIC ACID, LIQUID	1803	8	
PHENOXYACETIC ACID DERIVATIVE PESTICIDE, LIQUID, FLAMMABLE, TOXIC, flash-point less than 23 °C	3346	3	
PHENOXYACETIC ACID DERIVATIVE PESTICIDE, LIQUID, TOXIC	3348	6.1	

Name and description	UN No.	Class	Remarks
PHENOXYACETIC ACID DERIVATIVE PESTICIDE, LIQUID, TOXIC, FLAMMABLE, flash-point not less than 23 °C	3347	6.1	
PHENOXYACETIC ACID DERIVATIVE PESTICIDE, SOLID, TOXIC	3345	6.1	
PHENYLACETONITRILE, LIQUID	2470	6.1	
PHENYLACETYL CHLORIDE	2577	8	
Phenylamine, see	1547	6.1	
1-Phenylbutane, see	2709	3	
2-Phenylbutane, see	2709	3	
PHENYLCARBYLAMINE CHLORIDE	1672	6.1	
PHENYL CHLOROFORMATE	2746	6.1	
Phenyl cyanide, see	2224	6.1	
PHENYLENEDIAMINES (o-, m-, p-)	1673	6.1	
Phenylethylene, see	2055	3	
PHENYLHYDRAZINE	2572	6.1	
PHENYL ISOCYANATE	2487	6.1	
Phenylisocyanodichloride, see	1672	6.1	
PHENYL MERCAPTAN	2337	6.1	
PHENYLMERCURIC ACETATE	1674	6.1	
PHENYLMERCURIC COMPOUND, N.O.S.	2026	6.1	
PHENYLMERCURIC HYDROXIDE	1894	6.1	
PHENYLMERCURIC NITRATE	1895	6.1	
PHENYLPHOSPHORUS DICHLORIDE	2798	8	
PHENYLPHOSPHORUS THIODICHLORIDE	2799	8	
2-Phenylpropene, see	2303	3	
PHENYLTRICHLOROSILANE	1804	8	
PHOSGENE	1076	2	
9-PHOSPHABICYCLO-NONANES	2940	4.2	
PHOSPHINE	2199	2	
PHOSPHINE, ADSORBED	3525	2	
Phosphoretted hydrogen, see	2199	2	
PHOSPHORIC ACID, SOLUTION	1805	8	
PHOSPHORIC ACID, SOLID	3453	8	
Phosphoric acid, anhydrous, see	1807	8	
PHOSPHOROUS ACID	2834	8	
PHOSPHORUS, AMORPHOUS	1338	4.1	
Phosphorus bromide, see	1808	8	

Name and description	UN	Class	Remarks
Phosphorus chloride, see	1809	6.1	
PHOSPHORUS HEPTASULPHIDE, free from yellow and white phosphorus	1339	4.1	
PHOSPHORUS OXYBROMIDE	1939	8	
PHOSPHORUS OXYBROMIDE, MOLTEN	2576	8	
PHOSPHORUS OXYCHLORIDE	1810	6.1	
PHOSPHORUS PENTABROMIDE	2691	8	
PHOSPHORUS PENTACHLORIDE	1806	8	
PHOSPHORUS PENTAFLUORIDE	2198	2	
PHOSPHORUS PENTAFLUORIDE, ADSORBED	3524	2	
PHOSPHORUS PENTASULPHIDE, free from yellow and white phosphorus	1340	4.3	
PHOSPHORUS PENTOXIDE	1807	8	
PHOSPHORUS SESQUISULPHIDE, free from yellow and white phosphorus	1341	4.1	
Phosphorus (V) sulphide, free from yellow and white phosphorus, see	1340	4.3	
Phosphorus sulphochloride, see	1837	8	
PHOSPHORUS TRIBROMIDE	1808	8	
PHOSPHORUS TRICHLORIDE	1809	6.1	
PHOSPHORUS TRIOXIDE	2578	8	
PHOSPHORUS TRISULPHIDE, free from yellow and white phosphorus	1343	4.1	
PHOSPHORUS, WHITE, DRY	1381	4.2	
PHOSPHORUS, WHITE IN SOLUTION	1381	4.2	
PHOSPHORUS, WHITE, MOLTEN	2447	4.2	
PHOSPHORUS, WHITE, UNDER WATER	1381	4.2	
PHOSPHORUS, YELLOW, DRY	1381	4.2	
PHOSPHORUS, YELLOW, IN SOLUTION	1381	4.2	
PHOSPHORUS, YELLOW, UNDER WATER	1381	4.2	
Phosphoryl chloride, see	1810	6.1	
PHTHALIC ANHYDRIDE with more than 0.05 % of maleic anhydride	2214	8	
PICOLINES	2313	3	
PICRAMIDE, see	0153	1	
PICRIC ACID, WETTED, see	1344 3364	4.1 4.1	
PICRITE, see	0282	1	
PICRITE, WETTED, see	1336	4.1	
Picrotoxin, see	3172 3462	6.1 6.1	
PICRYL CHLORIDE, see	0155	1	
PICRYL CHLORIDE, WETTED, see	3365	4.1	
alpha-PINENE	2368	3	
PINE OIL	1272	3	
PIPERAZINE	2579	8	
PIPERIDINE	2401	8	
Pivaloyl chloride, see	2438	6.1	
Plastic explosives, see	0084	1	
PLASTICS MOULDING COMPOUND in dough, sheet or extruded rope form evolving flammable vapour	3314	9	
PLASTICS, NITROCELLULOSE-BASED, SELF-HEATING, N.O.S.	2006	4.2	
Polish, see	1263 3066 3469 3470	3 8 3 8	
POLYAMINES, FLAMMABLE, CORROSIVE, N.O.S.	2733	3	
POLYAMINES, LIQUID, CORROSIVE, N.O.S.	2735	8	
POLYAMINES, LIQUID, CORROSIVE, FLAMMABLE, N.O.S.	2734	8	
POLYAMINES, SOLID, CORROSIVE, N.O.S.	3259	8	
POLYCHLORINATED BIPHENYLS, LIQUID	2315	9	
POLYCHLORINATED BIPHENYLS, SOLID	3432	9	
POLYESTER RESIN KIT, liquid base material	3269	3	
POLYESTER RESIN KIT, solid base material	3527	4.1	
POLYHALOGENATED BIPHENYLS, LIQUID	3151	9	
POLYHALOGENATED BIPHENYLS, SOLID	3152	9	
POLYHALOGENATED TERPHENYLS, LIQUID	3151	9	
POLYHALOGENATED TERPHENYLS, SOLID	3152	9	
POLYMERIC BEADS, EXPANDABLE, evolving flammable vapour	2211	9	

Name and description	UN	Class	Remarks
POLYMERIZING SUBSTANCE, LIQUID, STABILIZED, N.O.S.	3532	4.1	
POLYMERIZING SUBSTANCE, LIQUID, TEMPERATURE CONTROLLED, N.O.S.	3534	4.1	
POLYMERIZING SUBSTANCE, SOLID, STABILIZED, N.O.S.	3531	4.1	
POLYMERIZING SUBSTANCE, SOLID, TEMPERATURE CONTROLLED, N.O.S	3533	4.1	
Polystyrene beads, expandable, see	2211	9	
POTASSIUM	2257	4.3	
POTASSIUM ARSENATE	1677	6.1	
POTASSIUM ARSENITE	1678	6.1	
Potassium bifluoride, see	1811	8	
Potassium bisulphate, see	2509	8	
Potassium bisulphite solution, see	2693	8	
POTASSIUM BOROHYDRIDE	1870	4.3	
POTASSIUM BROMATE	1484	5.1	
POTASSIUM CHLORATE	1485	5.1	
POTASSIUM CHLORATE, AQUEOUS SOLUTION	2427	5.1	
Potassium chlorate mixed with mineral oil, see	0083	1	
POTASSIUM CUPROCYANIDE	1679	6.1	
POTASSIUM CYANIDE, SOLID	1680	6.1	
POTASSIUM CYANIDE, SOLUTION	3413	6.1	
Potassium dicyanocuprate (I), see	1679	6.1	
POTASSIUM DITHIONITE	1929	4.2	
POTASSIUM FLUORIDE, SOLID	1812	6.1	
POTASSIUM FLUORIDE, SOLUTION	3422	6.1	
POTASSIUM FLUOROACETATE	2628	6.1	
POTASSIUM FLUOROSILICATE	2655	6.1	
Potassium hexafluorosilicate, see	2655	6.1	
Potassium hydrate, see	1814	8	
POTASSIUM HYDROGENDIFLUORIDE, SOLID	1811	8	
POTASSIUM HYDROGENDIFLUORIDE, SOLUTION	3421	8	
POTASSIUM HYDROGEN SULPHATE	2509	8	
POTASSIUM HYDROSULPHITE, see	1929	4.2	
Potassium hydroxide, liquid, see	1814	8	

Name and description	UN No.	Class	Remarks
POTASSIUM HYDROXIDE, SOLID	1813	8	
POTASSIUM HYDROXIDE SOLUTION	1814	8	
POTASSIUM METAL ALLOYS, LIQUID	1420	4.3	
POTASSIUM METAL ALLOYS, SOLID	3403	4.3	
POTASSIUM METAVANADATE	2864	6.1	
POTASSIUM MONOXIDE	2033	8	
POTASSIUM NITRATE	1486	5.1	
Potassium nitrate and sodium nitrate mixture, see	1499	5.1	
POTASSIUM NITRATE AND SODIUM NITRITE MIXTURE	1487	5.1	
POTASSIUM NITRITE	1488	5.1	
POTASSIUM PERCHLORATE	1489	5.1	
POTASSIUM PERMANGANATE	1490	5.1	
POTASSIUM PEROXIDE	1491	5.1	
POTASSIUM PERSULPHATE	1492	5.1	
POTASSIUM PHOSPHIDE	2012	4.3	
Potassium selenate, see	2630	6.1	
Potassium selenite, see	2630	6.1	
Potassium silicofluoride, see	2655	6.1	
POTASSIUM SODIUM ALLOYS, LIQUID	1422	4.3	
POTASSIUM SODIUM ALLOYS, SOLID	3404	4.3	
POTASSIUM SULPHIDE with less than 30 % water of crystallization	1382	4.2	
POTASSIUM SULPHIDE, ANHYDROUS	1382	4.2	
POTASSIUM SULPHIDE, HYDRATED with not less than 30 % water of crystallization	1847	8	
POTASSIUM SUPEROXIDE	2466	5.1	
Potassium tetracyanomercurate (II), see	1626	6.1	
POWDER CAKE, WETTED with not less than 17 % alcohol, by mass	0433	1	
POWDER CAKE, WETTED with not less than 25 % water, by mass	0159	1	
POWDER PASTE, see	0159 0433	1 1	
POWDER, SMOKELESS	0160 0161 0509	1 1 1	

Name and description	UN	Class	Remarks
Power devices, explosive, see	0275	1	
	0276	1	
	0323	1	
	0381	1	
PRIMERS, CAP TYPE	0044	1	
	0377	1	
	0378	1	
Primers, small arms, see	0044	1	
PRIMERS, TUBULAR	0319	1	
	0320	1	
	0376	1	
PRINTING INK, flammable or PRINTING INK RELATED MATERIAL (including printing ink thinning or reducing compound), flammable	1210	3	
Projectiles, illuminating, see	0171	1	
	0254	1	
	0297	1	
PROJECTILES, inert with tracer	0345	1	
	0424	1	
	0425	1	
PROJECTILES with burster or expelling charge	0346	1	
	0347	1	
	0426	1	
	0427	1	
	0434	1	
	0435	1	
PROJECTILES with bursting charge	0167	1	
	0168	1	
	0169	1	
	0324	1	
	0344	1	
PROPADIENE, STABILIZED	2200	2	
Propadiene and methyl acetylene mixture, stabilized, see	1060	2	
PROPANE	1978	2	
PROPANETHIOLS	2402	3	
n-PROPANOL	1274	3	
PROPELLANT, LIQUID	0495	1	
	0497	1	
PROPELLANT, SOLID	0498	1	
	0499	1	
	0501	1	
Propellant with a single base, Propellant with a double base, Propellant with a triple base, see	0160	1	
	0161	1	
Propene, see	1077	2	
PROPIONALDEHYDE	1275	3	
PROPIONIC ACID with not less than 10 % and less than 90 % acid by mass	1848	8	
PROPIONIC ACID with not less than 90 % acid by mass	3463	8	

Name and description	UN No.	Class	Remarks
PROPIONIC ANHYDRIDE	2496	8	
PROPIONITRILE	2404	3	
PROPIONYL CHLORIDE	1815	3	
n-PROPYL ACETATE	1276	3	
PROPYL ALCOHOL, NORMAL, see	1274	3	
PROPYLAMINE	1277	3	
n-PROPYLBENZENE	2364	3	
Propyl chloride, see	1278	3	
n-PROPYL CHLOROFORMATE	2740	6.1	
PROPYLENE	1077	2	
PROPYLENE CHLOROHYDRIN	2611	6.1	
1,2-PROPYLENEDIAMINE	2258	8	
Propylene dichloride, see	1279	3	
PROPYLENEIMINE, STABILIZED	1921	3	
PROPYLENE OXIDE	1280	3	
PROPYLENE TETRAMER	2850	3	
Propylene trimer, see	2057	3	
PROPYL FORMATES	1281	3	
n-PROPYL ISOCYANATE	2482	6.1	
Propyl mercaptan, see	2402	3	
n-PROPYL NITRATE	1865	3	
PROPYLTRICHLOROSILANE	1816	8	
Pyrazine hexahydride, see	2579	8	
PYRETHROID PESTICIDE, LIQUID, FLAMMABLE, TOXIC, flash-point less than 23 °C	3350	3	
PYRETHROID PESTICIDE, LIQUID, TOXIC	3352	6.1	
PYRETHROID PESTICIDE, LIQUID, TOXIC, FLAMMABLE, flash-point not less than 23 °C	3351	6.1	
PYRETHROID PESTICIDE, SOLID, TOXIC	3349	6.1	
PYRIDINE	1282	3	
PYROPHORIC ALLOY, N.O.S.	1383	4.2	
Pyrophoric organometallic compound, water-reactive, n.o.s., liquid, see	3394	4.2	
Pyrophoric organometallic compound, water-reactive, n.o.s., solid, see	3393	4.2	
PYROPHORIC LIQUID, INORGANIC, N.O.S.	3194	4.2	
PYROPHORIC LIQUID, ORGANIC, N.O.S.	2845	4.2	
PYROPHORIC METAL, N.O.S.	1383	4.2	

Name and description	UN	Class	Remarks
PYROPHORIC SOLID, INORGANIC, N.O.S.	3200	4.2	
PYROPHORIC SOLID, ORGANIC, N.O.S.	2846	4.2	
PYROSULPHURYL CHLORIDE	1817	8	
Pyroxylin solution, see	2059	3	
PYRROLIDINE	1922	3	
QUINOLINE	2656	6.1	
Quinone, see	2587	6.1	
RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - ARTICLES MANUFACTURED FROM NATURAL URANIUM or DEPLETED URANIUM or NATURAL THORIUM	2909	7	
RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - EMPTY PACKAGING	2908	7	
RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - INSTRUMENTS or ARTICLES	2911	7	
RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - LIMITED QUANTITY OF MATERIAL	2910	7	
RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-I), non fissile or fissile-excepted	2912	7	
RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), FISSILE	3324	7	
RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), non fissile or fissile-excepted	3321	7	
RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), FISSILE	3325	7	
RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), non fissile or fissile-excepted	3322	7	
RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I or SCO-II), FISSILE	3326	7	
RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I, SCO-II or SCO-III), non fissile or fissile-excepted	2913	7	
RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, FISSILE	3331	7	
RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, non fissile or fissile-excepted	2919	7	
RADIOACTIVE MATERIAL, TYPE A PACKAGE, FISSILE, non-special form	3327	7	
RADIOACTIVE MATERIAL, TYPE A PACKAGE, non-special form, non fissile or fissile-excepted	2915	7	
RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, FISSILE	3333	7	
RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, non fissile or fissile-excepted	3332	7	
RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, FISSILE	3329	7	
RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, non fissile or fissile-excepted	2917	7	
RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, FISSILE	3328	7	
RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, non fissile or fissile-excepted	2916	7	
RADIOACTIVE MATERIAL, TYPE C PACKAGE, FISSILE	3330	7	
RADIOACTIVE MATERIAL, TYPE C PACKAGE, non fissile or fissile-excepted	3323	7	
RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE	2977	7	
RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, non fissile or fissile-excepted	2978	7	
Rags, oily	1856	4.2	Not subject to the Code
RDX, see	0072 0391 0483	1 1 1	
RECEPTACLES, SMALL, CONTAINING GAS without a release device, non-refillable	2037	2	
Red phosphorus, see	1338	4.1	
REFRIGERANT GAS, N.O.S., such as mixture F1, mixture F2 or mixture P2	1078	2	
REFRIGERANT GAS R 12, see	1028	2	
REFRIGERANT GAS R 12B1, see	1974	2	
REFRIGERANT GAS R 13, see	1022	2	
REFRIGERANT GAS R 13B1, see	1009	2	

Name and description	UN	Class	Remarks
REFRIGERANT GAS R 14, see	1982	2	
REFRIGERANT GAS R 21, see	1029	2	
REFRIGERANT GAS R 22, see	1018	2	
REFRIGERANT GAS R 23, see	1984	2	
REFRIGERANT GAS R 32, see	3252	2	
REFRIGERANT GAS R 40, see	1063	2	
REFRIGERANT GAS R 41, see	2454	2	
REFRIGERANT GAS R 114, see	1958	2	
REFRIGERANT GAS R 115, see	1020	2	
REFRIGERANT GAS R 116, see	2193	2	
REFRIGERANT GAS R 124, see	1021	2	
REFRIGERANT GAS R 125, see	3220	2	
REFRIGERANT GAS R 133a, see	1983	2	
REFRIGERANT GAS R 134a, see	3159	2	
REFRIGERANT GAS R 142b, see	2517	2	
REFRIGERANT GAS R 143a, see	2035	2	
REFRIGERANT GASR 152a, see	1030	2	
REFRIGERANT GAS R 161, see	2453	2	
REFRIGERANT GAS R 218, see	2424	2	
REFRIGERANT GAS R 227, see	3296	2	
REFRIGERANT GAS R 404A	3337	2	
REFRIGERANT GAS R 407A	3338	2	
REFRIGERANT GAS R 407B	3339	2	
REFRIGERANT GAS R 407C	3340	2	
REFRIGERANT GAS R 500, see	2602	2	
REFRIGERANT GAS R 502, see	1973	2	
REFRIGERANT GAS R 503, see	2599	2	
REFRIGERANT GAS R 1132a, see	1959	2	
REFRIGERANT GAS R 1216, see	1858	2	
REFRIGERANT GAS R 1318, see	2422	2	
REFRIGERANT GAS RC 318, see	1976	2	
REFRIGERATING MACHINES containing flammable, non-toxic, liquefied gas	3358	2	
REFRIGERATING MACHINES containing non-flammable, non-toxic, gases or ammonia solutions (UN 2672)	2857	2	
REGULATED MEDICAL WASTE, N.O.S.	3291	6.2	
RELEASE DEVICES, EXPLOSIVE	0173	1	
RESIN SOLUTION, flammable	1866	3	
Resorcin, see	2876	6.1	
RESORCINOL	2876	6.1	

Name and description	UN No.	Class	Remarks
RIVETS, EXPLOSIVE	0174	1	
Road oil, with a flash-point not greater than 60 °C, see	1999	3	
Road oil, with a flash-point above 60 °C, at or above its flash-point, see	3256	3	
Road oil, at or above 100 °C and below its flash-point, see	3257	9	
ROCKET MOTORS	0186	1	
	0280	1	
	0281	1	
	0510	1	
ROCKET MOTORS, LIQUID FUELLED	0395	1	
	0396	1	
ROCKET MOTORS WITH HYPERGOLIC LIQUIDS with or without expelling charge	0250	1	
	0322	1	
ROCKETS with bursting charge	0180	1	
	0181	1	
	0182	1	
	0295	1	
ROCKETS with expelling charge	0436	1	
	0437	1	
	0438	1	
ROCKETS with inert head	0183	1	
	0502	1	
ROCKETS, LINE-THROWING	0238	1	
	0240	1	
	0453	1	
ROCKETS, LIQUID FUELLED with bursting charge	0397	1	
	0398	1	
ROSIN OIL	1286	3	
RUBBER SCRAP, powdered or granulated, not exceeding 840 microns and rubber content exceeding 45 %	1345	4.1	
RUBBER SHODDY, powdered or granulated, not exceeding 840 microns and rubber content exceeding 45 %	1345	4.1	
RUBBER SOLUTION	1287	3	
RUBIDIUM	1423	4.3	
RUBIDIUM HYDROXIDE	2678	8	
RUBIDIUM HYDROXIDE SOLUTION	2677	8	
Rubidium nitrate, see	1477	5.1	
SAFETY DEVICES, electrically initiated	3268	9	
SAFETY DEVICES, PYROTECHNIC	0503	1	
Saltpetre, see	1486	5.1	
SAMPLES, EXPLOSIVE, other than initiating explosive	0190	1	

Name and description	UN	Class	Remarks
Sand acid, see	1778	8	
Seat-belt pretensioners, see	0503 3268	1 9	
SEED CAKE with more than 1.5 % oil and not more than 11 % moisture	1386	4.2	
SEED CAKE with not more than 1.5 % oil and not more than 11 % moisture	2217	4.2	
Seed expellers, see	1386 2217	4.2 4.2	
SELENATES	2630	6.1	
SELENIC ACID	1905	8	
SELENITES	2630	6.1	
SELENIUM COMPOUND, LIQUID, N.O.S.	3440	6.1	
SELENIUM COMPOUND, SOLID, N.O.S.	3283	6.1	
SELENIUM DISULPHIDE	2657	6.1	
SELENIUM HEXAFLUORIDE	2194	2	
SELENIUM OXYCHLORIDE	2879	8	
SELF-HEATING LIQUID, CORROSIVE, INORGANIC, N.O.S.	3188	4.2	
SELF-HEATING LIQUID, CORROSIVE, ORGANIC, N.O.S.	3185	4.2	
SELF-HEATING LIQUID, INORGANIC, N.O.S.	3186	4.2	
SELF-HEATING LIQUID, ORGANIC, N.O.S.	3183	4.2	
SELF-HEATING LIQUID, TOXIC, INORGANIC, N.O.S.	3187	4.2	
SELF-HEATING LIQUID, TOXIC, ORGANIC, N.O.S.	3184	4.2	
SELF-HEATING SOLID, CORROSIVE, INORGANIC, N.O.S.	3192	4.2	
SELF-HEATING SOLID, CORROSIVE, ORGANIC, N.O.S.	3126	4.2	
SELF-HEATING SOLID, INORGANIC, N.O.S.	3190	4.2	
SELF-HEATING SOLID, ORGANIC, N.O.S.	3088	4.2	
SELF-HEATING SOLID, OXIDIZING, N.O.S	3127	4.2	Carriage prohibited
SELF-HEATING SOLID, TOXIC, INORGANIC, N.O.S.	3191	4.2	
SELF-HEATING SOLID, TOXIC, ORGANIC, N.O.S.	3128	4.2	
SELF-REACTIVE LIQUID TYPE B	3221	4.1	
SELF-REACTIVE LIQUID TYPE B, TEMPERATURE CONTROLLED	3231	4.1	
SELF-REACTIVE LIQUID TYPE C	3223	4.1	
SELF-REACTIVE LIQUID TYPE C, TEMPERATURE CONTROLLED	3233	4.1	
SELF-REACTIVE LIQUID TYPE D	3225	4.1	
SELF-REACTIVE LIQUID TYPE D, TEMPERATURE CONTROLLED	3235	4.1	
SELF-REACTIVE LIQUID TYPE E	3227	4.1	
SELF-REACTIVE LIQUID TYPE E, TEMPERATURE CONTROLLED	3237	4.1	
SELF-REACTIVE LIQUID TYPE F	3229	4.1	
SELF-REACTIVE LIQUID TYPE F, TEMPERATURE CONTROLLED	3239	4.1	
SELF-REACTIVE SOLID TYPE B	3222	4.1	
SELF-REACTIVE SOLID TYPE B, TEMPERATURE CONTROLLED	3232	4.1	
SELF-REACTIVE SOLID TYPE C	3224	4.1	
SELF-REACTIVE SOLID TYPE C, TEMPERATURE CONTROLLED	3234	4.1	
SELF-REACTIVE SOLID TYPE D	3226	4.1	
SELF-REACTIVE SOLID TYPE D, TEMPERATURE CONTROLLED	3236	4.1	
SELF-REACTIVE SOLID TYPE E	3228	4.1	
SELF-REACTIVE SOLID TYPE E, TEMPERATURE CONTROLLED	3238	4.1	
SELF-REACTIVE SOLID TYPE F	3230	4.1	
SELF-REACTIVE SOLID TYPE F, TEMPERATURE CONTROLLED	3240	4.1	
SHALE OIL	1288	3	
Shaped charges, see	0059 0439 0440 0441	1 1 1 1	
Shellac, see	1263 3066 3469 3470	3 8 3 8	
SIGNAL DEVICES, HAND	0191 0373	1 1	
SIGNALS, DISTRESS, ship	0194 0195 0505 0506	1 1 1 1	
Signals, distress, ship, water-activated, see	0249	1	

Name and description	UN	Class	Remarks
SIGNALS, RAILWAY TRACK, EXPLOSIVE	0192 0193 0492 0493	1 1 1 1	
SIGNALS, SMOKE	0196 0197 0313 0487 0507	1 1 1 1 1	
SILANE	2203	2	
Silicofluoric acid, see	1778	8	
Silicofluorides, n.o.s., see	2856	6.1	
Silicon chloride, see	1818	8	
SILICON POWDER, AMORPHOUS	1346	4.1	
SILICON TETRACHLORIDE	1818	8	
SILICON TETRAFLUORIDE	1859	2	
SILICON TETRAFLUORIDE, ADSORBED	3521	2	
SILVER ARSENITE	1683	6.1	
SILVER CYANIDE	1684	6.1	
SILVER NITRATE	1493	5.1	
SILVER PICRATE, WETTED with not less than 30 % water, by mass	1347	4.1	
SLUDGE ACID	1906	8	
SODA LIME with more than 4 % sodium hydroxide	1907	8	
SODIUM	1428	4.3	
Sodium aluminate, solid	2812	8	Not subject to the Code
SODIUM ALUMINATE SOLUTION	1819	8	
SODIUM ALUMINIUM HYDRIDE	2835	4.3	
SODIUM AMMONIUM VANADATE	2863	6.1	
SODIUM ARSANILATE	2473	6.1	
SODIUM ARSENATE	1685	6.1	
SODIUM ARSENITE, AQUEOUS SOLUTION	1686	6.1	
SODIUM ARSENITE, SOLID	2027	6.1	
SODIUM AZIDE	1687	6.1	
Sodium bifluoride, see	2439	8	
Sodium binoxide, see	1504	5.1	
Sodium bisulphite solution, see	2693	8	
SODIUM BOROHYDRIDE	1426	4.3	

Name and description	UN No.	Class	Remarks
SODIUM BOROHYDRIDE AND SODIUM HYDROXIDE SOLUTION, with not more than 12 % sodium borohydride and not more than 40 % sodium hydroxide by mass	3320	8	
SODIUM BROMATE	1494	5.1	
SODIUM CACODYLATE	1688	6.1	
SODIUM CARBONATE PEROXYHYDRATE	3378	5.1	
SODIUM CHLORATE	1495	5.1	
SODIUM CHLORATE, AQUEOUS SOLUTION	2428	5.1	
Sodium chlorate mixed with dinitrotoluene, see	0083	1	
SODIUM CHLORITE	1496	5.1	
SODIUM CHLOROACETATE	2659	6.1	
SODIUM CUPROCYANIDE, SOLID	2316	6.1	
SODIUM CUPROCYANIDE SOLUTION	2317	6.1	
SODIUM CYANIDE, SOLID	1689	6.1	
SODIUM CYANIDE, SOLUTION	3414	6.1	
Sodium dicyanocuprate (I), solid, see	2316	6.1	
Sodium dicyanocuprate (I) solution, see	2317	6.1	
Sodium dimethylarsenate, see	1688	6.1	
SODIUM DINITRO-o-CRESOLATE, dry or wetted with less than 15 % water, by mass	0234	1	
SODIUM DINITRO-o-CRESOLATE, WETTED with not less than 10 % water, by mass	3369	4.1	
SODIUM DINITRO-o-CRESOLATE, WETTED with not less than 15 % water, by mass	1348	4.1	
Sodium dioxide, see	1504	5.1	
SODIUM DITHIONITE	1384	4.2	
SODIUM FLUORIDE, SOLID	1690	6.1	
SODIUM FLUORIDE, SOLUTION	3415	6.1	
SODIUM FLUOROACETATE	2629	6.1	
SODIUM FLUOROSILICATE	2674	6.1	
Sodium hexafluorosilicate, see	2674	6.1	
Sodium hydrate, see	1824	8	
SODIUM HYDRIDE	1427	4.3	
Sodium hydrogen 4-amino-phenylarsenate, see	2473	6.1	
SODIUM HYDROGEN-DIFLUORIDE	2439	8	

Name and description	UN	Class	Remarks
SODIUM HYDROSULPHIDE with less than 25 % water of crystallization	2318	4.2	
SODIUM HYDROSULPHIDE, HYDRATED with not less than 25 % water of crystallization	2949	8	
SODIUM HYDROSULPHITE, see	1384	4.2	
SODIUM HYDROXIDE, SOLID	1823	8	
SODIUM HYDROXIDE SOLUTION	1824	8	
Sodium metasilicate pentahydrate, see	3253	8	
SODIUM METHYLATE	1431	4.2	
SODIUM METHYLATE SOLUTION in alcohol	1289	3	
SODIUM MONOXIDE	1825	8	
SODIUM NITRATE	1498	5.1	
SODIUM NITRATE AND POTASSIUM NITRATE MIXTURE	1499	5.1	
SODIUM NITRITE	1500	5.1	
Sodium nitrite and potassium nitrate mixture, see	1487	5.1	
SODIUM PENTACHLORO-HENATE	2567	6.1	
SODIUM PERBORATE MONOHYDRATE	3377	5.1	
SODIUM PERCHLORATE	1502	5.1	
SODIUM PERMANGANATE	1503	5.1	
SODIUM PEROXIDE	1504	5.1	
SODIUM PEROXOBORATE, ANHYDROUS	3247	5.1	
SODIUM PERSULPHATE	1505	5.1	
SODIUM PHOSPHIDE	1432	4.3	
SODIUM PICRAMATE, dry or wetted with less than 20 % water, by mass	0235	1	
SODIUM PICRAMATE, WETTED with not less than 20 % water, by mass	1349	4.1	
Sodium potassium alloys, liquid, see	1422	4.3	
Sodium selenate, see	2630	6.1	
Sodium selenite, see	2630	6.1	
Sodium silicofluoride, see	2674	6.1	
SODIUM SULPHIDE, ANHYDROUS	1385	4.2	
SODIUM SULPHIDE with less than 30 % water of crystallization	1385	4.2	
SODIUM SULPHIDE, HYDRATED with not less than 30 % water	1849	8	
SODIUM SUPEROXIDE	2547	5.1	
SOLIDS CONTAINING CORROSIVE LIQUID, N.O.S.	3244	8	
SOLIDS or mixtures of solids (such as preparations and wastes) CONTAINING FLAMMABLE LIQUID, N.O.S. having a flash-point up to 60 °C	3175	4.1	
SOLIDS CONTAINING TOXIC LIQUID, N.O.S.	3243	6.1	
Solvents, flammable, n.o.s., see	1993	3	
Solvents, flammable, toxic, n.o.s., see	1992	3	
SOUNDING DEVICES, EXPLOSIVE	0204 0296 0374 0375	1 1 1 1	
Squibs, see	0325 0454	1 1	
Stain, see	1263 3066 3469 3470	3 8 3 8	
STANNIC CHLORIDE, ANHYDROUS	1827	8	
STANNIC CHLORIDE PENTAHYDRATE	2440	8	
STANNIC PHOSPHIDES	1433	4.3	
Steel swarf, see	2793	4.2	
STIBINE	2676	2	
Straw	1327	4.1	Not subject to the Code
Strontium alloys, pyrophoric, see	1383	4.2	
STRONTIUM ARSENITE	1691	6.1	
STRONTIUM CHLORATE	1506	5.1	
Strontium dioxide, see	1509	5.1	
STRONTIUM NITRATE	1507	5.1	
STRONTIUM PERCHLORATE	1508	5.1	
STRONTIUM PEROXIDE	1509	5.1	
STRONTIUM PHOSPHIDE	2013	4.3	
STRYCHNINE	1692	6.1	
STRYCHNINE SALTS	1692	6.1	
STYPHNIC ACID, see	0219 0394	1 1	
STYRENE MONOMER, STABILIZED	2055	3	
SUBSTANCES, EVI, N.O.S., see	0482	1	

Name and description	UN	Class	Remarks
SUBSTANCES, EXPLOSIVE, N.O.S.	0357	1	
	0358	1	
	0359	1	
	0473	1	
	0474	1	
	0475	1	
	0476	1	
	0477	1	
	0478	1	
	0479	1	
	0480	1	
	0481	1	
	0485	1	
SUBSTANCES, EXPLOSIVE, VERY INSENSITIVE, N.O.S.	0482	1	
Substances liable to spontaneous combustion, n.o.s., see	2845	4.2	
	2846	4.2	
	3194	4.2	
	3200	4.2	
SUBSTITUTED NITROPHENOL PESTICIDE, LIQUID, FLAMMABLE, TOXIC, flash-point less than 23 °C	2780	3	
SUBSTITUTED NITROPHENOL PESTICIDE, LIQUID, TOXIC	3014	6.1	
SUBSTITUTED NITROPHENOL PESTICIDE, LIQUID, TOXIC, FLAMMABLE, flash-point not less than 23 °C	3013	6.1	
SUBSTITUTED NITROPHENOL PESTICIDE, SOLID, TOXIC	2779	6.1	
SULPHAMIC ACID	2967	8	
SULPHUR	1350	4.1	
SULPHUR CHLORIDES	1828	8	
Sulphur dichloride, see	1828	8	
SULPHUR DIOXIDE	1079	2	
Sulphuretted hydrogen, see	1053	2	
SULPHUR HEXAFLUORIDE	1080	2	
SULPHURIC ACID with more than 51 % acid	1830	8	
SULPHURIC ACID with not more than 51 % acid	2796	8	
SULPHURIC ACID, FUMING	1831	8	
SULPHURIC ACID, SPENT	1832	8	
Sulphuric and hydrofluoric acid mixture, see	1786	8	
SULPHUR, MOLTEN	2448	4.1	
Sulphur monochloride, see	1828	8	
SULPHUROUS ACID	1833	8	
SULPHUR TETRAFLUORIDE	2418	2	
SULPHUR TRIOXIDE, STABILIZED	1829	8	

Name and description	UN No.	Class	Remarks
SULPHURYL CHLORIDE	1834	6.1	
SULPHURYL FLUORIDE	2191	2	
Table Tennis Balls, see	2000	4.1	
Talcum with tremolite and/or actinolite, see	2212	9	
TARS, LIQUID, including road oils, and cutback bitumens, with a flash-point not greater than 60 °C	1999	3	
Tars, liquid, with a flash-point above 60 °C, at or above its flash-point, see	3256	3	
Tars, liquid, at or above 100 °C and below its flash-point, see	3257	9	
Tartar emetic, see	1551	6.1	
TEAR GAS CANDLES	1700	6.1	
TEAR GAS SUBSTANCE, LIQUID, N.O.S.	1693	6.1	
TEAR GAS SUBSTANCE, SOLID, N.O.S.	3448	6.1	
TELLURIUM COMPOUND, N.O.S.	3284	6.1	
TELLURIUM HEXAFLUORIDE	2195	2	
TERPENE HYDROCARBONS, N.O.S.	2319	3	
TERPINOLENE	2541	3	
TETRABROMOETHANE	2504	6.1	
1,1,2,2-TETRACHLOROETHANE	1702	6.1	
TETRACHLOROETHYLENE	1897	6.1	
TETRAETHYL DITHIO-PYROPHOSPHATE	1704	6.1	
TETRAETHYLENEPENTAMINE	2320	8	
Tetraethyl lead, see	1649	6.1	
TETRAETHYL SILICATE	1292	3	
Tetraethyoxysilane, see	1292	3	
Tetrafluorodichloroethane, see	1958	2	
1,1,1,2-TETRAFLUOROETHANE	3159	2	
TETRAFLUOROETHYLENE, STABILIZED	1081	2	
TETRAFLUOROMETHANE	1982	2	
1,2,3,6-TETRAHYDRO-BENZALDEHYDE	2498	3	
TETRAHYDROFURAN	2056	3	
TETRAHYDRO-FURFURYLAMINE	2943	3	
Tetrahydro-1,4-oxazine, see	2054	3	
TETRAHYDROPHTHALIC ANHYDRIDES with more than 0.05 % of maleic anhydride	2698	8	
1,2,3,6-TETRAHYDROPYRIDINE	2410	3	

Name and description	UN	Class	Remarks
TETRAHYDROTHIOPHENE	2412	3	
Tetramethoxysilane, see	2606	6.1	
TETRAMETHYLAMMONIUM HYDROXIDE SOLID	3423	8	
TETRAMETHYLAMMONIUM HYDROXIDE SOLUTION	1835	8	
Tetramethylene, see	2601	2	
Tetramethylene cyanide, see	2205	6.1	
Tetramethyl lead, see	1649	6.1	
TETRAMETHYLSILANE	2749	3	
TETRANITROANILINE	0207	1	
TETRANITROMETHANE	1510	6.1	
TETRAPROPYL ORTHOTITANATE	2413	3	
TETRAZENE, WETTED with not less than 30 % water, or mixture of alcohol and water, by mass, see	0114	1	
TETRAZOL-1-ACETIC ACID	0407	1	
1H-TETRAZOLE	0504	1	
TETRYL, see	0208	1	
Textile waste, wet	1857	4.2	Not subject to the Code
THALLIUM CHLORATE	2573	5.1	
Thallium (I) chlorate, see	2573	5.1	
THALLIUM COMPOUND, N.O.S.	1707	6.1	
THALLIUM NITRATE	2727	6.1	
Thallium (I) nitrate, see	2727	6.1	
Thallous chlorate, see	2573	5.1	
4-THIAPENTANAL	2785	6.1	
Thia-4-pentanal, see	2785	6.1	
THIOACETIC ACID	2436	3	
THIOCARBAMATE PESTICIDE, LIQUID, FLAMMABLE, TOXIC, flash-point less than 23 °C	2772	3	
THIOCARBAMATE PESTICIDE, LIQUID, TOXIC	3006	6.1	
THIOCARBAMATE PESTICIDE, LIQUID, TOXIC, FLAMMABLE, flash-point not less than 23 °C	3005	6.1	
THIOCARBAMATE PESTICIDE, SOLID, TOXIC	2771	6.1	
THIOGLYCOL	2966	6.1	
THIOGLYCOLIC ACID	1940	8	
THIOLACTIC ACID	2936	6.1	
THIONYL CHLORIDE	1836	8	
THIOPHENE	2414	3	
Thiophenol, see	2337	6.1	

Name and description	UN No.	Class	Remarks
THIOPHOSGENE	2474	6.1	
THIOPHOSPHORYL CHLORIDE	1837	8	
THIOUREA DIOXIDE	3341	4.2	
Tin (IV) chloride, anhydrous, see	1827	8	
Tin (IV) chloride pentahydrate, see	2440	8	
TINCTURES, MEDICINAL	1293	3	
Tin tetrachloride, see	1827	8	
TITANIUM DISULPHIDE	3174	4.2	
TITANIUM HYDRIDE	1871	4.1	
TITANIUM POWDER, DRY	2546	4.2	
TITANIUM POWDER, WETTED with not less than 25 % water	1352	4.1	
TITANIUM SPONGE GRANULES	2878	4.1	
TITANIUM SPONGE POWDERS	2878	4.1	
TITANIUM TETRACHLORIDE	1838	6.1	
TITANIUM TRICHLORIDE MIXTURE	2869	8	
TITANIUM TRICHLORIDE MIXTURE, PYROPHORIC	2441	4.2	
TITANIUM TRICHLORIDE, PYROPHORIC	2441	4.2	
TNT, see	0209 0388 0389	1 1 1	
TNT mixed with aluminium, see	0390	1	
TNT, WETTED with not less than 30 % water, by mass, see	1356	4.1	
TNT, WETTED with not less than 10 % water, by mass, see	3366	4.1	
Toe puffs, nitrocellulose base, see	1353	4.1	
TOLUENE	1294	3	
TOLUENE DIISOCYANATE	2078	6.1	
TOLUIDINES, LIQUID	1708	6.1	
TOLUIDINES, SOLID	3451	6.1	
Toluol, see	1294	3	
2,4-TOLUYLENEDIAMINE, SOLID	1709	6.1	
2,4-TOLUYLENEDIAMINE, SOLUTION	3418	6.1	
Toluylene diisocyanate, see	2078	6.1	
Tolylene diisocyanate, see	2078	6.1	
Tolylethylene, inhibited, see	2618	3	
TORPEDOES with bursting charge	0329 0330 0451	1 1 1	
TORPEDOES, LIQUID FUELLED with inert head	0450	1	

Name and description	UN	Class	Remarks
TORPEDOES, LIQUID FUELLED with or without bursting charge	0449	1	
TOXIC BY INHALATION LIQUID, N.O.S. with an LC_{50} lower than or equal to 200 ml/m³ and saturated vapour concentration greater than or equal to 500 LC_{50}	3381	6.1	
TOXIC BY INHALATION LIQUID, N.O.S. with an LC_{50} lower than or equal to 1000 ml/m³ and saturated vapour concentration greater than or equal to 10 LC_{50}	3382	6.1	
TOXIC BY INHALATION LIQUID, CORROSIVE, N.O.S. with an LC_{50} lower than or equal to 200 ml/m³ and saturated vapour concentration greater than or equal to 500 LC_{50}	3389	6.1	
TOXIC BY INHALATION LIQUID, CORROSIVE, N.O.S. with an LC_{50} lower than or equal to 1000 ml/m³ and saturated vapour concentration greater than or equal to 10 LC_{50}	3390	6.1	
TOXIC BY INHALATION LIQUID, FLAMMABLE, N.O.S. with an LC_{50} lower than or equal to 200 ml/m³ and saturated vapour concentration greater than or equal to 500 LC_{50}	3383	6.1	
TOXIC BY INHALATION LIQUID, FLAMMABLE, N.O.S. with an LC_{50} lower than or equal to 1000 ml/m³ and saturated vapour concentration greater than or equal to 10 LC_{50}	3384	6.1	
TOXIC BY INHALATION LIQUID, FLAMMABLE, CORROSIVE, N.O.S. with an LC_{50} lower than or equal to 200 ml/m³ and saturated vapour concentration greater than or equal to 500 LC_{50}	3488	6.1	
TOXIC BY INHALATION LIQUID, FLAMMABLE, CORROSIVE, N.O.S. with an LC_{50} lower than or equal to 1000 ml/m³ and saturated vapour concentration greater than or equal to 10 LC_{50}	3489	6.1	
TOXIC BY INHALATION LIQUID, OXIDIZING, N.O.S. with an LC_{50} lower than or equal to 200 ml/m³ and saturated vapour concentration greater than or equal to 500 LC_{50}	3387	6.1	
TOXIC BY INHALATION LIQUID, OXIDIZING, N.O.S. with an LC_{50} lower than or equal to 1000 ml/m³ and saturated vapour concentration greater than or equal to 10 LC_{50}	3388	6.1	
TOXIC BY INHALATION LIQUID, WATER-REACTIVE, N.O.S. with an LC_{50} lower than or equal to 200 ml/m³ and saturated vapour concentration greater than or equal to 500 LC_{50}	3385	6.1	
TOXIC BY INHALATION LIQUID, WATER-REACTIVE, N.O.S. with an LC_{50} lower than or equal to 1000 ml/m³ and saturated vapour concentration greater than or equal to 10 LC_{50}	3386	6.1	
TOXIC BY INHALATION LIQUID, WATER-REACTIVE, FLAMMABLE, N.O.S. with an LC_{50} lower than or equal to 200 ml/m³ and saturated vapour concentration greater than or equal to 500 LC_{50}	3490	6.1	
TOXIC BY INHALATION LIQUID, WATER-REACTIVE, FLAMMABLE, N.O.S. with an LC_{50} lower than or equal to 1000 ml/m³ and saturated vapour concentration greater than or equal to 10 LC_{50}	3491	6.1	
TOXIC LIQUID, CORROSIVE, INORGANIC, N.O.S.	3289	6.1	
TOXIC LIQUID, CORROSIVE, ORGANIC, N.O.S.	2927	6.1	
TOXIC LIQUID, FLAMMABLE, ORGANIC, N.O.S.	2929	6.1	
TOXIC LIQUID, INORGANIC, N.O.S.	3287	6.1	
TOXIC LIQUID, ORGANIC, N.O.S.	2810	6.1	
TOXIC LIQUID, OXIDIZING, N.O.S.	3122	6.1	
TOXIC LIQUID, WATER-REACTIVE, N.O.S.	3123	6.1	
TOXIC SOLID, CORROSIVE, INORGANIC, N.O.S.	3290	6.1	
TOXIC SOLID, CORROSIVE, ORGANIC, N.O.S.	2928	6.1	
TOXIC SOLID, FLAMMABLE, INORGANIC, N.O.S.	3535	6.1	
TOXIC SOLID, FLAMMABLE, ORGANIC, N.O.S.	2930	6.1	
TOXIC SOLID, INORGANIC, N.O.S.	3288	6.1	
TOXIC SOLID, ORGANIC, N.O.S.	2811	6.1	
TOXIC SOLID, OXIDIZING, N.O.S.	3086	6.1	
TOXIC SOLID, SELF-HEATING, N.O.S.	3124	6.1	

Name and description	UN	Class	Remarks
TOXIC SOLID, WATER-REACTIVE, N.O.S.	3125	6.1	
TOXINS, EXTRACTED FROM LIVING SOURCES, LIQUID, N.O.S.	3172	6.1	
TOXINS, EXTRACTED FROM LIVING SOURCES, SOLID, N.O.S.	3462	6.1	
TRACERS FOR AMMUNITION	0212 0306	1 1	
Tremolite, see	2212	9	
TRIALLYLAMINE	2610	3	
TRIALLYL BORATE	2609	6.1	
TRIAZINE PESTICIDE, LIQUID, FLAMMABLE, TOXIC, flash-point less than 23 °C	2764	3	
TRIAZINE PESTICIDE, LIQUID, TOXIC	2998	6.1	
TRIAZINE PESTICIDE, LIQUID, TOXIC, FLAMMABLE, flash-point not less than 23 °C	2997	6.1	
TRIAZINE PESTICIDE, SOLID, TOXIC	2763	6.1	
Tribromoborane, see	2692	8	
TRIBUTYLAMINE	2542	6.1	
TRIBUTYLPHOSPHANE	3254	4.2	
Trichloroacetaldehyde, see	2075	6.1	
TRICHLOROACETIC ACID	1839	8	
TRICHLOROACETIC ACID SOLUTION	2564	8	
Trichlororaceticaldehyde, see	2075	6.1	
TRICHLOROACETYL CHLORIDE	2442	8	
TRICHLOROBENZENES, LIQUID	2321	6.1	
TRICHLOROBUTENE	2322	6.1	
1,1,1-TRICHLOROETHANE	2831	6.1	
TRICHLOROETHYLENE	1710	6.1	
TRICHLOROISOCYANURIC ACID, DRY	2468	5.1	
Trichloronitromethane, see	1580	6.1	
TRICHLOROSILANE	1295	4.3	
1,3,5-Trichloro-s-triazine-2,4,6-trione, see	2468	5.1	
2,4,6-Trichloro-1,3,5- triazine, see	2670	8	
TRICRESYL PHOSPHATE with more than 3 % ortho isomer	2574	6.1	
TRIETHYLAMINE	1296	3	
Triethyl borate, see	1176	3	
TRIETHYLENETETRAMINE	2259	8	

Name and description	UN No.	Class	Remarks
Triethyl orthoformate, see	2524	3	
TRIETHYL PHOSPHITE	2323	3	
TRIFLUOROACETIC ACID	2699	8	
TRIFLUOROACETYL CHLORIDE	3057	2	
Trifluorobromomethane, see	1009	2	
Trifluorochloroethane, see	1983	2	
TRIFLUOROCHLORO-ETHYLENE, STABILIZED, REFRIGERANT GAS R 1113	1082	2	
Trifluorochloromethane, see	1022	2	
1,1,1-TRIFLUOROETHANE	2035	2	
TRIFLUOROMETHANE	1984	2	
TRIFLUOROMETHANE, REFRIGERATED LIQUID	3136	2	
2-TRIFLUOROMETHYLANILINE	2942	6.1	
3-TRIFLUOROMETHYLANILINE	2948	6.1	
TRIISOBUTYLENE	2324	3	
TRIISOPROPYL BORATE	2616	3	
TRIMETHYLACETYL CHLORIDE	2438	6.1	
TRIMETHYLAMINE, ANHYDROUS	1083	2	
TRIMETHYLAMINE, AQUEOUS SOLUTION, not more than 50 % trimethylamine, by mass	1297	3	
1,3,5-TRIMETHYLBENZENE	2325	3	
TRIMETHYL BORATE	2416	3	
TRIMETHYLCHLOROSILANE	1298	3	
TRIMETHYLCYCLOHEXYL-AMINE	2326	8	
Trimethylene chlorobromide, see	2688	6.1	
TRIMETHYLHEXA-METHYLENEDIAMINES	2327	8	
TRIMETHYLHEXAMETHYLENE DIISOCYANATE	2328	6.1	
2,4,4-Trimethylpentene-1, see	2050	3	
2,4,4-Trimethylpentene-2, see	2050	3	
TRIMETHYL PHOSPHITE	2329	3	
TRINITROANILINE	0153	1	
TRINITROANISOLE	0213	1	
TRINITROBENZENE, dry or wetted with less than 30 % water, by mass	0214	1	
TRINITROBENZENE, WETTED with not less than 10 % water, by mass	3367	4.1	
TRINITROBENZENE, WETTED with not less than 30 % water, by mass	1354	4.1	

Name and description	UN	Class	Remarks
TRINITROBENZENE-SULPHONIC ACID	0386	1	
TRINITROBENZOIC ACID, dry or wetted with less than 30 % water, by mass	0215	1	
TRINITROBENZOIC ACID, WETTED with not less than 10 % water, by mass	3368	4.1	
TRINITROBENZOIC ACID, WETTED with not less than 30 % water, by mass	1355	4.1	
TRINITROCHLOROBENZENE	0155	1	
TRINITROCHLOROBENZENE WETTED with not less than 10 % water, by mass	3365	4.1	
TRINITRO-m-CRESOL	0216	1	
TRINITROFLUORENONE	0387	1	
TRINITRONAPHTHALENE	0217	1	
TRINITROPHENETOLE	0218	1	
TRINITROPHENOL, dry or wetted with less than 30 % water, by mass	0154	1	
TRINITROPHENOL (PICRIC ACID), WETTED with not less than 30 % water, by mass	1344	4.1	
TRINITROPHENOL WETTED with not less than 10 % water, by mass	3364	4.1	
TRINITROPHENYL-METHYLNITRAMINE	0208	1	
TRINITRORESORCINOL, dry or wetted with less than 20 % water, or mixture of alcohol and water, by mass	0219	1	
TRINITRORESORCINOL, WETTED with not less than 20 % water, or mixture of alcohol and water, by mass	0394	1	
TRINITROTOLUENE (TNT), dry or wetted with less than 30 % water, by mass	0209	1	
TRINITROTOLUENE AND HEXANITROSTILBENE MIXTURE	0388	1	
TRINITROTOLUENE MIXTURE CONTAINING TRINITROBENZENE AND HEXANITROSTILBENE	0389	1	
TRINITROTOLUENE AND TRINITROBENZENE MIXTURE	0388	1	
TRINITROTOLUENE, WETTED with not less than 10 % water, by mass	3366	4.1	
TRINITROTOLUENE, WETTED with not less than 30 % water, by mass	1356	4.1	

Name and description	UN No.	Class	Remarks
TRIPROPYLAMINE	2260	3	
TRIPROPYLENE	2057	3	
TRIS-(1-AZIRIDINYL) PHOSPHINE OXIDE SOLUTION	2501	6.1	
TRITONAL	0390	1	
Tropilidene, see	2603	3	
TUNGSTEN HEXAFLUORIDE	2196	2	
TURPENTINE	1299	3	
TURPENTINE SUBSTITUTE	1300	3	
UNDECANE	2330	3	
URANIUM HEXAFLUORIDE, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE, less than 0.1 kg per package, non-fissile or fissile-excepted	3507	6.1	
UREA HYDROGEN PEROXIDE	1511	5.1	
UREA NITRATE, dry or wetted with less than 20 % water, by mass	0220	1	
UREA NITRATE, WETTED with not less than 10 % water, by mass	3370	4.1	
UREA NITRATE, WETTED with not less than 20 % water, by mass	1357	4.1	
Valeral, see	2058	3	
VALERALDEHYDE	2058	3	
n-Valeraldehyde, see	2058	3	
Valeric aldehyde, see	2058	3	
VALERYL CHLORIDE	2502	8	
VANADIUM COMPOUND, N.O.S.	3285	6.1	
Vanadium (IV) oxide sulphate, see	2931	6.1	
Vanadium oxysulphate, see	2931	6.1	
VANADIUM OXYTRICHLORIDE	2443	8	
VANADIUM PENTOXIDE, non-fused form	2862	6.1	
VANADIUM TETRACHLORIDE	2444	8	
VANADIUM TRICHLORIDE	2475	8	
VANADYL SULPHATE	2931	6.1	
Varnish, see	1263 3066 3469 3470	3 8 3 8	
VEHICLE, FLAMMABLE GAS POWERED	3166	9	
VEHICLE, FLAMMABLE LIQUID POWERED	3166	9	
VEHICLE, FUEL CELL, FLAMMABLE GAS POWERED	3166	9	

Name and description	UN	Class	Remarks
VEHICLE, FUEL CELL, FLAMMABLE LIQUID POWERED	3166	9	
Villiaumite, see	1690	6.1	
VINYL ACETATE, STABILIZED	1301	3	
Vinylbenzene, see	2055	3	
VINYL BROMIDE, STABILIZED	1085	2	
VINYL BUTYRATE, STABILIZED	2838	3	
VINYL CHLORIDE, STABILIZED	1086	2	
VINYL CHLOROACETATE	2589	6.1	
VINYL ETHYL ETHER, STABILIZED	1302	3	
VINYL FLUORIDE, STABILIZED	1860	2	
VINYLIDENE CHLORIDE, STABILIZED	1303	3	
VINYL ISOBUTYL ETHER, STABILIZED	1304	3	
VINYL METHYL ETHER, STABILIZED	1087	2	
VINYLPYRIDINES, STABILIZED	3073	6.1	
VINYLTOLUENES, STABILIZED	2618	3	
VINYLTRICHLOROSILANE	1305	3	
Warheads for guided missiles, see	0286 0287 0369 0370 0371	1 1 1 1 1	
WARHEADS, ROCKET with burster or expelling charge	0370 0371	1 1	
WARHEADS, ROCKET with bursting charge	0286 0287 0369	1 1 1	
WARHEADS, TORPEDO with bursting charge	0221	1	
WATER-REACTIVE LIQUID, N.O.S.	3148	4.3	
WATER-REACTIVE LIQUID, CORROSIVE, N.O.S.	3129	4.3	
WATER-REACTIVE LIQUID, TOXIC, N.O.S.	3130	4.3	
WATER-REACTIVE SOLID, N.O.S.	2813	4.3	
WATER-REACTIVE SOLID, CORROSIVE, N.O.S.	3131	4.3	
WATER-REACTIVE SOLID, FLAMMABLE, N.O.S.	3132	4.3	
WATER-REACTIVE SOLID, OXIDIZING, N.O.S.	3133	4.3	Carriage prohibited
WATER-REACTIVE SOLID, SELF-HEATING, N.O.S.	3135	4.3	
WATER-REACTIVE SOLID, TOXIC, N.O.S.	3134	4.3	
White arsenic, see	1561	6.1	
White spirit, see	1300	3	
WOOD PRESERVATIVES, LIQUID	1306	3	
Wool waste, wet	1387	4.2	Not subject to the Code
XANTHATES	3342	4.2	
XENON	2036	2	
XENON, REFRIGERATED LIQUID	2591	2	
XYLENES	1307	3	
XYLENOLS, LIQUID	3430	6.1	
XYLENOLS, SOLID	2261	6.1	
XYLIDINES, LIQUID	1711	6.1	
XYLIDINES, SOLID	3452	6.1	
Xylols, see	1307	3	
XYLYL BROMIDE, LIQUID	1701	6.1	
XYLYL BROMIDE, SOLID	3417	6.1	
ZINC AMMONIUM NITRITE	1512	5.1	
ZINC ARSENATE	1712	6.1	
ZINC ARSENATE AND ZINC ARSENITE MIXTURE	1712	6.1	
ZINC ARSENITE	1712	6.1	
ZINC ASHES	1435	4.3	
Zinc bisulphite solution, see	2693	8	
ZINC BROMATE	2469	5.1	
ZINC CHLORATE	1513	5.1	
ZINC CHLORIDE, ANHYDROUS	2331	8	
ZINC CHLORIDE SOLUTION	1840	8	
ZINC CYANIDE	1713	6.1	
ZINC DITHIONITE	1931	9	
ZINC DUST	1436	4.3	
ZINC FLUOROSILICATE	2855	6.1	
Zinc hexafluorosilicate, see	2855	6.1	
ZINC HYDROSULPHITE, see	1931	9	
ZINC NITRATE	1514	5.1	
ZINC PERMANGANATE	1515	5.1	
ZINC PEROXIDE	1516	5.1	
ZINC PHOSPHIDE	1714	4.3	
ZINC POWDER	1436	4.3	
ZINC RESINATE	2714	4.1	
Zinc selenate, see	2630	4.1	

Name and description	UN	Class	Remarks
Zinc selenite, see	2630	4.1	
Zinc silicofluoride, see	2855	6.1	
ZIRCONIUM, DRY, coiled wire, finished metal sheets, strip (thinner than 254 microns but not thinner than 18 microns)	2858	4.1	
ZIRCONIUM, DRY, finished sheets, strip or coiled wire	2009	4.2	
ZIRCONIUM HYDRIDE	1437	4.1	
ZIRCONIUM NITRATE	2728	5.1	
ZIRCONIUM PICRAMATE, dry or wetted with less than 20 % water, by mass	0236	1	
ZIRCONIUM PICRAMATE, WETTED with not less than 20 % water, by mass	1517	4.1	
ZIRCONIUM POWDER, DRY	2008	4.2	
ZIRCONIUM POWDER, WETTED with not less than 25 % water	1358	4.1	
ZIRCONIUM SCRAP	1932	4.2	
ZIRCONIUM SUSPENDED IN A FLAMMABLE LIQUID	1308	3	
ZIRCONIUM TETRACHLORIDE	2503	8	

3.2.3 Table C: Groupings of dangerous goods having similar chemical properties

The following groupings are provided to assist in the application of segregation for incompatible dangerous goods. Compatibility requirements are specified in Part 7 of this Code.

The table is provided as guidance only and should not be considered as definitive.

Acids

*** Identifies strong acids**

1052	HYDROGEN FLUORIDE, ANHYDROUS*
1182	ETHYL CHLOROFORMATE
1183	ETHYLDICHLOROSILANE
1238	METHYL CHLOROFORMATE
1242	METHYLDICHLOROSILANE
1250	METHYLTRICHLOROSILANE
1295	TRICHLOROSILANE
1298	TRIMETHYLCHLOROSILANE
1305	VINYLTRICHLOROSILANE
1595	DIMETHYL SULPHATE
1715	ACETIC ANHYDRIDE
1716	ACETYL BROMIDE
1717	ACETYL CHLORIDE
1718	BUTYL ACID PHOSPHATE
1722	ALLYL CHLOROFORMATE
1723	ALLYL IODIDE
1724	ALLYLTRICHLOROSILANE, STABILIZED
1725	ALUMINIUM BROMIDE, ANHYDROUS
1726	ALUMINIUM CHLORIDE, ANHYDROUS
1727	AMMONIUM HYDROGENDIFLUORIDE, SOLID
1728	AMYLTRICHLOROSILANE
1729	AMYLTRICHLOROSILANE
1730	ANTIMONY PENTACHLORIDE, LIQUID
1731	ANTIMONY PENTACHLORIDE SOLUTION
1732	ANTIMONY PENTAFLUORIDE
1733	ANTIMONY TRICHLORIDE
1736	BENZOYL CHLORIDE
1737	BENZYL BROMIDE
1738	BENZYL CHLORIDE
1739	BENZYL CHLOROFORMATE
1740	HYDROGENDIFLUORIDES, SOLID, N.O.S.
1742	BORON TRIFLUORIDE ACETIC ACID COMPLEX, LIQUID
1743	BORON TRIFLUORIDE PROPIONIC ACID COMPLEX, LIQUID
1744	BROMINE or BROMINE SOLUTION
1745	BROMINE PENTAFLUORIDE
1746	BROMINE TRIFLUORIDE
1747	BUTYLTRICHLOROSILANE
1750	CHLOROACETIC ACID SOLUTION
1751	CHLOROACETIC ACID, SOLID
1752	CHLOROACETYL CHLORIDE
1753	CHLOROPHENYL-TRICHLOROSILANE
1754	CHLOROSULPHONIC ACID (with or without sulphur trioxide)
1755	CHROMIC ACID SOLUTION
1756	CHROMIC FLUORIDE, SOLID
1757	CHROMIC FLUORIDE SOLUTION
1758	CHROMIUM OXYCHLORIDE
1762	CYCLOHEXENYLTRICHLORO-SILANE
1763	CYCLOHEXYLTRICHLORO-SILANE
1764	DICHLOROACETIC ACID
1765	DICHLOROACETYL CHLORIDE
1766	DICHLOROPHENYL-TRICHLOROSILANE
1767	DIETHYLDICHLOROSILANE
1768	DIFLUOROPHOSPHORIC ACID, ANHYDROUS
1769	DIPHENYLDICHLOROSILANE
1770	DIPHENYLMETHYL BROMIDE
1771	DODECYLTRICHLOROSILANE
1773	FERRIC CHLORIDE, ANHYDROUS
1775	FLUOROBORIC ACID
1776	FLUOROPHOSPHORIC ACID, ANHYDROUS
1777	FLUOROSULPHONIC ACID*
1778	FLUOROSILICIC ACID
1779	FORMIC ACID with more than 85 % acid by mass
1780	FUMARYL CHLORIDE
1781	HEXADECYLTRICHLOROSILANE
1782	HEXAFLUOROPHOSPHORIC ACID
1784	HEXYLTRICHLOROSILANE
1786	HYDROFLUORIC ACID AND SULPHURIC ACID MIXTURE*
1787	HYDRIODIC ACID*
1788	HYDROBROMIC ACID*
1789	HYDROCHLORIC ACID*
1790	HYDROFLUORIC ACID*
1792	IODINE MONOCHLORIDE, SOLID
1793	ISOPROPYL ACID PHOSPHATE
1794	LEAD SULPHATE with more than 3 % free acid
1796	NITRATING ACID MIXTURE*
1798	NITROHYDROCHLORIC ACID*
1799	NONYLTRICHLOROSILANE
1800	OCTADECYLTRICHLOROSILANE
1801	OCTYLTRICHLOROSILANE

1802 PERCHLORIC ACID with not more than 50 % acid, by mass*
1803 PHENOLSULPHONIC ACID, LIQUID
1804 PHENYLTRICHLOROSILANE
1805 PHOSPHORIC ACID, SOLUTION
1806 PHOSPHORUS PENTACHLORIDE
1807 PHOSPHORUS PENTOXIDE
1808 PHOSPHORUS PENTOXIDE
1809 PHOSPHORUS TRICHLORIDE
1810 PHOSPHORUS OXYCHLORIDE
1811 POTASSIUM HYDROGENDIFLUORIDE, SOLID
1815 PROPIONYL CHLORIDE
1816 PROPYLTRICHLOROSILANE
1817 PYROSULPHURYL CHLORIDE
1818 SILICON TETRACHLORIDE
1826 NITRATING ACID MIXTURE, SPENT*
1827 STANNIC CHLORIDE, ANHYDROUS
1828 SULPHUR CHLORIDES
1829 SULPHUR TRIOXIDE, STABILIZED
1830 SULPHURIC ACID with more than 51 % acid*
1831 SULPHURIC ACID, FUMING*
1832 SULPHURIC ACID, SPENT*
1833 SULPHUROUS ACID
1834 SULPHURYL CHLORIDE
1836 THIONYL CHLORIDE
1837 THIOPHOSPHORYL CHLORIDE
1838 TITANIUM TETRACHLORIDE
1839 TRICHLOROACETIC ACID
1840 ZINC CHLORIDE SOLUTION
1848 PROPIONIC ACID with not less than 10 % and less than 90 % acid by mass
1873 PERCHLORIC ACID with more than 50 % but not more than 72 % acid, by mass*
1898 ACETYL IODIDE
1902 DIISOOCTYL ACID PHOSPHATE
1905 SELENIC ACID
1906 SLUDGE ACID*
1938 BROMOACETIC ACID SOLUTION
1939 PHOSPHORUS OXYBROMIDE
1940 THIOGLYCOLIC ACID
2031 NITRIC ACID, other than red fuming*
2032 NITRIC ACID, RED FUMING*
2214 PHTHALIC ANHYDRIDE with more than 0.05 % of maleic anhydride
2215 MALEIC ANHYDRIDE
2218 ACRYLIC ACID, STABILIZED
2225 BENZENESULPHONYL CHLORIDE
2226 BENZOTRICHLORIDE
2240 CHROMOSULPHURIC ACID
2262 DIMETHYLCARBAMOYL CHLORIDE
2267 DIMETHYL THIOPHOSPHORYL CHLORIDE
2305 NITROBENZENE-SULPHONIC ACID
2308 NITROSYLSULPHURIC ACID, LIQUID*
2331 ZINC CHLORIDE, ANHYDROUS
2353 BUTYRYL CHLORIDE
2395 ISOBUTYRYL CHLORIDE
2407 ISOPROPYL CHLOROFORMATE
2434 DIBENZYL-DICHLOROSILANE
2435 ETHYLPHENYL-DICHLOROSILANE
2437 METHYLPHENYL-DICHLOROSILANE
2438 TRIMETHYLACETYL CHLORIDE
2439 SODIUM HYDROGENDIFLUORIDE
2440 STANNIC CHLORIDE PENTAHYDRATE
2442 TRICHLOROACETYL CHLORIDE
2443 VANADIUM OXYTRICHLORIDE
2444 VANADIUM TETRACHLORIDE
2475 VANADIUM TRICHLORIDE
2495 IODINE PENTAFLUORIDE
2496 PROPIONIC ANHYDRIDE
2502 VALERYL CHLORIDE
2503 ZIRCONIUM TETRACHLORIDE
2506 AMMONIUM HYDROGEN SULPHATE
2507 CHLOROPLATINIC ACID, SOLID
2508 MOLYBDENUM PENTACHLORIDE
2509 POTASSIUM HYDROGEN SULPHATE
2511 2-CHLOROPROPIONIC ACID
2513 BROMOACETYL BROMIDE
2531 METHACRYLIC ACID, STABILIZED
2564 TRICHLOROACETIC ACID SOLUTION
2571 ALKYLSULPHURIC ACIDS
2576 PHOSPHORUS OXYBROMIDE, MOLTEN
2577 PHENYLACETYL CHLORIDE
2578 PHOSPHORUS TRIOXIDE
2580 ALUMINIUM BROMIDE SOLUTION
2581 ALUMINIUM CHLORIDE SOLUTION
2582 FERRIC CHLORIDE SOLUTION
2583 ALKYLSULPHONIC ACIDS, SOLID or ARYLSULPHONIC ACIDS, SOLID with more than 5 % free sulphuric acid
2584 ALKYLSULPHONIC ACIDS, LIQUID or ARYLSULPHONIC ACIDS, LIQUID with more than 5 % free sulphuric acid
2585 ALKYLSULPHONIC ACIDS, SOLID or ARYLSULPHONIC ACIDS, SOLID with not more than 5 % free sulphuric acid
2586 ALKYLSULPHONIC ACIDS, LIQUID or ARYLSULPHONIC ACIDS, LIQUID with not more than 5 % free sulphuric acid
2604 BORON TRIFLUORIDE DIETHYL ETHERATE
2626 CHLORIC ACID, AQUEOUS SOLUTION with not more than 10 %

chloric acid
2642 FLUOROACETIC ACID
2670 CYANURIC CHLORIDE
2691 PHOSPHORUS PENTABROMIDE
2692 BORON TRIBROMIDE
2698 TETRAHYDROPHTHALIC ANHYDRIDES with more than 0.05 % of maleic anhydride
2699 TRIFLUOROACETIC ACID
2739 BUTYRIC ANHYDRIDE
2740 n-PROPYL CHLOROFORMATE
2742 CHLOROFORMATES, TOXIC, CORROSIVE, FLAMMABLE, N.O.S.
2743 n-BUTYL CHLOROFORMATE
2744 CYCLOBUTYL CHLOROFORMATE
2745 CHLOROMETHYL CHLOROFORMATE
2746 PHENYL CHLOROFORMATE
2748 2-ETHYLHEXYL CHLOROFORMATE
2751 DIETHYLTHIO-PHOSPHORYL CHLORIDE
2789 ACETIC ACID, GLACIAL or ACETIC ACID SOLUTION, more than 80 % acid, by mass
2790 ACETIC ACID SOLUTION, not less than 50 % but not more than 80 % acid, by mass
2794 BATTERIES, WET, FILLED WITH ACID, electric storage
2796 SULPHURIC ACID with not more than 51 % acid or BATTERY FLUID, ACID*
2798 PHENYLPHOSPHORUS DICHLORIDE
2799 PHENYLPHOSPHORUS THIODICHLORIDE
2802 COPPER CHLORIDE
2817 AMMONIUM HYDROGENDIFLUORIDE SOLUTION
2819 AMYL ACID PHOSPHATE
2820 BUTYRIC ACID
2823 CROTONIC ACID, SOLID
2826 ETHYL CHLOROTHIOFORMATE
2829 CAPROIC ACID
2834 PHOSPHOROUS ACID
2851 BORON TRIFLUORIDE DIHYDRATE
2865 HYDROXYLAMINE SULPHATE
2869 TITANIUM TRICHLORIDE MIXTURE
2879 SELENIUM OXYCHLORIDE
2967 SULPHAMIC ACID
2985 CHLOROSILANES, FLAMMABLE, CORROSIVE, N.O.S.
2986 CHLOROSILANES, CORROSIVE, FLAMMABLE, N.O.S.
2987 CHLOROSILANES, CORROSIVE, N.O.S.
2988 CHLOROSILANES, WATER-REACTIVE, FLAMMABLE, CORROSIVE, N.O.S.
3246 METHANESULPHONYL CHLORIDE
3250 CHLOROACETIC ACID, MOLTEN
3260 CORROSIVE SOLID, ACIDIC, INORGANIC, N.O.S.
3261 CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S.
3264 CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S.
3265 CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S.
3277 CHLOROFORMATES, TOXIC, CORROSIVE, N.O.S.
3361 CHLOROSILANES, TOXIC, CORROSIVE, N.O.S.
3362 CHLOROSILANES, TOXIC, CORROSIVE, FLAMMABLE, N.O.S.
3412 FORMIC ACID with not less than 10 % but not more than 85 % acid by mass
3412 FORMIC ACID with not less than 5 % but less than 10 % acid by mass
3419 BORON TRIFLUORIDE ACETIC ACID COMPLEX, SOLID
3420 BORON TRIFLUORIDE PROPIONIC ACID COMPLEX, SOLID
3421 POTASSIUM HYDROGENDIFLUORIDE SOLUTION
3425 BROMOACETIC ACID, SOLID
3453 PHOSPHORIC ACID, SOLID
3456 NITROSYLSULPHURIC ACID, SOLID
3463 PROPIONIC ACID with not less than 90 % acid by mass
3472 CROTONIC ACID, LIQUID
3498 IODINE MONOCHLORIDE, LIQUID

*** Identifies strong acids**

Alkalis

1005 AMMONIA, ANHYDROUS
1160 DIMETHYLAMINE AQUEOUS SOLUTION
1163 DIMETHYLHYDRAZINE, UNSYMMETRICAL
1235 METHYLAMINE, AQUEOUS SOLUTION
1244 METHYLHYDRAZINE
1289 SODIUM METHYLATE SOLUTION in alcohol
1382 POTASSIUM SULPHIDE, ANHYDROUS or POTASSIUM SULPHIDE with less than 30 % water of crystallization
1385 SODIUM SULPHIDE, ANHYDROUS or SODIUM SULPHIDE with less than 30 % water of crystallization
1431 SODIUM METHYLATE
1604 ETHYLENEDIAMINE
1719 CAUSTIC ALKALI LIQUID, N.O.S.
1813 POTASSIUM HYDROXIDE, SOLID
1814 POTASSIUM HYDROXIDE SOLUTION

1819 SODIUM ALUMINATE SOLUTION
1823 SODIUM HYDROXIDE, SOLID
1824 SODIUM HYDROXIDE SOLUTION
1825 SODIUM MONOXIDE
1835 TETRAMETHYL-AMMONIUM HYDROXIDE SOLUTION
1847 POTASSIUM SULPHIDE, HYDRATED with not less than 30 % water of crystallization
1849 SODIUM SULPHIDE, HYDRATED with not less than 30 % water
1907 SODA LIME with more than 4 % sodium hydroxide
1922 PYRROLIDINE
2029 HYDRAZINE, ANHYDROUS
2030 HYDRAZINE AQUEOUS SOLUTION, with more than 37 % hydrazine by mass
2033 POTASSIUM MONOXIDE
2073 AMMONIA SOLUTION, relative density less than 0.880 at 15 °C in water, with more than 35 % but not more than 50 % ammonia
2079 DIETHYLENETRIAMINE
2259 TRIETHYLENETETRAMINE
2270 ETHYLAMINE, AQUEOUS SOLUTION with not less than 50 % but not more than 70 % ethylamine
2318 SODIUM HYDROSULPHIDE with less than 25 % water of crystallization
2320 TETRAETHYLENE-PENTAMINE
2379 1,3-DIMETHYLBUTYLAMINE
2382 DIMETHYLHYDRAZINE, SYMMETRICAL
2386 1-ETHYLPIPERIDINE
2399 1-METHYLPIPERIDINE
2401 PIPERIDINE
2491 ETHANOLAMINE or ETHANOLAMINE SOLUTION
2579 PIPERAZINE
2671 AMINOPYRIDINES
2672 AMMONIA SOLUTION, relative density between 0.880 and 0.957 at 15 °C in water, with more than 10 % but not more than 35 % ammonia
2677 RUBIDIUM HYDROXIDE SOLUTION
2678 RUBIDIUM HYDROXIDE
2679 LITHIUM HYDROXIDE SOLUTION
2680 LITHIUM HYDROXIDE
2681 CAESIUM HYDROXIDE SOLUTION
2682 CAESIUM HYDROXIDE
2683 AMMONIUM SULPHIDE SOLUTION
2733 AMINES, FLAMMABLE, CORROSIVE, N.O.S. or POLYAMINES, FLAMMABLE, CORROSIVE, N.O.S.
2734 AMINES, LIQUID, CORROSIVE, FLAMMABLE, N.O.S. or POLYAMINES, LIQUID, CORROSIVE, FLAMMABLE, N.O.S.
2735 AMINES, LIQUID, CORROSIVE, N.O.S. or POLYAMINES, LIQUID, CORROSIVE, N.O.S.
2795 BATTERIES, WET, FILLED WITH ALKALI, electric storage
2797 BATTERY FLUID, ALKALI
2818 AMMONIUM POLYSULPHIDE SOLUTION
2949 SODIUM HYDROSULPHIDE, HYDRATED with not less than 25 % water of crystallization
3028 BATTERIES, DRY, CONTAINING POTASSIUM HYDROXIDE SOLID, electric storage
3073 VINYLPYRIDINES, STABILIZED
3206 ALKALI METAL ALCOHOLATES, SELF-HEATING, CORROSIVE, N.O.S.
3253 DISODIUM TRIOXOSILICATE
3259 AMINES, SOLID, CORROSIVE, N.O.S. or POLYAMINES, SOLID, CORROSIVE, N.O.S.
3262 CORROSIVE SOLID, BASIC, INORGANIC, N.O.S.
3263 CORROSIVE SOLID, BASIC, ORGANIC, N.O.S.
3266 CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S.
3267 CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S.
3274 ALCOHOLATES SOLUTION, N.O.S., in alcohol
3293 HYDRAZINE, AQUEOUS SOLUTION with not more than 37 % hydrazine, by mass
3318 AMMONIA SOLUTION, relative density less than 0.880 at 15 °C in water, with more than 50 % ammonia
3320 SODIUM BOROHYDRIDE AND SODIUM HYDROXIDE SOLUTION, with not more than 12 % sodium borohydride and not more than 40 % sodium hydroxide by mass
3423 TETRAMETHYL-AMMONIUM HYDROXIDE, SOLID
3484 HYDRAZINE AQUEOUS SOLUTION, FLAMMABLE with more than 37 % hydrazine, by mass

Ammonium compounds

0004 AMMONIUM PICRATE dry or wetted with less than 10 % water, by mass
0222 AMMONIUM NITRATE
0402 AMMONIUM PERCHLORATE
1310 AMMONIUM PICRATE, WETTED with not less than 10 % water, by mass
1439 AMMONIUM DICHROMATE
1442 AMMONIUM PERCHLORATE
1444 AMMONIUM PERSULPHATE
1546 AMMONIUM ARSENATE
1630 MERCURY AMMONIUM CHLORIDE
1727 AMMONIUM

HYDROGENDIFLUORIDE, SOLID
1835 TETRAMETHYL-AMMONIUM HYDROXIDE SOLUTION
1843 AMMONIUM DINITRO-o-CRESOLATE, SOLID
1942 AMMONIUM NITRATE with not more than 0.2 % combustible substances, including any organic substance calculated as carbon, to the exclusion of any other added substance
2067 AMMONIUM NITRATE BASED FERTILIZER
2071 AMMONIUM NITRATE BASED FERTILIZER
2073 AMMONIA SOLUTION, relative density less than 0.880 at 15 °C in water, with more than 35 % but not more than 50 % ammonia
2426 AMMONIUM NITRATE, LIQUID (hot concentrated solution)
2505 AMMONIUM FLUORIDE
2683 AMMONIUM SULPHIDE SOLUTION
2687 DICYCLOHEXYL-AMMONIUM NITRITE
2817 AMMONIUM HYDROGENDIFLUORIDE SOLUTION
2818 AMMONIUM POLYSULPHIDE SOLUTION
2854 AMMONIUM FLUOROSILICATE
2859 AMMONIUM METAVANADATE
2861 AMMONIUM POLYVANADATE
2863 SODIUM AMMONIUM VANADATE
3375 AMMONIUM NITRATE EMULSION or SUSPENSION or GEL, intermediate for blasting explosives
3423 TETRAMETHYL-AMMONIUM HYDROXIDE, SOLID
3424 AMMONIUM DINITRO-o-CRESOLATE SOLUTION

Bromates

1450 BROMATES, INORGANIC, N.O.S.
1473 MAGNESIUM BROMATE
1484 POTASSIUM BROMATE
1494 SODIUM BROMATE
2469 ZINC BROMATE
2719 BARIUM BROMATE
3213 BROMATES, INORGANIC, AQUEOUS SOLUTION, N.O.S.

Chlorates

1445 BARIUM CHLORATE, SOLID
1452 CALCIUM CHLORATE
1458 CHLORATE AND BORATE MIXTURE
1459 CHLORATE AND MAGNESIUM CHLORIDE MIXTURE, SOLID
1461 CHLORATES, INORGANIC, N.O.S.
1485 POTASSIUM CHLORATE
1495 SODIUM CHLORATE
1506 STRONTIUM CHLORATE
1513 ZINC CHLORATE
2427 POTASSIUM CHLORATE, AQUEOUS SOLUTION
2428 SODIUM CHLORATE, AQUEOUS SOLUTION
2429 CALCIUM CHLORATE, AQUEOUS SOLUTION
2573 THALLIUM CHLORATE
2721 COPPER CHLORATE
2723 MAGNESIUM CHLORATE
3405 BARIUM CHLORATE SOLUTION
3407 CHLORATE AND MAGNESIUM CHLORIDE MIXTURE SOLUTION

Chlorites

1453 CALCIUM CHLORITE
1462 CHLORITES, INORGANIC, N.O.S.
1496 SODIUM CHLORITE
1908 CHLORITE SOLUTION

Cyanides

1541 ACETONE CYANOHYDRIN, STABILIZED
1565 BARIUM CYANIDE
1575 CALCIUM CYANIDE
1587 COPPER CYANIDE
1588 CYANIDES, INORGANIC, SOLID, N.O.S.
1620 LEAD CYANIDE
1626 MERCURIC POTASSIUM CYANIDE
1642 MERCURY OXYCYANIDE, DESENSITIZED
1653 NICKEL CYANIDE
1679 POTASSIUM CUPROCYANIDE
1680 POTASSIUM CYANIDE, SOLID
1684 SILVER CYANIDE
1689 SODIUM CYANIDE, SOLID
1694 BROMOBENZYL CYANIDES, LIQUID
1713 ZINC CYANIDE
1889 CYANOGEN BROMIDE
1935 CYANIDE SOLUTION, N.O.S.
2205 ADIPONITRILE
2316 SODIUM CUPROCYANIDE, SOLID
2317 SODIUM CUPROCYANIDE SOLUTION
3413 POTASSIUM CYANIDE SOLUTION
3414 SODIUM CYANIDE SOLUTION
3449 BROMOBENZYL CYANIDES, SOLID

Hypochlorites

1471 LITHIUM HYPOCHLORITE
1748 CALCIUM HYPOCHLORITE, DRY or CALCIUM HYPOCHLORITE MIXTURE, DRY with more than 39 % available chlorine (8.8 % available oxygen)
1791 HYPOCHLORITE SOLUTION
2208 CALCIUM HYPOCHLORITE MIXTURE, DRY with more than 10 % but not more than 39 % available chlorine

2741 BARIUM HYPOCHLORITE with more than 22 % available chlorine
2880 CALCIUM HYPOCHLORITE, HYDRATED, or CALCIUM HYPOCHLORITE, HYDRATED MIXTURE, with not less than 5.5 % but not more than 16 % water
3212 HYPOCHLORITES, INORGANIC, N.O.S.
3255 tert-BUTYL HYPOCHLORITE
3485 CALCIUM HYPOCHLORITE, DRY, CORROSIVE or CALCIUM HYPOCHLORITE MIXTURE, DRY, CORROSIVE with more than 39 % available chlorine (8.8 % available oxygen)
3486 CALCIUM HYPOCHLORITE MIXTURE, DRY, CORROSIVE with more than 10 % but not more than 39 % available chlorine
3487 CALCIUM HYPOCHLORITE, HYDRATED, CORROSIVE or CALCIUM HYPOCHLORITE, HYDRATED MIXTURE, CORROSIVE with not less than 5.5 % but not more than 16 % water

Nitrites

1487 POTASSIUM NITRATE AND SODIUM NITRITE MIXTURE
1488 POTASSIUM NITRITE
1500 SODIUM NITRITE
2627 NITRITES, INORGANIC, N.O.S.
2726 NICKEL NITRITE
3219 NITRITES, INORGANIC, AQUEOUS SOLUTION, N.O.S.

Perchlorates

1442 POTASSIUM SODIUM ALLOYS, LIQUID
1447 BARIUM PERCHLORATE, SOLID
1455 CALCIUM PERCHLORATE
1470 LEAD PERCHLORATE, SOLID
1475 MAGNESIUM PERCHLORATE
1481 PERCHLORATES, INORGANIC, N.O.S.
1489 POTASSIUM PERCHLORATE
1502 SODIUM PERCHLORATE
1508 STRONTIUM PERCHLORATE
3211 PERCHLORATES, INORGANIC, AQUEOUS SOLUTION, N.O.S.
3406 BARIUM PERCHLORATE SOLUTION
3408 LEAD PERCHLORATE SOLUTION

Permanganates

1448 BARIUM PERMANGANATE
1456 CALCIUM PERMANGANATE
1482 PERMANGANATES, INORGANIC, N.O.S.
1490 POTASSIUM PERMANGANATE
1503 SODIUM PERMANGANATE
1515 ZINC PERMANGANATE
3214 PERMANGANATES, INORGANIC, AQUEOUS SOLUTION, N.O.S.

Peroxides

1449 BARIUM PEROXIDE
1457 CALCIUM PEROXIDE
1472 LITHIUM PEROXIDE
1476 MAGNESIUM PEROXIDE
1483 PEROXIDES, INORGANIC, N.O.S.
1491 POTASSIUM PEROXIDE
1504 SODIUM PEROXIDE
1509 STRONTIUM PEROXIDE
1516 ZINC PEROXIDE
2014 HYDROGEN PEROXIDE, AQUEOUS SOLUTION with not less than 20 % but not more than 60 % hydrogen peroxide (stabilized as necessary)
2015 HYDROGEN PEROXIDE, STABILIZED
2466 POTASSIUM SUPEROXIDE
2547 SODIUM SUPEROXIDE
3149 HYDROGEN PEROXIDE AND PEROXYACETIC ACID MIXTURE
3377 SODIUM PERBORATE MONOHYDRATE
3378 SODIUM CARBONATE PEROXYHYDRATE

Powdered metals

1309 ALUMINIUM POWDER, COATED
1326 HAFNIUM POWDER, WETTED with not less than 25 % water
1352 TITANIUM POWDER, WETTED with not less than 25 % water
1358 ZIRCONIUM POWDER, WETTED with not less than 25 % water
1383 PYROPHORIC METAL, N.O.S. or PYROPHORIC ALLOY, N.O.S.
1396 ALUMINIUM POWDER, UNCOATED
1398 ALUMINIUM SILICON POWDER, UNCOATED
1418 MAGNESIUM POWDER or MAGNESIUM ALLOYS POWDER
1435 ZINC ASHES
1436 ZINC POWDER or ZINC DUST
1854 BARIUM ALLOYS, PYROPHORIC
2008 ZIRCONIUM POWDER, DRY
2009 ZIRCONIUM, DRY, finished sheets, strip or coiled wire
2545 HAFNIUM POWDER, DRY
2546 TITANIUM POWDER, DRY
2878 TITANIUM SPONGE GRANULES or TITANIUM SPONGE POWDERS
2881 METAL CATALYST, DRY
2950 MAGNESIUM GRANULES, COATED, particle size not less than 149 microns
3078 CERIUM, turnings or gritty powder
3089 METAL POWDER, FLAMMABLE, N.O.S.
3170 ALUMINIUM SMELTING BY-

	PRODUCTS or ALUMINIUM REMELTING BY-PRODUCTS
3189	METAL POWDER, SELF-HEATING, N.O.S.

CHAPTER 3.3

SPECIAL PROVISIONS APPLICABLE TO CERTAIN ARTICLES OR SUBSTANCES

3.3.1 When Column (6) of Table A of Chapter 3.2 indicates that a special provision is relevant to a substance or article, the meaning and requirements of that special provision are as set forth below. Where a special provision includes a requirement for package marking, the provisions of 5.2.1.2 (a) and (b) shall be met. If the required mark is in the form of specific wording indicated in quotation marks, such as "LITHIUM BATTERIES FOR DISPOSAL", the size of the mark shall be at least 12 mm, unless otherwise indicated in the special provision or elsewhere in this Code.

16 Samples of new or existing explosive substances or articles may be carried as directed by the competent authorities (see 2.2.1.1.3) for purposes including: testing, classification, research and development, quality control, or as a commercial sample. Explosive samples which are not wetted or desensitized shall be limited to 10 kg in small packages as specified by the competent authorities. Explosive samples which are wetted or desensitized shall be limited to 25 kg.

23 Even though this substance has a flammability hazard, it only exhibits such hazard under extreme fire conditions in confined areas.

32 This substance is not subject to the requirements of this Code when in any other form.

37 This substance is not subject to the requirements of this Code when coated.

38 This substance is not subject to the requirements of this Code when it contains not more than 0.1 % calcium carbide.

39 This substance is not subject to the requirements of this Code when it contains less than 30 % or not less than 90 % silicon.

43 When offered for carriage as pesticides, these substances shall be carried under the relevant pesticide entry and in accordance with the relevant pesticide provisions (see 2.2.61.1.10 to 2.2.61.1.11.2).

45 Antimony sulphides and oxides which contain not more than 0.5 % of arsenic calculated on the total mass are not subject to the requirements of this Code.

47 Ferricyanides and ferrocyanides are not subject to the requirements of this Code.

48 The carriage of this substance, when it contains more than 20 % hydrocyanic acid, is prohibited.

59 These substances are not subject to the requirements of this Code when they contain not more than 50 % magnesium.

60 If the concentration is more than 72 %, the carriage of this substance is prohibited.

61 The technical name which shall supplement the proper shipping name shall be the ISO common name (see also ISO 1750:1981 "*Pesticides and other agrochemicals - common names*", as amended), other name listed in the WHO "*Recommended Classification of Pesticides by Hazard and Guidelines to Classification*" or the name of the active substance (see also 3.1.2.8.1 and 3.1.2.8.1.1).

62 This substance is not subject to the requirements of this Code when it contains not more than 4 % sodium hydroxide.

65 Hydrogen peroxide aqueous solutions with less than 8 % hydrogen peroxide are not subject to the requirements of this Code.

66 Cinnabar is not subject to the requirements of this Code.

103 The carriage of ammonium nitrites and mixtures of an inorganic nitrite with an ammonium salt is prohibited.

105 Nitrocellulose meeting the descriptions of UN No. 2556 or UN No. 2557 may be classified in Class 4.1.

113 The carriage of chemically unstable mixtures is prohibited.

119 Refrigerating machines include machines or other appliances which have been designed for the specific purpose of keeping food or other items at a low temperature in an internal compartment, and air conditioning units. Refrigerating machines and refrigerating machine components are not subject to the provisions of this Code if they contain less than 12 kg of gas in Class 2, group A or O according to 2.2.2.1.3, or if they contain less than 12 litres ammonia solution (UN No. 2672).

NOTE: *For the purposes of carriage, heat pumps may be considered as refrigerating machines.*

122 The subsidiary hazards, control and emergency temperatures if any, and the UN number (generic entry) for each of the currently assigned organic peroxide formulations are given in 2.2.52.4, 4.1.4.2 packing instruction IBC520 and 4.2.5.2.6 portable tank instruction T23.

123 *(Reserved)*

127 Other inert material or inert material mixture may be used, provided this inert material has identical phlegmatizing properties.

131 The phlegmatized substance shall be significantly less sensitive than dry PETN.

135 The dihydrated sodium salt of dichloroisocyanuric acid does not meet the criteria for inclusion in Class 5.1 and is not subject to this Code unless meeting the criteria for inclusion in another Class.

138 p-Bromobenzyl cyanide is not subject to the requirements of this Code.

141 Products which have undergone sufficient heat treatment so that they present no hazard during carriage are not subject to the requirements of this Code.

142 Solvent extracted soya bean meal containing not more than 1.5 % oil and 11 % moisture, which is substantially free of flammable solvent, is not subject to the requirements of this Code.

144 An aqueous solution containing not more than 24 % alcohol by volume is not subject to the requirements of this Code.

145 Alcoholic beverages of packing group III, when carried in receptacles of 250 litres or less, are not subject to the requirements of this Code.

152 The classification of this substance will vary with particle size and packaging, but borderlines have not been experimentally determined. Appropriate classifications shall be made in accordance with 2.2.1.

153 This entry applies only if it is demonstrated, on the basis of tests, that the substances when in contact with water are not combustible nor show a tendency to auto-ignition and that the mixture of gases evolved is not flammable.

162 *(Deleted)*

163 A substance mentioned by name in Table A of Chapter 3.2 shall not be carried under this entry. Substances carried under this entry may contain 20 % or less nitrocellulose provided the nitrocellulose contains not more than 12.6 % nitrogen (by dry mass).

168 Asbestos which is immersed or fixed in a natural or artificial binder (such as cement, plastics, asphalt, resins or mineral ore) in such a way that no escape of hazardous quantities of respirable asbestos fibres can occur during carriage is not subject to the requirements of this Code. Manufactured articles containing asbestos and not meeting this provision are nevertheless not subject to the requirements of this Code when packed so that no escape of hazardous quantities of respirable asbestos fibres can occur during carriage.

169 Phthalic anhydride in the solid state and tetrahydrophthalic anhydrides, with not more than 0.05 % maleic anhydride, are not subject to the requirements of this Code. Phthalic anhydride molten at a temperature above its flash-point, with not more than 0.05 % maleic anhydride, shall be classified under UN No. 3256.

172 Where a radioactive material has (a) subsidiary hazard(s):

(a) The substance shall be allocated to packing group I, II or III, if appropriate, by application of the packing group criteria provided in Part 2 corresponding to the nature of the predominant subsidiary hazard;

(b) Packages shall be labelled with subsidiary hazard labels corresponding to each subsidiary risk exhibited by the material; corresponding placards shall be affixed to cargo transport units in accordance with the relevant provisions of 5.3.1;

(c) For the purposes of documentation and package marking, the proper shipping name shall be supplemented with the name of the constituents which most predominantly contribute to this (these) subsidiary hazard(s) and which shall be enclosed in parenthesis;

(d) The dangerous goods transport document shall indicate the label model number(s) corresponding to each subsidiary hazard in parenthesis after the Class number "7" and, where assigned the packing group as required by 5.4.1.1.1 (d).

For packing, see also 4.1.9.1.5.

177 Barium sulphate is not subject to the requirements of this Code.

178 This designation shall be used only when no other appropriate designation exists in Table A of Chapter 3.2, and only with the approval of the competent authority of the country of origin (see 2.2.1.1.3).

181 Packages containing this type of substance shall bear a label conforming to model No. 1 (see 5.2.2.2.2) unless the competent authority of the country or state of origin has permitted this label to be dispensed with for the specific packaging employed because test data have proved that the substance in this packaging does not exhibit explosive behaviour (see 5.2.2.1.9).

182 The group of alkali metals includes lithium, sodium, potassium, rubidium and caesium.

183 The group of alkaline earth metals includes magnesium, calcium, strontium and barium.

186 *(Deleted)*

188 Cells and batteries offered for carriage are not subject to other provisions of this Code if they meet the following:

(a) For a lithium metal or lithium alloy cell, the lithium content is not more than 1 g, and for a lithium ion cell, the Watt-hour rating is not more than 20 Wh;

NOTE: *When lithium batteries in conformity with 2.2.9.1.7 (f) are carried in accordance with this special provision, the total lithium content of all lithium metal cells contained in the battery shall not exceed 1.5 g and the total capacity of all lithium ion cells contained in the battery shall not exceed 10 Wh (see special provision 387).*

(b) For a lithium metal or lithium alloy battery the aggregate lithium content is not more than 2 g, and for a lithium ion battery, the Watt-hour rating is not more than 100 Wh. Lithium ion batteries subject to this provision shall be marked with the Watt-hour rating on the outside case, except those manufactured before 1 January 2009;

NOTE: *When lithium batteries in conformity with 2.2.9.1.7 (f) are carried in accordance with this special provision, the total lithium content of all lithium metal cells contained in the battery shall not exceed 1.5 g and the total capacity of all lithium ion cells contained in the battery shall not exceed 10 Wh (see special provision 387).*

(c) Each cell or battery meets the provisions of 2.2.9.1.7 (a), (e), (f) if applicable and (g);

(d) Cells and batteries, except when installed in equipment, shall be packed in inner packagings that completely enclose the cell or battery. Cells and batteries shall be protected so as to prevent short circuits. This includes protection against contact with electrically conductive material within the same packaging that could lead to a short circuit. The inner packagings shall be packed in strong outer packagings which conform to the provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.5;

(e) Cells and batteries when installed in equipment shall be protected from damage and short circuit, and the equipment shall be equipped with an effective means of preventing accidental activation. This requirement does not apply to devices which are intentionally active in carriage (radio frequency identification (RFID) transmitters, watches, sensors, etc.) and which are not capable of generating a dangerous evolution of heat. When batteries are installed in equipment, the equipment shall be packed in strong outer packagings constructed of suitable material of adequate strength and design in relation to the packaging's capacity and its intended use unless the battery is afforded equivalent protection by the equipment in which it is contained;

(f) Each package shall be marked with the appropriate lithium battery mark, as illustrated in 5.2.1.9;

This requirement does not apply to:

(i) Packages containing only button cell batteries installed in equipment (including circuit boards); and

(ii) Packages containing no more than four cells or two batteries installed in equipment, where there are not more than two packages in the consignment;

When packages are placed in an overpack, the lithium battery mark shall either be clearly visible or be reproduced on the outside of the overpack and the overpack shall be marked with the word "OVERPACK". The lettering of the "OVERPACK" mark shall be at least 12 mm high.

NOTE: *Packages containing lithium batteries packed in conformity with the provisions of Part 4, Chapter 11, packing instructions 965 or 968, Section IB of the ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air that bear the mark as shown in 5.2.1.9 (lithium battery mark) and the label shown in 5.2.2.2.2, model No. 9A shall be deemed to meet the provisions of this special provision.*

(g) Except when cells or batteries are installed in equipment, each package shall be capable of withstanding a 1.2 m drop test in any orientation without damage to cells or batteries contained therein, without shifting of the contents so as to allow battery to battery (or cell to cell) contact and without release of contents; and

(h) Except when cells or batteries are installed in or packed with equipment, packages shall not exceed 30 kg gross mass.

As used above and elsewhere in this Code, "lithium content" means the mass of lithium in the anode of a lithium metal or lithium alloy cell. As used in this special provision "equipment" means apparatus for which the lithium cells or batteries will provide electrical power for its operation.

Separate entries exist for lithium metal batteries and lithium ion batteries to facilitate the carriage of these batteries for specific modes of carriage and to enable the application of different emergency response actions.

A single cell battery as defined in Part III, sub-section 38.3.2.3 of the Manual of Tests and Criteria is considered a "cell" and shall be carried according to the requirements for "cells" for the purpose of this special provision.

190 Aerosol dispensers shall be provided with protection against inadvertent discharge. Aerosols with a capacity not exceeding 50 ml containing only non-toxic constituents are not subject to the requirements of this Code.

191 Receptacles, small, with a capacity not exceeding 50 ml, containing only non-toxic constituents are not subject to the requirements of this Code.

193 This entry may only be used for ammonium nitrate based compound fertilizers. They shall be classified in accordance with the procedure as set out in the Manual of Tests and Criteria, Part III, Section 39. Fertilizers meeting the criteria for this UN number are not subject to the requirements of this Code.

194 The control and emergency temperatures, if any, and the UN number (generic entry) for each of the currently assigned self-reactive substances are given in 2.2.41.4.

196 Formulations which in laboratory testing neither detonate in the cavitated state nor deflagrate, which show no effect when heated under confinement and which exhibit no explosive power may be carried under this entry. The formulation must also be thermally stable (i.e. the SADT is 60 °C or higher for a 50 kg package). Formulations not meeting these criteria shall be carried under the provisions of Class 5.2, (see 2.2.52.4).

198 Nitrocellulose solutions containing not more than 20 % nitrocellulose may be carried as paint, perfumery products or printing ink, as applicable (see UN Nos. 1210, 1263, 1266, 3066, 3469 and 3470).

199 Lead compounds which, when mixed in a ratio of 1:1000 with 0.07M hydrochloric acid and stirred for one hour at a temperature of 23 °C ± 2 °C, exhibit a solubility of 5 % or less (see ISO 3711:1990 *"Lead chromate pigments and lead chromate -molybdate pigments – Specifications and methods of test"*) are considered insoluble and are not subject to the requirements of this Code unless they meet the criteria for inclusion in another class.

201 Lighters and lighter refills shall comply with the provisions of the country in which they were filled. They shall be provided with protection against inadvertent discharge. The liquid portion of the gas shall not exceed 85 % of the capacity of the receptacle at 15 °C. The receptacles, including the closures, shall be capable of withstanding an internal pressure of twice the pressure of the liquefied petroleum gas at 55 °C. The valve mechanisms and ignition devices shall be securely sealed, taped or otherwise fastened or designed to prevent operation or leakage of the contents during carriage. Lighters shall not contain more than 10 g of liquefied petroleum gas. Lighter refills shall not contain more than 65 g of liquefied petroleum gas.

NOTE: *For waste lighters collected separately see Chapter 3.3, special provision 654.*

203 This entry shall not be used for polychlorinated biphenyls, liquid, UN No. 2315 and polychlorinated biphenyls, solid, UN No.3432.

204 *(Deleted)*

205 This entry shall not be used for UN No. 3155 PENTACHLOROPHENOL.

207 Plastics moulding compounds may be made from polystyrene, poly(methyl methacrylate) or other polymeric material.

208 The commercial grade of calcium nitrate fertilizer, when consisting mainly of a double salt (calcium nitrate and ammonium nitrate) containing not more than 10 % ammonium nitrate and at least 12 % water of crystallization, is not subject to the requirements of this Code.

210 Toxins from plant, animal or bacterial sources which contain infectious substances, or toxins that are contained in infectious substances, shall be classified in Class 6.2.

215 This entry only applies to the technically pure substance or to formulations derived from it having an SADT higher than 75 °C and therefore does not apply to formulations which are self-reactive substances (for self-reactive substances, see 2.2.41.4). Homogeneous mixtures containing not more than 35 % by mass of azodicarbonamide and at least 65 % of inert substance are not subject to the requirements of this Code unless criteria of other classes are met.

216 Mixtures of solids which are not subject to the requirements of this Code and flammable liquids may be carried under this entry without first applying the classification criteria of Class 4.1, provided there is no free liquid visible at the time the substance is loaded or at the time the packaging or cargo transport unit is closed. Sealed packets and articles containing less than 10 ml

of a packing group II or III flammable liquid absorbed into a solid material are not subject to this Code provided there is no free liquid in the packet or article.

217 Mixtures of solids which are not subject to the requirements of this Code and toxic liquids may be carried under this entry 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 or cargo transport unit is closed. This entry shall not be used for solids containing a packing group I liquid.

218 Mixtures of solids which are not subject to the requirements of this Code and corrosive liquids may be carried under this entry without first applying the classification criteria of Class 8, provided there is no free liquid visible at the time the substance is loaded or at the time the packaging or cargo transport unit is closed.

219 Genetically modified microorganisms (GMMOs) and genetically modified organisms (GMOs) packed and marked in accordance with packing instruction P904 of 4.1.4.1 are not subject to any other requirements of this Code.

If GMMOs or GMOs meet the criteria for inclusion in Class 6.1 or 6.2 (see 2.2.61.1 and 2.2.62.1) the requirements in this Code for the carriage of toxic substances or infectious substances apply.

220 Only the technical name of the flammable liquid component of this solution or mixture shall be shown in parentheses immediately following the proper shipping name.

221 Substances included under this entry shall not be of packing group I.

224 Unless it can be demonstrated by testing that the sensitivity of the substance in its frozen state is no greater than in its liquid state, the substance shall remain liquid during normal transport conditions. It shall not freeze at temperatures above -15 °C.

225 Fire extinguishers under this entry may include installed actuating cartridges (cartridges, power device of classification code 1.4C or 1.4S), without changing the classification of Class 2, group A or O according to 2.2.2.1.3 provided the total quantity of deflagrating (propellant) explosives does not exceed 3.2 g per extinguishing unit. Fire extinguishers shall be manufactured, tested, approved and labelled according to the provisions applied in the country of manufacture.

NOTE: *"Provisions applied in the country of manufacture" means the provisions applicable in the country of manufacture or those applicable in the country of use.*

Fire extinguishers under this entry include:

(a) portable fire extinguishers for manual handling and operation;

NOTE: *This entry applies to portable fire extinguishers, even if some components that are necessary for their proper functioning (e.g. hoses and nozzles) are temporarily detached, as long as the safety of the pressurized extinguishing agent containers is not compromised and the fire extinguishers continue to be identified as a portable fire extinguisher.*

(b) fire extinguishers for installation in aircraft;

(c) fire extinguishers mounted on wheels for manual handling;

(d) fire extinguishing equipment or machinery mounted on wheels or wheeled platforms or units carried similar to (small) trailers, and

(e) fire extinguishers composed of a non-rollable pressure drum and equipment, and handled e.g. by fork lift or crane when loaded or unloaded.

NOTE: *Pressure receptacles which contain gases for use in the above-mentioned fire extinguishers or for use in stationary fire-fighting installations shall meet the requirements of Chapter 6.2 and all requirements applicable to the relevant dangerous goods when these pressure receptacles are carried separately.*

226 Formulations of this substance containing not less than 30 % non-volatile, non-flammable phlegmatizer are not subject to the requirements of this Code.

227 When phlegmatized with water and inorganic inert material the content of urea nitrate may not exceed 75 % by mass and the mixture shall not be capable of being detonated by the Series 1, type (a), test in the *Manual of Tests and Criteria*, Part 1.

228 Mixtures not meeting the criteria for flammable gases (see 2.2.2.1.5) shall be carried under UN No. 3163.

230 Lithium cells and batteries may be carried under this entry if they meet the provisions of 2.2.9.1.7.

235 This entry applies to articles which contain Class 1 explosive substances and which may also contain dangerous goods of other classes. These articles are used to enhance safety in vehicles, vessels or aircraft – e.g. air bag inflators, air bag modules, seat-belt pretensioners, and pyromechanical devices.

236 Polyester resin kits consist of two components: a base material (either Class 3 or Class 4.1, packing group II or III) and an activator (organic peroxide). The organic peroxide shall be type D, E, or F, not requiring temperature control. The packing group shall be II or III, according to the criteria of either Class 3 or Class 4.1, as appropriate, applied to the base material. The quantity limit shown in column (7a) of Table A of Chapter 3.2 applies to the base material.

237 The membrane filters, including paper separators, coating or backing materials, etc., that are present in carriage, shall not be liable to propagate a detonation as tested by one of the tests described in the *Manual of Tests and Criteria*, Part I, Test series 1 (a).

In addition the competent authority may determine, on the basis of the results of suitable burning rate tests taking account of the standard tests in the *Manual of Tests and Criteria*, Part III, sub-section 33.2, that nitrocellulose membrane filters in the form in which they are to be carried are not subject to the requirements applicable to flammable solids in Class 4.1.

238 (a) Batteries can be considered as non-spillable provided that they are capable of withstanding the vibration and pressure differential tests given below, without leakage of battery fluid.

Vibration test: The battery is rigidly clamped to the platform of a vibration machine and a simple harmonic motion having an amplitude of 0.8 mm (1.6 mm maximum total excursion) is applied. The frequency is varied at the rate of 1 Hz/min between the limits of 10 Hz and 55 Hz. The entire range of frequencies and return is traversed in 95 ± 5 minutes for each mounting position (direction of vibration) of the battery. The battery is tested in three mutually perpendicular positions (to include testing with fill openings and vents, if any, in an inverted position) for equal time periods.

Pressure differential test: Following the vibration test, the battery is stored for six hours at 24 °C ± 4 °C while subjected to a pressure differential of at least 88 kPa. The battery is tested in three mutually perpendicular positions (to include testing with fill openings and vents, if any, in an inverted position) for at least six hours in each position.

(b) Non-spillable batteries are not subject to the requirements of this Code if, at a temperature of 55 °C, the electrolyte will not flow from a ruptured or cracked case and there is no free liquid to flow and if, as packaged for carriage, the terminals are protected from short circuit.

239 Batteries or cells shall not contain dangerous substances other than sodium, sulphur or sodium compounds (e.g. sodium polysulphides and sodium tetrachloroaluminate). Batteries or cells shall not be offered for carriage at a temperature such that liquid elemental sodium is present in the battery or cell unless approved and under the conditions established by the competent authority.

Cells shall consist of hermetically sealed metal casings which fully enclose the dangerous substances and which are so constructed and closed as to prevent the release of the dangerous substances under normal conditions of carriage.

Batteries shall consist of cells secured within and fully enclosed by a metal casing so constructed and closed as to prevent the release of the dangerous substances under normal conditions of carriage.

240 *(Deleted)*

241 The formulation shall be prepared so that it remains homogeneous and does not separate during carriage. Formulations with low nitrocellulose contents and not showing dangerous properties when tested for their liability to detonate, deflagrate or explode when heated under defined confinement by tests of Test series 1 (a), 2 (b) and 2 (c) respectively in the *Manual of Tests and Criteria*, Part I and not being a flammable solid when tested in accordance with test N.1 in the *Manual of Tests and Criteria*, Part III, sub-section 33.2.4 (chips, if necessary, crushed and sieved to a particle size of less than 1.25 mm) are not subject to the requirements of this Code.

242 Sulphur is not subject to the requirements of this Code when it has been formed to a specific shape (e.g. prills, granules, pellets, pastilles or flakes).

243 Gasoline, motor spirit and petrol for use in spark-ignition engines (e.g. in automobiles, stationary engines and other engines) shall be assigned to this entry regardless of variations in volatility.

244 This entry includes e.g. aluminium dross, aluminium skimmings, spent cathodes, spent potliner, and aluminium salt slags.

247 Alcoholic beverages containing more than 24 % alcohol but not more than 70 % by volume, when carried as part of the manufacturing process, may be carried in wooden barrels with a capacity of more than 250 litres and not more than 500 litres meeting the general requirements of 4.1.1, as appropriate, on the following conditions:

(a) The wooden barrels shall be checked and tightened before filling;

(b) Sufficient ullage (not less than 3 %) shall be left to allow for the expansion of the liquid;

(c) The wooden barrels shall be carried with the bungholes pointing upwards;

(d) The wooden barrels shall be carried in containers meeting the requirements of the International Convention for Safe Containers (CSC). Each wooden barrel shall be secured in custom-made cradles and be wedged by appropriate means to prevent it from being displaced in any way during carriage.

249 Ferrocerium, stabilized against corrosion, with a minimum iron content of 10 % is not subject to the requirements of this Code.

250 This entry may only be used for samples of chemicals taken for analysis in connection with the implementation of the Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction. The carriage of substances under this entry shall be in accordance with the chain of custody and security procedures specified by the Organisation for the Prohibition of Chemical Weapons.

The chemical sample may only be carried providing prior approval has been granted by the competent authority or the Director General of the Organisation for the Prohibition of Chemical Weapons and providing the sample complies with the following provisions:

(a) It shall be packed according to packing instruction 623 in the ICAO Technical Instructions; and

(b) During carriage, a copy of the document of approval for transport, showing the quantity limitations and the packing provisions shall be attached to the transport document.

251 The entry CHEMICAL KIT or FIRST AID KIT is intended to apply to boxes, cases etc. containing small quantities of various dangerous goods which are used for example for medical, analytical or testing or repair purposes. Such kits shall only contain dangerous goods that are permitted as:

(a) Excepted quantities not exceeding the quantity indicated by the code in column (7b) of Table A of Chapter 3.2, provided that the net quantity per inner packaging and net quantity per package are as prescribed in 3.5.1.2 and 3.5.1.3; or

(b) Limited quantities as indicated in column (7a) of Table A of Chapter 3.2, provided that the net quantity per inner packaging does not exceed 250 ml or 250 g.

Components shall not react dangerously (see "dangerous reaction" in 1.2.1). The total quantity of dangerous goods in any one kit shall not exceed either 1 *l* or 1 kg.

For the purposes of completion of the transport document as set out in 5.4.1.1.1, the packing group shown on the document shall be the most stringent packing group assigned to any individual substance in the kit. Where the kit contains only dangerous goods to which no packing group is assigned, no packing group need be indicated on the dangerous goods transport document.

Kits which are carried on board vehicles for first-aid or operating purposes are not subject to the requirements of this Code.

Chemical kits and first aid kits containing dangerous goods in inner packagings which do not exceed the quantity limits for limited quantities applicable to individual substances as specified in Column (7a) of Table A of Chapter 3.2 may be carried in accordance with Chapter 3.4.

252 Provided the ammonium nitrate remains in solution under all conditions of carriage, aqueous solutions of ammonium nitrate, with not more than 0.2 % combustible material, in a concentration not exceeding 80 %, are not subject to the requirements of this Code.

266 This substance, when containing less alcohol, water or phlegmatizer than specified, shall not be carried unless specifically authorized by the competent authority (see 2.2.1.1).

267 Any explosives, blasting, type C containing chlorates shall be segregated from explosives containing ammonium nitrate or other ammonium salts.

270 Aqueous solutions of Class 5.1 inorganic solid nitrate substances are considered as not meeting the criteria of Class 5.1 if the concentration of the substances in solution at the minimum temperature encountered during carriage is not greater than 80 % of the saturation limit.

271 Lactose or glucose or similar materials, may be used as a phlegmatizer provided that the substance contains not less than 90 %, by mass, of phlegmatizer. The competent authority may authorize these mixtures to be classified in Class 4.1 on the basis of a test Series 6(c) of Section 16 of Part I of the *Manual of Tests and Criteria* on at least three packages as prepared for carriage. Mixtures containing at least 98 %, by mass, of phlegmatizer are not subject to the requirements of this Code. Packages containing mixtures with not less than 90 %, by mass, of phlegmatizer need not bear a label conforming to model No. 6.1.

272 This substance shall not be carried under the provisions of Class 4.1 unless specifically authorized by the competent authority (see UN No. 0143 or UN No. 0150 as appropriate).

273 Maneb and maneb preparations stabilized against self-heating need not be classified in Class 4.2 when it can be demonstrated by testing that a cubic volume of 1 m³ of substance does not self-ignite and that the temperature at the centre of the sample does not exceed 200 °C, when the sample is maintained at a temperature of not less than 75 °C ± 2 °C for a period of 24 hours.

274 The provisions of 3.1.2.8 apply.

278 These substances shall not be classified and carried unless authorized by the competent authority on the basis of results from Series 2 tests and a Series 6(c) test of Part I of the *Manual of Tests and Criteria* on packages as prepared for carriage (see 2.2.1.1). The competent authority shall assign the packing group on the basis of 2.2.3 criteria and the package type used for the Series 6(c) test.

279 The substance is assigned to this classification or packing group based on human experience rather than the strict application of classification criteria set out in this Code.

280 This entry applies to safety devices for vehicles, vessels or aircraft, e.g. air bag inflators, air bag modules, seat-belt pretensioners, and pyromechanical devices, which contain dangerous goods of Class 1 or of other classes, when carried as component parts and if these articles as presented for carriage have been tested in accordance with Test Series 6(c) of Part 1 of the Manual of Tests and Criteria, with no explosion of the device, no fragmentation of device casing or pressure receptacle, and no projection hazard nor thermal effect which would significantly hinder fire-fighting or emergency response efforts in the immediate vicinity. This entry does not apply to life saving appliances described in special provision 296 (UN Nos. 2990 and 3072).

282 *(Deleted)*

283 Articles, containing gas, intended to function as shock absorbers, including impact energy-absorbing devices, or pneumatic springs are not subject to the requirements of this Code provided:

(a) Each article has a gas space capacity not exceeding 1.6 litres and a charge pressure not exceeding 280 bar where the product of the capacity (litres) and charge pressure (bars) does not exceed 80 (i.e. 0.5 litres gas space and 160 bar charge pressure, 1 litre gas space and 80 bar charge pressure, 1.6 litres gas space and 50 bar charge pressure, 0.28 litres gas space and 280 bar charge pressure);

(b) Each article has a minimum burst pressure of 4 times the charge pressure at 20 °C for products not exceeding 0.5 litres gas space capacity and 5 times charge pressure for products greater than 0.5 litres gas space capacity;

(c) Each article is manufactured from material which will not fragment upon rupture;

(d) Each article is manufactured in accordance with a quality assurance standard acceptable to the competent authority; and

(e) The design type has been subjected to a fire test demonstrating that the article relieves its pressure by means of a fire degradable seal or other pressure relief device, such that the article will not fragment and that the article does not rocket.

See also 1.1.3.2 (d) for equipment used for the operation of the vehicle.

284 An oxygen generator, chemical, containing oxidizing substances shall meet the following conditions:

(a) The generator when containing an explosive actuating device shall only be carried under this entry when excluded from Class 1 in accordance with the NOTE under paragraph 2.2.1.1.1 (b);

(b) The generator, without its packaging, shall be capable of withstanding a 1.8 m drop test onto a rigid, non-resilient, flat and horizontal surface, in the position most likely to cause damage, without loss of its contents and without actuation;

(c) When a generator is equipped with an actuating device, it shall have at least two positive means of preventing unintentional actuation.

286 Nitrocellulose membrane filters covered by this entry, each with a mass not exceeding 0.5 g, are not subject to the requirements of this Code when contained individually in an article or a sealed packet.

288 These substances shall not be classified and carried unless authorized by the competent authority on the basis of results from Series 2 tests and a Series 6(c) test of Part I of the *Manual of tests and Criteria* on packages as prepared for carriage (see 2.2.1.1).

289 Safety devices, electrically initiated and safety devices, pyrotechnic installed in vehicles, wagons, vessels or aircraft or in completed components such as steering columns, door panels, seats, etc. are not subject to this Code.

290 When this radioactive material meets the definitions and criteria of other classes as defined in Part 2, it shall be classified in accordance with the following:

(a) Where the substance meets the criteria for dangerous goods in excepted quantities as set out in Chapter 3.5, the packagings shall be in accordance with 3.5.2 and meet the testing requirements of 3.5.3. All other requirements applicable to radioactive material, excepted packages as set out in 1.7.1.5 shall apply without reference to the other class;

(b) Where the quantity exceeds the limits specified in 3.5.1.2 the substance shall be classified in accordance with the predominant subsidiary hazard. The transport document shall describe the substance with the UN number and proper shipping name applicable to the other class supplemented with the name applicable to the radioactive excepted package according to Column (2) of Table A of Chapter 3.2, and the substance shall be carried in accordance with the provisions applicable to that UN number. An example of the information shown on the transport document is:

"UN 1993, Flammable liquid, n.o.s. (ethanol and toluene mixture), Radioactive material, excepted package – limited quantity of material, 3, PG II".

In addition, the requirements of 2.2.7.2.4.1 shall apply;

(c) The provisions of Chapter 3.4 for the carriage of dangerous goods packed in limited quantities shall not apply to substances classified in accordance with sub-paragraph (b);

(d) When the substance meets a special provision that exempts this substance from all dangerous goods provisions of the other classes it shall be classified in accordance with the applicable UN number of Class 7 and all requirements specified in 1.7.1.5 shall apply.

291 Flammable liquefied gases shall be contained within refrigerating machine components. These components shall be designed and tested to at least three times the working pressure of the machinery. The refrigerating machines shall be designed and constructed to contain the liquefied gas and preclude the risk of bursting or cracking of the pressure retaining components during normal conditions of carriage. Refrigerating machines and refrigerating-machine components are not subject to the requirements of this Code if they contain less than 12 kg of gas.

NOTE: *For the purposes of carriage, heat pumps may be considered as refrigerating machines.*

292 *(Deleted)*

293 The following definitions apply to matches:

(a) Fusee matches are matches the heads of which are prepared with a friction-sensitive igniter composition and a pyrotechnic composition which burns with little or no flame, but with intense heat;

(b) Safety matches are matches that are combined with or attached to the box, book or card that can be ignited by friction only on a prepared surface;

(c) Strike anywhere matches are matches that can be ignited by friction on a solid surface;

(d) Wax Vesta matches are matches that can be ignited by friction either on a prepared surface or on a solid surface.

294 Safety matches and wax “Vesta” matches in outer packagings not exceeding 25 kg net mass are not subject to any other requirement (except marking) of this Code when packaged in accordance with packing instruction P407

295 Batteries need not be individually marked and labelled if the pallet bears the appropriate mark and label.

296 These entries apply to life-saving appliances such as life rafts, personal flotation devices and self-inflating slides. UN No. 2990 applies to self-inflating appliances and UN No. 3072 applies to life-saving appliances that are not self-inflating. Life-saving appliances may contain:

(a) Signal devices (Class 1) which may include smoke and illumination signal flares packed in packagings that prevent them from being inadvertently activated;

(b) For UN No. 2990 only, cartridges, power device of Division 1.4, compatibility group S, may be contained for purposes of the self-inflating mechanism and provided that the quantity of explosives per appliance does not exceed 3.2 g;

(c) Class 2 compressed or liquefied gases, group A or O, according to 2.2.2.1.3;

(d) Electric storage batteries (Class 8) and lithium batteries (Class 9);

(e) First aid kits or repair kits containing small quantities of dangerous goods (e.g.: substances of Class 3, 4.1, 5.2, 8 or 9); or

(f) "Strike anywhere" matches packed in packagings that prevent them from being inadvertently activated.

Life-saving appliances packed in strong rigid outer packagings with a total maximum gross mass of 40 kg, containing no dangerous goods other than compressed or liquefied gases of Class 2, group A or group O, in receptacles with a capacity not exceeding 120 ml, installed solely for the purpose of the activation of the appliance, are not subject to the requirements of this Code.

298 *(Deleted)*

300 Fish meal, fish scrap and krill meal shall not be loaded if the temperature at the time of loading exceeds 35 °C or 5 °C above the ambient temperature whichever is higher.

301 This entry only applies to articles such as machinery, apparatus or devices containing dangerous goods as a residue or an integral element of the articles. It shall not be used for articles for which a proper shipping name already exists in Table A of Chapter 3.2. Articles carried under this entry shall only contain dangerous goods which are authorized to be carried in accordance with the provisions of Chapter 3.4 (Limited quantities). The quantity of dangerous goods in articles shall not exceed the quantity specified in Column (7a) of Table A of Chapter 3.2 for each item of dangerous goods contained. If the articles contain more than one item of dangerous goods, the individual dangerous goods shall be enclosed to prevent them reacting dangerously with one another during carriage (see 4.1.1.6). When it is required to ensure liquid dangerous goods remain in their intended orientation, orientation arrows shall be displayed on at least two opposite vertical sides with the arrows pointing in the correct direction in accordance with 5.2.1.10.

302 Fumigated cargo transport units containing no other dangerous goods are only subject to the provisions of 5.5.2.

303 Receptacles shall be assigned to the classification code of the gas or mixture of gases contained therein determined in accordance with the provisions of section 2.2.2.

304 This entry may only be used for the transport of non-activated batteries which contain dry potassium hydroxide and which are intended to be activated prior to use by addition of an appropriate amount of water to the individual cells.

305 These substances are not subject to the requirements of this Code when in concentrations of not more than 50 mg/kg.

306 This entry may only be used for substances that are too insensitive for acceptance into Class 1 when tested in accordance with Test Series 2 (see *Manual of Tests and Criteria*, Part I).

307 This entry may only be used for ammonium nitrate based fertilizers. They shall be classified in accordance with the procedure as set out in the Manual of Tests and Criteria, Part III, Section 39 subject to the restrictions of 2.2.51.2.2, thirteenth and fourteenth indents.

309A This entry applies to non sensitized emulsions, suspensions and gels consisting primarily of a mixture of ammonium nitrate and fuel, intended to produce a Type E blasting explosive only after further processing prior to use.

The mixture for emulsions typically has the following composition: 60-85 % ammonium nitrate, 5-30 % water, 2-8 % fuel, 0.5-4 % emulsifier agent, 0-10 % soluble flame suppressants, and trace additives. Other inorganic nitrate salts may replace part of the ammonium nitrate.

The mixture for suspensions and gels typically has the following composition: 60-85 % ammonium nitrate, 0-5 % sodium or potassium perchlorate, 0-17 % hexamine nitrate or monomethylamine nitrate, 5-30 % water, 2-15 % fuel, 0.5-4 % thickening agent, 0-10 % soluble flame suppressants, and trace additives. Other inorganic nitrate salts may replace part of the ammonium nitrate.

Substances shall satisfy the criteria for classification as an ammonium nitrate emulsion, suspension or gel, intermediate for blasting explosives (ANE) of Test Series 8 test (a), (b), (c) and (e) of the *Manual of Tests and Criteria*, Part I, Section 18 and be approved by the competent authority.

Substances are determined to be approved by the competent authority, provided they meet all of the following conditions:

(a) As soon as there is a change in the formulation of any substance, so as to deviate from any of the ingredients or the tolerances of the chemical and physical analysis of established UN 3375 formulations, new classification testing must be conducted to validate the classification.

(b) Candidates for UN 3375 must be tested at the most sensitive formulation.

(c) The testing must be recorded in a report and, except for Test 8 (a) and (e), by associated video.

(d) Files must be maintained of all UN 3375 products with relevant test reports, videos, product names and specifications and must be produced on request by any competent authority. Files must be kept for two years from the time of the manufacture of the last batch.

(e) Except where testing is conducted overseas (refer (f) below), the manufacturer responsible for the testing must extend an invitation to all jurisdictions inviting them to witness the testing. The invitation must allow sufficient time to schedule the witnessing of the test. The fact that no Competent Authority sends a representative will not impact on the validity of the testing.

(f) Testing certified by overseas Competent Authorities is acceptable where the manufacture of the product is conducted overseas, or where the locally manufactured formulation is shown to be identical to the one manufactured and tested overseas. Testing certified by the Australian Maritime Safety Authority is also acceptable. Testing must be performed under conditions (temperature, density, etc) which are representative of those found in Australia.

310 The testing requirements in the Manual of Tests and Criteria, part III sub-section 38.3 do not apply to production runs, consisting of not more than 100 cells or batteries, or to pre-production prototypes of cells or batteries when these prototypes are carried for testing when packaged in accordance with packing instruction P910 of 4.1.4.1 or LP905 of 4.1.4.3, as applicable.

The transport document shall include the following statement: "Carriage in accordance with special provision 310".

Damaged or defective cells, batteries, or cells and batteries contained in equipment shall be carried in accordance with special provision 376.

Cells, batteries or cells and batteries contained in equipment carried for disposal or recycling may be packaged in accordance with special provision 377 and packing instruction P909 of 4.1.4.1.

311 Substances shall not be carried under this entry unless approved by the competent authority on the basis of the results of appropriate tests according to Part I of the *Manual of Tests and Criteria*. Packaging shall ensure that the percentage of diluent does not fall below that stated in the competent authority approval, at any time during carriage.

312 and 313 *(Deleted)*

314 (a) These substances are liable to exothermic decomposition at elevated temperatures. Decomposition can be initiated by heat or by impurities (e.g. powdered metals (iron, manganese, cobalt, magnesium) and their compounds);

(b) During the course of carriage, these substances shall be shaded from direct sunlight and all sources of heat and be placed in adequately ventilated areas.

315 This entry shall not be used for Class 6.1 substances which meet the inhalation toxicity criteria for packing group I described in 2.2.61.1.8.

316 This entry applies only to calcium hypochlorite, dry, when carried in non friable tablet form.

317 "Fissile-excepted" applies only to those fissile material and packages containing fissile material which are excepted in accordance with 2.2.7.2.3.5.

318 For the purposes of documentation, the proper shipping name shall be supplemented with the technical name (see 3.1.2.8). When the infectious substances to be carried are unknown, but suspected of meeting the criteria for inclusion in Category A and assignment to UN No. 2814 or 2900, the words "suspected Category A infectious substance" shall be shown, in parentheses, following the proper shipping name on the transport document.

319 Substances packed and packages which are marked in accordance with packing instruction P650 are not subject to any other requirements of this Code.

320 *(Deleted)*

321 These storage systems shall always be considered as containing hydrogen.

322 When carried in non-friable tablet form, these goods are assigned to packing group III.

323 *(Reserved)*

324 This substance needs to be stabilized when in concentrations of not more than 99 %.

325 In the case of non-fissile or fissile excepted uranium hexafluoride, the material shall be classified under UN No. 2978.

326 In the case of fissile uranium hexafluoride, the material shall be classified under UN No. 2977.

327 Waste aerosols and waste gas cartridges consigned in accordance with 5.4.1.1.3.1 may be carried under UN Nos. 1950 or 2037, as appropriate, for the purposes of reprocessing or disposal. They need not be protected against movement and inadvertent discharge provided that measures to prevent dangerous build-up of pressure and dangerous atmospheres are addressed. Waste aerosols, other than those leaking or severely deformed, shall be packed in accordance with packing instruction P207 and special provision PP87, or packing instruction LP200 and special packing provision L2. Waste gas cartridges, other than those leaking or severely deformed, shall be packed in accordance with packing instruction P003 and special packing provisions PP17 and PP96, or packing instruction LP200 and special packing provision L2. Leaking or severely deformed aerosols and gas cartridges shall be carried in salvage pressure receptacles or salvage packagings provided appropriate measures are taken to ensure there is no dangerous build-up of pressure.

NOTE: *For maritime carriage, waste aerosols and waste gas cartridges shall not be carried in closed containers.*

Waste gas cartridges that were filled with non-flammable, non-toxic gases of Class 2, group A or O and have been pierced are not subject to this Code.

328 This entry applies to fuel cell cartridges including when contained in equipment or packed with equipment. Fuel cell cartridges installed in or integral to a fuel cell system are regarded as contained in equipment. Fuel cell cartridge means an article that stores fuel for discharge into the fuel cell through (a) valve(s) that control(s) the discharge of fuel into the fuel cell. Fuel cell cartridges, including when contained in equipment, shall be designed and constructed to prevent fuel leakage under normal conditions of carriage.

Fuel cell cartridge design types using liquids as fuels shall pass an internal pressure test at a pressure of 100 kPa (gauge) without leakage.

Except for fuel cell cartridges containing hydrogen in metal hydride which shall be in compliance with special provision 339, each fuel cell cartridge design type shall be shown to pass a 1.2 meter drop test onto an unyielding surface in the orientation most likely to result in failure of the containment system with no loss of contents.

When lithium metal or lithium ion batteries are contained in the fuel cell system, the consignment shall be consigned under this entry and under the appropriate entries for UN 3091 LITHIUM METAL BATTERIES CONTAINED IN EQUIPMENT or UN 3481 LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT.

329 *(Reserved)*

330 *(Deleted)*

331 *(Reserved)*

332 Magnesium nitrate hexahydrate is not subject to the requirements of this Code.

333 Ethanol and gasoline, motor spirit or petrol mixtures for use in spark-ignition engines (e.g. in automobiles, stationary engines and other engines) shall be assigned to this entry regardless of variations in volatility.

334 A fuel cell cartridge may contain an activator provided it is fitted with two independent means of preventing unintended mixing with the fuel during carriage.

335 Mixtures of solids which are not subject to the requirements of this Code and environmentally hazardous liquids or solids shall be classified as UN 3077 and may be carried under this entry provided there is no free liquid visible at the time the substance is loaded or at the time the packaging or cargo transport unit is closed. Each cargo transport unit shall be leakproof when used for carriage in bulk. If free liquid is visible at the time the mixture is loaded or at the time the packaging or cargo transport unit is closed, the mixture shall be classified as UN 3082. Sealed packets and articles containing less than 10 ml of an environmentally hazardous liquid, absorbed into a solid material but with no free liquid in the packet or article, or containing less than 10 g of an environmentally hazardous solid, are not subject to the requirements of this Code.

336 A single package of non-combustible solid LSA-II or LSA-III material, if carried by air, shall not contain an activity greater than 3 000 A_2.

337 Type B(U) and Type B(M) packages, if carried by air, shall not contain activities greater than the following:

(a) For low dispersible radioactive material: as authorized for the package design as specified in the certificate of approval;

(b) For special form radioactive material: 3 000 A_1 or 100 000 A_2, whichever is the lower; or

(c) For all other radioactive material: 3 000 A_2.

338 Each fuel cell cartridge carried under this entry and designed to contain a liquefied flammable gas shall:

(a) Be capable of withstanding, without leakage or bursting, a pressure of at least two times the equilibrium pressure of the contents at 55 °C;

(b) Not contain more than 200 ml liquefied flammable gas, the vapour pressure of which shall not exceed 1 000 kPa at 55 °C; and

(c) Pass the hot water bath test prescribed in 6.2.6.3.1.

339 Fuel cell cartridges containing hydrogen in a metal hydride carried under this entry shall have a water capacity less than or equal to 120 ml.

The pressure in the fuel cell cartridge shall not exceed 5 MPa at 55 °C. The design type shall withstand, without leaking or bursting, a pressure of twice the design pressure of the cartridge at 55 °C or 200 kPa more than the design pressure of the cartridge at 55 °C, whichever is greater. The pressure at which this test is conducted is referred to in the drop test and the hydrogen cycling test as the "minimum shell burst pressure".

Fuel cell cartridges shall be filled in accordance with procedures provided by the manufacturer. The manufacturer shall provide the following information with each fuel cell cartridge:

(a) Inspection procedures to be carried out before initial filling and before refilling of the fuel cell cartridge;

(b) Safety precautions and potential hazards to be aware of;

(c) Method for determining when the rated capacity has been achieved;

(d) Minimum and maximum pressure range;

(e) Minimum and maximum temperature range; and

(f) Any other requirements to be met for initial filling and refilling including the type of equipment to be used for initial filling and refilling.

The fuel cell cartridges shall be designed and constructed to prevent fuel leakage under normal conditions of carriage. Each cartridge design type, including cartridges integral to a fuel cell, shall be subjected to and shall pass the following tests:

Drop test

A 1.8 metre drop test onto an unyielding surface in four different orientations:

(a) Vertically, on the end containing the shut-off valve assembly;

(b) Vertically, on the end opposite to the shut-off valve assembly;

(c) Horizontally, onto a steel apex with a diameter of 38 mm, with the steel apex in the upward position; and

(d) At a 45° angle on the end containing the shut-off valve assembly.

There shall be no leakage, determined by using a soap bubble solution or other equivalent means on all possible leak locations, when the cartridge is charged to its rated charging pressure. The fuel cell cartridge shall then be hydrostatically pressurized to destruction. The recorded burst pressure shall exceed 85 % of the minimum shell burst pressure.

Fire test

A fuel cell cartridge filled to rated capacity with hydrogen shall be subjected to a fire engulfment test. The cartridge design, which may include a vent feature integral to it, is deemed to have passed the fire test if:

(a) The internal pressure vents to zero gauge pressure without rupture of the cartridge; or

(b) The cartridge withstands the fire for a minimum of 20 minutes without rupture.

Hydrogen cycling test

This test is intended to ensure that a fuel cell cartridge design stress limits are not exceeded during use.

The fuel cell cartridge shall be cycled from not more than 5 % rated hydrogen capacity to not less than 95 % rated hydrogen capacity and back to not more than 5 % rated hydrogen capacity. The rated charging pressure shall be used for charging and temperatures shall be held within the operating temperature range. The cycling shall be continued for at least 100 cycles.

Following the cycling test, the fuel cell cartridge shall be charged and the water volume displaced by the cartridge shall be measured. The cartridge design is deemed to have passed the hydrogen cycling test if the water volume displaced by the cycled cartridge does not exceed the water volume displaced by an uncycled cartridge charged to 95 % rated capacity and pressurized to 75 % of its minimum shell burst pressure.

Production leak test

Each fuel cell cartridge shall be tested for leaks at 15 °C ± 5 °C, while pressurized to its rated charging pressure. There shall be no leakage, determined by using a soap bubble solution or other equivalent means on all possible leak locations.

Each fuel cell cartridge shall be permanently marked with the following information:

(a) The rated charging pressure in MPa;

(b) The manufacturer's serial number of the fuel cell cartridges or unique identification number; and

(c) The date of expiry based on the maximum service life (year in four digits; month in two digits).

340 Chemical kits, first aid kits and polyester resin kits containing dangerous substances in inner packagings which do not exceed the quantity limits for excepted quantities applicable to individual substances as specified in column (7b) of Table A of Chapter 3.2, may be carried in accordance with Chapter 3.5. Class 5.2 substances, although not individually authorized as excepted quantities in column (7b) of Table A of Chapter 3.2, are authorized in such kits and are assigned Code E2 (see 3.5.1.2).

341 *(Reserved)*

342 Glass inner receptacles (such as ampoules or capsules) intended only for use in sterilization devices, when containing less than 30 ml of ethylene oxide per inner packaging with not more than 300 ml per outer packaging, may be carried in accordance with the provisions in Chapter 3.5, irrespective of the indication of "E0" in column (7b) of Table A of Chapter 3.2 provided that:

(a) After filling, each glass inner receptacle has been determined to be leak-tight by placing the glass inner receptacle in a hot water bath at a temperature, and for a period of time, sufficient to ensure that an internal pressure equal to the vapour pressure of ethylene oxide at 55 °C is achieved. Any glass inner receptacle showing evidence of leakage, distortion or other defect under this test shall not be carried under the terms of this special provision;

(b) In addition to the packaging required by 3.5.2, each glass inner receptacle is placed in a sealed plastics bag compatible with ethylene oxide and capable of containing the contents in the event of breakage or leakage of the glass inner receptacle; and

(c) Each glass inner receptacle is protected by a means of preventing puncture of the plastics bag (e.g. sleeves or cushioning) in the event of damage to the packaging (e.g. by crushing).

343 This entry applies to crude oil containing hydrogen sulphide in sufficient concentration that vapours evolved from the crude oil can present an inhalation hazard. The packing group assigned shall be determined by the flammability hazard and inhalation hazard, in accordance with the degree of danger presented.

344 The provisions of 6.2.6 shall be met.

345 This gas contained in open cryogenic receptacles with a maximum capacity of 1 litre constructed with glass double walls having the space between the inner and outer wall evacuated (vacuum insulated) is not subject to this Code provided each receptacle is carried in an outer packaging with suitable cushioning or absorbent materials to protect it from impact damage.

346 Open cryogenic receptacles conforming to the requirements of packing instruction P203 of 4.1.4.1 and containing no dangerous goods except for UN No. 1977 nitrogen, refrigerated liquid,

which is fully absorbed in a porous material are not subject to any other requirements of this Code.

347 This entry shall only be used if the results of Test series 6 (d) of Part I of the Manual of Tests and Criteria have demonstrated that any hazardous effects arising from functioning are confined within the package.

348 Batteries manufactured after 31 December 2011 shall be marked with the Watt-hour rating on the outside case.

349 Mixtures of a hypochlorite with an ammonium salt are not to be accepted for carriage. UN No. 1791 hypochlorite solution is a substance of Class 8.

350 Ammonium bromate and its aqueous solutions and mixtures of a bromate with an ammonium salt are not to be accepted for carriage.

351 Ammonium chlorate and its aqueous solutions and mixtures of a chlorate with an ammonium salt are not to be accepted for carriage.

352 Ammonium chlorite and its aqueous solutions and mixtures of a chlorite with an ammonium salt are not to be accepted for carriage.

353 Ammonium permanganate and its aqueous solutions and mixtures of a permanganate with an ammonium salt are not to be accepted for carriage.

354 This substance is toxic by inhalation.

355 Oxygen cylinders for emergency use carried under this entry may include installed actuating cartridges (cartridges, power device of Division 1.4, Compatibility Group C or S), without changing the classification in Class 2 provided the total quantity of deflagrating (propellant) explosives does not exceed 3.2 g per oxygen cylinder. The cylinders with the installed actuating cartridges as prepared for carriage shall have an effective means of preventing inadvertent activation.

356 Metal hydride storage systems intended to be installed in vehicles, wagons, vessels, machinery, engines or aircraft shall be approved by the competent authority. The transport document shall include an indication that the package was approved by the competent authority or a copy of the competent authority approval shall accompany each consignment.

357 Petroleum crude oil containing hydrogen sulphide in sufficient concentration that vapours evolved from the crude oil can present an inhalation hazard shall be consigned under the entry UN 3494 PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC.

358 Nitroglycerin solution in alcohol with more than 1 % but not more than 5 % nitroglycerin may be classified in Class 3 and assigned to UN No. 3064 provided all the requirements of packing instruction P300 of 4.1.4.1 are complied with.

359 Nitroglycerin solution in alcohol with more than 1 % but not more than 5 % nitroglycerin shall be classified in Class 1 and assigned to UN No. 0144 if not all the requirements of packing instruction P300 of 4.1.4.1 are complied with.

360 Vehicles only powered by lithium metal batteries or lithium ion batteries shall be assigned to the entry UN 3171 BATTERY-POWERED VEHICLE. Lithium batteries installed in cargo transport units, designed only to provide power external to the transport unit shall be assigned to entry UN 3536 LITHIUM BATTERIES INSTALLED IN CARGO TRANSPORT UNIT lithium ion batteries or lithium metal batteries.

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

(a) Capacitors not installed in equipment shall be carried in an uncharged state. Capacitors installed in equipment shall be carried either in an uncharged state or protected against short circuit;

(b) Each capacitor shall be protected against a potential short circuit hazard in carriage as follows:

(i) When a capacitor's energy storage capacity is less than or equal to 10 Wh or when the energy storage capacity of each capacitor in a module is less than or equal to 10 Wh, the capacitor or module shall be protected against short circuit or be fitted with a metal strap connecting the terminals; and

(ii) When the energy storage capacity of a capacitor or a capacitor in a module is more than 10 Wh, the capacitor or module shall be fitted with a metal strap connecting the terminals;

(c) Capacitors containing dangerous goods shall be designed to withstand a 95 kPa pressure differential;

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

(e) Capacitors shall be marked with the energy storage capacity in Wh.

Capacitors containing an electrolyte not meeting the classification criteria of any class of dangerous goods, including when installed in equipment, are not subject to other provisions of this Code.

Capacitors containing an electrolyte meeting the classification criteria of any class of dangerous goods, with an energy storage capacity of 10 Wh or less are not subject to other provisions of this Code when they are capable of withstanding a 1.2 metre drop test unpackaged on an unyielding surface without loss of contents.

Capacitors containing an electrolyte meeting the classification criteria of any class of dangerous goods that are not installed in equipment and with an energy storage capacity of more than 10 Wh are subject to this Code.

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

NOTE: *Capacitors which by design maintain a terminal voltage (e.g. asymmetrical capacitors) do not belong to this entry.*

362 *(Reserved)*

363 This entry may only be used when the conditions of this special provision are met. No other requirements of this Code apply.

(a) This entry applies to engines or machinery, powered by fuels classified as dangerous goods via internal combustion systems or fuel cells (e.g. combustion engines, generators, compressors, turbines, heating units, etc.), except vehicle equipment assigned to UN No. 3166 referred to in special provision 666.

NOTE: *This entry does not apply to equipment referred to in 1.1.3.2 (a), (d) and (e), 1.1.3.3 and 1.1.3.7.*

(b) Engines or machinery which are empty of liquid or gaseous fuels and which do not contain other dangerous goods, are not subject to this Code.

NOTE 1: *An engine or machinery is considered to be empty of liquid fuel when the liquid fuel tank has been drained and the engine or machinery cannot be operated due to a lack of fuel. Engine or machinery components such as fuel lines, fuel filters and injectors do not need to be cleaned, drained or purged to be considered empty of liquid fuels. In addition, the liquid fuel tank does not need to be cleaned or purged.*

NOTE 2: *An engine or machinery is considered to be empty of gaseous fuels when the gaseous fuel tanks are empty of liquid (for liquefied gases), the pressure in the tanks does not exceed 2 bar and the fuel shut-off or isolation valve is closed and secured.*

(c) Engines and machinery containing fuels meeting the classification criteria of Class 3, shall be assigned to the entries UN No. 3528 ENGINE, INTERNAL COMBUSTION, FLAMMABLE LIQUID POWERED or UN No. 3528 ENGINE, FUEL CELL, FLAMMABLE LIQUID POWERED or UN No. 3528 MACHINERY, INTERNAL COMBUSTION, FLAMMABLE LIQUID POWERED or UN No. 3528 MACHINERY, FUEL CELL, FLAMMABLE LIQUID POWERED, as appropriate.

(d) Engines and machinery containing fuels meeting the classification criteria of flammable gases of Class 2, shall be assigned to the entries UN No. 3529 ENGINE, INTERNAL COMBUSTION, FLAMMABLE GAS POWERED or UN No. 3529 ENGINE, FUEL CELL, FLAMMABLE GAS POWERED or UN No. 3529 MACHINERY, INTERNAL COMBUSTION, FLAMMABLE GAS POWERED or UN No. 3529 MACHINERY, FUEL CELL, FLAMMABLE GAS POWERED, as appropriate.

Engines and machinery powered by both a flammable gas and a flammable liquid shall be assigned to the appropriate UN No. 3529 entry.

(e) Engines and machinery containing liquid fuels meeting the classification criteria of 2.2.9.1.10 for environmentally hazardous substances and not meeting the classification criteria of any other class shall be assigned to the entries UN No. 3530 ENGINE, INTERNAL COMBUSTION or UN No. 3530 MACHINERY, INTERNAL COMBUSTION, as appropriate.

(f) Engines or machinery may contain other dangerous goods than fuels (e.g. batteries, fire extinguishers, compressed gas accumulators or safety devices) required for their functioning or safe operation without being subject to any additional requirements for these other dangerous goods, unless otherwise specified in this Code. However, lithium batteries shall meet the provisions of 2.2.9.1.7, except as provided for in special provision 667.

(g) The engine or machinery, including the means of containment containing dangerous goods, shall be in compliance with the construction requirements specified by the competent authority of the country of manufacture[2];

(h) Any valves or openings (e.g. venting devices) shall be closed during carriage;

(i) The engines or machinery shall be oriented to prevent inadvertent leakage of dangerous goods and secured by means capable of restraining the engines or machinery to prevent any movement during carriage which would change the orientation or cause them to be damaged;

(j) For UN No. 3528 and UN No. 3530:

Where the engine or machinery contains more than 60 l of liquid fuel and has a capacity of not more than 450 l, the labelling requirements of 5.2.2 shall apply.

Where the engine or machinery contains more than 60 *l* of liquid fuel and has a capacity of more than 450 *l* but not more than 3 000 *l*, it shall be labelled on two opposite sides in accordance with 5.2.2.

[2] *For example, compliance with the relevant provisions of Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (Official Journal of the European Union No. L 157 of 9 June 2006, pp. 0024-0086).*

Where the engine or machinery contains more than 60 *l* of liquid fuel and has a capacity of more than 3 000 *l*, it shall be placarded on two opposite sides. Placards shall correspond to the labels required in Column (5) of Table A of Chapter 3.2 and shall conform to the specifications given in 5.3.1.7. Placards shall be displayed on a background of contrasting colour, or shall have either a dotted or solid outer boundary line.

NOTE: *On engines and machinery with a capacity of more than 450 l but containing 60 l of liquid fuel or less, labelling and placarding compliant with the above requirements are permitted.*

(k) For UN No. 3529:

Where the fuel tank of the engine or machinery has a water capacity of not more than 450 l, the labelling requirements of 5.2.2 shall apply

Where the fuel tank of the engine or machinery has a water capacity of more than 450 *l* but not more than 1 000 *l*, it shall be labelled on two opposite sides in accordance with 5.2.2.

Where the fuel tank of the engine or machinery has a water capacity of more than 1 000 *l*, it shall be placarded on two opposite sides. Placards shall correspond to the labels required in Column (5) of Table A of Chapter 3.2 and shall conform to the specifications given in 5.3.1.7. Placards shall be displayed on a background of contrasting colour, or shall have either a dotted or solid outer boundary line.

(*l*) A transport document in accordance with 5.4 is required, except for UN 3528 and UN 3530, where the a transport document is only required when the engine or machinery contains more than 60 l of liquid fuels. This transport document shall contain the following additional statement "Transport in accordance with special provision 363";

(m) The requirements specified in packing instruction P005 of 4.1.4.1 shall be met.

364 This article may only be carried under the provisions of Chapter 3.4 if, as presented for carriage, the package is capable of passing the test in accordance with Test Series 6(d) of Part I of the Manual of Tests and Criteria as determined by the competent authority.

365 For manufactured instruments and articles containing mercury, see UN No. 3506.

366 Manufactured instruments and articles containing not more than 1 kg of mercury are not subject to this Code.

367 For the purposes of documentation and package marking:

The proper shipping name "Paint related material" may be used for consignments of packages containing "Paint" and "Paint related material" in the same package;

The proper shipping name "Paint related material, corrosive, flammable" may be used for consignments of packages containing "Paint, corrosive, flammable" and "Paint related material, corrosive, flammable" in the same package;

The proper shipping name "Paint related material, flammable, corrosive" may be used for consignments of packages containing "Paint, flammable, corrosive" and "Paint related material, flammable, corrosive" in the same package; and

The proper shipping name "Printing ink related material" may be used for consignments of packages containing "Printing ink" and "Printing ink related material" in the same package.

368 In the case of non-fissile or fissile-excepted uranium hexafluoride, the material shall be classified under UN No. 3507 or UN No. 2978.

369 In accordance with 2.1.3.5.3 (a), this radioactive material in an excepted package possessing toxic and corrosive properties is classified in Class 6.1 with radioactivity and corrosivity subsidiary hazards.

Uranium hexafluoride may be classified under this entry only if the conditions of 2.2.7.2.4.1.2, 2.2.7.2.4.1.5, 2.2.7.2.4.5.2 and, for fissile-excepted material, of 2.2.7.2.3.5 are met.

In addition to the provisions applicable to the carriage of Class 6.1 substances with a corrosivity subsidiary hazard, the provisions of 5.1.3.2, 5.1.5.2.2, 5.1.5.4.1 (b), 7.5.11 CV33 (3.1), (5.1) to (5.4) and (6) shall apply.

No Class 7 label is required to be displayed.

370 This entry only applies to ammonium nitrate that meets one of the following criteria:

(a) ammonium nitrate with more than 0.2 % combustible substances, including any organic substance calculated as carbon, to the exclusion of any added substance; or

(b) ammonium nitrate with not more than 0.2 % combustible substances, including any organic substance calculated as carbon, to the exclusion of any added substance, that gives a positive result when tested in accordance with Test Series 2 (see Manual of Tests and Criteria, Part I). See also UN No. 1942.

This entry shall not be used for ammonium nitrate for which a proper shipping name already exists in Table A of Chapter 3.2 including ammonium nitrate mixed with fuel oil (ANFO) or any of the commercial grades of ammonium nitrate.

371 (1) This entry also applies to articles, containing a small pressure receptacle with a release device. Such articles shall comply with the following requirements:

(a) The water capacity of the pressure receptacle shall not exceed 0.5 litres and the working pressure shall not exceed 25 bar at 15 °C;

(b) The minimum burst pressure of the pressure receptacle shall be at least four times the pressure of the gas at 15 °C;

(c) Each article shall be manufactured in such a way that unintentional firing or release is avoided under normal conditions of handling, packing, carriage and use. This may be fulfilled by an additional locking device linked to the activator;

(d) Each article shall be manufactured in such a way as to prevent hazardous projections of the pressure receptacle or parts of the pressure receptacle;

(e) Each pressure receptacle shall be manufactured from material which will not fragment upon rupture;

(f) The design type of the article shall be subjected to a fire test. For this test, the provisions of paragraphs 16.6.1.2 except letter g, 16.6.1.3.1 to 16.6.1.3.6, 16.6.1.3.7 (b) and 16.6.1.3.8 of the Manual of Tests and Criteria shall be applied. It shall be demonstrated that the article relieves its pressure by means of a fire degradable seal or other pressure relief device, in such a way that the pressure receptacle will not fragment and that the article or fragments of the article do not rocket more than 10 metres;

(g) The design type of the article shall be subjected to the following test. A stimulating mechanism shall be used to initiate one article in the middle of the packaging. There shall be no hazardous effects outside the package such as disruption of the package, metal fragments or a receptacle which passes through the packaging.

(2) The manufacturer shall produce technical documentation of the design type, manufacture as well as the tests and their results. The manufacturer shall apply procedures to ensure that articles produced in series are made of good quality, conform to the design type and are able to meet the requirements in (1). The manufacturer shall provide such information to the competent authority on request.

372 This entry applies to asymmetric capacitors with an energy storage capacity greater than 0.3 Wh. Capacitors with an energy storage capacity of 0.3 Wh or less are not subject to this Code.

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

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

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

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

(a) Capacitors or modules shall be protected against short circuit;

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

(c) Capacitors shall be marked with the energy storage capacity in Wh; and

(d) Capacitors containing an electrolyte meeting the classification criteria of any class of dangerous goods shall be designed to withstand a 95 kPa pressure differential;

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

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

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

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

NOTE: *Notwithstanding the provisions of this special provision, nickel-carbon asymmetric capacitors containing Class 8 alkaline electrolytes shall be carried as UN 2795 BATTERIES, WET, FILLED WITH ALKALI, electric storage.*

373 Neutron radiation detectors containing non-pressurized boron trifluoride gas may be carried under this entry provided that the following conditions are met:

(a) Each radiation detector shall meet the following conditions.

(i) The pressure in each detector shall not exceed 105 kPa absolute at 20 °C;

(ii) The amount of gas shall not exceed 13 g per detector;

(iii) Each detector shall be manufactured under a registered quality assurance programme;

NOTE: *ISO 9001 may be used for this purpose.*

(iv) Each neutron radiation detector shall be of welded metal construction with brazed metal to ceramic feed through assemblies. These detectors shall have a minimum burst pressure of 1800 kPa as demonstrated by design type qualification testing; and

(v) Each detector shall be tested to a 1×10^{-10} cm^3/s leaktightness standard before filling.

(b) Radiation detectors carried as individual components shall be carried as follows:

(i) Detectors shall be packed in a sealed intermediate plastics liner with sufficient absorbent or adsorbent material to absorb or adsorb the entire gas contents;

(ii) They shall be packed in strong outer packaging. The completed package shall be capable of withstanding a 1.8 m drop test without leakage of gas contents from detectors;

(iii) The total amount of gas from all detectors per outer packaging shall not exceed 52 g.

(c) Completed neutron radiation detection systems containing detectors meeting the conditions of paragraph (a) shall be carried as follows:

(i) The detectors shall be contained in a strong sealed outer casing;

(ii) The casing shall contain sufficient absorbent or adsorbent material to absorb or adsorb the entire gas contents;

(iii) The completed systems shall be packed in strong outer packagings capable of withstanding a 1.8 m drop test without leakage unless a system's outer casing affords equivalent protection.

Packing instruction P200 of 4.1.4.1 is not applicable.

The transport document shall include the following statement "Transport in accordance with special provision 373".

Neutron radiation detectors containing not more than 1 g of boron trifluoride, including those with solder glass joints, are not subject to this Code provided they meet the requirements in paragraph (a) and are packed in accordance with paragraph (b). Radiation detection systems containing such detectors are not subject to this Code provided they are packed in accordance with paragraph (c).

374 *(Reserved)*

375A These substances are not subject to any other provisions of this Code provided the following are met:

(a) when carried in single or combination packagings containing a net quantity per single or inner packaging of 30 l or less for liquids or having a net mass per single or inner packaging of 30 kg or less for solids, 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.

NOTE: *In the UN Model Regulations, the maximum net quantity is 5 kg/l. The 30 kg/l applies only to transport by road or rail wholly within Australia.*

(b) when carried in single or combinations packagings with a capacity exceeding 30 l for liquids or having a net mass per single or inner packaging exceeding 30 kg for solids:
(i) packagings meet the relevant provisions of 4.1; and
(ii) they are marked and labelled in conformity with 5.2.1 and 5.2.2.

376 Lithium ion cells or batteries and lithium metal cells or batteries identified as being damaged or defective such that they do not conform to the type tested according to the applicable provisions of the Manual of Tests and Criteria shall comply with the requirements of this special provision.

For the purposes of this special provision, these may include, but are not limited to:

- Cells or batteries identified as being defective for safety reasons;

- Cells or batteries that have leaked or vented;

- Cells or batteries that cannot be diagnosed prior to carriage; or

- Cells or batteries that have sustained physical or mechanical damage.

NOTE: *In assessing a cell or battery as damaged or defective, an assessment or evaluation shall be performed based on safety criteria from the cell, battery or product manufacturer or by a technical expert with knowledge of the cell's or battery's safety features. An assessment or evaluation may include, but is not limited to, the following criteria:*

(a) Acute hazard, such as gas, fire, or electrolyte leaking;

(b) The use or misuse of the cell or battery;

(c) Signs of physical damage, such as deformation to cell or battery casing, or colours on the casing;

(d) External and internal short circuit protection, such as voltage or isolation measures;

(e) The condition of the cell or battery safety features; or

(f) Damage to any internal safety components, such as the battery management system.

Cells and batteries shall be carried according to the provisions applicable to UN No. 3090, UN No. 3091, UN No. 3480 and UN No. 3481, except special provision 230 and as otherwise stated in this special provision.

Cells and batteries shall be packed in accordance with packing instructions P908 of 4.1.4.1 or LP904 of 4.1.4.3, as applicable.

Cells and batteries identified as damaged or defective and liable to rapidly disassemble, dangerously react, produce a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours under normal conditions of carriage shall be packed and carried in accordance with packing instruction P911 of 4.1.4.1 or LP906 of 4.1.4.3, as applicable. Alternative packing and/or carriage conditions may be authorized by the competent authority, who may also recognize an approval granted by another competent authority 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. In both cases the cells and batteries are assigned to transport category 0.

Packages shall be marked "DAMAGED/DEFECTIVE LITHIUM ION BATTERIES" or "DAMAGED/DEFECTIVE LITHIUM METAL BATTERIES", as applicable.

The transport document shall include the following statement "Transport in accordance with special provision 376".

If applicable, a copy of the competent authority approval shall accompany the carriage.

377 Lithium ion and lithium metal cells and batteries and equipment containing such cells and batteries carried for disposal or recycling, either packed together with or packed without non-lithium batteries, may be packaged in accordance with packing instruction P909 of 4.1.4.1.

These cells and batteries are not subject to the provisions of 2.2.9.1.7 (a) to (g).

Packages shall be marked "LITHIUM BATTERIES FOR DISPOSAL" or "LITHIUM BATTERIES FOR RECYCLING".

Identified damaged or defective batteries shall be carried in accordance with special provision 376.

378 Radiation detectors containing this gas in non-refillable pressure receptacles not meeting the requirements of Chapter 6.2 and packing instruction P200 of 4.1.4.1 may be carried under this entry provided:

(a) The working pressure in each receptacle does not exceed 50 bar;

(b) The receptacle capacity does not exceed 12 litres;

(c) Each receptacle has a minimum burst pressure of at least 3 times the working pressure when a relief device is fitted and at least 4 times the working pressure when no relief device is fitted;

(d) Each receptacle is manufactured from material which will not fragment upon rupture;

(e) Each detector is manufactured under a registered quality assurance programme;

NOTE: *ISO 9001 may be used for this purpose.*

(f) Detectors are carried in strong outer packagings. The complete package shall be capable of withstanding a 1.2 metre drop test without breakage of the detector or rupture of the outer packaging. Equipment that includes a detector shall be packed in strong outer packaging unless the detector is afforded equivalent protection by the equipment in which it is contained; and

(g) The transport document includes the following statement "Transport in accordance with special provision 378".

Radiation detectors, including detectors in radiation detection systems, are not subject to any other requirements of this Code if the detectors meet the requirements in (a) to (f) above and the capacity of detector receptacles does not exceed 50 ml.

379 Anhydrous ammonia adsorbed or absorbed on a solid contained in ammonia dispensing systems or receptacles intended to form part of such systems are not subject to the other provisions of this Code if the following conditions are observed:

(a) The adsorption or absorption presents the following properties:

(i) The pressure at a temperature of 20 °C in the receptacle is less than 0.6 bar;

(ii) The pressure at a temperature of 35 °C in the receptacle is less than 1 bar;

(iii) The pressure at a temperature of 85 °C in the receptacle is less than 12 bar.

(b) The adsorbent or absorbent material shall not have dangerous properties listed in classes 1 to 8;

(c) The maximum contents of a receptacle shall be 10 kg of ammonia; and

(d) Receptacles containing adsorbed or absorbed ammonia shall meet the following conditions:

(i) Receptacles shall be made of a material compatible with ammonia as specified in ISO 11114-1:2012 + A1:2017;

(ii) Receptacles and their means of closure shall be hermetically sealed and able to contain the generated ammonia;

(iii) Each receptacle shall be able to withstand the pressure generated at 85 °C with a volumetric expansion no greater than 0.1 %;

(iv) Each receptacle shall be fitted with a device that allows for gas evacuation once pressure exceeds 15 bar without violent rupture, explosion or projection; and

(v) Each receptacle shall be able to withstand a pressure of 20 bar without leakage when the pressure relief device is deactivated.

When carried in an ammonia dispenser, the receptacles shall be connected to the dispenser in such a way that the assembly is guaranteed to have the same strength as a single receptacle.

The properties of mechanical strength mentioned in this special provision shall be tested using a prototype of a receptacle and/or dispenser filled to nominal capacity, by increasing the temperature until the specified pressures are reached.

The test results shall be documented, shall be traceable and shall be communicated to the relevant authorities upon request.

380 and 381 *(Reserved)*

382 Polymeric beads may be made from polystyrene, poly (methyl methacrylate) or other polymeric material. When it can be demonstrated that no flammable vapour, resulting in a flammable atmosphere, is evolved according to test U1 (Test method for substances liable to evolve flammable vapours) of Part III, sub-section 38.4.4 of the Manual of Tests and Criteria, polymeric beads, expandable need not be classified under this UN number. This test should only be performed when de-classification of a substance is considered.

383 Table tennis balls manufactured from celluloid are not subject to this Code where the net mass of each table tennis ball does not exceed 3.0 g and the total net mass of table tennis balls does not exceed 500 g per package.

384 *(Reserved)*

385 *(Deleted)*

386 When substances are stabilized by temperature control, the provisions of 2.2.41.1.21, 7.1.7, special provision V8 of Chapter 7.2, special provision S4 of Chapter 8.5 and the requirements of Chapter 9.6 apply. When chemical stabilization is employed, the person offering the packaging, IBC or tank for carriage shall ensure that the level of stabilization is sufficient to prevent the substance in the packaging, IBC or tank from dangerous polymerization at a bulk mean temperature of 50 °C, or, in the case of a portable tank, 45 °C. Where chemical stabilization becomes ineffective at lower temperatures within the anticipated duration of carriage, temperature control is required. In making this determination factors to be taken into consideration include, but are not limited to, the capacity and geometry of the packaging, IBC or tank and the effect of any insulation present, the temperature of the substance when offered for carriage, the duration of the journey and the ambient temperature conditions typically encountered in the journey (considering also the season of year), the effectiveness and other properties of the stabilizer employed, applicable operational controls imposed by regulation (e.g. requirements to protect from sources of heat, including other cargo carried at a temperature above ambient) and any other relevant factors.

387 Lithium batteries in conformity with 2.2.9.1.7 (f) containing both primary lithium metal cells and rechargeable lithium ion cells shall be assigned to UN Nos. 3090 or 3091 as appropriate. When such batteries are carried in accordance with special provision 188, the total lithium content of all lithium metal cells contained in the battery shall not exceed 1.5 g and the total capacity of all lithium ion cells contained in the battery shall not exceed 10 Wh.

388 UN No. 3166 entries apply to vehicles powered by flammable liquid or gas internal combustion engines or fuel cells.

Vehicles powered by a fuel cell engine shall be assigned to the entries UN 3166 VEHICLE, FUEL CELL, FLAMMABLE GAS POWERED or UN 3166 VEHICLE, FUEL CELL, FLAMMABLE LIQUID POWERED, as appropriate. These entries include hybrid electric vehicles powered by both a fuel cell and an internal combustion engine with wet batteries, sodium batteries, lithium metal batteries or lithium ion batteries, carried with the battery(ies) installed.

Other vehicles which contain an internal combustion engine shall be assigned to the entries UN 3166 VEHICLE, FLAMMABLE GAS POWERED or UN 3166 VEHICLE, FLAMMABLE LIQUID POWERED, as appropriate. These entries include hybrid electric vehicles powered by both an internal combustion engine and wet batteries, sodium batteries, lithium metal batteries or lithium ion batteries, carried with the battery(ies) installed.

If a vehicle is powered by a flammable liquid and a flammable gas internal combustion engine, it shall be assigned to UN 3166 VEHICLE, FLAMMABLE GAS POWERED.

Entry UN 3171 only applies to vehicles powered by wet batteries, sodium batteries, lithium metal batteries or lithium ion batteries and equipment powered by wet batteries or sodium batteries carried with these batteries installed.

For the purpose of this special provision, vehicles are self-propelled apparatus designed to carry one or more persons or goods. Examples of such vehicles are cars, motorcycles, scooters, three- and four-wheeled vehicles or motorcycles, trucks, locomotives, bicycles (pedal cycles with a motor) and other vehicles of this type (e.g. self-balancing vehicles or vehicles not equipped with at least one seating position), wheelchairs, lawn tractors, self-propelled farming and construction equipment, boats and aircraft. This includes vehicles carried in a packaging. In this case some parts of the vehicle may be detached from its frame to fit into the packaging.

Examples of equipment are lawnmowers, cleaning machines or model boats and model aircraft. Equipment powered by lithium metal batteries or lithium ion batteries shall be assigned to the entries UN 3091 LITHIUM METAL BATTERIES CONTAINED IN EQUIPMENT or UN 3091 LITHIUM METAL BATTERIES PACKED WITH EQUIPMENT or UN 3481 LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT or UN 3481 LITHIUM ION BATTERIES PACKED WITH EQUIPMENT, as appropriate. Lithium ion batteries or lithium metal batteries installed in a cargo transport unit and designed only to provide power external to the cargo transport unit shall be assigned to the entry UN 3536 LITHIUM BATTERIES INSTALLED IN CARGO TRANSPORT UNIT lithium ion batteries or lithium metal batteries.

Dangerous goods, such as batteries, airbags, fire extinguishers, compressed gas accumulators, safety devices and other integral components of the vehicle that are necessary for the operation of the vehicle or for the safety of its operator or passengers, shall be securely installed in the vehicle and are not otherwise subject to this Code. However, lithium batteries shall meet the provisions of 2.2.9.1.7, except as otherwise provided for in special provision 667.

Where a lithium battery installed in a vehicle or equipment is damaged or defective, the vehicle or equipment shall be carried in accordance with the conditions defined in special provision 667 (c).

389 This entry only applies to lithium ion batteries or lithium metal batteries installed in a cargo transport unit and designed only to provide power external to the unit. The lithium batteries shall meet the provisions of 2.2.9.1.7 (a) to (g) and contain the necessary systems to prevent overcharge and over discharge between the batteries.

The batteries shall be securely attached to the interior structure of the cargo transport unit (e.g., by means of placement in racks, cabinets, etc.) in such a manner as to prevent short circuits, accidental operation, and significant movement relative to the cargo transport unit under the shocks, loadings and vibrations normally incident to carriage. Dangerous goods necessary for the safe and proper operation of the cargo transport unit (e.g., fire extinguishing systems and air conditioning systems), shall be properly secured to or installed in the cargo transport unit and are not otherwise subject to this Code. Dangerous goods not necessary for the safe and proper operation of the cargo transport unit shall not be carried within the cargo transport unit.

The batteries inside the cargo transport unit are not subject to marking or labelling requirements. Except as provided in 1.1.3.6, the cargo transport unit shall bear emergency information panels in accordance with 5.3.2.2 and placards in accordance with 5.3.1.1 on two opposing sides.

390 When a package contains a combination of lithium batteries contained in equipment and lithium batteries packed with equipment, the following requirements apply for the purposes of package marking and documentation:

(a) the package shall be marked "UN 3091" or "UN 3481", as appropriate. If a package contains both lithium ion batteries and lithium metal batteries packed with and contained in equipment, the package shall be marked as required for both battery types. However, button cell batteries installed in equipment (including circuit boards) need not be considered;

(b) the transport document shall indicate "UN 3091 LITHIUM METAL BATTERIES PACKED WITH EQUIPMENT" or "UN 3481 LITHIUM ION BATTERIES PACKED WITH EQUIPMENT", as appropriate. If a package contains both lithium metal batteries and lithium ion batteries packed with and contained in equipment, then the transport document shall indicate both "UN 3091 LITHIUM METAL BATTERIES PACKED WITH EQUIPMENT" and "UN 3481 LITHIUM ION BATTERIES PACKED WITH EQUIPMENT".

391 *(Reserved)*

392 For the carriage of fuel gas containment systems designed and approved to be fitted in motor vehicles containing this gas the provisions of 4.1.4.1 and Chapter 6.2 need not be applied when carried for disposal, recycling, repair, inspection, maintenance or from where they are manufactured to a vehicle assembly plant, provided the following conditions are met:

(a) The fuel gas containment systems shall meet the requirements of the standards or regulations for fuel tanks for vehicles, as applicable. Examples of applicable standards and regulations are:

LP Gas, Natural Gas (CNG & LNG) & Hydrogen	
The Australian Design Rules and Heavy Vehicle (Vehicle Standards) National Regulations requires gas fuel systems fitted to vehicles to comply with the relevant Australian Standards. Motor Vehicle Standards Act 1989 (Cth) Motor Vehicle Standards Regulations 1989 (Cth) Australian Design Rules third edition ADR 42 General Safety Requirements ADR 44 Specific Vehicle requirements ADR 80 Emission control for heavy vehicles	
LPG Tanks	
AS/NZS 1425:2013	Provisions for the design, manufacture and installation, with technical requirements, of LP Gas fuel systems for motor vehicles
ECE Regulation No. 67 Revision 2	Uniform provisions concerning: I. Approval of specific equipment of vehicles of category M and N using liquefied petroleum gases in their propulsion system; II. Approval of vehicles of category M and N fitted with specific equipment for the use of liquefied petroleum gases in their propulsion system with regard to the installation of such equipment
ECE Regulation No. 115	Uniform provisions concerning the approval of: I. Specific LPG (liquefied petroleum gases) retrofit systems to be installed in motor vehicles for the use of LPG in their propulsion systems; II Specific CNG (compressed natural gas) retrofit systems to be installed in motor vehicles for the use of CNG in their propulsion system
CNG tanks	
AS/NZS 2739:2009	Specifies design requirements for natural gas (NG) fuel systems for motor vehicles. Set out requirements for the design and construction of component parts, their installation in vehicles, and for tests, commissioning and periodic inspection. Applicable to all vehicle types (including rigid chassis, articulated chassis and semitrailers).
ECE Regulation No. 110	Uniform provisions concerning the approval of: I. Specific components of motor vehicles using compressed natural gas (CNG) and/or liquefied natural gas (LNG) in their propulsion system; II. Vehicles with regard to the installation of specific components of an approved type for the use of compressed natural gas (CNG) and/or liquefied natural gas (LNG) in their propulsion system
ECE Regulation No. 115	(Uniform provisions concerning the approval of: I. Specific LPG (liquefied petroleum gases) retrofit systems to be installed in motor vehicles for the use of LPG in their propulsion systems; II Specific CNG (compressed natural gas) retrofit systems to be installed in motor vehicles for the use of CNG in their propulsion system)
ISO 11439:2013	Gas cylinders — High pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles

ISO 15500-Series	ISO 15500: Road vehicles -- Compressed natural gas (CNG) fuel system components – several parts as applicable
ANSI NGV 2	Compressed natural gas vehicle fuel containers
CSA B51 Part 2: 2014	Boiler, pressure vessel, and pressure piping code part 2 Requirements for high-pressure cylinders for on-board storage of fuels for automotive vehicles
Hydrogen pressure tanks	
AS ISO 19881:2020, Gaseous hydrogen - Land vehicle fuel containers	Specified the requirements for material, design, manufacture and testing of refillable, permanently attached containers intended for the storage of compressed hydrogen gas for land vehicle operation.
Global Technical Regulation (GTR) No. 13	Global technical regulation on hydrogen and fuel cell vehicles (ECE/TRANS/180/Add.13).
ISO/TS 15869:2009	Gaseous hydrogen and hydrogen blends - Land vehicle fuel tanks
Regulation (EC) No.79/2009	Regulation (EC) No. 79/2009 of the European Parliament and of the Council of 14 January 2009 on type approval of hydrogen-powered motor vehicles, and amending Directive 2007/46/EC
Regulation (EU) No. 406/2010	Commission Regulation (EU) No 406/2010 of 26 April 2010 implementing Regulation (EC) No 79/2009 of the European Parliament and of the Council on type-approval of hydrogen-powered motor vehicles.
ECE Regulation No. 134	Uniform provisions concerning the approval of motor vehicles and their components with regards to the safety-related performance of hydrogen and fuel cell vehicles (HFCV)
CSA B51 Part 2: 2014	Boiler, pressure vessel, and pressure piping code Part 2 Requirements for high-pressure cylinders for on-board storage of fuels for automotive vehicles

Gas tanks designed and constructed in accordance with previous versions of relevant standards or regulations for gas tanks for motor vehicles, which were applicable at the time of the certification of the vehicles for which the gas tanks were designed and constructed may continue to be carried;

(b) The fuel gas containment systems shall be leakproof and shall not exhibit any signs of external damage which may affect their safety;

NOTE 1: *Criteria may be found in standard ISO 11623:2015 Gas cylinders – Composite construction – Periodic inspection and testing (or ISO 19078:2013 Gas cylinders – Inspection of the cylinder installation, and requalification of high pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles).*

NOTE 2: *If the fuel gas containment systems are not leakproof or are overfilled or if they exhibit damage that could affect their safety (e.g. in case of a safety related recall), they shall only be carried in salvage pressure receptacles in conformity with this Code.*

(c) If a fuel gas containment system is equipped with two valves or more integrated in line, the two valves shall be closed as to be gastight under normal conditions of carriage. If only one valve exists or only one valve works, all openings with the exception of the opening of the pressure relief device shall be closed as to be gastight under normal conditions of carriage;

(d) Fuel gas containment systems shall be carried in such a way as to prevent obstruction of the pressure relief device or any damage to the valves and any other pressurised part of the fuel gas containment systems and unintentional release of the gas under normal conditions of carriage. The fuel gas containment system shall be secured in order to prevent slipping, rolling or vertical movement;

(e) Valves shall be protected by one of the methods described in 4.1.6.1.8 (a) to (e);

(f) Except for the case of fuel gas containment systems removed for disposal, recycling, repair, inspection or maintenance, they shall be filled with not more than 20 % of their nominal filling ratio or nominal working pressure, as applicable;

(g) Notwithstanding the provisions of Chapter 5.2, when fuel gas containment systems are consigned in a handling device, marks and labels may be affixed to the handling device; and

(h) Notwithstanding the provisions of 5.4.1.1.1 (f) the information on the total quantity of dangerous goods may be replaced by the following information:

(i) The number of fuel gas containment systems; and

(ii) In the case of liquefied gases the total net mass (kg) of gas of each fuel gas containment system and, in the case of compressed gases, the total water capacity (*l*) of each fuel gas containment system followed by the nominal working pressure.

Examples for information in the transport document:

Example 1: "UN 1971 natural gas, compressed, 2.1, 1 fuel gas containment system of 50 *l* in total, 200 bar".

Example 2: "UN 1965 hydrocarbon gas mixture, liquefied, n.o.s., 2.1, 3 fuel gas containment systems, each of 15 kg net mass of gas".

393 The nitrocellulose shall meet the criteria of the Bergmann-Junk test or methyl violet paper test in the Manual of Tests and Criteria Appendix 10. Tests of type 3 (c) need not be applied.

394 The nitrocellulose shall meet the criteria of the Bergmann-Junk test or methyl violet paper test in the Manual of Tests and Criteria Appendix 10.

395 This entry shall only be used for solid medical waste of Category A carried for disposal.

396 Large and robust articles may be carried with connected gas cylinders with the valves open regardless of 4.1.6.5 provided:

(a) The gas cylinders contain nitrogen of UN No. 1066 or compressed gas of UN No. 1956 or compressed air of UN No. 1002;

(b) The gas cylinders are connected with the article through pressure regulators and fixed piping in such a way that the pressure of the gas (gauge pressure) in the article does not exceed 35 kPa (0.35 bar);

(c) The gas cylinders are properly secured so that they cannot move in relation to the article and are fitted with strong and pressure resistant hoses and pipes;

(d) The gas cylinders, pressure regulators, piping and other components are protected from damage and impacts during carriage by wooden crates or other suitable means;

(e) The transport document includes the following statement "Transport in accordance with special provision 396";

(f) Cargo transport units containing articles carried with cylinders with open valves containing a gas presenting a risk of asphyxiation are well ventilated and marked in accordance with 5.5.3.6."

397 Mixtures of nitrogen and oxygen containing not less than 19.5 % and not more than 23.5 % oxygen by volume may be carried under this entry when no other oxidizing gases are present. A Class 5.1 subsidiary hazard label (model No. 5.1, see 5.2.2.2.2) is not required for any concentrations within this limit.

398 This entry applies to mixtures of butylenes, 1-butylene, cis-2-butylene and trans-2-butylene. For isobutylene, see UN No. 1055.

NOTE: *For additional information to be added in the transport document, see 5.4.1.2.2 (e).*

399-499 *(Reserved)*

500 *(Deleted)*

501 For naphthalene, molten, see UN No. 2304.

502 UN No. 2006 plastics, nitrocellulose-based, self-heating, n.o.s., and 2002 celluloid scrap are substances of Class 4.2.

503 For phosphorus, white, molten, see UN No. 2447.

504 UN No. 1847 potassium sulphide, hydrated with not less than 30 % water of crystallization, UN No. 1849 sodium sulphide, hydrated with not less than 30 % water of crystallization and UN No. 2949 sodium hydrosulphide hydrated with not less than 25 % water of crystallization are substances of Class 8.

505 UN No. 2004 magnesium diamide is a substance of Class 4.2.

506 Alkaline earth metals and alkaline earth metal alloys in pyrophoric form are substances of Class 4.2.

UN No. 1869 magnesium or magnesium alloys containing more than 50 % magnesium as pellets, turnings or ribbons, are substances of Class 4.1.

507 UN No. 3048 aluminium phosphide pesticides, with additives inhibiting the emission of toxic flammable gases are substances of Class 6.1.

508 UN No. 1871 titanium hydride and UN No. 1437 zirconium hydride are substances of Class 4.1. UN No. 2870 aluminium borohydride is a substance of Class 4.2.

509 UN No. 1908 chlorite solution is a substance of Class 8.

510 UN No. 1755 chromic acid solution is a substance of Class 8.

511 UN No. 1625 mercuric nitrate, UN No. 1627 mercurous nitrate and UN No. 2727 thallium nitrate are substances of Class 6.1. Thorium nitrate, solid, uranyl nitrate hexahydrate solution and uranyl nitrate, solid are substances of Class 7.

512 UN No. 1730 antimony pentachloride, liquid, UN No. 1731 antimony pentachloride solution, UN No. 1732 antimony pentafluoride and UN No. 1733 antimony trichloride are substances of Class 8.

513 UN No. 0224 barium azide, dry or wetted with less than 50 % water, by mass, is a substance of Class 1. UN No. 1571 barium azide, wetted with not less than 50 % water, by mass, is a substance of Class 4.1. UN No. 1854 barium alloys, pyrophoric, are substances of Class 4.2. UN No. 1445 barium chlorate, solid, UN No. 1446 barium nitrate, UN No. 1447 barium perchlorate, solid, UN No. 1448 barium permanganate, UN No. 1449 barium peroxide, UN No. 2719 barium bromate, UN No. 2741 barium hypochlorite with more than 22 % available chlorine, UN No. 3405 barium chlorate, solution and UN No. 3406 barium perchlorate, solution, are substances of Class 5.1. UN No. 1565 barium cyanide and UN No. 1884 barium oxide are substances of Class 6.1.

514 UN No. 2464 beryllium nitrate is a substance of Class 5.1.

515 UN No. 1581 chloropicrin and methyl bromide mixture and UN No. 1582 chloropicrin and methyl chloride mixture are substances of Class 2.

516 UN No. 1912 methyl chloride and methylene chloride mixture is a substance of Class 2.

517 UN No. 1690 sodium fluoride, solid, UN No. 1812 potassium fluoride, solid, UN No. 2505 ammonium fluoride, UN No. 2674 sodium fluorosilicate, UN No. 2856 fluorosilicates, n.o.s., UN No. 3415 sodium fluoride, solution and UN No. 3422 potassium fluoride, solution, are substances of Class 6.1.

518 UN No. 1463 chromium trioxide, anhydrous (chromic acid, solid) is a substance of Class 5.1.

519 UN No. 1048 hydrogen bromide, anhydrous, is a substance of Class 2.

520 UN No. 1050 hydrogen chloride, anhydrous, is a substance of Class 2.

521 Solid chlorites and hypochlorites are substances of Class 5.1.

522 UN No. 1873 perchloric acid aqueous solution with more than 50 % but not more than 72 % pure acid, by mass are substances of Class 5.1. Perchloric acid solutions containing more than 72 % pure acid, by mass, or mixtures of perchloric acid with any liquid other than water, are not to be accepted for carriage.

523 UN No. 1382 anhydrous potassium sulphide and UN No. 1385 anhydrous sodium sulphide and their hydrates with less than 30 % water of crystallization, and UN No. 2318 sodium hydrosulphide with less than 25 % water of crystallization are substances of Class 4.2.

524 UN No. 2858 finished zirconium products of a thickness of 18 μm or more are substances of Class 4.1.

525 Solutions of inorganic cyanides with a total cyanide ion content of more than 30 % shall be classified in packing group I, solutions with a total cyanide ion content of more than 3 % and not more than 30 % in packing group II and solutions with a cyanide ion content of more than 0.3 % and not more than 3 % in packing group III.

526 UN No. 2000 celluloid is assigned to Class 4.1.

528 UN No. 1353 fibres or fabrics impregnated with weakly nitrated cellulose, non-self heating are substances of Class 4.1.

529 UN No. 0135 mercury fulminate, wetted with not less than 20 % water, or mixture of alcohol and water, by mass, is a substance of Class 1. Mercurous chloride (calomel) is a substance of Class 6.1 (UN No. 2025).

530 UN No. 3293 hydrazine, aqueous solution with not more than 37 % hydrazine, by mass, is a substance of Class 6.1.

531 Mixtures having a flash-point below 23 °C and containing more than 55 % nitrocellulose, whatever its nitrogen content or containing not more than 55 % nitrocellulose with a nitrogen content above 12.6 % (by dry mass), are substances of Class 1 (see UN Nos. 0340 or 0342) or of Class 4.1 (UN Nos. 2555, 2556 or 2557).

532 UN No. 2672 ammonia solution containing not less than 10 % but not more than 35 % ammonia is a substance of Class 8.

533 UN No. 1198 formaldehyde solutions, flammable are substances of Class 3. Formaldehyde solutions, non-flammable, with less than 25 % formaldehyde are not subject to the requirements of this Code.

534 While in some climatic conditions, petrol (gasoline) may have a vapour pressure at 50 °C of more than 110 kPa (1.10 bar) but not more than 150 kPa (1.50 bar) it is to continue to be considered as a substance having a vapour pressure at 50 °C of not more than 110 kPa (1.10 bar).

535 UN No. 1469 lead nitrate, UN No. 1470 lead perchlorate, solid and UN No. 3408 lead perchlorate, solution, are substances of Class 5.1.

536 For naphthalene, solid, see UN No. 1334.

537 UN No. 2869 titanium trichloride mixture, not pyrophoric, is a substance of Class 8.

538 For sulphur (in the solid state), see UN No. 1350.

539 Solutions of isocyanates having a flash-point of not less than 23 °C are substances of Class 6.1.

540 UN No. 1326 hafnium powder, wetted, UN No. 1352 titanium powder, wetted or UN No. 1358 zirconium powder, wetted, with not less than 25 % water, are substances of Class 4.1.

541 Nitrocellulose mixtures with a water content, alcohol content or plasticizer content lower than the stated limits are substances of Class 1.

542 Talc containing tremolite and/or actinolite is covered by this entry.

543 UN No. 1005 ammonia, anhydrous, UN No. 3318 ammonia solution with more than 50 % ammonia and UN No. 2073 ammonia solution, with more than 35 % but not more than 50 % ammonia, are substances of Class 2. Ammonia solutions with not more than 10 % ammonia are not subject to the requirements of this Code.

544 UN No. 1032 dimethylamine, anhydrous, UN No. 1036 ethylamine, UN No. 1061 methylamine, anhydrous and UN No. 1083 trimethylamine, anhydrous, are substances of Class 2.

545 UN No. 0401 dipicryl sulphide, wetted with less than 10 % water by mass is a substance of Class 1.

546 UN No. 2009 zirconium, dry, finished sheets, strip or coiled wire, in thicknesses of less than 18 μm, is a substance of Class 4.2. Zirconium, dry, finished sheets, strip or coiled wire, in thicknesses of 254 μm or more, is not subject to the requirements of this Code.

547 UN No. 2210 maneb or UN No. 2210 maneb preparations in self-heating form are substances of Class 4.2.

548 Chlorosilanes which, in contact with water, emit flammable gases, are substances of Class 4.3.

549 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.

550 UN No. 1333 cerium in slabs, rods or ingots is a substance of Class 4.1.

551 Solutions of these isocyanates having a flash-point below 23 °C are substances of Class 3.

552 Metals and metal alloys in powdered or other flammable form, liable to spontaneous combustion, are substances of Class 4.2. Metals and metal alloys in powdered or other flammable form which, in contact with water, emit flammable gases are substances of Class 4.3.

553 This mixture of hydrogen peroxide and peroxyacetic acid shall, in laboratory testing (see *Manual of Tests and Criteria*, Part II, section 20), neither detonate in the cavitated state nor deflagrate at all and shall show no effect when heated under confinement nor any explosive power. The formulation shall be thermally stable (self-accelerating decomposition temperature 60 °C or higher for a 50 kg package), and a liquid compatible with peroxyacetic acid shall be used for desensitization. Formulations not meeting these criteria are to be regarded as substances of Class 5.2 (see *Manual of Tests and Criteria*, Part II, paragraph 20.4.3(g)).

554 Metal hydrides which, in contact with water, emit flammable gases are substances of Class 4.3. UN No. 2870 aluminium borohydride or UN No. 2870 aluminium borohydride in devices is a substance of Class 4.2.

555 Dust and powder of metals in non-spontaneously combustible form, non-toxic which nevertheless, in contact with water, emit flammable gases, are substances of Class 4.3.

556 *(Deleted)*

557 Dust and powder of metals in pyrophoric form are substances of Class 4.2.

558 Metals and metal alloys in pyrophoric form are substances of Class 4.2. Metals and metal alloys which, in contact with water, do not emit flammable gases and are not pyrophoric or self-heating, but which are easily ignited, are substances of Class 4.1.

559 *(Deleted)*

560 An elevated temperature liquid, n.o.s. at or above 100 °C (including molten metals and molten salts) and, for a substance having a flashpoint, at a temperature below its flashpoint, is a substance of Class 9 (UN No. 3257).

561 Chloroformates having predominantly corrosive properties are substances of Class 8.

562 Spontaneously combustible organometallic compounds are substances of Class 4.2. Water-reactive organometallic compounds, flammable, are substances of Class 4.3.

563 UN No. 1905 selenic acid is a substance of Class 8.

564 UN No. 2443 vanadium oxytrichloride, UN No. 2444 vanadium tetrachloride and UN No. 2475 vanadium trichloride are substances of Class 8.

565 Unspecified wastes resulting from medical/veterinary treatment of humans/animals or from biological research, and which are unlikely to contain substances of Class 6.2 shall be assigned to this entry. Decontaminated clinical wastes or wastes resulting from biological research which previously contained infectious substances are not subject to the requirements of Class 6.2.

566 UN No. 2030 hydrazine aqueous solution, with more than 37 % hydrazine, by mass, is a substance of Class 8.

567 *(Deleted)*

568 Barium azide with a water content lower than the stated limit is a substance of Class 1, UN No. 0224.

569-579 *(Reserved)*

580 (*Deleted*)

581 This entry covers mixtures of propadiene with 1 to 4 % methylacetylene as well as the following mixtures:

Mixture	Content, % by volume			Permitted technical name for purposes of 5.4.1.1
	Methylacetylene and propadiene, not more than	Propane and propylene, not more than	C4-saturated hydrocarbons, not less than	
P1	63	24	14	"Mixture P1"
P2	48	50	5	"Mixture P2"

582 This entry covers, inter alia, mixtures of gases indicated by the letter "R ...", with the following properties:

Mixture	Maximum vapour pressure at 70 °C (MPa)	Minimum density at 50 °C (kg/l)	Permitted technical name for purposes of 5.4.1.1
F1	1.3	1.30	"Mixture F1"
F2	1.9	1.21	"Mixture F2"
F3	3.0	1.09	"Mixture F3"

NOTE 1: *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.*

NOTE 2: *The reference densities correspond to the densities of dichlorofluoromethane (1.30 kg/l), dichlorodifluoromethane (1.21 kg/l) and chlorodifluoromethane (1.09 kg/l).*

583 This entry covers, inter alia, mixtures of gases with the following properties:

Mixture	Maximun vapour pressure at 70 °C (MPa)	Minimun density at 50 °C (kg/l)	Permitted technical name[a] for purposes of 5.4.1.1
A	1.1	0.525	"Mixture A" or "Butane"
A01	1.6	0.516	"Mixture A01" or "Butane"
A02	1.6	0.505	"Mixture A02" or "Butane"

Mixture	Maximun vapour pressure at 70 °C (MPa)	Minimun density at 50 °C (kg/l)	Permitted technical name[a] for purposes of 5.4.1.1
A0	1.6	0.495	"Mixture A0" or "Butane"
A1	2.1	0.485	"Mixture A1"
B1	2.6	0.474	"Mixture B1"
B2	2.6	0.463	"Mixture B2"
B	2.6	0.450	"Mixture B"
C	3.1	0.440	"Mixture C" or "Propane"

[a] *For carriage in tanks, the trade names "Butane" or "Propane" may be used only as a complement*

584 This gas is not subject to the requirements of this Code when:

- It contains not more than 0.5 % air in the gaseous state;
- It is contained in metal capsules (sodors, sparklets) free from defects which may impair their strength;
- The leakproofness of the closure of the capsule is ensured;
- A capsule contains not more than 25 g of this gas;
- A capsule contains not more than 0.75 g of this gas per cm^3 of capacity.

585 *(Deleted)*

586 Hafnium, titanium and zirconium powders shall contain a visible excess of water. Hafnium, titanium and zirconium powders, wetted, mechanically produced, of a particle size of 53 μm and over, or chemically produced, of a particle size of 840 μm and over, are not subject to the requirements of this Code.

587 Barium stearate and barium titanate are not subject to the requirements of this Code.

588 Solid hydrated forms of aluminium bromide and aluminium chloride are not subject to the requirements of this Code.

589A Natural ‘greasy wool’ fleece and bales are not subject to this Code.

590 Ferric chloride hexahydrate is not subject to the requirements of this Code.

591 Lead sulphate with not more than 3 % free acid is not subject to the requirements of Class 8 of this Code.

592 Uncleaned empty packagings (including empty IBCs and large packagings), empty tank-vehicles, empty tank-wagons, empty demountable tanks, empty portable tanks, empty tank-containers and empty small containers which have contained this substance are not subject to the requirements of this Code.

593 This gas, when used for cooling goods not fulfilling the criteria of any class, e.g. medical or biological specimens, if contained in double wall receptacles which comply with the provisions of packing instruction P203, paragraph (6) for open cryogenic receptacles of 4.1.4.1, is not subject to the requirements of this Code except as specified in 5.5.3.

594 The following articles, manufactured and filled according to the provisions applied in the country of manufacture, are not subject to the requirements of this Code:

(a) UN No. 1044 fire extinguishers provided with protection against inadvertent discharge, when:

- they are packaged in a strong outer packaging; or
- they are large fire extinguishers which meet the requirements of special packing provision PP91 of packing instruction P003 in 4.1.4.1;

(b) UN No. 3164 articles, pressurized pneumatic or hydraulic, designed to withstand stresses greater than the internal gas pressure by virtue of transmission of force, intrinsic strength or construction, when they are packaged in a strong outer packaging.

NOTE: *"Provisions applied in the country of manufacture" means the provisions applicable in the country of manufacture or those applicable in the country of use.*

596 *(Deleted)*

597 Acetic acid solutions with not more than 10 % pure acid by mass, are not subject to the requirements of this Code.

598 The following are not subject to the requirements of this Code:

(a) New storage batteries when:

- they are secured in such a way that they cannot slip, fall or be damaged;
- they are provided with carrying devices, unless they are suitably stacked, e.g. on pallets;
- there are no dangerous traces of alkalis or acids on the outside;
- they are protected against short circuits;

(b) Used storage batteries when:

- their cases are undamaged;
- they are secured in such a way that they cannot leak, slip, fall or be damaged, e.g. by stacking on pallets;
- there are no dangerous traces of alkalis or acids on the outside of the articles;
- they are protected against short circuits.

"Used storage batteries" means storage batteries carried for recycling at the end of their normal service life.

599 *(Deleted)*

600 Vanadium pentoxide, fused and solidified, is not subject to the requirements of this Code.

601 Pharmaceutical products (medicines) ready for use, which are substances manufactured and packaged for retail sale or distribution for personal or household consumption are not subject to the requirements of this Code.

602 Phosphorus sulphides which are not free from yellow and white phosphorus are not to be accepted for carriage.

603 Anhydrous hydrogen cyanide not meeting the description for UN No. 1051 or UN No. 1614 is not to be accepted for carriage. Hydrogen cyanide (hydrocyanic acid) containing less than 3 % water is stable, if the pH-value is 2.5 ± 0.5 and the liquid is clear and colourless.

604-606 *(Deleted)*

607 Mixtures of potassium nitrate and sodium nitrite with an ammonium salt are not to be accepted for carriage.

608 *(Deleted)*

609 Tetranitromethane not free from combustible impurities is not to be accepted for carriage.

610 The carriage of this substance, when it contains more than 45 % hydrogen cyanide is prohibited.

611 Ammonium nitrate containing more than 0.2 % combustible substances (including any organic substance calculated as carbon) is not to be accepted for carriage unless it is a constituent of a substance or article of Class 1.

612 *(Reserved)*

613 Chloric acid solution containing more than 10 % chloric acid and mixtures of chloric acid with any liquid other than water is not to be accepted for carriage.

614 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) in concentrations considered highly toxic according to the criteria in 2.2.61.1 is not to be accepted for carriage.

615 *(Reserved)*

616 Substances containing more than 40 % liquid nitric esters shall satisfy the exudation test specified in 2.3.1.

617 In addition to the type of explosive, the commercial name of the particular explosive shall be marked on the package.

618 In receptacles containing 1,2-butadiene, the oxygen concentration in the gaseous phase shall not exceed 50 ml/m³.

619-622 *(Reserved)*

623 UN No. 1829 sulphur trioxide shall be inhibited. Sulphur trioxide, 99.95 % pure or above, may be carried without inhibitor in tanks provided that its temperature is maintained at or above 32.5 °C. For the carriage of this substance without inhibitor in tanks at a minimum temperature of 32.5 °C, the specification "**Transport under minimum temperature of the product of 32.5 °C**" shall appear in the transport document.

625 Packages containing these articles shall be clearly marked as follows: "**UN 1950 AEROSOLS**".

626-627 *(Reserved)*

632 Considered to be spontaneously flammable (pyrophoric).

633 Packages and small containers containing this substance shall bear the following mark: "**Keep away from any source of ignition**".

634 *(Deleted)*

635 Packages containing these articles need not bear a label conforming to model No. 9 unless the article is fully enclosed by packaging, crates or other means that prevent the ready identification of the article.

636 Up to the intermediate processing facility, lithium cells and batteries with a gross mass of not more than 500 g each, lithium ion cells with a Watt-hour rating of not more than 20 Wh, lithium ion batteries with a Watt-hour rating of not more than 100 Wh, lithium metal cells with a lithium content of not more than 1 g and lithium metal batteries with an aggregate lithium content of not more than 2 g, not contained in equipment, collected and handed over for carriage for sorting, disposal or recycling, together with or without other non-lithium cells or batteries, are not subject to the other provisions of this Code including special provision 376 and 2.2.9.1.7, if the following conditions are met:

(a) The cells and batteries are packed according to packing instruction P909 of 4.1.4.1 except for the additional requirements 1 and 2;

(b) A quality assurance system is in place to ensure that the total amount of lithium cells and batteries per transport unit, wagon or large receptacle does not exceed 333 kg;

NOTE: *The total quantity of lithium cells and batteries in the mix may be assessed by means of a statistical method included in the quality assurance system. A copy of the quality assurance records shall be made available to the competent authority upon request.*

(c) Packages are marked "LITHIUM BATTERIES FOR DISPOSAL" or "LITHIUM BATTERIES FOR RECYCLING" as appropriate.

637 Genetically modified microorganisms and genetically modified organisms are those which are not dangerous for humans and animals, but which could alter animals, plants, microbiological substances and ecosystems in such a way as cannot occur naturally. Genetically modified microorganisms and genetically modified organisms are not subject to the requirements of this Code when authorized for use by the competent authorities of the countries of origin, transit and destination[3].

Live vertebrate or invertebrate animals shall not be used to carry these substances classified under this UN number unless the substance can be carried in no other way.

For the carriage of easily perishable substances under this UN number appropriate information shall be given, e.g.: "**Cool at +2/+4 °C**" or "**Carry in frozen state**" or "**Do not freeze**".

638 Substances related to self-reactive substances (see 2.2.41.1.19).

639 See 2.2.2.3, classification code 2F, UN No. 1965, Note 2.

640A The physical and technical characteristics mentioned in column (2) of Table A of Chapter 3.2 determine different tank codes for the carriage of substances of the same packing group in this Code tanks.

In order to identify these physical and technical characteristics of the product carried in the tank, the following shall be added, to the particulars required in the transport document, only in case of carriage in ADR tanks:

"Special provision 640X" where "X" is the applicable capital letter appearing after the reference to special provision 640 in column (6) of Table A of Chapter 3.2.

These particulars may, however, be dispensed with in the case of carriage in the type of tank which, for substances of a specific packing group of a specific UN number, meets at least the most stringent requirements.

NOTE: This special provision does not apply to tanks designed in accordance with AS 2809.

642 Except as authorized under 1.1.4.2, this entry of the UN Model Regulations shall not be used for the carriage of fertilizer ammoniating solutions with free ammonia. Otherwise, for carriage of ammonia solution, see UN Nos. 2073, 2672 and 3318.

643 Stone or aggregate asphalt mixture is not subject to the requirements for Class 9.

644 This substance is admitted for carriage provided that:

- The pH is between 5 and 7 measured in an aqueous solution of 10 % of the substance carried;
- The solution does not contain more than 93 % ammonium nitrate;
- The solution does not contain more than 0.2 % combustible material or chlorine compounds in quantities such that the chlorine level exceeds 0.02 %.

645 The classification code as mentioned in Column (3b) of Table A of Chapter 3.2 shall be used only with the approval of the competent authority prior to carriage. The approval shall be given in writing as a classification approval certificate (see 5.4.1.2.1 (g)) and shall be provided with a unique reference. When assignment to a division is made in accordance with the procedure in 2.2.1.1.7.2, the competent authority may require the default classification to be verified on the

[3] *See in particular Part C of Directive 2001/18/EC of the European Parliament and of the Council on the deliberate release into the environment of genetically modified organisms and repealing Council Directive 90/220/EEC (Official Journal of the European Communities, No. L 106, of 17 April 2001, pp. 8-14), which sets out the authorization procedures for the European Community*.

basis of test data derived from Test Series 6 of the Manual of Tests and Criteria, Part I, Section 16.

646 Carbon made by steam activation process is not subject to the requirements of this Code.

647 *(Deleted)*

648 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 this Code.

649 *(Deleted)*

650A Waste consisting of packaging residues, solidified residues and liquid residues of paint may be carried under the conditions of packing group II. In addition to the provisions of UN No. 1263 packing group II, the waste may also be packed and carried as follows:

(a) The waste may be packed in a device capable of meeting the requirements in 6.15.4 for a Type II segregation device, fitted with a lid that shall be latched during transport;

(b) Paint tins shall be contained within a liquid tight plastic liner that is closed/sealed during transit.

(c) Paint tins shall be placed upright and tightly packed to minimise movement, e.g. by completely filling the pallet box or through the use of a tightly closed plastics bag.

(d) Carriage in a covered bulk container. The bulk container shall be leakproof or rendered leakproof, for example by means of a suitable and sufficiently stout inner lining;

(e) If the waste is carried under the conditions of this special provision, the goods shall be declared in accordance with 5.4.1.1.3.1 in the transport document, as follows:
"UN 1263 WASTE PAINT, 3, II", or
"UN 1263 WASTE PAINT, 3, PG II".

651 (Reserved)

~~Special provision V2 (1) does not apply if the net explosive mass per transport unit does not exceed 4 000 kg, provided that the net explosive mass per vehicle does not exceed 3 000 kg.~~

652 Austenitic stainless steel, ferritic and austenitic steel (Duplex steel) and welded titanium receptacles which do not meet the requirements of Chapter 6.2 but have been constructed and approved in accordance with national aviation provisions for use as hot air balloon or hot air airship fuel receptacles, brought into service (date of initial inspection) before 1 July 2004, may be carried by road provided they meet the following conditions:

(a) The general provisions of 6.2.1 shall be complied with;

(b) The design and construction of the receptacles shall have been approved for aviation use by a national air transport authority;

(c) As an exemption from 6.2.3.1.2, the calculation pressure shall be derived from a reduced maximum ambient temperature of +40 °C; in this case:

(i) as an exemption from 6.2.5.1, cylinders may be manufactured from rolled and annealed commercially pure titanium with the minimum requirements of $R_m > 450$ MPa, $\varepsilon_A > 20$ % (ε_A = elongation after fracture);

(ii) austenitic stainless steel and ferritic and austenitic steel (Duplex steel) cylinders may be used with a stress level up to 85 % of the minimum guaranteed yield strength (Re) at a calculation pressure derived from a reduced maximum ambient temperature of +40 °C;

(iii) the receptacles shall be equipped with a pressure relief device having a nominal set pressure of 26 bar; the test pressure of these receptacles shall be not less than 30 bar;

(d) When the exemptions from (c) are not applied, the receptacles shall be designed for a reference temperature of 65 °C and shall be equipped with pressure relief devices with a nominal set pressure specified by the competent authority of the country of use;

(e) The main body of the receptacles shall be covered by an outer, water-resistant protective layer at least 25 mm thick made from structural cellular foam or similar material;

(f) During carriage, the receptacle shall be firmly secured in a crate or an additional safety device;

(g) The receptacles shall be marked with a clear, visible label stating that the receptacles are for use only in hot air balloons and hot air airships;

(h) The duration of service (from the date of initial inspection) shall not exceed 25 years.

653 The carriage of this gas in cylinders having a test pressure capacity product of maximum 15.2 MPa.litre (152 bar.litre) is not subject to the other provisions of this Code if the following conditions are met:

- The provisions for construction, testing and filling of cylinders are observed;
- The cylinders are contained in outer packagings which at least meet the requirements of Part 4 for combination packagings. The general provisions of packing of 4.1.1.1, 4.1.1.2 and 4.1.1.5 to 4.1.1.7 shall be observed;
- The cylinders are not packed together with other dangerous goods;
- The total gross mass of a package does not exceed 30 kg; and
- Each package is clearly and durably marked with "UN 1006" for argon compressed, "UN 1013" for carbon dioxide, "UN 1046" for helium compressed or "UN 1066" for nitrogen compressed. This mark is displayed within a diamond-shaped area surrounded by a line that measures at least 100 mm by 100 mm.

654 Waste lighters collected separately and consigned in accordance with 5.4.1.1.3.1 may be carried under this entry for the purposes of disposal. They need not be protected against inadvertent discharge provided that measures are taken to prevent the dangerous build-up of pressure and dangerous atmospheres.

Waste lighters, other than those leaking or severely deformed, shall be packed in accordance with packing instruction P003. In addition the following provisions shall apply:

- Only rigid packagings of a maximum capacity of 60 litres shall be used;
- The packagings shall be filled with water or any other appropriate protection material to avoid any ignition;
- Under normal conditions of carriage all ignition devices of the lighters shall fully be covered by the protection material;
- The packagings shall be adequately vented to prevent the creation of flammable atmosphere and the build-up of pressure;
- The packages shall only be carried in ventilated or open vehicles, wagons or containers.

Leaking or severely deformed lighters shall be carried in salvage packagings, provided appropriate measures are taken to ensure there is no dangerous build-up of pressure.

NOTE: *Special provision 201 and special packing provisions PP84 of packing instruction P002 in 4.1.4.1 do not apply to waste lighters.*

655 *(Deleted)*

656 *(Deleted)*

657 This entry shall be used for the technically pure substance only; for mixtures of LPG components, see UN No. 1965 or see UN No. 1075 in conjunction with NOTE 2 in 2.2.2.3.

658 UN No. 1057 LIGHTERS complying with standard EN ISO 9994:2019 "Lighters – Safety Specification" and UN No. 1057 LIGHTER REFILLS, may be carried subject only to the provisions of 3.4.1 (a) to (h), 3.4.2 (except for the total gross mass of 30 kg), 3.4.3 (except for the total gross mass of 20 kg), 3.4.11 and 3.4.12, provided the following conditions are met:

(a) The total gross mass of each package is not more than 10 kg;

(b) Not more than 100 kg gross mass of such packages is carried in a vehicle, wagon or large container; and

(c) Each outer packaging is clearly and durably marked with "UN 1057 LIGHTERS" or "UN 1057 LIGHTER REFILLS", as appropriate.

659 Substances to which PP86 or TP7 are assigned in Column (9a) and Column (11) of Table A in Chapter 3.2 and therefore require air to be eliminated from the vapour space, shall not be used for carriage under this UN number but shall be carried under their respective UN numbers as listed in Table A of Chapter 3.2.

NOTE: *See also 2.2.2.1.7.*

660 and 661 *(Deleted)*

662 Cylinders not conforming to the provisions of Chapter 6.2 which are used exclusively on board a ship or aircraft, may be carried for the purpose of filling or inspection and subsequent return, provided the cylinders are designed and constructed in accordance with a standard recognized by the competent authority of the country of approval and all the other relevant requirements of this Code are met including:

(a) The cylinders shall be carried with valve protection in conformity with 4.1.6.8;

(b) The cylinders shall be marked and labelled in conformity with 5.2.1 and 5.2.2; and

(c) All the relevant filling requirements of packing instruction P200 of 4.1.4.1 shall be complied with.

The transport document shall include the following statement: "Carriage in accordance with special provision 662".

663 This entry may only be used for packagings, large packagings or IBCs, or parts thereof, which have contained dangerous goods which are carried for disposal, recycling or recovery of their material, other than reconditioning, repair, routine maintenance, remanufacturing or reuse, and which have been emptied to the extent that only residues of dangerous goods adhering to the packaging parts are present when they are handed over for carriage.

Scope:

Residues present in the packagings, discarded, empty, uncleaned shall only be of dangerous goods of classes 3, 4.1, 5.1, 6.1, 8 or 9. In addition, they shall not be:

- Substances assigned to packing group I or that have "0" assigned in Column (7a) of Table A of Chapter 3.2; nor
- Substances classified as desensitized explosive substances of Class 3 or Class 4.1; nor
- Substances classified as self-reactive substances of Class 4.1; nor
- Radioactive material; nor
- Asbestos (UN 2212 and UN 2590), polychlorinated biphenyls (UN 2315 and UN 3432) and polyhalogenated biphenyls, halogenated monomethyldiphenylmethanes or polyhalogenated terphenyls (UN 3151 and UN 3152).

General provisions:

Packagings, discarded, empty, uncleaned with residues presenting a primary or subsidiary hazard of Class 5.1 shall not be loaded in bulk together with packagings, discarded, empty, uncleaned with residues presenting a hazard of other classes. Packagings, discarded, empty, uncleaned with residues presenting a primary or subsidiary hazard of Class 5.1 shall not be packed with other packagings, discarded, empty, uncleaned with residues presenting hazards of other classes in the same outer packaging.

Documented sorting procedures shall be implemented on the loading site to ensure compliance with the provisions applicable to this entry.

NOTE: *All the other provisions of this Code apply.*

664 When substances under this entry are carried in fixed tanks (tank-vehicles) or demountable tanks, these tanks may be equipped with additive devices.

Additive devices:

- are part of the service equipment for dispensing additives of UN 1202, UN 1993 packing group III, UN 3082 or non-dangerous substances during discharge of the tank;
- consist of elements such as connecting pipes and hoses, closing devices, pumps and dosing devices which are permanently connected to the discharge device of the tank's service equipment;
- include means of containment which are an integral part of the shell, or permanently fixed to the exterior of the tank or tank-vehicle.

Alternatively, additive devices may have connectors for connecting packagings. In this latter case, the packaging itself is not considered part of the additive device.

The following requirements shall apply depending on the configuration:

(a) Construction of the means of containment:

(i) As an integral part of the shell (e.g. a tank compartment), they shall meet the relevant provisions of Chapter 6.8.

(ii) When permanently fixed to the exterior of the tank or to the tank-vehicle, they are not subject to the construction provisions of this Code provided they comply with the following provisions:

They shall be made of a metallic material and comply with the following minimum wall thickness requirements:

Material	*Minimum wall thickness*[a]
Austenitic stainless steels	2.5 mm
Other steels	3 mm
Aluminium alloys	4 mm
Pure aluminium of 99.80 %	6 mm

[a] *For means of containment made with double walls, the aggregate thickness of the outer metal wall and the inner metal wall shall correspond to the wall thickness prescribed.*

Welding shall be carried out in accordance with the first paragraph of 6.8.2.1.23, except that other suitable methods may be applied to confirm the quality of the welding.

(iii) Packagings which are connectable to the additive device shall be metal packagings and meet the relevant construction requirements of Chapter 6.1, as applicable for the additive concerned.

(b) Tank approval

For tanks equipped or intended to be equipped with additive devices, where the additive device is not included in the original type approval of the tank, the provisions of 6.8.2.3.4 shall apply.

(c) Use of means of containment and additive devices

(i) In case of (a) (i) above, no additional requirements.

(ii) In case of (a) (ii) above, the total capacity of the means of containment shall not exceed 400 litres per vehicle.

(iii) In case of (a) (iii) above, 7.5.7.5 and 8.3.3 shall not apply. The packagings may only be connected to the additive device during discharge of the tank. During carriage, the closures and connectors shall be closed so as to be leaktight.

(d) Testing for additive devices

The provisions of 6.8.2.4 shall apply to the additive device. However, in case of (a) (ii) above, at the time of the initial, intermediate or periodic inspection of the tank, the means of containment of the additive device shall only be subject to an external visual inspection and a leakproofness test. The leakproofness test shall be carried out at a test pressure of at least 0.2 bar.

NOTE: *For the packagings described in (a) (iii) above, the relevant provisions of this Code shall apply.*

(e) Transport document

Only the information required in accordance with 5.4.1.1.1 (a) to (d) needs to be added to the transport document for the additive concerned. In this case, the remark "additive device" shall be added to the transport document.

(f) Training of drivers

Drivers who have been trained in accordance with 8.2.1 for carriage of this substance in tanks need no additional training for the carriage of the additives.se

(g) Placarding or marking

Placarding or marking of the fixed tank (tank-vehicle) or demountable tank for the carriage of substances under this entry in accordance with Chapter 5.3 is not affected by the presence of an additive device or the additives contained therein.

665 When carried in bulk, hard coal, coke and anthracite, meeting the classification criteria of Class 4.2, packing group III may also be carried in open wagons, vehicles or containers, provided that

(a) The coal is conveyed from fresh extraction directly into the wagon, vehicle or container (without measuring the temperature) or

(b) The temperature of the cargo is not higher than 60°C during or immediately after loading into the wagon, vehicle or container. Using suitable measuring methods, the filler shall ensure and document that the maximum permissible temperature of the cargo is not exceeded during or immediate after loading the wagons, vehicles or containers.

The consignor shall ensure that the following statement is included in the document accompanying the consignment (such as a bill of lading, manifest or consignment note):

“CARRIAGE IN ACCORDANCE WITH SPECIAL PROVISION 665’.

The other provisions of this Code do not apply.

666 Vehicles and battery powered equipment, referred to by special provision 388, when carried as a load, as well as any dangerous goods they contain that are necessary for their operation or the

operation of their equipment, are not subject to any other provisions of this Code, provided the following conditions are met:

(a) For liquid fuels, any valves between the engine or equipment and the fuel tank shall be closed during carriage unless it is essential for the equipment to remain operational. Where appropriate, the vehicles shall be loaded upright and secured against falling;

(b) For gaseous fuels, the valve between the gas tank and engine shall be closed and the electric contact open unless it is essential for the equipment to remain operational;

(c) Metal hydride storage systems shall be approved by the competent authority;

(d) The provisions of (a) and (b) do not apply to vehicles which are empty of liquid or gaseous fuels,

NOTE 1: *A vehicle is considered to be empty of liquid fuel when the liquid fuel tank has been drained and the vehicle cannot be operated due to a lack of fuel. Vehicle components such as fuel lines, fuel filters and injectors do not need to be cleaned, drained or purged to be considered empty of liquid fuels. In addition, the liquid fuel tank does not need to be cleaned or purged.*

NOTE 2: *A vehicle is considered to be empty of gaseous fuels when the gaseous fuel tanks are empty of liquid (for liquefied gases), the pressure in the tanks does not exceed 2 bar and the fuel shut-off or isolation valve is closed and secured.*

667 (a) The provisions of 2.2.9.1.7 (a) do not apply when pre-production prototype lithium cells or batteries or lithium cells or batteries of a small production run, consisting of not more than 100 cells or batteries, are installed in the vehicle, engine or machinery;

(b) The provisions of 2.2.9.1.7 do not apply to lithium cells or batteries in damaged or defective vehicles, engine or machinery. In such cases the following conditions shall be met:

(i) If the damage or defect has no significant impact on the safety of the cell or battery, damaged and defective vehicles, engines or machinery, may be carried under the conditions defined in special provisions 363 or 666, as appropriate;

(ii) If the damage or defect has a significant impact on the safety of the cell or battery, the lithium cell or battery shall be removed and carried according to special provision 376;

However, if it is not possible to safely remove the cell or battery or it is not possible to verify the status of the cell or battery, the vehicle, engine or machinery may be towed or carried as specified in (i).

(c) The procedures described in (b) also apply to damaged lithium cells or batteries in vehicles, engines or machinery.

668 Elevated temperature substances for the purpose of applying road markings are not subject to the requirements of this Code, provided that the following conditions are met:

(a) They do not fulfil the criteria of any class other than Class 9;

(b) The temperature of the outer surface of the boiler does not exceed 70 °C;

(c) The boiler is closed in such a way that any loss of product is prevented during carriage;

(d) The maximum capacity of the boiler is limited to 3 000 *l*.

669 A trailer fitted with equipment, powered by a liquid or gaseous fuel or an electric energy storage and production system, that is intended for use during carriage operated by this trailer as a part of a transport unit, shall be assigned to UN numbers 3166 or 3171 and be subject to the same conditions as specified for these UN numbers, when carried as a load on a vehicle or wagon, provided that the total capacity of the tanks containing liquid fuel does not exceed 500 litres.

670 (a) Lithium cells and batteries installed in equipment from private households collected and handed over for carriage for depollution, dismantling, recycling or disposal are not subject to the other provisions of this Code including special provision 376 and 2.2.9.1.7 when:

(i) They are not the main power source for the operation of the equipment in which they are contained;

(ii) The equipment in which they are contained does not contain any other lithium cell or battery used as the main power source; and

(iii) They are afforded protection by the equipment in which they are contained.

Examples for cells and batteries covered by this paragraph are button cells used for data integrity in household appliances (e.g. refrigerators, washing machines, dishwashers) or in other electrical or electronic equipment;

(b) Up to the intermediate processing facility lithium cells and batteries contained in equipment from private households not meeting the requirements of (a) collected and handed over for carriage for depollution, dismantling, recycling or disposal are not subject to the other provisions of this Code including special provision 376 and 2.2.9.1.7, if the following conditions are met:

(i) The equipment is packed in accordance with packing instruction P909 of 4.1.4.1 except for the additional requirements 1 and 2; or it is packed in strong outer packagings, e.g. specially designed collection receptacles, which meet the following requirements:

- The packagings shall be constructed of suitable material and be of adequate strength and design in relation to the packaging capacity and its intended use. The packagings need not meet the requirements of 4.1.1.3;

- Appropriate measures shall be taken to minimize the damage of the equipment when filling and handling the packaging, e.g. use of rubber mats; and

- The packagings shall be constructed and closed so as to prevent any loss of contents during carriage, e.g. by lids, strong inner liners, covers for transport. Openings designed for filling are acceptable if they are constructed so as to prevent loss of content;

(ii) A quality assurance system is in place to ensure that the total amount of lithium cells and batteries per transport unit does not exceed 333 kg;

NOTE: *The total quantity of lithium cells and batteries in the equipment from private households may be assessed by means of a statistical method included in the quality assurance system. A copy of the quality assurance records shall be made available to the competent authority upon request.*

(iii) Packages are marked "LITHIUM BATTERIES FOR DISPOSAL" or "LITHIUM BATTERIES FOR RECYCLING" as appropriate. If equipment containing lithium cells or batteries is carried unpackaged or on pallets in accordance with packing instruction P909 (3) of 4.1.4.1, this mark may alternatively be affixed to the external surface of the vehicles, wagons or containers).

NOTE: *"Equipment from private households" means equipment which comes from private households and equipment which comes from commercial, industrial, institutional and other sources which, because of its nature and quantity, is similar to that from private households. Equipment likely to be used by both private households and users other than private households shall in any event be considered to be equipment from private households.*

671 *(Reserved)*

672 Articles, such as machinery, apparatus or devices carried under this entry and in conformity with special provision 301 are not subject to any other provision of this Code provided they are either:

- packed in a strong outer packaging constructed of suitable material, and of adequate strength and design in relation to the packaging's capacity and its intended use, and meeting the applicable requirements of 4.1.1.1; or

- carried without outer packaging if the article is constructed and designed so that the receptacles containing the dangerous goods are afforded adequate protection.

673 *(Reserved)*

674 This special provision applies to periodic inspection and test of over-moulded cylinders as defined in 1.2.1.

Over-moulded cylinders subject to 6.2.3.5.3.1 shall be subject to periodic inspection and test in accordance with 6.2.1.6.1, adapted by the following alternative method:

- Substitute test required in 6.2.1.6.1 d) by alternative destructive tests;

- Perform specific additional destructive tests related to the characteristics of over-moulded cylinders.

The procedures and requirements of this alternative method are described below.

Alternative method:

(a) General

The following provisions apply to over-moulded cylinders produced serially and based on welded steel cylinder shells in accordance with EN 1442:2017, EN 14140:2014 + AC:2015 or annex I, parts 1 to 3 to Council Directive 84/527/EEC. The design of the over-moulding shall prevent water from penetrating on to the inner steel cylinder shell. The conversion of the steel cylinder shell to an over-moulded cylinder shall comply with the relevant requirements of EN 1442:2017 and EN 14140:2014 + AC:2015.

Over-moulded cylinders shall be equipped with self-closing valves.

(b) Basic population

A basic population of over-moulded cylinders is defined as the production of cylinders from only one over-moulding manufacturer using new inner steel cylinder shells manufactured by only one manufacturer within one calendar year, based on the same design type, the same materials and production processes.

(c) Sub-groups of a basic population

Within the above defined basic population, over-moulded cylinders belonging to different owners shall be separated into specific sub-groups, one per owner.

If the whole basic population is owned by one owner, the sub-group equals the basic population.

(d) Traceability

Inner steel cylinder shell marks in accordance with 6.2.3.9 shall be repeated on the over-moulding. In addition, each over-moulded cylinder shall be fitted with an individual resilient electronic identification device. The detailed characteristics of the over-moulded cylinders shall be recorded by the owner in a central database. The database shall be used to:

- Identify the specific sub-group;

- Make available to inspection bodies, filling centres and competent authorities the specific technical characteristics of the cylinders consisting of at least the following: serial number, steel cylinder shell production batch, over-moulding production batch, date of over-moulding;

- Identify the cylinder by linking the electronic device to the database with the serial

number;

- Check individual cylinder history and determine measures (e.g. filling, sampling, retesting, withdrawal);

- Record performed measures including the date and the address of where it was done.

The recorded data shall be kept available by the owner of the over-moulded cylinders for the entire life of the sub-group.

(e) Sampling for statistical assessment

The sampling shall be random among a sub-group as defined in sub-paragraph (c). The size of each sample per sub-group shall be in accordance with the table in sub-paragraph (g).

(f) Test procedure for destructive testing

The inspection and test required by 6.2.1.6.1 shall be carried out except (d) which shall be substituted by the following test procedure:

- Burst test (according to EN 1442:2017 or EN 14140:2014 + AC:2015).

In addition, the following tests shall be performed:

- Adhesion test (according to EN 1442:2017 or EN 14140:2014 + AC:2015);

- Peeling and Corrosion tests (according to EN ISO 4628-3:2016).

Adhesion test, peeling and corrosion tests, and burst test shall be performed on each related sample according to the table in sub-paragraph (g) and shall be conducted after the first 3 years in service and every 5 years thereafter.

(g) Statistical evaluation of test results – Method and minimum requirements

The procedure for statistical evaluation according to the related rejection criteria is described in the following.

Test interval (years)	**Type of test**	**Standard**	**Rejection criteria**	**Sampling out of a sub-group**
After 3 years in service (see (f))	Burst test	EN 1442:2017	Burst pressure point of the representative sample must be above the lower limit of tolerance interval on the Sample Performance Chart $\Omega_m \geq 1 + \Omega_s \times k3(n;p;1-\alpha)$ [a] No individual test result shall be less than the test pressure	$3\sqrt[3]{Q}$ or Q/200 whichever is lower, and with a minimum of 20 per sub-group (Q)
	Peeling and corrosion	EN ISO 4628-3:2016	Max corrosion grade: Ri2	Q/1 000
	Adhesion of Polyurethane	ISO 2859-1:1999 + A1:2011 EN 1442:2017 EN 14140:2014 + AC:2015	Adhesion value > 0.5 N/mm²	See ISO 2859-1:1999 + A1:2011 applied to Q/1000
Every 5 years thereafter (see (f))	Burst test	EN 1442:2017	Burst pressure point of the representative sample must be above the lower limit of tolerance interval on the Sample Performance Chart $\Omega_m \geq 1 + \Omega_s \times k3(n;p;1-\alpha)$ [a] No individual test result shall be less than the test pressure	$6\sqrt[3]{Q}$ or Q/100 whichever is lower, and with a minimum of 40 per sub-group (Q)

	Peeling and corrosion	EN ISO 4628-3:2016	Max corrosion grade: Ri2	Q/1 000
	Adhesion of Polyurethane	ISO 2859-1:1999 + A1:2011 EN 1442:2017 EN 14140:2014 + AC:2015	Adhesion value > 0.5 N/mm²	See ISO 2859-1:1999 + A1:2011 applied to Q/1000

[a] *Burst pressure point (BPP) of the representative sample is used for the evaluation of test results by using a Sample Performance Chart:*

Step 1: Determination of the burst pressure point (BPP) of a representative sample

Each sample is represented by a point whose coordinates are the mean value of burst test results and the standard deviation of burst test results, each normalised to the relevant test pressure.

$$BPP: (\Omega_s = \frac{s}{PH} ; \Omega_m = \frac{x}{PH})$$

with

x: sample mean value;

s: sample standard deviation;

PH: test pressure

Step 2: Plotting on a Sample Performance Chart

Each BPP is plotted on a Sample Performance Chart with following axis:

- *Abscissa : Standard Deviation normalised to test pressure (Ω_s)*
- *Ordinate : Mean value normalised to test pressure (Ω_m)*

Step 3: Determination of the relevant lower limit of tolerance interval in the Sample Performance Chart

Results for burst pressure shall first be checked according to the Joint Test (multidirectional test) using a significance level of α=0.05 (see paragraph 7 of ISO 5479:1997) to determine whether the distribution of results for each sample is normal or non-normal.

- *For a normal distribution, the determination of the relevant lower limit of tolerance is given in step 3.1.*
- *For a non-normal distribution, the determination of the relevant lower limit of tolerance is given in step 3.2.*

Step 3.1: Lower limit of tolerance interval for results following a normal distribution

In accordance with the standard ISO 16269-6:2014, and considering that the variance is unknown, the unilateral statistical tolerance interval shall be considered for a confidence level of 95 % and a fraction of population equal to 99.9999 %.

By application in the Sample Performance Chart, the lower limit of tolerance interval is represented by a line of constant survival rate defined by the formula:

$\Omega_m = 1 + \Omega_s \times k3(n;p;1-\alpha)$

with

k3: factor function of n, p and 1-α;

p: proportion of the population selected for the tolerance interval (99.9999 %);

1- α: confidence level (95 %);

n: sample size.

The value for k3 dedicated to Normal Distributions shall be taken from the table at end of Step 3.

Step 3.2: Lower limit of tolerance interval for results following a non-normal distribution

The unilateral statistical tolerance interval shall be calculated for a confidence level of 95 % and a fraction of population equal to 99.9999 %.

The lower limit of tolerance is represented by a line of constant survival rate defined by the formula given in previous step 3.1, with factors k3 based and calculated on the properties of a Weibull Distribution.

The value for k3 dedicated to Weibull Distributions shall be taken from the table below at end of Step 3.

Table for k3 *p=99.9999 % and (1- α)=0.95*		
Sample size n	***Normal distribution k3***	***Weibull distribution k3***
20	*6.901*	*16.021*
22	*6.765*	*15.722*
24	*6.651*	*15.472*
26	*6.553*	*15.258*
28	*6.468*	*15.072*
30	*6.393*	*14.909*
35	*6.241*	*14.578*
40	*6.123*	*14.321*
45	*6.028*	*14.116*
50	*5.949*	*13.947*
60	*5.827*	*13.683*
70	*5.735*	*13.485*
80	*5.662*	*13.329*
90	*5.603*	*13.203*
100	*5.554*	*13.098*
150	*5.393*	*12.754*
200	*5.300*	*12.557*
250	*5.238*	*12.426*
300	*5,193*	*12.330*
400	*5.131*	*12.199*
500	*5.089*	*12.111*
1000	*4.988*	*11.897*
∞	*4.753*	*11.408*

NOTE: *If sample size is between two values, the closest lower sample size shall be selected.*

(h) Measures if the acceptance criteria are not met

If a result of the burst test, peeling and corrosion test or adhesion test does not comply with the criteria detailed in the table in paragraph (g), the affected sub-group of over-moulded cylinders shall be segregated by the owner for further investigations and not be filled or made available for transport and use.

In agreement with the competent authority or the Xa-body which issued the design

approval, additional tests shall be performed to determine the root cause of the failure.

If the root cause cannot be proved to be limited to the affected sub-group of the owner, the competent authority or the Xa-body shall take measures concerning the whole basic population and potentially other years of production.

If the root cause can be proved to be limited to a part of the affected sub-group, not affected parts may be authorized by the competent authority to return to service. It shall be proved that no individual over-moulded cylinder returning to service is affected.

(i) Filling centre requirements

The owner shall make available to the competent authority documentary evidence that the filling centres:

- Comply with the provisions of packing instruction P200 (7) of 4.1.4.1 and that the requirements of the standard on pre-fill inspections referenced in table P200 (11) of 4.1.4.1 are fulfilled and correctly applied;
- Have the appropriate means to identify over-moulded cylinders through the electronic identification device;
- Have access to the database as defined in (d);
- Have the capacity to update the database;
- Apply a quality system, according to the standard ISO 9000 (series) or equivalent, certified by an accredited independent body recognized by the competent authority.

675 For packages containing these dangerous goods, mixed loading with substances and articles of Class 1, with the exception of 1.4S, shall be prohibited.

676 For the carriage of packages containing polymerizing substances the provisions of special provision 386, in conjunction with 7.1.7.3, 7.1.7.4, 5.4.1.1.15 and 5.4.1.2.3.1, need not be applied, when carried for disposal or recycling provided the following conditions are met:

(a) Before loading an examination has shown that there is no significant deviation between the outside temperature of the package and the ambient temperature;

(b) The carriage is effected within a period of not more than 24 hours from that examination;

(c) The packages are protected from direct sunlight and from the impact of other sources of heat (e.g. additional loads that are being carried above ambient temperature) during carriage;

(d) The ambient temperatures during the carriage are below 45 °C;

(e) Vehicles and containers are adequately ventilated;

(f) The substances are packed in packages with a maximum capacity of 1000 litres.

In assessing the substances for carriage under the conditions of this special provision, additional measures to prevent dangerous polymerization may be considered, for example the addition of inhibitors.

CHAPTER 3.4

DANGEROUS GOODS PACKED IN LIMITED QUANTITIES

3.4.1 This Chapter provides the provisions applicable to the carriage of dangerous goods of certain classes packed in limited quantities. The applicable quantity limit for the inner packaging or article is specified for each substance in Column (7a) of Table A of Chapter 3.2. In addition, the quantity "0" has been indicated in this column for each entry not permitted to be carried in accordance with this Chapter.

Limited quantities of dangerous goods packed in such limited quantities, meeting the provisions of this Chapter are not subject to any other provisions of this Code except the relevant provisions of:

(a) Part 1, Chapters 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.8, 1.9;

(b) Part 2;

(c) Part 3, Chapters 3.1, 3.2, 3.3;

(d) Part 4, paragraphs 4.1.1.1, 4.1.1.2, 4.1.1.4 to 4.1.1.8;

(e) Part 5, 5.1.2.1(a) (i) and (b), 5.1.2.2, 5.1.2.3, 5.2.1.10, 5.4.2;

(f) Part 6, construction requirements of 6.1.4 and paragraphs 6.2.5.1 and 6.2.6.1 to 6.2.6.3;

(g) Part 7, Chapter 7.1 and 7.2.1, 7.2.2, 7.5.1, 7.5.2.4, 7.5.7, 7.5.8 and 7.5.9;

(h) Chapter 8.6.

3.4.2 Dangerous goods shall be packed only in inner packagings placed in suitable outer packagings. Intermediate packagings may be used. In addition, for articles of Division 1.4, Compatibility Group S, the provisions of section 4.1.5 shall be fully complied with. The use of inner packagings is not necessary for the carriage of articles such as aerosols or "receptacles, small, containing gas". The total gross mass of the package shall not exceed 30 kg.

3.4.3 Except for articles of Division 1.4, Compatibility Group S, shrink-wrapped or stretch-wrapped trays meeting the conditions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8 are acceptable as outer packagings for articles or inner packagings containing dangerous goods carried in accordance with this Chapter. Inner packagings that are liable to break or be easily punctured, such as those made of glass, porcelain, stoneware or certain plastics, shall be placed in suitable intermediate packagings meeting the provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8, and be so designed that they meet the construction requirements of 6.1.4. The total gross mass of the package shall not exceed 20 kg.

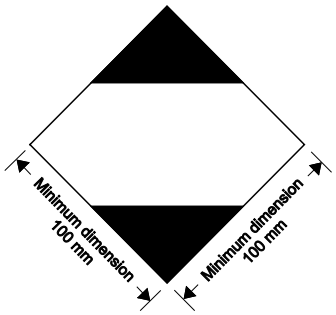
3.4.4 Liquid goods of Class 8, packing group II in glass, porcelain or stoneware inner packagings shall be enclosed in a compatible and rigid intermediate packaging.

3.4.5 and 3.4.6 *(Reserved)*

3.4.7 Marking of packages containing limited quantities

3.4.7.1 Except for air transport, packages containing dangerous goods in limited quantities shall bear the mark shown in Figure 3.4.7.1:

Figure 3.4.7.1



Mark for packages containing limited quantities

The mark shall be readily visible, legible and able to withstand open weather exposure without a substantial reduction in effectiveness.

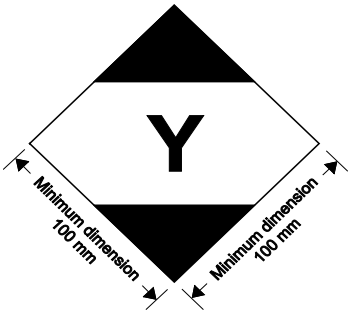
The mark shall be in the form of a square set at an angle of 45° (diamond-shaped). The top and bottom portions and the surrounding line shall be black. The centre area shall be white or a suitable contrasting background. The minimum dimensions shall be 100 mm × 100 mm and the minimum width of the line forming the diamond shall be 2 mm. Where dimensions are not specified, all features shall be in approximate proportion to those shown.

3.4.7.2 If the size of the package so requires, the minimum outer dimensions shown in Figure 3.4.7.1 may be reduced to be not less than 50 mm × 50 mm provided the mark remains clearly visible. The minimum width of the line forming the diamond may be reduced to a minimum of 1 mm.

3.4.8 Marking of packages containing limited quantities conforming to Part 3, Chapter 4 of the ICAO Technical Instructions

3.4.8.1 Packages containing dangerous goods packed in conformity with the provisions of Part 3, Chapter 4 of the ICAO Technical Instructions may bear the mark shown in Figure 3.4.8.1 to certify conformity with these provisions:

Figure 3.4.8.1



Mark for packages containing limited quantities conforming to Part 3, Chapter 4 of the ICAO Technical Instructions

The mark shall be readily visible, legible and able to withstand open weather exposure without a substantial reduction in effectiveness.

The mark shall be in the form of a square set at an angle of 45° (diamond-shaped). The top and bottom portions and the surrounding line shall be black. The centre area shall be white or a suitable contrasting background. The minimum dimensions shall be 100 mm × 100 mm and the minimum width of the line forming the diamond shall be 2 mm. The symbol "Y" shall be placed in the centre of the mark and shall be clearly visible. Where dimensions are not specified, all features shall be in approximate proportion to those shown.

3.4.8.2 If the size of the package so requires, the minimum outer dimensions shown in Figure 3.4.8.1 may be reduced to be not less than 50 mm × 50 mm provided the mark remains clearly visible. The minimum width of the line forming the diamond may be reduced to a minimum of 1 mm. The symbol "Y" shall remain in approximate proportion to that shown in Figure 3.4.8.1.

3.4.9 Packages containing dangerous goods bearing the mark shown in 3.4.8 with or without the additional labels and marks for air transport shall be deemed to meet the provisions of section 3.4.1 as appropriate and of sections 3.4.2 to 3.4.4 and need not bear the mark shown in 3.4.7.

3.4.10 Packages containing dangerous goods in limited quantities bearing the mark shown in 3.4.7 and conforming with the provisions of the ICAO Technical Instructions, including all necessary marks and labels specified in Parts 5 and 6, shall be deemed to meet the provisions of section 3.4.1 as appropriate and of sections 3.4.2 to 3.4.4.

3.4.11 Use of overpacks

For an overpack containing dangerous goods packed in limited quantities, the following applies:

Unless the marks representative of all dangerous goods in an overpack are visible, the overpack shall be marked with the marks required by this Chapter.

Except for air transport, the other provisions of 5.1.2.1 apply only if other dangerous goods which are not packed in limited quantities are contained in the overpack and only in relation to these other dangerous goods.

3.4.12 Information to be available during transport

3.4.12.1 Prior to consigning the goods for transport, the consignor of the dangerous goods packed in limited quantities shall inform the carrier, of the following details:

(a) the gross mass of each consignment of dangerous goods packed in limited quantities, and, if the goods consist of multiple consignments, the combined gross mass of all consignments; and

(b) if the goods to be consigned include an aggregate quantity of 2000 kg (or L) or greater of any one UN Number, for each of those UN numbers the following information:

(i) The UN number;

(ii) The proper shipping name; and

(iii) The total aggregate quantity.

3.4.12.2 The carrier must ensure that the information provided to them under 3.4.12.1 is readily ascertainable during transport of the dangerous goods.

NOTE: *Where the transport unit is fitted with an emergency information holder, and the information required under 3.4.12.1 is carried as a document, this information should be kept in the emergency information holder.*

3.4.13 Transport units carrying dangerous goods packed in limited quantities shall be placarded at the front and at the rear with the LQ mark (Label model No. 11).

Where the transport unit is carrying other dangerous goods requiring placarding, the transport unit may display the mixed class dangerous goods placard (Label model No. 10) only, or both the mixed class dangerous goods placard and the placards in accordance with 3.4.15.

3.4.14 The placards specified in 3.4.13 may be dispensed with, if:

(a) The total gross mass of the packages containing dangerous goods packed in limited quantities carried does not exceed 8 tonnes per transport unit, and the only dangerous goods on the transport unit is dangerous goods packed in limited quantities; or

(b) There is dangerous goods packed in limited quantities, and other packaged dangerous goods in the transport unit, and the calculation in 1.1.3.6.6 is less than “1 000”.

3.4.15 The placards specified in 3.4.13 shall be the same as the one required in 3.4.7, except that their minimum dimensions shall be 250 mm × 250 mm. These marks shall be removed or covered if no dangerous goods in limited quantities are carried.

3.4.16 Documentation

A dangerous goods transport document is not required for dangerous goods that meet the requirements of this Chapter.

Any transport document for the consignment (e.g. consignment note, bill of lading, etc.) must include the notation 'Contains Dangerous Goods Packed in Limited Quantities'

CHAPTER 3.5

DANGEROUS GOODS PACKED IN EXCEPTED QUANTITIES

3.5.1 Excepted quantities

3.5.1.1 Excepted quantities of dangerous goods of certain classes, other than articles, meeting the provisions of this Chapter are not subject to any other provisions of this Code except for:

(a) The training requirements in Chapter 1.3;

(b) The classification procedures and packing group criteria in Part 2;

(c) The packaging requirements of 4.1.1.1, 4.1.1.2, 4.1.1.4 and 4.1.1.6.

NOTE: *In the case of radioactive material, the requirements for radioactive material in excepted packages in 1.7.1.5 apply.*

3.5.1.2 Dangerous goods which may be carried as excepted quantities in accordance with the provisions of this Chapter are shown in column (7b) of Table A of Chapter 3.2 list by means of an alphanumeric code as follows:

Code	**Maximum net quantity per inner packaging** (in grams for solids and ml for liquids and gases)	**Maximum net quantity per outer packaging** (in grams for solids and ml for liquids and gases, or sum of grams and ml in the case of mixed packing)
E0	Not permitted as Excepted Quantity	
E1	30	1000
E2	30	500
E3	30	300
E4	1	500
E5	1	300

For gases, the volume indicated for inner packagings refers to the water capacity of the inner receptacle and the volume indicated for outer packagings refers to the combined water capacity of all inner packagings within a single outer packaging.

3.5.1.3 Where dangerous goods in excepted quantities for which different codes are assigned are packaged together the total quantity per outer packaging shall be limited to that corresponding to the most restrictive code.

3.5.1.4 Excepted quantities of dangerous goods assigned to codes E1, E2, E4 and E5 with a maximum net quantity of dangerous goods per inner packaging limited to 1 ml for liquids and gases and 1 g for solids and a maximum net quantity of dangerous goods per outer packaging which does not exceed 100 g for solids or 100 ml for liquids and gases are only subject to:

(a) The provisions of 3.5.2, except that an intermediate packaging is not required if the inner packagings are securely packed in an outer packaging with cushioning material in such a way that, under normal conditions of carriage, they cannot break, be punctured, or leak their contents; and for liquids, the outer packaging contains sufficient absorbent material to absorb the entire contents of the inner packagings; and

(b) The provisions of 3.5.3.

3.5.2 Packagings

Packagings used for the carriage of dangerous goods in excepted quantities shall be in compliance with the following:

(a) There shall be an inner packaging and each inner packaging shall be constructed of plastic (with a minimum thickness of 0.2 mm when used for liquids), or of glass, porcelain, stoneware, earthenware or metal (see also 4.1.1.2) and the closure of each inner packaging shall be held securely in place with wire, tape or other positive means; any receptacle having a neck with moulded screw threads shall have a leak proof threaded type cap. The closure shall be resistant to the contents;

(b) Each inner packaging shall be securely packed in an intermediate packaging with cushioning material in such a way that, under normal conditions of carriage, they cannot break, be punctured or leak their contents. For liquid dangerous goods, the intermediate or outer packaging shall contain sufficient absorbent material to absorb the entire contents of the inner packagings. When placed in the intermediate packaging, the absorbent material may be the cushioning material. Dangerous goods shall not react dangerously with cushioning, absorbent material and packaging material or reduce the integrity or function of the materials. Regardless of its orientation, the package shall completely contain the contents in case of breakage or leakage;

(c) The intermediate packaging shall be securely packed in a strong, rigid outer packaging (wooden, fibreboard or other equally strong material);

(d) Each package type shall be in compliance with the provisions in 3.5.3;

(e) Each package shall be of such a size that there is adequate space to apply all necessary marks; and

(f) Overpacks may be used and may also contain packages of dangerous goods or goods not subject to the requirements of this Code.

3.5.3 Tests for packages

3.5.3.1 The complete package as prepared for carriage, with inner packagings filled to not less than 95 % of their capacity for solids or 98 % for liquids, shall be capable of withstanding, as demonstrated by testing which is appropriately documented, without breakage or leakage of any inner packaging and without significant reduction in effectiveness:

(a) Drops onto a rigid, non-resilient flat and horizontal surface from a height of 1.8 m:

(i) Where the sample is in the shape of a box, it shall be dropped in each of the following orientations:

- flat on the base;
- flat on the top;
- flat on the longest side;
- flat on the shortest side;
- on a corner;

(ii) Where the sample is in the shape of a drum, it shall be dropped in each of the following orientations:

- diagonally on the top chime, with the centre of gravity directly above the point of impact;
- diagonally on the base chime;
- flat on the side;

NOTE: *Each of the above drops may be performed on different but identical packages.*

(b) A force applied to the top surface for a duration of 24 hours, equivalent to the total weight of identical packages if stacked to a height of 3 m (including the sample).

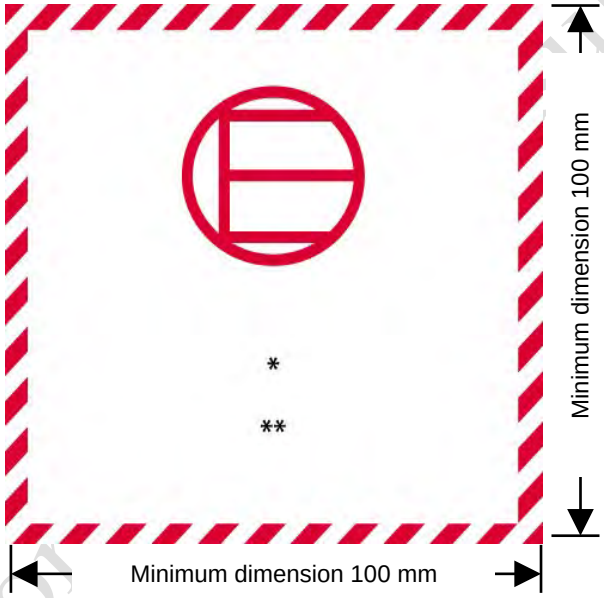
3.5.3.2 For the purposes of testing, the substances to be carried in the packaging may be replaced by other substances except where this would invalidate the results of the tests. For solids, when another substance is used, it must have the same physical characteristics (mass, grain size, etc.) as the substance to be carried. In the drop tests for liquids, when another substance is used, its relative density (specific gravity) and viscosity should be similar to those of the substance to be carried.

3.5.4 Marking of packages

3.5.4.1 Packages containing excepted quantities of dangerous goods prepared in accordance with this Chapter shall be durably and legibly marked with the mark shown in 3.5.4.2. The first or only label number indicated in column (5) of Table A of Chapter 3.2 for each of the dangerous goods contained in the package shall be shown in the mark. Where the name of the consignor or consignee is not shown elsewhere on the package this information shall be included within the mark.

3.5.4.2 ***Excepted quantities mark***

Figure 3.5.4.2



Excepted quantities mark

* The first or only label number indicated in column (5) of Table A of Chapter 3.2 shall be shown in this location.

** The name of the consignor or of the consignee shall be shown in this location if not shown elsewhere on the package.

The mark shall be in the form of a square. The hatching and symbol shall be of the same colour, black or red, on white or suitable contrasting background. The minimum dimensions shall be 100 mm × 100 mm. Where dimensions are not specified, all features shall be in approximate proportion to those shown.

3.5.4.3 ***Use of overpacks***

For an overpack containing dangerous goods packed in excepted quantities, the following applies:

Unless the marks representative of all dangerous goods in an overpack are visible, the overpack shall be:

(a) marked with the word “OVERPACK”. The lettering of the “OVERPACK” mark shall be at least 12 mm high. The mark shall be in English; and

(b) marked with the marks required by this Chapter.

The other provisions of 5.1.2.1 apply only if other dangerous goods which are not packed in excepted quantities are contained in the overpack and only in relation to these other dangerous goods.

3.5.5 **Maximum number of packages in any vehicle or container**

The number of packages in any vehicle or container shall not exceed 1 000.

3.5.6 **Documentation**

If a document or documents (such as a bill of lading, air waybill or CMR/CIM consignment note) accompanies(y) dangerous goods in excepted quantities, at least one of these documents shall include the statement "Dangerous Goods in Excepted Quantities" and indicate the number of packages.

PART 4

Packing and tank provisions

CHAPTER 4.1

USE OF PACKAGINGS, INCLUDING INTERMEDIATE BULK CONTAINERS (IBCs) AND LARGE PACKAGINGS

NOTE: *Packagings, including IBCs and large packagings, marked in accordance with Part 6 of this Code for packaging of its type, in confirmation that the packaging is ADR approved, ICAO approved, IMO approved, RID approved or UN approved may nevertheless be used for carriage under this Code.*

4.1.1 General provisions for the packing of dangerous goods in packagings, including IBCs and large packagings

NOTE: *For the packing of goods of Classes 2, 6.2 and 7, the general provisions of this section only apply as indicated in 4.1.8.2 (Class 6.2, UN Nos. 2814 and 2900), 4.1.9.1.5 (Class 7) and in the applicable packing instructions of 4.1.4 (P201, P207 and LP200 for Class 2 and P620, P621, P622, IBC620, LP621 and LP622 for Class 6.2).*

4.1.1.1 Dangerous goods shall be packed in good quality packagings, including IBCs and large packagings, which shall be strong enough to withstand the shocks and loadings normally encountered during carriage, including trans-shipment between cargo transport units and between cargo transport units and warehouses as well as any removal from a pallet or overpack for subsequent manual or mechanical handling. Packagings, including IBCs and large packagings, shall be constructed and closed so as to prevent any loss of contents when prepared for transport which might be caused under normal conditions of transport, by vibration, or by changes in temperature, humidity or pressure (resulting from altitude, for example). Packagings, including IBCs and large packagings, shall be closed in accordance with the information provided by the manufacturer. No dangerous residue shall adhere to the outside of packagings, IBCs and large packagings during carriage. These provisions apply, as appropriate, to new, reused, reconditioned or remanufactured packagings and to new, reused, repaired or remanufactured IBCs, and to new, reused or remanufactured large packagings.

4.1.1.2 Parts of packagings, including IBCs and large packagings, which are in direct contact with dangerous goods:

(a) shall not be affected or significantly weakened by those dangerous goods;

(b) shall not cause a dangerous effect e.g. catalysing a reaction or reacting with the dangerous goods; and

(c) shall not allow permeation of the dangerous goods that could constitute a danger under normal conditions of carriage.

Where necessary, they shall be provided with a suitable inner coating or treatment.

NOTE: *For chemical compatibility of plastics packagings, including IBCs, made from polyethylene see 4.1.1.21.*

4.1.1.3 ***Design type***

4.1.1.3.1 Unless otherwise provided elsewhere in this Code, each packaging, including IBCs and large packagings, except inner packagings, shall conform to a design type successfully tested in accordance with the requirements of 6.1.5, 6.3.5, 6.5.6 or 6.6.5, as applicable.

4.1.1.3.2 Packagings, including IBCs and large packagings, may conform to one or more than one successfully tested design type and may bear more than one mark.

4.1.1.4 When filling packagings, including IBCs and large packagings, with liquids, sufficient ullage (outage) shall be left to ensure that neither leakage nor permanent distortion of the packaging occurs as a result of an expansion of the liquid caused by temperatures likely to occur during transport. Unless specific requirements are prescribed, liquids shall not completely fill a packaging at a temperature of 55 °C. However, sufficient ullage shall be left in an IBC to ensure that at the mean bulk temperature of 50 °C it is not filled to more than 98 % of its water capacity. For a filling temperature of 15 °C, the maximum degree of filling shall be determined as follows, unless otherwise provided, either:

(a)

Boiling point (initial boiling point) of the substance in °C	< 60	≥ 60 < 100	≥ 100 < 200	≥ 200 < 300	≥ 300
Degree of filling as a percentage of the capacity of the packaging	90	92	94	96	98

or

(b) $$\text{degree of filling} = \frac{98}{1 + \alpha\,(50 - t_f)}\ \%\ \text{of the capacity of the packaging.}$$

In this formula α represents the mean coefficient of cubic expansion of the liquid substance between 15 °C and 50 °C; that is to say, for a maximum rise in temperature of 35 °C,

α is calculated according to the formula : $\alpha = \frac{d_{15} - d_{50}}{35 \times d_{50}}$

d_{15} and d_{50} being the relative densities[1] of the liquid at 15 °C and 50 °C and t_f the mean temperature of the liquid at the time of filling.

4.1.1.5 Inner packagings shall be packed in an outer packaging in such a way that, under normal conditions of carriage, they cannot break, be punctured or leak their contents into the outer packaging. Inner packagings containing liquids shall be packed with their closures upward and placed within outer packagings consistent with the orientation marks prescribed in 5.2.1.10. Inner packagings that are liable to break or be punctured easily, such as those made of glass, porcelain or stoneware or of certain plastics materials, etc., shall be secured in outer packagings with suitable cushioning material. Any leakage of the contents shall not substantially impair the protective properties of the cushioning material or of the outer packaging.

4.1.1.5.1 Where an outer packaging of a combination packaging or a large packaging has been successfully tested with different types of inner packagings, a variety of such different inner packagings may also be assembled in this outer packaging or large packaging. In addition, provided an equivalent level of performance is maintained, the following variations in inner packagings are allowed without further testing of the package:

(a) Inner packagings of equivalent or smaller size may be used provided:

(i) the inner packagings are of similar design to the tested inner packagings (e.g. shape - round, rectangular, etc.);

(ii) the material of construction of the inner packagings (glass, plastics, metal, etc.) offers resistance to impact and stacking forces equal to or greater than that of the originally tested inner packaging;

(iii) the inner packagings have the same or smaller openings and the closure is of similar design (e.g. screw cap, friction lid, etc.);

(iv) sufficient additional cushioning material is used to take up void spaces and to prevent significant movement of the inner packagings; and

(v) inner packagings are oriented within the outer packaging in the same manner as in the tested package.

(b) A lesser number of the tested inner packagings, or of the alternative types of inner packagings identified in (a) above, may be used provided sufficient cushioning is added to fill the void space(s) and to prevent significant movement of the inner packagings.

4.1.1.5.2 Use of supplementary packagings within an outer packaging (e.g. an intermediate packaging or a receptacle inside a required inner packaging) additional to what is required by the packing instructions is authorized provided all relevant requirements are met, including those of 4.1.1.3, and, if appropriate, suitable cushioning is used to prevent movement within the packaging.

[1] *Relative density (d) is considered to be synonymous with specific gravity (SG) and will be used throughout this Chapter.*

4.1.1.6 Dangerous goods shall not be packed together in the same outer packaging or in large packagings, with dangerous or other goods if they react dangerously with each other and cause:

(a) combustion or evolution of considerable heat;

(b) evolution of flammable, asphyxiant, oxidizing or toxic gases;

(c) the formation of corrosive substances; or

(d) the formation of unstable substances.

4.1.1.7 The closures of packagings containing wetted or diluted substances shall be such that the percentage of liquid (water, solvent or phlegmatizer) does not fall below the prescribed limits during transport.

4.1.1.7.1 Where two or more closure systems are fitted in series on an IBC, that nearest to the substance being carried shall be closed first.

4.1.1.8 Where pressure may develop in a package by the emission of gas from the contents (as a result of temperature increase or other causes), the packaging or IBC may be fitted with a vent provided that the gas emitted will not cause danger on account of its toxicity, its flammability or the quantity released, for example.

A venting device shall be fitted if dangerous overpressure may develop due to normal decomposition of substances. The vent shall be so designed that, when the packaging or IBC is in the attitude in which it is intended to be carried, leakages of liquid and the penetration of foreign substances are prevented under normal conditions of carriage.

NOTE: *Venting of the package is not permitted for air carriage.*

4.1.1.8.1 Liquids may only be filled into inner packagings which have an appropriate resistance to internal pressure that may be developed under normal conditions of carriage.

4.1.1.9 New, remanufactured or reused packagings, including IBCs and large packagings, or reconditioned packagings and repaired or routinely maintained IBCs shall be capable of passing the tests prescribed in 6.1.5, 6.3.5, 6.5.6 or 6.6.5, as applicable. Before being filled and handed over for carriage, every packaging, including IBCs and large packagings, shall be inspected to ensure that it is free from corrosion, contamination or other damage and every IBC shall be inspected with regard to the proper functioning of any service equipment. Any packaging which shows signs of reduced strength as compared with the approved design type shall no longer be used or shall be so reconditioned, that it is able to withstand the design type tests. Any IBC which shows signs of reduced strength as compared with the tested design type shall no longer be used or shall be so repaired or routinely maintained that it is able to withstand the design type tests.

4.1.1.10 Liquids shall be filled only into packagings, including IBCs, which have an appropriate resistance to the internal pressure that may develop under normal conditions of carriage. Packagings and IBCs marked with the hydraulic test pressure prescribed in 6.1.3.1 (d) and 6.5.2.2.1, respectively shall be filled only with a liquid having a vapour pressure:

(a) such that the total gauge pressure in the packaging or IBC (i.e. the vapour pressure of the filling substance plus the partial pressure of air or other inert gases, less 100 kPa) at 55 °C, determined on the basis of a maximum degree of filling in accordance with 4.1.1.4 and a filling temperature of 15 °C, will not exceed two-thirds of the marked test pressure; or

(b) at 50 °C less than four-sevenths of the sum of the marked test pressure plus 100 kPa; or

(c) at 55 °C less than two-thirds of the sum of the marked test pressure plus 100 kPa.

IBCs intended for the carriage of liquids shall not be used to carry liquids having a vapour pressure of more than 110 kPa (1.1 bar) at 50 °C or 130 kPa (1.3 bar) at 55 °C.

Examples of required marked test pressures for packagings, including IBCs, calculated as in 4.1.1.10 (c)

UN No	Name	Class	Packing group	V_{p55} (kPa)	$V_{p55} \times 1.5$ (kPa)	$(V_{p55} \times 1.5)$ minus 100 (kPa)	Required minimum test pressure gauge under 6.1.5.5.4(c) (kPa)	Minimum test pressure (gauge) to be marked on the packaging (kPa)
2056	Tetrahydrofuran	3	II	70	105	5	100	100
2247	n-Decane	3	III	1.4	2.1	-97.9	100	100
1593	Dichloromethane	6.1	III	164	246	146	146	150
1155	Diethyl ether	3	I	199	299	199	199	250

NOTE 1: *For pure liquids the vapour pressure at 55 °C (V_{p55}) can often be obtained from scientific tables.*

NOTE 2: *The table refers to the use of 4.1.1.10 (c) only, which means that the marked test pressure shall exceed 1.5 times the vapour pressure at 55 °C less 100 kPa. When, for example, the test pressure for n-decane is determined according to 6.1.5.5.4 (a), the minimum marked test pressure may be lower.*

NOTE 3: *For diethyl ether the required minimum test pressure under 6.1.5.5.5 is 250 kPa.*

4.1.1.11 Empty packagings, including IBCs and large packagings, that have contained a dangerous substance are subject to the same requirements as those for a filled packaging, unless adequate measures have been taken to nullify any hazard.

NOTE: *When such packagings are carried for disposal, recycling or recovery of their material, they may also be carried under UN 3509 provided the conditions of special provision 663 of Chapter 3.3 are met.*

4.1.1.12 Every packaging as specified in Chapter 6.1 intended to contain liquids shall successfully undergo a suitable leakproofness test. This test is part of a quality assurance programme as stipulated in 6.1.1.4 which shows the capability of meeting the appropriate test level indicated in 6.1.5.4.3:

(a) before it is first used for carriage;

(b) after remanufacturing or reconditioning of any packaging, before it is re-used for carriage.

For this test the packaging need not have its closures fitted. The inner receptacle of a composite packaging may be tested without the outer packaging, provided the test results are not affected. This test is not required for inner packagings of combination packagings or large packagings;

4.1.1.13 Packagings, including IBCs, used for solids which may become liquid at temperatures likely to be encountered during carriage shall also be capable of containing the substance in the liquid state.

4.1.1.14 Packagings, including IBCs, used for powdery or granular substances shall be sift-proof or shall be provided with a liner.

4.1.1.15 For plastics drums and jerricans, rigid plastics IBCs and composite IBCs with plastics inner receptacles, unless otherwise approved by the competent authority, the period of use permitted for the carriage of dangerous substances shall be five years from the date of manufacture of the receptacles, except where a shorter period of use is prescribed because of the nature of the substance to be carried.

NOTE: *For composite IBCs the period of use refers to the date of manufacture of the inner receptacle.*

4.1.1.16 Where ice is used as a coolant it shall not affect the integrity of the packaging.

4.1.1.17 *(Deleted)*

4.1.1.18 ***Explosives, self-reactive substances and organic peroxides***

Unless specific provision to the contrary is made in this Code, the packagings, including IBCs and large packagings, used for goods of Class 1, self-reactive substances of Class 4.1 and organic peroxides of Class 5.2 shall comply with the provisions for the medium danger group (packing group II).

4.1.1.19 ***Use of salvage packagings and large salvage packagings***

4.1.1.19.1 Damaged, defective, leaking or non-conforming packages, or dangerous goods that have spilled or leaked may be carried in salvage packagings mentioned in 6.1.5.1.11 and in large salvage packagings mentioned in 6.6.5.1.9. This does not prevent the use of a larger size packaging, an IBC of type 11A or a large packaging of appropriate type and performance level and under the conditions of 4.1.1.19.2 and 4.1.1.19.3.

4.1.1.19.2 Appropriate measures shall be taken to prevent excessive movement of the damaged or leaking packages within a salvage packaging or large salvage packaging. When the salvage packaging or large salvage packaging contains liquids, sufficient inert absorbent material shall be added to eliminate the presence of free liquid.

4.1.1.19.3 Appropriate measures shall be taken to ensure that there is no dangerous build-up of pressure.

4.1.1.20 ***Use of salvage pressure receptacles***

4.1.1.20.1 In the case of damaged, defective, leaking or non-conforming pressure receptacles, salvage pressure receptacles according to 6.2.3.11 may be used.

NOTE: *A salvage pressure receptacle may be used as an overpack in accordance with 5.1.2. When used as an overpack, marks shall be in accordance with 5.1.2.1 instead of 5.2.1.3.*

4.1.1.20.2 Pressure receptacles shall be placed in salvage pressure receptacles of suitable size. More than one pressure receptacle may be placed in the same salvage pressure receptacle only if the contents are known and do not react dangerously with each other (see 4.1.1.6). In this case the total sum of water capacities of the placed pressure receptacles shall not exceed 3 000 litres. Appropriate measures shall be taken to prevent movement of the pressure receptacles within the salvage pressure receptacle e.g. by partitioning, securing or cushioning.

4.1.1.20.3 A pressure receptacle may only be placed in a salvage pressure receptacle if:

(a) The salvage pressure receptacle is in accordance with 6.2.3.11 and a copy of the approval certificate is available;

(b) Parts of the salvage pressure receptacle which are, or are likely to be in direct contact with the dangerous goods will not be affected or weakened by those dangerous goods and will not cause a dangerous effect (e.g. catalyzing reaction or reacting with the dangerous goods); and

(c) The contents of the contained pressure receptacle(s) are limited in pressure and volume so that if totally discharged into the salvage pressure receptacle, the pressure in the salvage pressure receptacle at 65 °C will not exceed the test pressure of the salvage pressure receptacle (for gases, see packing instruction in P200 (3) in 4.1.4.1). The reduction of the useable water capacity of the salvage pressure receptacle, e.g. by any contained equipment and cushioning, shall be taken into account.

4.1.1.20.4 The proper shipping name, the UN number preceded by the letters "UN" and label(s) as required for packages in Chapter 5.2 applicable to the dangerous goods inside the contained pressure receptacle(s) shall be applied to the salvage pressure receptacle for carriage.

4.1.1.20.5 Salvage pressure receptacles shall be cleaned, purged and visually inspected internally and externally after each use. They shall be periodically inspected and tested in accordance with 6.2.3.5 at least once every five years.

4.1.1.21 ***Verification of the chemical compatibility of plastics packagings, including IBCs, by assimilation of filling substances to standard liquids***

4.1.1.21.1 *Scope*

For polyethylene packagings as specified in 6.1.5.2.6, and for polyethylene IBCs as specified in 6.5.6.3.5, the chemical compatibility with filling substances may be verified by assimilation to standard liquids following the procedures, as set out in 4.1.1.21.3 to 4.1.1.21.5 and using the list in table 4.1.1.21.6, provided that the particular design types have been tested with these standard liquids in accordance with 6.1.5 or 6.5.6, taking into account 6.1.6 and that the conditions in 4.1.1.21.2 are met. When assimilation in accordance with this sub-section is not possible, the chemical compatibility needs to be verified by design type testing in accordance with 6.1.5.2.5 or by laboratory tests in accordance with 6.1.5.2.7 for packagings, and in accordance with 6.5.6.3.3 or 6.5.6.3.6 for IBCs, respectively.

NOTE: *Irrespective of the provisions of this sub-section, the use of packagings, including IBCs, for a specific filling substance is subject to the limitations of Table A of Chapter 3.2, and the packing instructions in Chapter 4.1.*

4.1.1.21.2 *Conditions*

The relative densities of the filling substances shall not exceed that used to determine the height for the drop test performed successfully according to 6.1.5.3.5 or 6.5.6.9.4 and the mass for the stacking test performed successfully according to 6.1.5.6 or where necessary according to 6.5.6.6 with the assimilated standard liquid(s). The vapour pressures of the filling substances at 50 °C or 55 °C shall not exceed that used to determine the pressure for the internal pressure (hydraulic) test performed successfully according to 6.1.5.5.4 or 6.5.6.8.4.2 with the assimilated standard liquid(s). In case that filling substances are assimilated to a combination of standard liquids, the corresponding values of the filling substances shall not exceed the minimum values derived from the applied drop heights, stacking masses and internal test pressures.

Example: UN 1736 Benzoyl chloride is assimilated to the combination of standard liquids "Mixture of hydrocarbons and wetting solution". It has a vapour pressure of 0.34 kPa at 50 °C and a relative density of approximately 1.2. Design type tests for plastics drums and jerricans were frequently performed at minimum required test levels. In practice this means that the stacking test is commonly performed with stacking loads considering only a relative density of 1.0 for the "Mixture of hydrocarbons" and a relative density of 1.2 for the "Wetting solution" (see definition of standard liquids in 6.1.6). As a consequence chemical compatibility of such tested design types would not be verified for benzoyl chloride by reason of the inadequate test level of the design type with the standard liquid "mixture of hydrocarbons". (Due to the fact that in the majority of cases the applied internal hydraulic test pressure is not less than 100 kPa, the vapour pressure of benzoyl chloride would be covered by such test level according to 4.1.1.10).

All components of a filling substance, which may be a solution, mixture or preparation, such as wetting agents in detergents and disinfectants, irrespective whether dangerous or non-dangerous, shall be included in the assimilation procedure.

4.1.1.21.3 *Assimilation procedure*

The following steps shall be taken to assign filling substances to listed substances or groups of substances in table 4.1.1.21.6 (see also scheme in Figure 4.1.1.21.1):

(a) Classify the filling substance in accordance with the procedures and criteria of Part 2 (determination of the UN number and packing group);

(b) If it is included there, go to the UN number in column (1) of table 4.1.1.21.6;

(c) Select the line that corresponds in terms of packing group, concentration, flashpoint, the presence of non-dangerous components etc. by means of the information given in columns (2a), (2b) and (4), if there is more than one entry for this UN number.

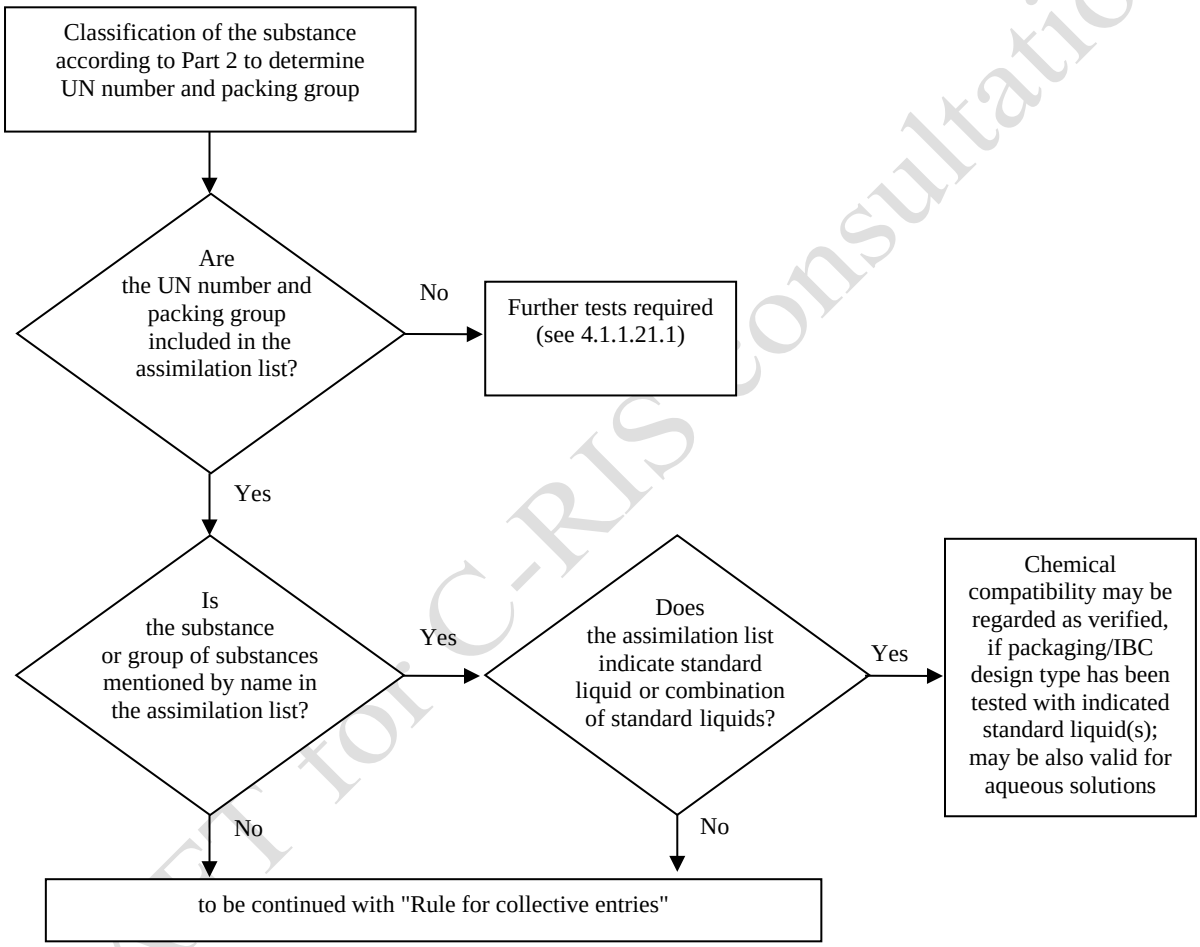
If this is not possible, the chemical compatibility shall be verified in accordance with 6.1.5.2.5 or 6.1.5.2.7 for packagings, and in accordance with 6.5.6.3.3 or 6.5.6.3.6 for IBCs (however, in the case of aqueous solutions, see 4.1.1.21.4);

(d) If the UN number and packing group of the filling substance determined in accordance with (a) is not included in the assimilation list, the chemical compatibility shall be proved in accordance with 6.1.5.2.5 or 6.1.5.2.7 for packagings, and in accordance with 6.5.6.3.3 or 6.5.6.3.6 for IBCs;

(e) Apply the "Rule for collective entries", as described in 4.1.1.21.5, if this is indicated in column (5) of the selected line;

(f) The chemical compatibility of the filling substance may be regarded as verified taking into account 4.1.1.21.1 and 4.1.1.21.2, if a standard liquid or a combination of standard liquids is assimilated in column (5) and the design type is approved for that/those standard liquid(s).

Figure 4.1.1.21.1: Scheme for the assimilation of filling substances to standard liquids



4.1.1.21.4 *Aqueous solutions*

Aqueous solutions of substances and groups of substances assimilated to specific standard liquid(s) in accordance with 4.1.1.21.3 may also be assimilated to that (those) standard liquid(s) provided the following conditions are met:

(a) the aqueous solution can be assigned to the same UN number as the listed substance in accordance with the criteria of 2.1.3.3, and

(b) the aqueous solution is not specifically mentioned by name otherwise in the assimilation list in 4.1.1.21.6, and

(c) no chemical reaction is taking place between the dangerous substance and the solvent water.

Example: Aqueous solutions of UN 1120 tert-Butanol:

- *Pure tert-Butanol itself is assigned to the standard liquid "acetic acid" in the assimilation list.*
- *Aqueous solutions of tert-Butanol can be classified under the entry UN 1120 BUTANOLS in accordance with 2.1.3.3, because the aqueous solution of tert-Butanol does not differ from the entries of the pure substances relating to the class, the packing group(s) and the physical state. Furthermore, the entry "1120 BUTANOLS" is not explicitly limited to the pure substances, and aqueous solutions of these substances are not specifically mentioned by name otherwise in Table A of chapter 3.2 as well as in the assimilation list.*
- *UN 1120 BUTANOLS do not react with water under normal conditions of carriage.*

As a consequence, aqueous solutions of UN 1120 tert-Butanol may be assigned to the standard liquid "acetic acid".

4.1.1.21.5 *Rule for collective entries*

For the assimilation of filling substances for which "Rule for collective entries" is indicated in column (5), the following steps shall be taken and conditions be met (see also scheme in Figure 4.1.1.21.2):

(a) Perform the assimilation procedure for each dangerous component of the solution, mixture or preparation in accordance with 4.1.1.21.3 taking into account the conditions in 4.1.1.21.2. In the case of generic entries, components may be neglected, that are known to have no damaging effect on high density polyethylene (e.g. solid pigments in UN 1263 PAINT or PAINT RELATED MATERIAL);

(b) A solution, mixture or preparation cannot be assimilated to a standard liquid, if:

(i) the UN number and packing group of one or more of the dangerous components does not appear in the assimilation list; or

(ii) "Rule for collective entries" is indicated in column (5) of the assimilation list for one or more of the components; or

(iii) (with the exception of UN 2059 NITROCELLULOSE SOLUTION, FLAMMABLE) the classification code of one or more of its dangerous components differs from that of the solution, mixture or preparation.

(c) If all dangerous components are listed in the assimilation list, and its classification codes are in accordance with the classification code of the solution, mixture or preparation itself, and all dangerous components are assimilated to the same standard liquid or combination of standard liquids in column (5), the chemical compatibility of the solution, mixture or preparation may be regarded as verified taking into account 4.1.1.21.1 and 4.1.1.21.2;

(d) If all dangerous components are listed in the assimilation list and its classification codes are in accordance with the classification code of the solution, mixture or preparation itself, but different standard liquids are indicated in column (5), the chemical compatibility may only be

regarded as verified for the following combinations of standard liquids taking into account 4.1.1.21.1 and 4.1.1.21.2:

(i) water/nitric acid 55 %; with the exception of inorganic acids with the classification code C1, which are assigned to standard liquid "water";

(ii) water/wetting solution;

(iii) water/acetic acid;

(iv) water/mixture of hydrocarbons;

(v) water/n-butyl acetate – n-butyl acetate-saturated wetting solution;

(e) In the scope of this rule, chemical compatibility is not regarded as verified for other combinations of standard liquids than those specified in (d) and for all cases specified in (b). In such cases the chemical compatibility shall be verified by other means (see 4.1.1.21.3 (d)).

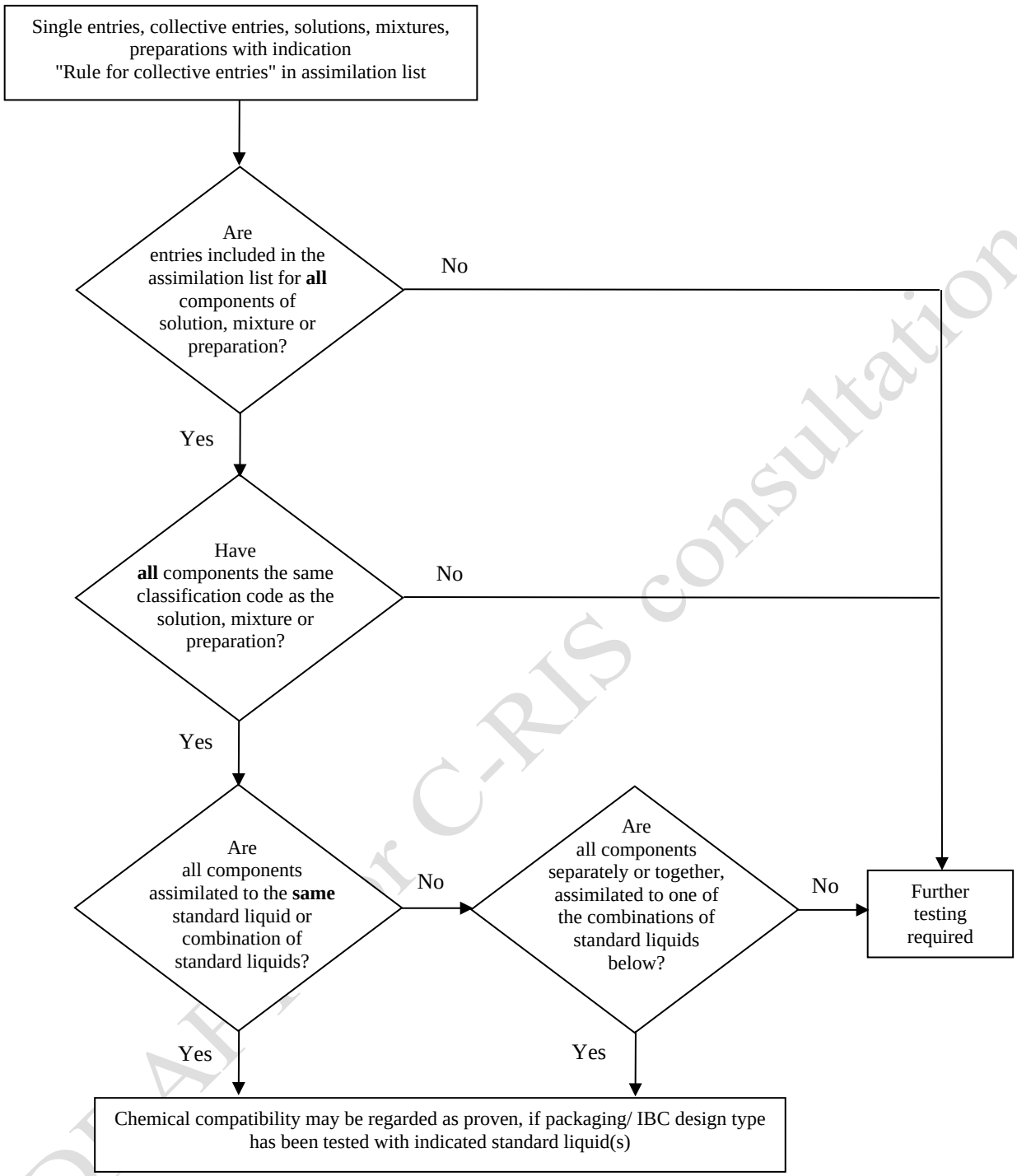
Example 1: Mixture of UN 1940 THIOGLYCOLIC ACID (50 %) and UN 2531 METHACRYLIC ACID, STABILIZED (50 %); classification of the mixture: UN 3265 CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S.

- *Both the UN numbers of the components and the UN number of the mixture are included in the assimilation list;*
- *Both the components and the mixture have the same classification code: C3;*
- *UN 1940 THIOGLYCOLIC ACID is assimilated to standard liquid "acetic acid", and UN 2531 METHACRYLIC ACID, STABILIZED is assimilated to standard liquid "n-butyl acetate/n-butyl acetate-saturated wetting solution". According to paragraph (d) this is not an acceptable combination of standard liquids. The chemical compatibility of the mixture has to be verified by other means.*

Example 2: Mixture of UN 1793 ISOPROPYL ACID PHOSPHATE (50 %) and UN 1803 PHENOLSULPHONIC ACID, LIQUID (50 %); classification of the mixture: UN 3265 CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S.

- *Both the UN numbers of the components and the UN number of the mixture are included in the assimilation list;*
- *Both the components and the mixture have the same classification code: C3;*
- *UN 1793 ISOPROPYL ACID PHOSPHATE is assimilated to standard liquid "wetting solution", and UN 1803 PHENOLSULPHONIC ACID, LIQUID is assimilated to standard liquid "water". According to paragraph (d) this is one of the acceptable combinations of standard liquids. As a consequence the chemical compatibility may be regarded as verified for this mixture, provided the packaging design type is approved for the standard liquids "wetting solution" and "water".*

Figure 4.1.1.21.2: Scheme "Rules for collective entries"



Acceptable combinations of standard liquids:

- water/nitric acid (55 %), with the exception of inorganic acids of classification code C1 which are assigned to standard liquid "water";
- water/wetting solution;
- water/acetic acid;
- water/mixture of hydrocarbons;
- water/n-butyl acetate – n-butyl acetate saturated wetting solution

4.1.1.21.6 *Assimilation list*

In the following table (assimilation list) dangerous substances are listed in the numerical order of their UN numbers. As a rule, each line deals with a dangerous substance, single entry or collective entry covered by a specific UN number. However, several consecutive lines may be used for the same UN number, if substances belonging to the same UN number have different names (e.g. individual isomers of a group of substances), different chemical properties, different physical properties and/or different transport conditions. In such cases the single entry or collective entry within the particular packing group is the last one of such consecutive lines.

Columns (1) to (4) of table 4.1.1.21.6, following a structure similar to that of Table A of Chapter 3.2, are used to identify the substance for the purpose of this sub-section. The last column indicates the standard liquid(s) to which the substance can be assimilated.

Explanatory notes for each column:

Column (1) UN No.

Contains the UN number:

- of the dangerous substance, if the substance has been assigned its own specific UN number, or
- of the collective entry to which dangerous substances not listed by name have been assigned in accordance with the criteria ("decision trees") of Part 2.

Column (2a) Proper shipping name or technical name

Contains the name of the substance, the name of the single entry, which may cover various isomers, or the name of the collective entry itself.

The indicated name can deviate from the applicable proper shipping name.

Column (2b) Description

Contains a descriptive text to clarify the scope of the entry in those cases when the classification, the transport conditions and/or the chemical compatibility of the substance may be variable.

Column (3a) Class

Contains the number of the class, whose heading covers the dangerous substance. This class number is assigned in accordance with the procedures and criteria of Part 2.

Column (3b) Classification code

Contains the classification code of the dangerous substance in accordance with the procedures and criteria of Part 2.

Column (4) Packing group

Contains the packing group number(s) (I, II or III) assigned to the dangerous substance in accordance with the procedures and criteria of Part 2. Certain substances are not assigned to packing groups.

Column (5) Standard liquid

This column indicates, as definite information, either a standard liquid or a combination of standard liquids to which the substance can be assimilated, or a reference to the rule for collective entries in 4.1.1.21.5.

Table 4.1.1.21.6: Assimilation list

UN No.	Proper shipping name or technical name	Description	Class	Classification Code	Packing group	Standard liquid
	3.1.2	3.1.2	2.2	2.2	2.1.1.3	
(1)	(2a)	(2b)	(3a)	(3b)	(4)	(5)
1090	**Acetone**		3	F1	II	Mixture of hydrocarbons **Remark:** applicable only, if it is proved that the permeability of the substance out of the package intended for carriage has an acceptable level
1093	**Acrylonitrile, stabilized**		3	FT1	I	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1104	**Amyl acetates**	pure isomers and isomeric mixture	3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1105	**Pentanols**	pure isomers and isomeric mixture	3	F1	II/III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1106	**Amylamine**s	pure isomers and isomeric mixture	3	FC	II/III	Mixture of hydrocarbons **and** wetting solution
1109	**Amyl formates**	pure isomers and isomeric mixture	3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1120	**Butanols**	pure isomers and isomeric mixture	3	F1	II/III	Acetic acid
1123	**Butyl acetates**	pure isomers and isomeric mixture	3	F1	II/III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1125	**n-Butylamine**		3	FC	II	Mixture of hydrocarbons **and** wetting solution
1128	**n-Butyl formate**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1129	**Butyraldehyde**		3	F1	II	Mixture of hydrocarbons
1133	**Adhesives**	containing flammable liquid	3	F1	I/II/III	Rule for collective entries
1139	**Coating solution**	includes surface treatments or coatings used for industrial or other purposes such as vehicle under coating, drum or barrel lining	3	F1	I/II/III	Rule for collective entries
1145	**Cyclohexane**		3	F1	II	Mixture of hydrocarbons
1146	**Cyclopentane**		3	F1	II	Mixture of hydrocarbons
1153	**Ethylene glycol diethyl ether**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution **and** mixture of hydrocarbons
1154	**Diethylamine**		3	FC	II	Mixture of hydrocarbons **and** wetting solution
1158	**Diisopropylamine**		3	FC	II	Mixture of hydrocarbons **and** wetting solution

UN No.	Proper shipping name or technical name	Description	Class	Classifi-cation Code	Packing group	Standard liquid
	3.1.2	3.1.2	2.2	2.2	2.1.1.3	
(1)	(2a)	(2b)	(3a)	(3b)	(4)	(5)
1160	**Dimethylamine aqueous solution**		3	FC	II	Mixture of hydrocarbons **and** wetting solution
1165	**Dioxane**		3	F1	II	Mixture of hydrocarbons
1170	**Ethanol** or **Ethanol solution**	aqueous solution	3	F1	II/III	Acetic acid
1171	**Ethylene glycol monoethyl ether**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution **and** mixture of hydrocarbons
1172	**Ethylene glycol monoethyl ether acetate**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution **and** mixture of hydrocarbons
1173	**Ethyl acetate**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1177	**2-Ethylbutyl acetate**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1178	**2-Ethylbutyraldehyde**		3	F1	II	Mixture of hydrocarbons
1180	**Ethyl butyrate**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1188	**Ethylene glycol monomethyl ether**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution **and** mixture of hydrocarbons
1189	**Ethylene glycol monomethyl ether acetate**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution **and** mixture of hydrocarbons
1190	**Ethyl formate**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1191	**Octyl aldehydes**	pure isomers and isomeric mixture	3	F1	III	Mixture of hydrocarbons
1192	**Ethyl lactate**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1195	**Ethyl propionate**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1197	**Extracts, liquid**, for flavour or aroma		3	F1	II/III	Rule for collective entries
1198	**Formaldehyde solution, flammable**	aqueous solution, flashpoint between 23 °C and 60 °C	3	FC	III	Acetic acid
1202	**Diesel fuel**	complying with EN 590:2013 + A1:2017 or with a flashpoint not more than 100 °C	3	F1	III	Mixture of hydrocarbons

UN No.	Proper shipping name or technical name	Description	Class	Classification Code	Packing group	Standard liquid
	3.1.2	3.1.2	2.2	2.2	2.1.1.3	
(1)	(2a)	(2b)	(3a)	(3b)	(4)	(5)
1202	**Gas oil**	flashpoint not more than 100 °C	3	F1	III	Mixture of hydrocarbons
1202	**Heating oil, light**	extra light	3	F1	III	Mixture of hydrocarbons
1202	**Heating oil, light**	complying with EN 590:2013 + AC:2014 or with a flashpoint not more than 100 °C	3	F1	III	Mixture of hydrocarbons
1203	**Motor spirit,** or **gasoline, or petrol**		3	F1	II	Mixture of hydrocarbons
1206	**Heptanes**	pure isomers and isomeric mixture	3	F1	II	Mixture of hydrocarbons
1207	**Hexaldehyde**	n-Hexaldehyde	3	F1	III	Mixture of hydrocarbons
1208	**Hexanes**	pure isomers and isomeric mixture	3	F1	II	Mixture of hydrocarbons
1210	**Printing ink** or **Printing ink related material**	flammable, including printing ink thinning or reducing compound	3	F1	I/II/III	Rule for collective entries
1212	**Isobutanol**		3	F1	III	Acetic acid
1213	**Isobutyl acetate**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1214	**Isobutylamine**		3	FC	II	Mixture of hydrocarbons **and** wetting solution
1216	**Isooctenes**	pure isomers and isomeric mixture	3	F1	II	Mixture of hydrocarbons
1219	**Isopropanol**		3	F1	II	Acetic acid
1220	**Isopropyl acetate**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1221	**Isopropylamine**		3	FC	I	Mixture of hydrocarbons **and** wetting solution
1223	**Kerosene**		3	F1	III	Mixture of hydrocarbons
1224	3,3-Dimethyl-2-butanone		3	F1	II	Mixture of hydrocarbons
1224	**Ketones, liquid, n.o.s.**		3	F1	II/III	Rule for collective entries
1230	**Methanol**		3	FT1	II	Acetic acid
1231	**Methyl acetate**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1233	**Methylamyl acetate**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1235	**Methylamine, aqueous solution**		3	FC	II	Mixture of hydrocarbons **and** wetting solution
1237	**Methyl butyrate**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1247	**Methyl methacrylate monomer, stabilized**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution

UN No.	Proper shipping name or technical name	Description	Class	Classifi-cation Code	Packing group	Standard liquid
	3.1.2	3.1.2	2.2	2.2	2.1.1.3	
(1)	(2a)	(2b)	(3a)	(3b)	(4)	(5)
1248	**Methyl propionate**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1262	**Octanes**	pure isomers and isomeric mixture	3	F1	II	Mixture of hydrocarbons
1263	**Paint** or **Paint related material**	including paint, lacquer, enamel, stain, shellac, varnish, polish, liquid filler and liquid lacquer base or including paint thinning and reducing compound	3	F1	I/II/III	Rule for collective entries
1265	**Pentanes**	n-Pentane	3	F1	II	Mixture of hydrocarbons
1266	**Perfumery products**	with flammable solvents	3	F1	II/III	Rule for collective entries
1268	Coal tar naphtha	vapour pressure at 50 °C not more than 110 kPa	3	F1	II	Mixture of hydrocarbons
1268	**Petroleum distillates, n.o.s.** or **Petroleum products, n.o.s.**		3	F1	I/II/III	Rule for collective entries
1274	**n-Propanol**		3	F1	II/III	Acetic acid
1275	**Propionaldehyde**		3	F1	II	Mixture of hydrocarbons
1276	**n-Propyl acetate**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1277	**Propylamine**	n-Propylamine	3	FC	II	Mixture of hydrocarbons **and** wetting solution
1281	**Propyl formates**	pure isomers and isomeric mixture	3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1282	**Pyridine**		3	F1	II	Mixture of hydrocarbons
1286	**Rosin oil**		3	F1	II/III	Rule for collective entries
1287	**Rubber solution**		3	F1	II/III	Rule for collective entries
1296	**Triethylamine**		3	FC	II	Mixture of hydrocarbons **and** wetting solution
1297	**Trimethylamine, aqueous solution**	not more than 50 % trimethylamine, by mass	3	FC	I/II/III	Mixture of hydrocarbons **and** wetting solution
1301	**Vinyl acetate, stabilized**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1306	**Wood preservatives, liquid**		3	F1	II/III	Rule for collective entries
1547	**Aniline**		6.1	T1	II	Acetic acid
1590	**Dichloroanilines**, **liquid**	pure isomers and isomeric mixture	6.1	T1	II	Acetic acid
1602	**Dye, liquid, toxic, n.o.s.** or **Dye intermediate, liquid, toxic, n.o.s.**		6.1	T1	I/II/III	Rule for collective entries
1604	**Ethylenediamine**		8	CF1	II	Mixture of hydrocarbons **and** wetting solution

UN No.	Proper shipping name or technical name	Description	Class	Classification Code	Packing group	Standard liquid
	3.1.2	3.1.2	2.2	2.2	2.1.1.3	
(1)	(2a)	(2b)	(3a)	(3b)	(4)	(5)
1715	**Acetic anhydride**		8	CF1	II	Acetic acid
1717	**Acetyl chloride**		3	FC	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1718	**Butyl acid phosphate**		8	C3	III	Wetting solution
1719	Hydrogen sulphide	aqueous solution	8	C5	III	Acetic acid
1719	**Caustic alkali liquid, n.o.s.**	inorganic	8	C5	II/III	Rule for collective entries
1730	**Antimony pentachloride, liquid**	pure	8	C1	II	Water
1736	**Benzoyl chloride**		8	C3	II	Mixture of hydrocarbons **and** wetting solution
1750	**Chloroacetic acid solution**	aqueous solution	6.1	TC1	II	Acetic acid
1750	**Chloroacetic acid solution**	mixtures of mono- and dichloroacetic acid	6.1	TC1	II	Acetic acid
1752	**Chloroacetyl chloride**		6.1	TC1	I	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1755	**Chromic acid solution**	aqueous solution with not more than 30 % chromic acid	8	C1	II/III	Nitric acid
1760	Cyanamide	aqueous solution with not more than 50 % cyanamide	8	C9	II	Water
1760	O,O-Diethyl-dithiophosphoric acid		8	C9	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1760	O,O-Diisopropyl-dithiophosphoric acid		8	C9	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1760	O,O-Di-n-propyl-dithiophosphoric acid		8	C9	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1760	**Corrosive liquid, n.o.s.**	flashpoint more than 60 °C	8	C9	I/II/III	Rule for collective entries
1761	**Cupriethylenediamine solution**	aqueous solution	8	CT1	II/III	Mixture of hydrocarbons **and** wetting solution
1764	**Dichloroacetic acid**		8	C3	II	Acetic acid
1775	**Fluoroboric acid**	aqueous solution with not more than 50 % fluoroboric acid	8	C1	II	Water
1778	**Fluorosilicic acid**		8	C1	II	Water
1779	**Formic acid**	with more than 85 % acid by mass	8	C3	II	Acetic acid
1783	**Hexamethylenediamine solution**	aqueous solution	8	C7	II/III	Mixture of hydrocarbons **and** wetting solution
1787	**Hydriodic acid**	aqueous solution	8	C1	II/III	Water
1788	**Hydrobromic acid**	aqueous solution	8	C1	II/III	Water
1789	**Hydrochloric acid**	not more than 38 % aqueous solution	8	C1	II/III	Water
1790	**Hydrofluoric acid**	with not more than 60 % hydrogen fluoride	8	CT1	II	Water the permissible period of use: not more than 2 years
1791	**Hypochlorite solution**	aqueous solution, containing wetting agents as customary in trade	8	C9	II/III	Nitric acid **and** wetting solution *

UN No.	Proper shipping name or technical name	Description	Class	Classification Code	Packing group	Standard liquid
	3.1.2	**3.1.2**	**2.2**	**2.2**	**2.1.1.3**	
(1)	**(2a)**	**(2b)**	**(3a)**	**(3b)**	**(4)**	**(5)**
1791	**Hypochlorite solution**	aqueous solution	8	C9	II/III	Nitric acid *
** For UN 1791: Test to be carried out only with vent. If the test is carried out with nitric acid as the standard liquid, an acid-resistant vent and gasket shall be used. If the test is carried out with hypochlorite solutions themselves, vents and gaskets of the same design type, resistant to hypochlorite (e.g. of silicone rubber) but not resistant to nitric acid, are also permitted.*						
1793	**Isopropyl acid phosphate**		8	C3	III	Wetting solution
1802	**Perchloric acid**	aqueous solution with not more than 50 % acid, by mass	8	CO1	II	Water
1803	**Phenolsulphonic acid, liquid**	isomeric mixture	8	C3	II	Water
1805	**Phosphoric acid, solution**		8	C1	III	Water
1814	**Potassium hydroxide solution**	aqueous solution	8	C5	II/III	Water
1824	**Sodium hydroxide solution**	aqueous solution	8	C5	II/III	Water
1830	**Sulphuric acid**	with more than 51 % pure acid	8	C1	II	Water
1832	**Sulphuric acid, spent**	chemical stable	8	C1	II	Water
1833	**Sulphurous acid**		8	C1	II	Water
1835	**Tetramethylammonium hydroxide, solution**	aqueous solution, flashpoint more than 60 °C	8	C7	II	Water
1840	**Zinc chloride solution**	aqueous solution	8	C1	III	Water
1848	**Propionic acid**	with not less than 10 % and less than 90 % acid by mass	8	C3	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1862	**Ethyl crotonate**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1863	**Fuel, aviation, turbine engine**		3	F1	I/II/III	Mixture of hydrocarbons
1866	**Resin solution**	flammable	3	F1	I/II/III	Rule for collective entries
1902	**Diisooctyl acid phosphate**		8	C3	III	Wetting solution
1906	**Sludge acid**		8	C1	II	Nitric acid
1908	**Chlorite solution**	aqueous solution	8	C9	II/III	Acetic acid
1914	**Butyl propionates**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1915	**Cyclohexanone**		3	F1	III	Mixture of hydrocarbons
1917	**Ethyl acrylate, stabilized**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1919	**Methyl acrylate, stabilized**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1920	**Nonanes**	pure isomers and isomeric mixture, flashpoint between 23 °C and 60 °C	3	F1	III	Mixture of hydrocarbons
1935	**Cyanide solution, n.o.s.**	inorganic	6.1	T4	I/II/III	Water
1940	**Thioglycolic acid**		8	C3	II	Acetic acid
1986	**Alcohols, flammable, toxic, n.o.s.**		3	FT1	I/II/III	Rule for collective entries
1987	Cyclohexanol	technical pure	3	F1	III	Acetic acid
1987	**Alcohols, n.o.s.**		3	F1	II/III	Rule for collective entries

UN No.	Proper shipping name or technical name	Description	Class	Classifi-cation Code	Packing group	Standard liquid
	3.1.2	3.1.2	2.2	2.2	2.1.1.3	
(1)	(2a)	(2b)	(3a)	(3b)	(4)	(5)
1988	**Aldehydes, flammable, toxic, n.o.s.**		3	FT1	I/II/III	Rule for collective entries
1989	**Aldehydes, n.o.s.**		3	F1	I/II/III	Rule for collective entries
1992	2,6-cis-Dimethyl-morpholine		3	FT1	III	Mixture of hydrocarbons
1992	**Flammable liquid, toxic, n.o.s.**		3	FT1	I/II/III	Rule for collective entries
1993	Propionic acid vinyl ester		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1993	(1-Methoxy-2-propyl) acetate		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
1993	**Flammable liquid, n.o.s.**		3	F1	I/II/III	Rule for collective entries
2014	**Hydrogen peroxide, aqueous solution**	with not less than 20 % but not more than 60 % hydrogen peroxide, stabilized as necessary	5.1	OC1	II	Nitric acid
2022	**Cresylic acid**	liquid mixture containing cresols, xylenols and methyl phenols	6.1	TC1	II	Acetic acid
2030	**Hydrazine aqueous solution**	with not less than 37 % but not more than 64 % hydrazine, by mass	8	CT1	II	Water
2030	Hydrazine hydrate	aqueous solution with 64 % hydrazine	8	CT1	II	Water
2031	**Nitric acid**	other than red fuming, with not more than 55 % pure acid	8	CO1	II	Nitric acid
2045	**Isobutyraldehyde**		3	F1	II	Mixture of hydrocarbons
2050	**Diisobutylene isomeric compounds**		3	F1	II	Mixture of hydrocarbons
2053	**Methyl isobutyl carbinol**		3	F1	III	Acetic acid
2054	**Morpholine**		8	CF1	I	Mixture of hydrocarbons
2057	**Tripropylene**		3	F1	II/III	Mixture of hydrocarbons
2058	**Valeraldehyde**	pure isomers and isomeric mixture	3	F1	II	Mixture of hydrocarbons
2059	**Nitrocellulose solution, flammable**		3	D	I/II/III	Rule for collective entries: Deviating from the general procedure this rule may be applied to solvents of classification code F1
2075	**Chloral, anhydrous, stabilized**		6.1	T1	II	Wetting solution
2076	**Cresols, liquid**	pure isomers and isomeric mixture	6.1	TC1	II	Acetic acid
2078	**Toluene diisocyanate**	liquid	6.1	T1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2079	**Diethylenetriamine**		8	C7	II	Mixture of hydrocarbons
2209	**Formaldehyde solution**	aqueous solution with 37 % Form-aldehyde, methanol content: 8-10 %	8	C9	III	Acetic acid
2209	**Formaldehyde solution**	aqueous solution, with not less than 25 % formaldehyde	8	C9	III	Water

UN No.	Proper shipping name or technical name	Description	Class	Classifi-cation Code	Packing group	Standard liquid
	3.1.2	3.1.2	2.2	2.2	2.1.1.3	
(1)	(2a)	(2b)	(3a)	(3b)	(4)	(5)
2218	**Acrylic acid, stabilized**		8	CF1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2227	**n-Butyl methacrylate, stabilized**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2235	**Chlorobenzyl chlorides, liquid**	para-Chlorobenzyl chloride	6.1	T2	III	Mixture of hydrocarbons
2241	**Cycloheptane**		3	F1	II	Mixture of hydrocarbons
2242	**Cycloheptene**		3	F1	II	Mixture of hydrocarbons
2243	**Cyclohexyl acetate**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2244	**Cyclopentanol**		3	F1	III	Acetic acid
2245	**Cyclopentanone**		3	F1	III	Mixture of hydrocarbons
2247	**n-Decane**		3	F1	III	Mixture of hydrocarbons
2248	**Di-n-butylamine**		8	CF1	II	Mixture of hydrocarbons
2258	**1,2-Propylenediamine**		8	CF1	II	Mixture of hydrocarbons **and** wetting solution
2259	**Triethylenetetramine**		8	C7	II	Water
2260	**Tripropylamine**		3	FC	III	Mixture of hydrocarbons **and** wetting solution
2263	**Dimethylcyclohexanes**	pure isomers and isomeric mixture	3	F1	II	Mixture of hydrocarbons
2264	**N,N-Dimethyl-cyclohexylamine**		8	CF1	II	Mixture of hydrocarbons **and** wetting solution
2265	**N,N-Dimethyl-formamide**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2266	**Dimethyl-N-propylamine**		3	FC	II	Mixture of hydrocarbons **and** wetting solution
2269	**3,3'-Imino-dipropylamine**		8	C7	III	Mixture of hydrocarbons **and** wetting solution
2270	**Ethylamine, aqueous solution**	with not less than 50 % but not more than 70 % ethylamine, flashpoint below 23 °C, corrosive or slightly corrosive	3	FC	II	Mixture of hydrocarbons **and** wetting solution
2275	**2-Ethylbutanol**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2276	**2-Ethylhexylamine**		3	FC	III	Mixture of hydrocarbons **and** wetting solution
2277	**Ethyl methacrylate, stabilized**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2278	**n-Heptene**		3	F1	II	Mixture of hydrocarbons

UN No.	Proper shipping name or technical name	Description	Class	Classification Code	Packing group	Standard liquid
	3.1.2	3.1.2	2.2	2.2	2.1.1.3	
(1)	(2a)	(2b)	(3a)	(3b)	(4)	(5)
2282	**Hexanols**	pure isomers and isomeric mixture	3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2283	**Isobutyl methacrylate, stabilized**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2286	**Pentamethylheptane**		3	F1	III	Mixture of hydrocarbons
2287	**Isoheptenes**		3	F1	II	Mixture of hydrocarbons
2288	**Isohexenes**		3	F1	II	Mixture of hydrocarbons
2289	**Isophoronediamine**		8	C7	III	Mixture of hydrocarbons **and** wetting solution
2293	**4-Methoxy-4-methyl-pentan-2-one**		3	F1	III	Mixture of hydrocarbons
2296	**Methylcyclohexane**		3	F1	II	Mixture of hydrocarbons
2297	**Methylcyclohexanone**	pure isomers and isomeric mixture	3	F1	III	Mixture of hydrocarbons
2298	**Methylcyclopentane**		3	F1	II	Mixture of hydrocarbons
2302	**5-Methylhexan-2-one**		3	F1	III	Mixture of hydrocarbons
2308	**Nitrosylsulphuric acid, liquid**		8	C1	II	Water
2309	**Octadienes**		3	F1	II	Mixture of hydrocarbons
2313	**Picolines**	pure isomers and isomeric mixture	3	F1	III	Mixture of hydrocarbons
2317	**Sodium cuprocyanide solution**	aqueous solution	6.1	T4	I	Water
2320	**Tetraethylenepentamine**		8	C7	III	Mixture of hydrocarbons **and** wetting solution
2324	**Triisobutylene**	mixture of C12-mono-olefines, flashpoint between 23 °C and 60 °C	3	F1	III	Mixture of hydrocarbons
2326	**Trimethyl-cyclohexylamine**		8	C7	III	Mixture of hydrocarbons **and** wetting solution
2327	**Trimethylhexamethylene-diamines**	pure isomers and isomeric mixture	8	C7	III	Mixture of hydrocarbons **and** wetting solution
2330	**Undecane**		3	F1	III	Mixture of hydrocarbons
2336	**Allyl formate**		3	FT1	I	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2348	**Butyl acrylates, stabilized**	pure isomers and isomeric mixture	3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2357	**Cyclohexylamine**	flashpoint between 23 °C and 60 °C	8	CF1	II	Mixture of hydrocarbons **and** wetting solution
2361	**Diisobutylamine**		3	FC	III	Mixture of hydrocarbons **and** wetting solution
2366	**Diethyl carbonate**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution

UN No.	Proper shipping name or technical name	Description	Class	Classifi-cation Code	Packing group	Standard liquid
	3.1.2	3.1.2	2.2	2.2	2.1.1.3	
(1)	(2a)	(2b)	(3a)	(3b)	(4)	(5)
2367	**alpha-Methyl-valeraldehyde**		3	F1	II	Mixture of hydrocarbons
2370	**1-Hexene**		3	F1	II	Mixture of hydrocarbons
2372	**1,2-Di-(dimethylamino)-ethane**		3	F1	II	Mixture of hydrocarbons **and** wetting solution
2379	**1,3-Dimethylbutylamine**		3	FC	II	Mixture of hydrocarbons **and** wetting solution
2383	**Dipropylamine**		3	FC	II	Mixture of hydrocarbons **and** wetting solution
2385	**Ethyl isobutyrate**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2393	**Isobutyl formate**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2394	**Isobutyl propionate**	flashpoint between 23 °C and 60 °C	3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2396	**Methacrylaldehyde, stabilized**		3	FT1	II	Mixture of hydrocarbons
2400	**Methyl isovalerate**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2401	**Piperidine**		8	CF1	I	Mixture of hydrocarbons **and** wetting solution
2403	**Isopropenyl acetate**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2405	**Isopropyl butyrate**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2406	**Isopropyl isobutyrate**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2409	**Isopropyl propionate**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2410	**1,2,3,6-Tetrahydro-pyridine**		3	F1	II	Mixture of hydrocarbons
2427	**Potassium chlorate, aqueous solution**		5.1	O1	II/III	Water
2428	**Sodium chlorate, aqueous solution**		5.1	O1	II/III	Water
2429	**Calcium chlorate, aqueous solution**		5.1	O1	II/III	Water
2436	**Thioacetic acid**		3	F1	II	Acetic acid
2457	**2,3-Dimethylbutane**		3	F1	II	Mixture of hydrocarbons
2491	**Ethanolamine**		8	C7	III	Wetting solution
2491	**Ethanolamine solution**	aqueous solution	8	C7	III	Wetting solution

UN No.	Proper shipping name or technical name	Description	Class	Classifi-cation Code	Packing group	Standard liquid
	3.1.2	3.1.2	2.2	2.2	2.1.1.3	
(1)	(2a)	(2b)	(3a)	(3b)	(4)	(5)
2496	**Propionic anhydride**		8	C3	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2524	**Ethyl orthoformate**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2526	**Furfurylamine**		3	FC	III	Mixture of hydrocarbons **and** wetting solution
2527	**Isobutyl acrylate, stabilized**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2528	**Isobutyl isobutyrate**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2529	**Isobutyric acid**		3	FC	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2531	**Methacrylic acid, stabilized**		8	C3	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2542	**Tributylamine**		6.1	T1	II	Mixture of hydrocarbons
2560	**2-Methylpentan-2-ol**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2564	**Trichloroacetic acid solution**	aqueous solution	8	C3	II/III	Acetic acid
2565	**Dicyclohexylamine**		8	C7	III	Mixture of hydrocarbons **and** wetting solution
2571	Ethylsulphuric acid		8	C3	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2571	**Alkylsulphuric acids**		8	C3	II	Rule for collective entries
2580	**Aluminium bromide solution**	aqueous solution	8	C1	III	Water
2581	**Aluminium chloride solution**	aqueous solution	8	C1	III	Water
2582	**Ferric chloride solution**	aqueous solution	8	C1	III	Water
2584	Methane sulphonic acid	with more than 5 % free sulphuric acid	8	C1	II	Water
2584	**Alkylsulphonic acids, liquid**	with more than 5 % free sulphuric acid	8	C1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2584	Benzene sulphonic acid	with more than 5 % free sulphuric acid	8	C1	II	Water
2584	Toluene sulphonic acids	with more than 5 % free sulphuric acid	8	C1	II	Water
2584	**Arylsulphonic acids, liquid**	with more than 5 % free sulphuric acid	8	C1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2586	Methane sulfonic acid	with not more than 5 % free sulphuric acid	8	C1	III	Water
2586	**Alkylsulphonic acids, liquid**	with not more than 5 % free sulphuric acid	8	C1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution

UN No.	Proper shipping name or technical name	Description	Class	Classification Code	Packing group	Standard liquid
	3.1.2	3.1.2	2.2	2.2	2.1.1.3	
(1)	(2a)	(2b)	(3a)	(3b)	(4)	(5)
2586	Benzene sulphonic acid	with not more than 5 % free sulphuric acid	8	C1	III	Water
2586	Toluene sulphonic acids	with not more than 5 % free sulphuric acid	8	C1	III	Water
2586	**Arylsulphonic acids, liquid**	with not more than 5 % free sulphuric acid	8	C1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2610	**Triallylamine**		3	FC	III	Mixture of hydrocarbons **and** wetting solution
2614	**Methallyl alcohol**		3	F1	III	Acetic acid
2617	**Methylcyclohexanols**	pure isomers and isomeric mixture, flashpoint between 23 °C and 60 °C	3	F1	III	Acetic acid
2619	**Benzyldimethylamine**		8	CF1	II	Mixture of hydrocarbons **and** wetting solution
2620	**Amyl butyrates**	pure isomers and isomeric mixture, flashpoint between 23 °C and 60 °C	3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2622	**Glycidaldehyde**	flashpoint below 23 °C	3	FT1	II	Mixture of hydrocarbons
2626	**Chloric acid, aqueous solution**	with not more than 10 % chloric acid	5.1	O1	II	Nitric acid
2656	**Quinoline**	flashpoint more than 60 °C	6.1	T1	III	Water
2672	**Ammonia solution**	relative density between 0.880 and 0.957 at 15 °C in water, with more than 10 % but not more than 35 % ammonia	8	C5	III	Water
2683	**Ammonium sulphide solution**	aqueous solution, flashpoint between 23 °C and 60 °C	8	CFT	II	Acetic acid
2684	**3-Diethylamino-propylamine**		3	FC	III	Mixture of hydrocarbons **and** wetting solution
2685	**N,N-Diethylethylene-diamine**		8	CF1	II	Mixture of hydrocarbons **and** wetting solution
2693	**Bisulphites, aqueous solution, n.o.s.**	inorganic	8	C1	III	Water
2707	**Dimethyldioxanes**	pure isomers and isomeric mixture	3	F1	II/III	Mixture of hydrocarbons
2733	**Amines, flammable, corrosive , n.o.s.** or **Polyamines, flammable, corrosive, n.o.s.**		3	FC	I/II/III	Mixture of hydrocarbons **and** wetting solution
2734	Di-sec-butylamine		8	CF1	II	Mixture of hydrocarbons
2734	**Amines, liquid, corrosive, flammable, n.o.s.** or **Polyamines, liquid, corrosive, flammable, n.o.s.**		8	CF1	I/II	Mixture of hydrocarbons **and** wetting solution

UN No.	Proper shipping name or technical name	Description	Class	Classification Code	Packing group	Standard liquid
	3.1.2	**3.1.2**	**2.2**	**2.2**	**2.1.1.3**	
(1)	**(2a)**	**(2b)**	**(3a)**	**(3b)**	**(4)**	**(5)**
2735	**Amines, liquid, corrosive, n.o.s.** or **Polyamines, liquid, corrosive, n.o.s.**		8	C7	I/II/III	Mixture of hydrocarbons **and** wetting solution
2739	**Butyric anhydride**		8	C3	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2789	**Acetic acid, glacial** or **Acetic acid solution**	aqueous solution, more than 80 % acid, by mass	8	CF1	II	Acetic acid
2790	**Acetic acid solution**	aqueous solution, more than 10 % but not more than 80 % acid, by mass	8	C3	II/III	Acetic acid
2796	**Sulphuric acid**	with not more than 51 % pure acid	8	C1	II	Water
2797	**Battery fluid, alkali**	Potassium/Sodium hydroxide, aqueous solution	8	C5	II	Water
2810	2-Chloro-6-fluorobenzyl chloride	stabilized	6.1	T1	III	Mixture of hydrocarbons
2810	2-Phenylethanol		6.1	T1	III	Acetic acid
2810	Ethylene glycol monohexyl ether		6.1	T1	III	Acetic acid
2810	**Toxic liquid, organic, n.o.s.**		6.1	T1	I/II/III	Rule for collective entries
2815	**N-Aminoethylpiperazine**		8	CT1	III	Mixture of hydrocarbons **and** wetting solution
2818	**Ammonium polysulphide solution**	aqueous solution	8	CT1	II/III	Acetic acid
2819	**Amyl acid phosphate**		8	C3	III	Wetting solution
2820	**Butyric acid**	n-Butyric acid	8	C3	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2821	**Phenol solution**	aqueous solution, toxic, non-alkaline	6.1	T1	II/III	Acetic acid
2829	**Caproic acid**	n-Caproic acid	8	C3	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2837	**Bisulphates, aqueous solution**		8	C1	II/III	Water
2838	**Vinyl butyrate, stabilized**		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2841	**Di-n-amylamine**		3	FT1	III	Mixture of hydrocarbons **and** wetting solution
2850	**Propylene tetramer**	mixture of C12-monoolefines, flashpoint between 23 °C and 60 °C	3	F1	III	Mixture of hydrocarbons
2873	**Dibutylaminoethanol**	N,N-Di-n-butylaminoethanol	6.1	T1	III	Acetic acid
2874	**Furfuryl alcohol**		6.1	T1	III	Acetic acid
2920	O,O-Diethyl-dithiophosphoric acid	flashpoint between 23 °C and 60 °C	8	CF1	II	n-Butylacetate/ n-Butylacetate-saturated wetting solution

UN No.	Proper shipping name or technical name	Description	Class	Classification Code	Packing group	Standard liquid
	3.1.2	3.1.2	2.2	2.2	2.1.1.3	
(1)	(2a)	(2b)	(3a)	(3b)	(4)	(5)
2920	O,O-Dimethyl-dithiophosphoric acid	flashpoint between 23 °C and 60 °C	8	CF1	II	Wetting solution
2920	Hydrogen bromide	33 % solution in glacial acetic acid	8	CF1	II	Wetting solution
2920	Tetramethylammonium hydroxide	aqueous solution, flashpoint between 23 °C and 60 °C	8	CF1	II	Water
2920	**Corrosive liquid, flammable, n.o.s.**		8	CF1	I/II	Rule for collective entries
2922	Ammonium sulphide	aqueous solution, flashpoint more than 60 °C	8	CT1	II	Water
2922	Cresols	aqueous alkaline solution, mixture of sodium and potassium cresolate,	8	CT1	II	Acetic acid
2922	Phenol	aqueous alkaline solution, mixture of sodium and potassium phenolate	8	CT1	II	Acetic acid
2922	Sodium hydrogen difluoride	aqueous solution	8	CT1	III	Water
2922	**Corrosive liquid, toxic, n.o.s.**		8	CT1	I/II/III	Rule for collective entries
2924	**Flammable liquid, corrosive, n.o.s.**	slightly corrosive	3	FC	I/II/III	Rule for collective entries
2927	**Toxic liquid, corrosive, organic, n.o.s.**		6.1	TC1	I/II	Rule for collective entries
2933	**Methyl 2-chloro-propionate**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2934	**Isopropyl 2-chloro-propionate**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2935	**Ethyl 2-chloropropionate**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2936	**Thiolactic acid**		6.1	T1	II	Acetic acid
2941	**Fluoroanilines**	pure isomers and isomeric mixture	6.1	T1	III	Acetic acid
2943	**Tetrahydrofurfurylamine**		3	F1	III	Mixture of hydrocarbons
2945	**N-Methylbutylamine**		3	FC	II	Mixture of hydrocarbons **and** wetting solution
2946	**2-Amino-5-diethyl-aminopentane**		6.1	T1	III	Mixture of hydrocarbons **and** wetting solution
2947	**Isopropyl chloroacetate**		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
2984	**Hydrogen peroxide, aqueous solution**	with not less than 8 % but less than 20 % hydrogen peroxide, stabilized as necessary	5.1	O1	III	Nitric acid
3056	**n-Heptaldehyde**		3	F1	III	Mixture of hydrocarbons
3065	**Alcoholic beverages**	with more than 24 % alcohol by volume	3	F1	II/III	Acetic acid

UN No.	Proper shipping name or technical name	Description	Class	Classification Code	Packing group	Standard liquid
	3.1.2	3.1.2	2.2	2.2	2.1.1.3	
(1)	(2a)	(2b)	(3a)	(3b)	(4)	(5)
3066	**Paint** or **Paint related material**	including paint, lacquer, enamel, stain, shellac, varnish, polish, liquid filler and liquid lacquer base or including paint thinning and reducing compound	8	C9	II/III	Rule for collective entries
3079	**Methacrylonitrile, stabilized**		6.1	TF1	I	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
3082	sec-Alcohol C_6-C_{17} poly (3-6) ethoxylate		9	M6	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution **and** mixture of hydrocarbons
3082	Alcohol C_{12}-C_{15} poly (1-3) ethoxylate		9	M6	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution **and** mixture of hydrocarbons
3082	Alcohol C_{13}-C_{15} poly (1-6) ethoxylate		9	M6	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution **and** mixture of hydrocarbons
3082	Aviation turbine fuel JP-5	flashpoint more than 60 °C	9	M6	III	Mixture of hydrocarbons
3082	Aviation turbine fuel JP-7	flashpoint more than 60 °C	9	M6	III	Mixture of hydrocarbons
3082	Coal tar	flashpoint more than 60 °C	9	M6	III	Mixture of hydrocarbons
3082	Coal tar naphtha	flashpoint more than 60 °C	9	M6	III	Mixture of hydrocarbons
3082	Creosote produced of coal tar	flashpoint more than 60 °C	9	M6	III	Mixture of hydrocarbons
3082	Creosote produced of wood tar	flashpoint more than 60 °C	9	M6	III	Mixture of hydrocarbons
3082	Cresyl diphenyl phosphate		9	M6	III	Wetting solution
3082	Decyl acrylate		9	M6	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution **and** mixture of hydrocarbons
3082	Diisobutyl phthalate		9	M6	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution **and** mixture of hydrocarbons
3082	Di-n-butyl phthalate		9	M6	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution **and** mixture of hydrocarbons
3082	Hydrocarbons	liquid, flashpoint more than 60 °C, environmentally hazardous	9	M6	III	Rule for collective entries
3082	Isodecyl diphenyl phosphate		9	M6	III	Wetting solution
3082	Methylnaphthalenes	isomeric mixture, liquid	9	M6	III	Mixture of hydrocarbons
3082	Triaryl phosphates	n.o.s.	9	M6	III	Wetting solution

UN No.	Proper shipping name or technical name	Description	Class	Classification Code	Packing group	Standard liquid
	3.1.2	3.1.2	2.2	2.2	2.1.1.3	
(1)	(2a)	(2b)	(3a)	(3b)	(4)	(5)
3082	Tricresyl phosphate	with not more than 3 % ortho-isomer	9	M6	III	Wetting solution
3082	Trixylenyl phosphate		9	M6	III	Wetting solution
3082	Zinc alkyl dithiophosphate	C3-C14	9	M6	III	Wetting solution
3082	Zinc aryl dithiophosphate	C7-C16	9	M6	III	Wetting solution
3082	**Environmentally hazardous substance, liquid, n.o.s.**		9	M6	III	Rule for collective entries
3099	**Oxidizing liquid, toxic, n.o.s.**		5.1	OT1	I/II/III	Rule for collective entries
3101 3103 3105 3107 3109 3111 3113 3115 3117 3119	**Organic Peroxide, Type B, C, D, E** or **F, liquid** or **Organic Peroxide, Type B, C, D, E** or **F, liquid, temperature controlled**		5.2	P1		n-Butyl acetate/ n-butyl acetate-saturated wetting solution **and** mixture of hydrocarbons **and** nitric acid**
*** For UN Nos. 3101, 3103, 3105, 3107, 3109, 3111, 3113, 3115, 3117, 3119 (tert-butyl hydroperoxide with more than 40 % peroxide content and peroxyacetic acids are excluded): All organic peroxides in a technically pure form or in solution in solvents which, as far as their compatibility is concerned, are covered by the standard liquid "mixture of hydrocarbons" in this list. Compatibility of vents and gaskets with organic peroxides may be verified, also independently of the design type test, by laboratory tests with nitric acid.*						
3145	Butylphenols	liquid, n.o.s.	8	C3	I/II/III	Acetic acid
3145	**Alkylphenols, liquid, n.o.s.**	including C2 to C12 homologues	8	C3	I/II/III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
3149	**Hydrogen peroxide and peroxyacetic acid mixture, stabilized**	with UN 2790 acetic acid, UN 2796 sulphuric acid and/or UN 1805 phosphoric acid, water and not more than 5 % peroxyacetic acid	5.1	OC1	II	Wetting solution **and** nitric acid
3210	**Chlorates, inorganic, aqueous solution, n.o.s.**		5.1	O1	II/III	Water
3211	**Perchlorates, inorganic, aqueous solution, n.o.s.**		5.1	O1	II/III	Water
3213	**Bromates, inorganic, aqueous solution, n.o.s.**		5.1	O1	II/III	Water
3214	**Permanganates, inorganic, aqueous solution, n.o.s.**		5.1	O1	II	Water
3216	**Persulphates, inorganic, aqueous solution, n.o.s.**		5.1	O1	III	Wetting solution
3218	**Nitrates, inorganic, aqueous solution, n.o.s.**		5.1	O1	II/III	Water
3219	**Nitrites, inorganic, aqueous solution, n.o.s.**		5.1	O1	II/III	Water
3264	Cupric chloride	aqueous solution, slightly corrosive	8	C1	III	Water
3264	Hydroxylamine sulphate	25 % aqueous solution	8	C1	III	Water
3264	Phosphorous acid	aqueous solution	8	C1	III	Water

UN No.	Proper shipping name or technical name	Description	Class	Classification Code	Packing group	Standard liquid
	3.1.2	3.1.2	2.2	2.2	2.1.1.3	
(1)	(2a)	(2b)	(3a)	(3b)	(4)	(5)
3264	**Corrosive liquid, acidic, inorganic, n.o.s.**	flashpoint more than 60 °C	8	C1	I/II/III	Rule for collective entries; not applicable to mixtures having components of UN Nos.: 1830, 1832, 1906 and 2308
3265	Methoxyacetic acid		8	C3	I	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
3265	Allyl succinic acid anhydride		8	C3	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
3265	Dithioglycolic acid		8	C3	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
3265	Butyl phosphate	mixture of mono- and di-butyl phosphate	8	C3	III	Wetting solution
3265	Caprylic acid		8	C3	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
3265	Isovaleric acid		8	C3	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
3265	Pelargonic acid		8	C3	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
3265	Pyruvic acid		8	C3	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
3265	Valeric acid		8	C3	III	Acetic acid
3265	**Corrosive liquid, acidic, organic, n.o.s.**	flashpoint more than 60 °C	8	C3	I/II/III	Rule for collective entries
3266	Sodium hydrosulphide	aqueous solution	8	C5	II	Acetic acid
3266	Sodium sulphide	aqueous solution, slightly corrosive	8	C5	III	Acetic acid
3266	**Corrosive liquid, basic, inorganic, n.o.s.**	flashpoint more than 60 °C	8	C5	I/II/III	Rule for collective entries
3267	2,2'-(Butylimino)-bisethanol		8	C7	II	Mixture of hydrocarbons **and** wetting solution
3267	**Corrosive liquid, basic, organic, n.o.s.**	flashpoint more than 60 °C	8	C7	I/II/III	Rule for collective entries
3271	Ethylene glycol monobutyl ether	flashpoint 60 °C	3	F1	III	Acetic acid
3271	**Ether, n.o.s.**		3	F1	II/III	Rule for collective entries
3272	Acrylic acid tert-butyl ester		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
3272	Isobutyl propionate	flashpoint below 23 °C	3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
3272	Methyl valerate		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
3272	Trimethyl ortho-formate		3	F1	II	n-Butyl acetate/ n-butyl acetate-saturated wetting solution

UN No.	Proper shipping name or technical name	Description	Class	Classifi-cation Code	Packing group	Standard liquid
	3.1.2	3.1.2	2.2	2.2	2.1.1.3	
(1)	(2a)	(2b)	(3a)	(3b)	(4)	(5)
3272	Ethyl valerate		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
3272	Isobutyl isovalerate		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
3272	n-Amyl propionate		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
3272	n-Butylbutyrate		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
3272	Methyl lactate		3	F1	III	n-Butyl acetate/ n-butyl acetate-saturated wetting solution
3272	**Ester, n.o.s.**		3	F1	II/III	Rule for collective entries
3287	Sodium nitrite	40 % aqueous solution	6.1	T4	III	Water
3287	**Toxic liquid, inorganic, n.o.s.**		6.1	T4	I/II/III	Rule for collective entries
3291	**Clinical waste, unspecified, n.o.s.**	liquid	6.2	I3		Water
3293	**Hydrazine, aqueous solution**	with not more than 37 % hydrazine, by mass	6.1	T4	III	Water
3295	Heptenes	n.o.s	3	F1	II	Mixture of hydrocarbons
3295	Nonanes	flashpoint below 23 °C	3	F1	II	Mixture of hydrocarbons
3295	Decanes	n.o.s	3	F1	III	Mixture of hydrocarbons
3295	1,2,3-Trimethylbenzene		3	F1	III	Mixture of hydrocarbons
3295	**Hydrocarbons, liquid, n.o.s.**		3	F1	I/II/III	Rule for collective entries
3405	**Barium chlorate, solution**	aqueous solution	5.1	OT1	II/III	Water
3406	**Barium perchlorate, solution**	aqueous solution	5.1	OT1	II/III	Water
3408	**Lead perchlorate, solution**	aqueous solution	5.1	OT1	II/III	Water
3413	**Potassium cyanide, solution**	aqueous solution	6.1	T4	I/II/III	Water
3414	**Sodium cyanide, solution**	aqueous solution	6.1	T4	I/II/III	Water
3415	**Sodium fluoride, solution**	aqueous solution	6.1	T4	III	Water
3422	**Potassium fluoride, solution**	aqueous solution	6.1	T4	III	Water

4.1.2 Additional general provisions for the use of IBCs

4.1.2.1 When IBCs are used for the carriage of liquids with a flash-point of 60 °C (closed cup) or lower, or of powders liable to dust explosion, measures shall be taken to prevent a dangerous electrostatic discharge.

4.1.2.2 Every metal, rigid plastics and composite IBC, shall be inspected and tested, as relevant, in accordance with 6.5.4.4 or 6.5.4.5:

- before it is put into service;
- thereafter at intervals not exceeding two and a half and five years, as appropriate;
- after the repair or remanufacture, before it is re-used for carriage.

An IBC shall not be filled and offered for carriage after the date of expiry of the last periodic test or inspection. However, an IBC filled prior to the date of expiry of the last periodic test or inspection may be carried for a period not to exceed three months beyond the date of expiry of the last periodic test or inspection. In addition, an IBC may be carried after the date of expiry of the last periodic test or inspection:

(a) after emptying but before cleaning, for purposes of performing the required test or inspection prior to refilling; and

(b) unless otherwise approved by the competent authority, for a period not to exceed six months beyond the date of expiry of the last periodic test or inspection in order to allow the return of dangerous goods or residues for proper disposal or recycling.

NOTE: *For the particulars in the transport document, see 5.4.1.1.11.*

4.1.2.3 IBCs of type 31HZ2 shall be filled to at least 80 % of the volume of the outer casing.

4.1.2.4 Except for routine maintenance of metal, rigid plastics, composite and flexible IBCs performed by the owner of the IBC, whose State and name or authorized symbol is durably marked on the IBC, the party performing routine maintenance shall durably mark the IBC near the manufacturer's UN design type mark to show:

(a) The State in which the routine maintenance was carried out; and

(b) The name or authorized symbol of the party performing the routine maintenance.

4.1.3 General provisions concerning packing instructions

4.1.3.1 Packing instructions applicable to dangerous goods of Classes 1 to 9 are specified in Section 4.1.4. They are subdivided in three sub-sections depending on the type of packagings to which they apply:

Sub-section 4.1.4.1	for packagings other than IBCs and large packagings; these packing instructions are designated by an alphanumeric code starting with the letter "P";
Sub-section 4.1.4.2	for IBCs; these are designated by an alphanumeric code starting with the letters "IBCs";
Sub-section 4.1.4.3	for large packagings; these are designated by an alphanumeric code starting with the letters "LP".

Generally, packing instructions specify that the general provisions of 4.1.1, 4.1.2 or 4.1.3, as appropriate, are applicable. They may also require compliance with the special provisions of Sections 4.1.5, 4.1.6, 4.1.7, 4.1.8 or 4.1.9 when appropriate. Special packing provisions may also be specified in the packing instruction for individual substances or articles. They are also designated by an alphanumeric code comprising the letters:

"PP" for packagings other than IBCs and large packagings, or "RR" for special provisions specific to this Code;

"B" for IBCs or "BB" for special packing provisions specific to this Code;

"L" for large packagings or "LL" for special packing provisions specific to this Code.

Unless otherwise specified, each packaging shall conform to the applicable requirements of Part 6. Generally packing instructions do not provide guidance on compatibility and the user shall not select a packaging without checking that the substance is compatible with the packaging material selected (e.g. glass receptacles are unsuitable for most fluorides). Where glass receptacles are permitted in the packing instructions porcelain, earthenware and stoneware packagings are also allowed.

4.1.3.2 Column (8) of Table A of Chapter 3.2 shows for each article or substance the packing instruction(s) that shall be used. Columns (9a) and (9b) indicate the special packing provisions applicable to specific substances or articles.

4.1.3.3 Each packing instruction shows, where applicable, the acceptable single and combination packagings. For combination packagings, the acceptable outer packagings, inner packagings and when applicable the maximum quantity permitted in each inner or outer packaging, are shown. Maximum net mass and maximum capacity are as defined in 1.2.1. Where packagings which need not meet the requirements of 4.1.1.3 (e.g. crates, pallets) are authorized in a packing instruction or the special provisions listed in Table A in Chapter 3.2, these packagings are not subject to the mass or volume limits generally applicable to packagings conforming to the requirements of Chapter 6.1, unless otherwise indicated in the relevant packing instruction or special provision.

4.1.3.4 The following packagings shall not be used when the substances being carried are liable to become liquid during carriage:

Packagings

Drums:	1D and 1G
Boxes:	4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1 and 4H2
Bags:	5L1, 5L2, 5L3, 5H1, 5H2, 5H3, 5H4, 5M1 and 5M2
Composite packagings:	6HC, 6HD2, 6HG1, 6HG2, 6HD1, 6PC, 6PD1, 6PD2, 6PG1, 6PG2 and 6PH1

Large packagings

Flexible plastics:	51H (outer packaging)

IBCs

For substances of packing group I: All types of IBC

For substances of packing groups II and III:

Wooden:	11C, 11D and 11F
Fibreboard:	11G
Flexible:	13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 and 13M2
Composite:	11HZ2 and 21HZ2

For the purposes of this paragraph, substances and mixtures of substances having a melting point equal to or less than 45 °C shall be treated as solids liable to become liquid during carriage.

4.1.3.5 Where the packing instructions in this Chapter authorize the use of a particular type of packaging (e.g. 4G; 1A2), packagings bearing the same packaging identification code followed by the letters "V", "U" or "W" marked in accordance with the requirements of Part 6 (e.g. 4GV, 4GU or 4GW; 1A2V, 1A2U or 1A2W) may also be used under the same conditions and limitations applicable to the use of that type of packaging according to the relevant packing instructions. For example, a combination packaging marked with the packaging code "4GV" may be used whenever a combination packaging marked "4G" is authorized, provided the requirements in the relevant packing instruction regarding types of inner packagings and quantity limitations are respected.

4.1.3.6 ***Pressure receptacles for liquids and solids***

4.1.3.6.1 Unless otherwise indicated in this Code, pressure receptacles conforming to:

(a) the applicable requirements of Chapter 6.2; or

(b) the national or international standards on the design, construction, testing, manufacturing and inspection, as applied by the country in which the pressure receptacles are manufactured, provided that the provisions of 4.1.3.6 are met, and that, for metallic cylinders, tubes, pressure drums, bundles of cylinders and salvage pressure receptacles, the construction is such that the minimum burst ratio (burst pressure divided by test pressure) is:

(i) 1.50 for refillable pressure receptacles;

(ii) 2.00 for non-refillable pressure receptacles,

are authorized for the carriage of any liquid or solid substance other than explosives, thermally unstable substances, organic peroxides, self-reactive substances, substances where significant pressure may develop by evolution of chemical reaction and radioactive material (unless permitted in 4.1.9).

This sub-section is not applicable to the substances mentioned in 4.1.4.1, packing instruction P200, table 3.

4.1.3.6.2 Every design type of pressure receptacle shall be approved by the competent authority of the country of manufacture or as indicated in Chapter 6.2.

4.1.3.6.3 Unless otherwise indicated, pressure receptacles having a minimum test pressure of 0.6 MPa shall be used.

4.1.3.6.4 Unless otherwise indicated, pressure receptacles may be provided with an emergency pressure relief device designed to avoid bursting in case of overfill or fire accidents.

Pressure receptacle valves shall be designed and constructed in such a way that they are inherently able to withstand damage without release of the contents or shall be protected from damage which could cause inadvertent release of the contents of the pressure receptacle, by one of the methods as given in 4.1.6.8 (a) to (e).

4.1.3.6.5 The level of filling shall not exceed 95 % of the capacity of the pressure receptacle at 50 °C. Sufficient ullage (outage) shall be left to ensure that the pressure receptacle will not be liquid full at a temperature of 55 °C.

4.1.3.6.6 Unless otherwise indicated pressure receptacles shall be subjected to a periodic inspection and test every 5 years. The periodic inspection shall include an external examination, an internal examination or alternative method as approved by the competent authority, a pressure test or equivalent effective non-destructive testing with the agreement of the competent authority including an inspection of all accessories (e.g. tightness of valves, emergency relief valves or fusible elements). Pressure receptacles shall not be filled after they become due for periodic inspection and test but may be carried after the expiry of the time limit. Pressure receptacle repairs shall meet the requirements of 4.1.6.11.

4.1.3.6.7 Prior to filling, the packer shall perform an inspection of the pressure receptacle and ensure that the pressure receptacle is authorized for the substances to be carried and that the requirements of this Code have been met. Shut-off valves shall be closed after filling and remain closed during carriage. The consignor shall verify that the closures and equipment are not leaking.

4.1.3.6.8 Refillable pressure receptacles shall not be filled with a substance different from that previously contained unless the necessary operations for change of service have been performed.

4.1.3.6.9 Marking of pressure receptacles for liquids and solids according to 4.1.3.6 (not conforming to the requirements of Chapter 6.2) shall be in accordance with the requirements of the competent authority of the country of manufacturing.

4.1.3.7 Packagings or IBCs not specifically authorized in the applicable packing instruction shall not be used for the carriage of a substance or article unless specifically allowed under a temporary determination issued by the relevant competent authorities and provided:

(a) the alternative packaging complies with the general requirements of this Part;

(b) when the packing instruction indicated in the Dangerous Goods List so specifies, the alternative packaging meets the requirements of Part 6;

(c) the competent authority determines that the alternative packaging provides at least the same level of safety as if the substance were packed in accordance with a method specified in the particular packing instruction indicated in the Dangerous Goods List; and

(d) a copy of the competent authority determination accompanies each consignment or the transport document includes all information required under the determination.

NOTE: *The competent authorities making such determinations should take action to amend this Code to include the provisions covered by the determination as appropriate.*

4.1.3.8 Unpackaged articles other than Class 1 articles

4.1.3.8.1 Where large and robust articles cannot be packaged in accordance with the requirements of Chapters 6.1 or 6.6 and they have to be carried empty, uncleaned and unpackaged, the competent authority may approve such carriage. In doing so the competent authority shall take into account that:

(a) Large and robust articles shall be strong enough to withstand the shocks and loadings normally encountered during carriage including trans-shipment between cargo transport units and between cargo transport units and warehouses, as well as any removal from a pallet for subsequent manual or mechanical handling;

(b) All closures and openings shall be sealed so that there can be no loss of contents which might be caused under normal conditions of carriage, by vibration, or by changes in temperature, humidity or pressure (resulting from altitude, for example). No dangerous residue shall adhere to the outside of the large and robust articles;

(c) Parts of large and robust articles, which are in direct contact with dangerous goods:

(i) shall not be affected or significantly weakened by those dangerous goods; and

(ii) shall not cause a dangerous effect e.g. catalysing a reaction or reacting with the dangerous goods;

(d) Large and robust articles containing liquids shall be stowed and secured to ensure that neither leakage nor permanent distortion of the article occurs during carriage;

(e) They shall be fixed in cradles or crates or other handling devices or to the cargo transport unit in such a way that they will not become loose during normal conditions of carriage.

4.1.3.8.2 Unpackaged articles approved by the competent authority in accordance with the provisions of 4.1.3.8.1 shall be subject to the consignment procedures of Part 5. In addition the consignor of such articles shall ensure that a copy of any such approval is attached to the transport document.

NOTE: *A large and robust article may include flexible fuel containment systems, military equipment, machinery or equipment containing dangerous goods above the limited quantities according to 3.4.1.*

4.1.4 ***List of packing instructions***

NOTE: *Although the following packing instructions use the same numbering system as used in the IMDG Code and the UN Model Regulations, readers should be aware that some of the details may be different in the case of this Code.*

4.1.4.1 ***Packing instructions concerning the use of packagings (except IBCs and large packagings)***

P001	**PACKING INSTRUCTION (LIQUIDS)**			**P001**
The following packagings are authorized provided the general provisions of **4.1.1** and **4.1.3** are met:				
Combination packagings:		**Maximum capacity/Net mass (see 4.1.3.3)**		
Inner packagings	**Outer packagings**	**Packing group I**	**Packing group II**	**Packing group III**
	Drums			
Glass 10 *l*	steel (1A1, 1A2)	250 kg	400 kg	400 kg
Plastics 30 *l*	aluminium (1B1, 1B2)	250 kg	400 kg	400 kg
Metal 40 *l*	other metal (1N1, 1N2)	250 kg	400 kg	400 kg
	plastics (1H1, 1H2)	250 kg	400 kg	400 kg
	plywood (1D)	150 kg	400 kg	400 kg
	fibre (1G)	75 kg	400 kg	400 kg
	Boxes			
	steel (4A)	250 kg	400 kg	400 kg
	aluminium (4B)	250 kg	400 kg	400 kg
	other metal (4N)	250 kg	400 kg	400 kg
	natural wood (4C1, 4C2)	150 kg	400 kg	400 kg
	plywood (4D)	150 kg	400 kg	400 kg
	reconstituted wood (4F)	75 kg	400 kg	400 kg
	fibreboard (4G)	75 kg	400 kg	400 kg
	expanded plastics (4H1)	60 kg	60 kg	60 kg
	solid plastics (4H2)	150 kg	400 kg	400 kg
	Jerricans			
	steel (3A1, 3A2)	120 kg	120 kg	120 kg
	aluminium (3B1, 3B2)	120 kg	120 kg	120 kg
	plastics (3H1, 3H2)	120 kg	120 kg	120 kg
Single packagings:				
Drums				
steel, non-removable head (1A1)		250 *l*	450 *l*	450 *l*
steel, removable head (1A2)		250 *l* [a]	450 *l*	450 *l*
aluminium, non-removable head (1B1)		250 *l*	450 *l*	450 *l*
aluminium, removable head (1B2)		250 *l* [a]	450 *l*	450 *l*
metal other than steel or aluminium, non-removable head (1N1)		250 *l*	450 *l*	450 *l*
metal other than steel or aluminium, removable head (1N2)		250 *l* [a]	450 *l*	450 *l*
plastics, non-removable head (1H1)		250 *l*	450 *l*	450 *l*
plastics, removable head (1H2)		250 *l* [a]	450 *l*	450 *l*
Jerricans				
steel, non-removable head (3A1)		60 *l*	60 *l*	60 *l*
steel, removable head (3A2)		60 *l* [a]	60 *l*	60 *l*
aluminium, non-removable head (3B1)		60 *l*	60 *l*	60 *l*
aluminium, removable head (3B2)		60 *l* [a]	60 *l*	60 *l*
plastics, non-removable head (3H1)		60 *l*	60 *l*	60 *l*
plastics, removable head (3H2)		60 *l* [a]	60 *l*	60 *l*

[a] *Only substances with a viscosity of more than 2 680 mm²/s are authorized.*

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P001	PACKING INSTRUCTION (LIQUIDS) *(cont'd)*		P001
Single packagings *(cont'd)*	**Maximum capacity/Net mass (see 4.1.3.3)**		
Composite packagings	**Packing group I**	**Packing group II**	**Packing group III**
plastics receptacle with outer steel, aluminium or plastics drum (6HA1, 6HB1, 6HH1)	250 *l*	250 *l*	250 *l*
plastics receptacle with outer fibre or plywood drum (6HG1, 6HD1)	120 *l*	250 *l*	250 *l*
plastics receptacle with outer steel or aluminium crate or box or plastics receptacle with outer wooden, plywood, fibreboard or solid plastics box (6HA2, 6HB2, 6HC, 6HD2, 6HG2 or 6HH2)	60 *l*	60 *l*	60 *l*
glass receptacle with outer steel, aluminium, fibreboard, plywood, expanded plastics or solid plastics drum (6PA1, 6PB1, 6PG1, 6PD1, 6PH1 or 6PH2) or with outer steel or aluminium crate or box or with outer wooden or fibreboard box or with outer wickerwork hamper (6PA2, 6PB2, 6PC, 6PG2 or 6PD2)	60 *l*	60 *l*	60 *l*

Pressure receptacles, provided that the general provisions of 4.1.3.6 are met.

Additional requirement:

For substances of Class 3, packing group III, which give off small quantities of carbon dioxide or nitrogen, the packagings shall be vented.

Special packing provisions:

PP1 For UN Nos. 1133, 1210, 1263 and 1866 and for adhesives, printing inks, printing ink related materials, paints, paint related materials and resin solutions which are assigned to UN 3082, metal or plastics packagings for substances of packing groups II and III in quantities of 5 litres or less per packaging are not required to meet the performance tests in Chapter 6.1 when carried:

(a) in palletized loads, a pallet box or unit load device, e.g. individual packagings placed or stacked and secured by strapping, shrink or stretch-wrapping or other suitable means to a pallet; or

(b) as inner packagings of combination packagings with a maximum net mass of 40 kg.

PP2 For UN 3065, wooden barrels with a maximum capacity of 250 litres and which do not meet the provisions of Chapter 6.1 may be used.

PP4 For UN No. 1774, packagings shall meet the packing group II performance level.

PP5 For UN No. 1204, packagings shall be so constructed that explosion is not possible by reason of increased internal pressure. Cylinders, tubes and pressure drums shall not be used for these substances.

PP6 *(Deleted)*

PP10 For UN No. 1791, packing group II, the packaging shall be vented.

PP31 For UN No. 1131, packagings shall be hermetically sealed.

PP33 For UN No. 1308, packing groups I and II, only combination packagings with a maximum gross mass of 75 kg allowed.

PP81 For UN No. 1790 with more than 60 % but not more than 85 % hydrogen fluoride and UN No. 2031 with more than 55 % nitric acid, the permitted use of plastics drums and jerricans as single packagings shall be two years from their date of manufacture.

PP93 For UN Nos. 3532 and 3534, packagings shall be designed and constructed to permit the release of gas or vapour to prevent a build-up of pressure that could rupture the packagings in the event of loss of stabilization.

Special packing provisions specific to this Code:

RR2 For UN No. 1261, removable head packagings are not permitted.

P002	PACKING INSTRUCTION (SOLIDS)			P002
The following packagings are authorized provided the general provisions of **4.1.1** and **4.1.3** are met:				
Combination packagings:		**Maximum net mass (see 4.1.3.3)**		
Inner packagings	**Outer packagings**	**Packing group I**	**Packing group II**	**Packing group III**
Glass 10 kg Plastics [a] 50 kg Metal 50 kg Paper [a, b, c] 50 kg Fibre [a, b, c] 50 kg	**Drums**			
	steel (1A1, 1A2)	400 kg	400 kg	400 kg
	aluminium (1B1, 1B2)	400 kg	400 kg	400 kg
	other metal (1N1, 1N2)	400 kg	400 kg	400 kg
	plastics (1H1, 1H2)	400 kg	400 kg	400 kg
	plywood (1D)	400 kg	400 kg	400 kg
	fibre (1G)	400 kg	400 kg	400 kg
	Boxes			
	steel (4A)	400 kg	400 kg	400 kg
	aluminium (4B)	400 kg	400 kg	400 kg
	other metal (4N)	400 kg	400 kg	400 kg
	natural wood (4C1)	250 kg	400 kg	400 kg
	natural wood with sift proof walls (4C2)	250 kg	400 kg	400 kg
	plywood (4D)	250 kg	400 kg	400 kg
	reconstituted wood (4F)	125 kg	400 kg	400 kg
	fibreboard (4G)	125 kg	400 kg	400 kg
	expanded plastics (4H1)	60 kg	60 kg	60 kg
	solid plastics (4H2)	250 kg	400 kg	400 kg
	Jerricans			
	steel (3A1, 3A2)	120 kg	120 kg	120 kg
	aluminium (3B1, 3B2)	120 kg	120 kg	120 kg
	plastics (3H1, 3H2)	120 kg	120 kg	120 kg
Single packagings:				
Drums				
steel (1A1 or 1A2 [d])		400 kg	400 kg	400 kg
aluminium (1B1 or 1B2 [d])		400 kg	400 kg	400 kg
metal, other than steel or aluminium (1N1 or 1N2 [d])		400 kg	400 kg	400 kg
plastics (1H1 or 1H2 [d])		400 kg	400 kg	400 kg
fibre (1G) [e]		400 kg	400 kg	400 kg
plywood (1D) [e]		400 kg	400 kg	400 kg
Jerricans				
steel (3A1 or 3A2 [d])		120 kg	120 kg	120 kg
aluminium (3B1 or 3B2 [d])		120 kg	120 kg	120 kg
plastics (3H1 or 3H2 [d])		120 kg	120 kg	120 kg

[a] *These inner packagings shall be sift-proof.*

[b] *These inner packagings shall not be used when the substances being carried may become liquid during carriage (see 4.1.3.4).*

[c] *These inner packagings shall not be used for substances of packing group I.*

[d] *These packagings shall not be used for substances of packing group I that may become liquid during carriage (see 4.1.3.4).*

[e] *These packagings shall not be used when substances being carried may become liquid during carriage (see 4.1.3.4).*

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P002	PACKING INSTRUCTION (SOLIDS) *(cont'd)*		P002
	Maximum net mass (see 4.1.3.3)		
Single packagings *(cont'd)*:	**Packing group I**	**Packing group II**	**Packing group III**
Boxes			
steel (4A) [e]	Not allowed	400 kg	400 kg
aluminium (4B) [e]	Not allowed	400 kg	400 kg
other metal (4N) [e]	Not allowed	400 kg	400 kg
natural wood (4C1) [e]	Not allowed	400 kg	400 kg
plywood (4D) [e]	Not allowed	400 kg	400 kg
reconstituted wood (4F) [e]	Not allowed	400 kg	400 kg
natural wood with sift-proof walls (4C2) [e]	Not allowed	400 kg	400 kg
fibreboard (4G) [e]	Not allowed	400 kg	400 kg
solid plastics (4H2) [e]	Not allowed	400 kg	400 kg
Bags			
bags (5H3, 5H4, 5L3, 5M2) [e]	Not allowed	50 kg	50 kg
Composite packagings			
plastics receptacle with outer steel, aluminium, plywood, fibre or plastics drum (6HA1, 6HB1, 6HG1 [e] , 6HD1 [e], or 6HH1)	400 kg	400 kg	400 kg
plastics receptacle with outer steel or aluminium crate or box, wooden box, plywood box, fibreboard box or solid plastics box (6HA2, 6HB2, 6HC, 6HD2 [e], 6HG2 [e] or 6HH2)	75 kg	75 kg	75 kg
glass receptacle with outer steel, aluminium plywood or fibre drum (6PA1, 6PB1, 6PD1 [e] or 6PG1 [e]) or with outer steel or aluminium crate or box or with outer wooden, or fibreboard box or with outer wickerwork hamper (6PA2, 6PB2, 6PC, 6PD2 [e], or 6PG2[e]) or with outer expanded plastics or solid plastics packaging (6PH1 or 6PH2 [e])	75 kg	75 kg	75 kg
Pressure receptacles, provided that the general provisions of 4.1.3.6 are met.			

[e] *These packagings shall not be used when the substances being carried may become liquid during carriage (see 4.1.3.4).*

(Cont'd on next page)

Special packing provisions:

PP6 *(Deleted)*

PP7 For UN No. 2000, celluloid may also be transported unpacked on pallets, wrapped in plastic film and secured by appropriate means, such as steel bands as a full load in closed vehicles, closed wagons or closed containers. Each pallet shall not exceed 1 000 kg.

PP8 For UN No. 2002, packagings shall be so constructed that explosion is not possible by reason of increased internal pressure. Cylinders, tubes and pressure drums shall not be used for these substances.

PP9 For UN Nos. 3175, 3243 and 3244, packagings shall conform to a design type that has passed a leakproofness test at the packing group II performance level. For UN No. 3175, the leakproofness test is not required when the liquids are fully absorbed in solid material contained in sealed bags.

PP11 For UN No. 1309, packing group III, and UN No. 1362, 5H1, 5L1 and 5M1 bags are allowed if they are overpacked in plastic bags and are wrapped in shrink or stretch wrap on pallets.

PP12 For UN Nos. 1361, 2213 and UN No. 3077, 5H1, 5L1 and 5M1 bags are allowed when carried in closed vehicles, closed wagons or closed containers.

PP13 For articles classified under UN No. 2870, only combination packagings meeting the packing group I performance level are authorized.

PP14 For UN Nos. 2211, 2698 and 3314, packagings are not required to meet the performance tests in Chapter 6.1.

PP15 For UN Nos. 1324 and 2623, packagings shall meet the packing group III performance level.

PP20 For UN No. 2217, any sift-proof, tearproof receptacle may be used.

PP30 For UN No. 2471, paper or fibre inner packagings are not permitted.

PP34 For UN No. 2969 (as whole beans), 5H1, 5L1 and 5M1 bags are permitted.

PP37 For UN Nos. 2590 and 2212, 5M1 bags are permitted. All bags of any type shall be carried in closed vehicles, closed wagons or closed containers or be placed in closed rigid overpacks.

PP38 For UN No. 1309, packing group II, bags are permitted only in closed vehicles, closed wagons or closed containers.

PP84 For UN No. 1057, rigid outer packagings meeting the packing group II performance level shall be used. The packagings shall be designed and constructed and arranged to prevent movement, inadvertent ignition of the devices or inadvertent release of flammable gas or liquid.

NOTE: *For waste lighters collected separately see Chapter 3.3, special provision 654.*

PP85 For UN Nos. 1748, 2208, 2880, 3485, 3486 and 3487, if bags are used as single packagings they should be adequately separated to allow dissipation of heat.

PP92 For UN Nos. 3531 and 3533, packagings shall be designed and constructed to permit the release of gas or vapour to prevent a build-up of pressure that could rupture the packagings in the event of loss of stabilization.

Special packing provision specific to this Code:

RR5 Notwithstanding special packing provision PP84, only the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.5 to 4.1.1.7 need be complied with if the gross mass of the package is not more than 10 kg.

NOTE: *For waste lighters collected separately see Chapter 3.3, special provision 654.*

P003	PACKING INSTRUCTION	P003

Dangerous goods shall be placed in suitable outer packagings. The packagings shall meet the provisions of **4.1.1.1, 4.1.1.2, 4.1.1.4, 4.1.1.8** and **4.1.3** and be so designed that they meet the construction requirements of 6.1.4. Outer packagings constructed of suitable material, and of adequate strength and design in relation to the packaging capacity and its intended use, shall be used. Where this packing instruction is used for the transport of articles or inner packagings of combination packagings, the packaging shall be designed and constructed to prevent inadvertent discharge of articles during normal conditions of carriage.

Special packing provisions:

PP16 For UN No. 2800, batteries shall be protected from short circuits and shall be securely packed in strong outer packagings.

NOTE 1: *Non-spillable batteries which are an integral part of, and necessary for, the operation of mechanical or electronic equipment shall be securely fastened in the battery holder on the equipment and protected in such a manner as to prevent damage and short circuits.*

NOTE 2: *For used batteries (UN 2800), see P801.*

PP17 For UN No. 2037, packages shall not exceed 55 kg net mass for fibreboard packagings or 125 kg net mass for other packagings.

PP19 For UN Nos. 1364 and 1365, carriage as bales is authorized.

PP20 For UN Nos. 1363, 1386, 1408 and 2793 any sift-proof, tearproof receptacle may be used.

PP32 UN Nos. 2857 and 3358 and robust articles consigned under UN No. 3164 may be carried unpackaged, in crates or in appropriate overpacks.

NOTE: *The packagings authorized may exceed a net mass of 400 kg (see 4.1.3.3).*

PP87 *(Deleted)*

PP88 *(Deleted)*

PP90 For UN No. 3506, sealed inner liners or bags of strong leakproof and puncture resistant material impervious to mercury which will prevent escape of the substance from the package irrespective of the position or the orientation of the package shall be used.

PP91 For UN 1044, large fire extinguishers may also be carried unpackaged provided that the requirements of 4.1.3.8.1 (a) to (e) are met, the valves are protected by one of the methods in accordance with 4.1.6.8 (a) to (d) and other equipment mounted on the fire extinguisher is protected to prevent accidental activation. For the purpose of this special packing provision, "large fire extinguishers" means fire extinguishers as described in indents (c) to (e) of special provision 225 of Chapter 3.3.

PP96 For UN No. 2037 waste gas cartridges carried in accordance with special provision 327 of Chapter 3.3, the packagings shall be adequately ventilated to prevent the creation of dangerous atmospheres and the build-up of pressure.

Special packing provisions specific to this Code:

RR6 For UN No. 2037 in the case of carriage by full load, metal articles may also be packed as follows: the articles shall be grouped together in units on trays and held in position with an appropriate plastics cover; these units shall be stacked and suitably secured on pallets.

RR9 For UN 3509, packagings are not required to meet the requirements of 4.1.1.3.

Packagings meeting the requirements of 6.1.4, made leak tight or fitted with a leak tight and puncture resistant sealed liner or bag, shall be used.

When the only residues contained are solids which are not liable to become liquid at temperatures likely to be encountered during carriage, flexible packagings may be used.

When liquid residues are present, rigid packagings that provide a means of retention (e.g. absorbent material) shall be used.

Before being filled and handed over for carriage, every packaging shall be inspected to ensure that it is free from corrosion, contamination or other damage. Any packaging showing signs of reduced strength shall no longer be used (minor dents and scratches are not considered as reducing the strength of the packaging).

Packagings intended for the carriage of packagings, discarded, empty, uncleaned with residues of Class 5.1 shall be so constructed or adapted that the goods cannot come into contact with wood or any other combustible material.

P004	PACKING INSTRUCTION	P004

This instruction applies to UN Nos. 3473, 3476, 3477, 3478 and 3479.

The following packagings are authorized:

(1) For fuel cell cartridges, provided that the general provisions of **4.1.1.1, 4.1.1.2, 4.1.1.3, 4.1.1.6** and **4.1.3** are met:
Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G);
Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);
Jerricans (3A2, 3B2, 3H2).
Packagings shall conform to the packing group II performance level.

(2) For fuel cell cartridges packed with equipment: strong outer packagings which meet the general provisions of **4.1.1.1, 4.1.1.2, 4.1.1.6** and **4.1.3**.

When fuel cell cartridges are packed with equipment, they shall be packed in inner packagings or placed in the outer packaging with cushioning material or divider(s) so that the fuel cell cartridges are protected against damage that may be caused by the movement or placement of the contents within the outer packaging.

The equipment shall be secured against movement within the outer packaging.

For the purpose of this packing instruction, "equipment" means apparatus requiring the fuel cell cartridges with which it is packed for its operation.

(3) For fuel cell cartridges contained in equipment: strong outer packagings which meet the general provisions of **4.1.1.1, 4.1.1.2, 4.1.1.6** and **4.1.3**.

Large robust equipment (see 4.1.3.8) containing fuel cell cartridges may be carried unpackaged. For fuel cell cartridges contained in equipment, the entire system shall be protected against short circuit and inadvertent operation.

NOTE: *The packagings authorized in (2) and (3) may exceed a net mass of 400 kg (see 4.1.3.3).*

P005	PACKING INSTRUCTION	P005

This instruction applies to UN Nos. 3528, 3529 and 3530.

If the engine or machinery is constructed and designed so that the means of containment containing the dangerous goods affords adequate protection, an outer packaging is not required.

Dangerous goods in engines or machinery shall otherwise be packed in outer packagings constructed of suitable material, and of adequate strength and design in relation to the packaging capacity and its intended use, and meeting the applicable requirements of 4.1.1.1, or they shall be fixed in such a way that they will not become loose during normal conditions of carriage, e.g. in cradles or crates or other handling devices.

NOTE: *The packagings authorized may exceed a net mass of 400 kg (see 4.1.3.3).*

In addition, the manner in which means of containment are contained within the engine or machinery, shall be such that under normal conditions of carriage, damage to the means of containment containing the dangerous goods is prevented; and in the event of damage to the means of containment containing liquid dangerous goods, no leakage of the dangerous goods from the engine or machinery is possible (a leakproof liner may be used to satisfy this requirement).

Means of containment containing dangerous goods shall be so installed, secured or cushioned as to prevent their breakage or leakage and so as to control their movement within the engine or machinery during normal conditions of carriage. Cushioning material shall not react dangerously with the content of the means of containment. Any leakage of the contents shall not substantially impair the protective properties of the cushioning material.

Additional requirement:

Other dangerous goods (e.g. batteries, fire extinguishers, compressed gas accumulators or safety devices) required for the functioning or safe operation of the engine or machinery shall be securely mounted in the engine or machine.

P006	PACKING INSTRUCTION	P006

This instruction applies to UN Nos. 3537 to 3548.

(1) The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G);

Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);

Jerricans (3A2, 3B2, 3H2)

Packagings shall conform to the packing group II performance level.

(2) In addition, for robust articles the following packagings are authorized:

Strong outer packagings constructed of suitable material and of adequate strength and design in relation to the packaging capacity and its intended use. The packagings shall meet the provisions of 4.1.1.1, 4.1.1.2, 4.1.1.8 and 4.1.3 in order to achieve a level of protection that is at least equivalent to that provided by Chapter 6.1. Articles may be carried unpackaged or on pallets when the dangerous goods are afforded equivalent protection by the article in which they are contained.

NOTE: *The packagings authorized may exceed a net mass of 400 kg (see 4.1.3.3).*

(3) Additionally, the following conditions shall be met:

(a) Receptacles within articles containing liquids or solids shall be constructed of suitable materials and secured in the article in such a way that, under normal conditions of carriage, they cannot break, be punctured or leak their contents into the article itself or the outer packaging;

(b) Receptacles containing liquids with closures shall be packed with their closures correctly oriented. The receptacles shall in addition conform to the internal pressure test provisions of 6.1.5.5;

(c) Receptacles that are liable to break or be punctured easily, such as those made of glass, porcelain or stoneware or of certain plastics materials shall be properly secured. Any leakage of the contents shall not substantially impair the protective properties of the article or of the outer packaging;

(d) Receptacles within articles containing gases shall meet the requirements of Section 4.1.6 and Chapter 6.2 as appropriate or be capable of providing an equivalent level of protection as packing instructions P200 or P208;

(e) Where there is no receptacle within the article, the article shall fully enclose the dangerous substances and prevent their release under normal conditions of carriage.

(4) Articles shall be packed to prevent movement and inadvertent operation during normal conditions of carriage.

P010	PACKING INSTRUCTION	P010
The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:		
Combination packagings		
Inner packagings	**Outer packagings**	**Maximum net mass (see 4.1.3.3)**
Glass 1 *l* Steel 40 *l*	**Drums** steel (1A1, 1A2) plastics (1H1, 1H2) plywood (1D) fibre (1G) **Boxes** steel (4A) natural wood (4C1, 4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) expanded plastics (4H1) solid plastics (4H2)	 400 kg 400 kg 400 kg 400 kg 400 kg 400 kg 400 kg 400 kg 400 kg 60 kg 400 kg
Single packagings		**Maximum capacity (see 4.1.3.3)**
Drums steel, non-removable head (1A1) **Jerricans** steel, non-removable head (3A1) **Composite packagings** plastics receptacle in steel drums (6HA1)		 450 *l* 60 *l* 250 *l*
Steel pressure receptacles, provided that the general provisions of 4.1.3.6 are met.		

P099	PACKING INSTRUCTION	P099
Only packagings which are approved for these goods by the competent authority may be used. A copy of the competent authority approval shall accompany each consignment or the transport document shall include an indication that the packaging was approved by the competent authority.		

P101	PACKING INSTRUCTION	P101
Only packagings which are approved by the competent authority of the country of origin may be used. The distinguishing sign used on vehicles in international road traffic[a] of the country for which the authority acts, shall be marked on the transport documents as follows: "**Packaging approved by the competent authority of...**" (see 5.4.1.2.1 (e))		

[a] *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*

P110(a)	PACKING INSTRUCTION	P110(a)

The following packagings are authorized, provided that the general packing provisions of **4.1.1**, **4.1.3** and special packing provisions of **4.1.5** are met:

Explosives of Division 1.1A shall only be transported with the approval of the Competent Authority

Inner packagings	Intermediate packagings	Outer packagings
Bags plastics textile, plastic coated or lined rubber textile, rubberised textile **Receptacles** wood	**Bags** plastics textile, plastic coated or lined rubber textile, rubberized **Receptacles** plastics metal wood	**Drums** steel (1A1, 1A2) metal, other than steel or aluminium (1N1, 1N2) plastics (1H1, 1H2)

Additional requirements:

1. The intermediate packagings shall be filled with water saturated material such as an anti-freeze solution or wetted cushioning.
2. Outer packagings shall be filled with water saturated material such as an anti-freeze solution or wetted cushioning. Outer packagings shall be constructed and sealed to prevent evaporation of the wetting solution, except for UN 0224 when carried dry.

P110(b)	PACKING INSTRUCTION	P110(b)

The following packagings are authorized, provided the general packing provisions of **4.1.1**, **4.1.3** and special packing provisions of **4.1.5** are met:

Explosives of Division 1.1A shall only be transported with the approval of the Competent Authority

Inner packagings	Intermediate packagings	Outer packagings
Receptacles metal wood rubber, conductive plastics, conductive **Bags** rubber, conductive plastics, conductive	**Dividing partitions** metal wood plastics fibreboard	**Boxes** natural wood, sift-proof wall (4C2) plywood (4D) reconstituted wood (4F)

Special packing provision:

PP42 For UN Nos. 0074, 0113, 0114, 0129, 0130, 0135 and 0224, the following conditions shall be met:

(a) Inner packagings shall not contain more than 50 g of explosive substance (quantity corresponding to dry substance);

(b) Compartments between dividing partitions shall not contain more than one inner packaging, firmly fitted; and

(c) The outer packaging may be partitioned into up to 25 compartments.

P111	PACKING INSTRUCTION	P111

The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:

Inner packagings	Intermediate packagings	Outer packagings

Bags paper, waterproofed plastics textile, rubberized **Receptacles** wood **Sheets** plastics textile, rubberized	Not necessary	**Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary (4C1) natural wood, sift-proof (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, expanded (4H1) plastics, solid (4H2) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plywood (1D) fibre (1G) plastics (1H1, 1H2)

Special packing provision:

PP43 For UN 0159, inner packagings are not required when metal (1A1, 1A2, 1B1, 1B2, 1N1 or 1N2) or plastics (1H1 or 1H2) drums are used as outer packagings.

P112(a) **PACKING INSTRUCTION (Solid wetted, 1.1D)** **P112(a)**

The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:

Inner packagings	Intermediate packagings	Outer packagings
Bags paper, multiwall, water resistant plastics textile textile, rubberized woven plastics **Receptacles** metal plastics wood	**Bags** plastics textile, plastic coated or lined **Receptacles** metal plastics wood	**Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary (4C1) natural wood, sift-proof (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, expanded (4H1) plastics, solid (4H2) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plywood (1D) fibre (1G) plastics (1H1, 1H2)

Additional requirement:

Intermediate packagings are not required if leakproof removable head drums are used as the outer packaging.

Special packing provisions:

PP26 For UN Nos. 0004, 0076, 0078, 0154, 0219 and 0394, packagings shall be lead free.

PP45 For UN Nos. 0072 and 0226, intermediate packagings are not required.

P112(b)	PACKING INSTRUCTION (Solid dry, other than powder 1.1D)	P112(b)

The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:

Inner packagings	Intermediate packagings	Outer packagings
Bags paper, kraft paper, multiwall, water resistant plastics textile textile, rubberized woven plastics	**Bags** (for UN No. 0150 only) plastics textile, plastic coated or lined	**Bags** woven plastics, sift-proof (5H2) woven plastics, water-resistant (5H3) plastics, film (5H4) textile, sift-proof (5L2) textile, water resistant (5L3) paper, multiwall, water resistant (5M2) **Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary (4C1) natural wood, sift-proof (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, expanded (4H1) plastics, solid (4H2) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plywood (1D) fibre (1G) plastics (1H1, 1H2)

Special packing provisions:

PP26 For UN Nos. 0004, 0076, 0078, 0154, 0216, 0219 and 0386, packagings shall be lead free.

PP46 For UN Nos. 0209, bags, sift-proof (5H2) are recommended for flake or prilled TNT in the dry state and a maximum net mass of 30 kg.

PP47 For UN No. 0222, inner packagings are not required when the outer packaging is a bag.

P112(c)	PACKING INSTRUCTION (Solid dry powder 1.1D)	P112(c)

The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:

Inner packagings	Intermediate packagings	Outer packagings
Bags paper, multiwall, water resistant plastics woven plastics **Receptacles** fibreboard metal plastics wood	**Bags** paper, multiwall, water resistant with inner lining plastics **Receptacles** metal plastics wood	**Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary (4C1) natural wood, sift-proof (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, solid (4H2) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plywood (1D) fibre (1G) plastics (1H1, 1H2)

Additional requirements:

1. Inner packagings are not required if drums are used as the outer packaging.
2. The packaging shall be sift-proof.

Special packing provisions:

PP26 For UN Nos. 0004, 0076, 0078, 0154, 0216, 0219 and 0386, packagings shall be lead free.

PP46 For UN No. 0209, bags, sift-proof (5H2) are recommended for flake or prilled TNT in the dry state and a maximum net mass of 30 kg.

PP48 For UN No. 0504, metal packagings shall not be used. Packagings of other material with a small amount of metal, for example metal closures or other metal fittings such as those mentioned in 6.1.4, are not considered metal packagings.

P113	PACKING INSTRUCTION	P113

The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:

Inner packagings	Intermediate packagings	Outer packagings
Bags paper plastics textile, rubberized **Receptacles** fibreboard metal plastics wood	Not necessary	**Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary (4C1) natural wood, sift-proof walls (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, solid (4H2) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plywood (1D) fibre (1G) plastics (1H1, 1H2)

Additional requirement:

The packaging shall be sift-proof.

Special packing provisions:

PP49 For UN Nos. 0094 and 0305, no more than 50 g of substance shall be packed in an inner packaging.

PP50 For UN No. 0027, inner packagings are not necessary when drums are used as outer packagings.

PP51 For UN No. 0028, paper kraft or waxed paper sheets may be used as inner packagings.

P114(a)	PACKING INSTRUCTION (Solid wetted)	P114(a)

The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:

Inner packagings	Intermediate packagings	Outer packagings
Bags plastics textile woven plastics **Receptacles** metal plastics wood	**Bags** plastics textile, plastic coated or lined **Receptacles** metal plastics **Dividing partitions** wood	**Boxes** steel (4A) metal, other than steel or aluminium (4N) natural wood, ordinary (4C1) natural wood, sift-proof walls (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, solid (4H2) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) Plywood (1D) fibre (1G) plastics (1H1, 1H2)

Additional requirement:

Intermediate packagings are not required if leakproof removable head drums are used as outer packagings.

Special packing provisions:

PP26 For UN Nos. 0077, 0132, 0234, 0235 and 0236, packagings shall be lead free.

PP43 For UN 0342, inner packagings are not required when metal (1A1, 1A2, 1B1, 1B2, 1N1 or 1N2) or plastics (1H1 or 1H2) drums are used as outer packagings.

P114(b)	PACKING INSTRUCTION (Solid dry)	P114(b)

The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:

Inner packagings	Intermediate packagings	Outer packagings
Bags paper, kraft plastics textile, sift-proof woven plastics, sift-proof **Receptacles** fibreboard metal paper plastics woven plastics, sift-proof wood	Not necessary	**Boxes** natural wood, ordinary (4C1) natural wood, sift-proof walls (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plywood (1D) fibre (1G) plastics (1H1, 1H2)

Special packing provisions:

PP26 For UN Nos. 0077, 0132, 0234, 0235 and 0236, packagings shall be lead free.

PP48 For UN Nos. 0508 and 0509, metal packagings shall not be used. Packagings of other material with a small amount of metal, for example metal closures or other metal fittings such as those mentioned in 6.1.4, are not considered metal packagings.

PP50 For UN Nos. 0160, 0161 and 0508, inner packagings are not necessary if drums are used as outer packagings.

PP52 For UN Nos. 0160 and 0161, when metal drums (1A1, 1A2, 1B1, 1B2, 1N1 or 1N2) are used as outer packagings, metal packagings shall be so constructed that the risk of explosion, by reason of increased internal pressure from internal or external causes is prevented.

P115	PACKING INSTRUCTION	P115

The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:

Inner packagings	Intermediate packagings	Outer packagings
Receptacles plastics wood	**Bags** plastics in metal receptacles **Drums** metal **Receptacles** wood	**Box**es natural wood, ordinary (4C1) natural wood, sift-proof walls (4C2) plywood (4D) reconstituted wood (4F) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plywood (1D) fibre (1G) plastics (1H1, 1H2)

Special packing provisions:

PP45 For UN No. 0144, intermediate packagings are not required.

PP53 For UN Nos. 0075, 0143, 0495 and 0497, when boxes are used as outer packagings, inner packagings shall have taped screw cap closures and be not more than 5 litres capacity each. Inner packagings shall be surrounded with non-combustible absorbent cushioning materials. The amount of absorbent cushioning material shall be sufficient to absorb the liquid contents. Metal receptacles shall be cushioned from each other. Net mass of propellant is limited to 30 kg for each package when outer packagings are boxes.

PP54 For UN Nos. 0075, 0143, 0495 and 0497, when drums are used as outer packagings and when intermediate packagings are drums, they shall be surrounded with non-combustible cushioning material in a quantity sufficient to absorb the liquid contents. A composite packaging consisting of a plastics receptacle in a metal drum may be used instead of the inner and intermediate packagings. The net volume of propellant in each package shall not exceed 120 litres.

PP55 For UN No. 0144, absorbent cushioning material shall be inserted.

PP56 For UN No. 0144, metal receptacles may be used as inner packagings.

PP57 For UN Nos. 0075, 0143, 0495 and 0497, bags shall be used as intermediate packagings when boxes are used as outer packagings.

PP58 For UN Nos. 0075, 0143, 0495 and 0497, drums shall be used as intermediate packagings when drums are used as outer packagings.

PP59 For UN No. 0144, fibreboard boxes (4G) may be used as outer packagings.

PP60 For UN No. 0144, aluminium drums (1B1 and 1B2) and metal, other than steel or aluminium, drums (1N1 and 1N2) shall not be used.

P116	PACKING INSTRUCTION	P116

The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:

Inner packagings	Intermediate packagings	Outer packagings
Bags paper, water and oil resistant plastics textile, plastic coated or lined woven plastics, sift-proof **Receptacles** fibreboard, water resistant metal plastics wood, sift-proof **Sheets** paper, water resistant paper, waxed plastics	Not necessary	**Bags** woven plastics (5H1, 5H2, 5H3) paper, multiwall, water resistant (5M2) plastics, film (5H4) textile, sift-proof (5L2) textile, water resistant (5L3) **Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary (4C1) natural wood, sift-proof walls (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, solid (4H2) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plywood (1D) fibre (1G) plastics (1H1, 1H2) **Jerricans** steel (3A1, 3A2) plastics (3H1, 3H2)

Special packing provisions:

PP61 For UN Nos. 0082, 0241, 0331 and 0332, inner packagings are not required if leakproof removable head drums are used as outer packagings.

PP62 For UN Nos. 0082, 0241, 0331 and 0332, inner packagings are not required when the explosive is contained in a material impervious to liquid.

PP63 For UN No. 0081, inner packagings are not required when contained in rigid plastic which is impervious to nitric esters.

PP64 For UN No. 0331, inner packagings are not required when bags (5H2), (5H3) or (5H4) are used as outer packagings.

PP65 *(Deleted)*

PP66 For UN No. 0081, bags shall not be used as outer packagings.

P130	PACKING INSTRUCTION	P130
The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:		
Inner packagings	**Intermediate packagings**	**Outer packagings**
Not necessary	Not necessary	**Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary (4C1) natural wood, sift-proof walls (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, expanded (4H1) plastics, solid (4H2) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plywood (1D) fibre (1G) plastics (1H1, 1H2)

Special packing provision:

PP67 The following applies to UN Nos. 0006, 0009, 0010, 0015, 0016, 0018, 0019, 0034, 0035, 0038, 0039, 0048, 0056, 0137, 0138, 0168, 0169, 0171, 0181, 0182, 0183, 0186, 0221, 0243, 0244, 0245, 0246, 0254, 0280, 0281, 0286, 0287, 0297, 0299, 0300, 0301, 0303, 0321, 0328, 0329, 0344, 0345, 0346, 0347, 0362, 0363, 0370, 0412, 0424, 0425, 0434, 0435, 0436, 0437, 0438, 0451, 0488, 0502 and 0510:

Large and robust explosives articles, normally intended for military use, without their means of initiation or with their means of initiation containing at least two effective protective features, may be carried unpackaged. When such articles have propelling charges or are self-propelled, their ignition systems shall be protected against stimuli encountered during normal conditions of carriage. A negative result in Test Series 4 on an unpackaged article indicates that the article can be considered for carriage unpackaged. Such unpackaged articles may be fixed to cradles or contained in crates or other suitable handling devices.

NOTE: *The packagings authorized may exceed a net mass of 400 kg (see 4.1.3.3).*

P131	PACKING INSTRUCTION	P131
The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:		
Inner packagings **Bags** paper plastics **Receptacles** fibreboard metal plastics wood **Reels**	**Intermediate packagings** Not necessary	**Outer packagings** **Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary (4C1) natural wood, sift-proof walls (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, solid (4H2) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plywood (1D) fibre (1G) plastics (1H1, 1H2)
Special packing provision: **PP68** For UN Nos. 0029, 0267 and 0455, bags and reels shall not be used as inner packagings.		

P132(a)	PACKING INSTRUCTION **(Articles consisting of closed metal, plastics or fibreboard casings that contain a detonating explosive, or consisting of plastics-bonded detonating explosives)**	P132(a)
The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:		
Inner packagings Not necessary	**Intermediate packagings** Not necessary	**Outer packagings** **Boxes** steel (4A) aluminium (4B) other metal (4N) wood, natural, ordinary (4C1) wood, natural, sift-proof walls (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, solid (4H2)

P132(b)	PACKING INSTRUCTION (Articles without closed casings)	P132(b)
The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:		
Inner packagings **Receptacles** fibreboard metal plastics wood **Sheets** paper plastics	**Intermediate packagings** Not necessary	**Outer packagings** **Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary (4C1) natural wood, sift-proof walls (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, solid (4H2)

P133	PACKING INSTRUCTION	P133
The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:		
Inner packagings **Receptacles** fibreboard metal plastics wood **Trays, fitted with dividing partitions** fibreboard plastics wood	**Intermediate packagings** **Receptacles** fibreboard metal plastics wood	**Outer packagings** **Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary (4C1) natural wood, sift-proof walls (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, solid (4H2)
Additional requirement: Receptacles are only required as intermediate packagings when the inner packagings are trays.		
Special packing provision: **PP69** For UN Nos. 0043, 0212, 0225, 0268 and 0306, trays shall not be used as inner packagings.		

P134	PACKING INSTRUCTION	P134
The following packagings are authorized, provided the general packing provisions **of 4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:		
Inner packagings	**Intermediate packagings**	**Outer packagings**
Bags water resistant **Receptacles** fibreboard metal plastics wood **Sheets** fibreboard, corrugated **Tubes** fibreboard	Not necessary	**Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary (4C1) natural wood, sift-proof walls (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, expanded (4H1) plastics, solid (4H2) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plywood (1D) fibre (1G) plastics (1H1, 1H2)

P135	PACKING INSTRUCTION	P135
The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:		
Inner packagings	**Intermediate packagings**	**Outer packagings**
Bags paper plastics **Receptacles** fibreboard metal plastics wood **Sheets** paper plastics	Not necessary	**Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary (4C1) natural wood, sift-proof walls (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, expanded (4H1) plastics, solid (4H2) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plywood (1D) fibre (1G) plastics (1H1, 1H2)

P136	PACKING INSTRUCTION	P136
The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:		
Inner packagings **Bags** plastics textile Boxes fibreboard plastics wood **Dividing partitions in the outer packagings**	**Intermediate packagings** Not necessary	**Outer packagings** **Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary (4C1) natural wood, sift-proof walls (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, solid (4H2) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plywood (1D) fibre (1G) plastics (1H1, 1H2)

P137	PACKING INSTRUCTION	P137
The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:		
Inner packagings **Bags** plastics **Boxes** Fibreboard wood **Tubes** fibreboard metal plastics **Dividing partitions in the outer packagings**	**Intermediate packagings** Not necessary	**Outer packagings** **Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary (4C1) natural wood, sift-proof walls (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, solid (4H2) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plywood (1D) fibre (1G) plastics (1H1, 1H2)
Special packing provision: **PP70** For UN Nos. 0059, 0439, 0440 and 0441, when the shaped charges are packed singly, the conical cavity shall face downwards and the package shall be marked as illustrated in figures 5.2.1.10.1.1 or 5.2.1.10.1.2. When the shaped charges are packed in pairs, the conical cavities shall face inwards to minimize the jetting effect in the event of accidental initiation.		

P138	PACKING INSTRUCTION	P138
The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:		
Inner packagings	**Intermediate packagings**	**Outer packagings**
Bags plastics	Not necessary	**Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary (4C1) natural wood, sift-proof walls (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, solid (4H2) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plywood (1D) fibre (1G) plastics (1H1, 1H2)
Additional requirement: If the ends of the articles are sealed, inner packagings are not necessary.		

P139	PACKING INSTRUCTION	P139
The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:		
Inner packagings	**Intermediate packagings**	**Outer packagings**
Bags plastics **Receptacles** fibreboard metal plastics wood **Reels** **Sheets** paper plastics	Not necessary	**Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary (4C1) natural wood, sift-proof walls (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, solid (4H2) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plywood (1D) fibre (1G) plastics (1H1, 1H2)
Special packing provisions: **PP71** For UN Nos. 0065, 0102, 0104, 0289 and 0290, the ends of the detonating cord shall be sealed, for example, by a plug firmly fixed so that the explosive cannot escape. The ends of flexible detonating cord shall be fastened securely. **PP72** For UN Nos. 0065 and 0289, inner packagings are not required when they are in coils.		

P140	PACKING INSTRUCTION	P140
The following packagings are authorized, provided the general packing provisions **of 4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:		
Inner packagings **Bags** Plastics **Receptacles** wood **Reels** **Sheets** paper, kraft plastics	**Intermediate packagings** Not necessary	**Outer packagings** **Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary (4C1) natural wood, sift-proof walls (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, solid (4H2) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plywood (1D) fibre (1G) plastics (1H1, 1H2)
Special packing provisions: **PP73** For UN No. 0105, no inner packagings are required if the ends are sealed. **PP74** For UN No. 0101, the packaging shall be sift-proof except when the fuse is covered by a paper tube and both ends of the tube are covered with removable caps. **PP75** For UN No. 0101, steel, aluminium or other metal boxes or drums shall not be used.		

P141	PACKING INSTRUCTION	P141
The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:		
Inner packagings **Receptacles** fibreboard metal plastics wood **Trays, fitted with dividing partitions** plastics wood **Dividing partitions in the outer packagings**	**Intermediate packagings** Not necessary	**Outer packagings** **Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary (4C1) natural wood, sift-proof walls (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, solid (4H2) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plywood (1D) fibre (1G) plastics (1H1, 1H2)

P142	PACKING INSTRUCTION	P142
The following packagings are authorized, provided the general packing provisions **of 4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:		
Inner packagings	**Intermediate packagings**	**Outer packagings**
Bags paper plastics **Receptacles** fibreboard metal plastics wood **Sheets** paper **Trays, fitted with dividing partitions** plastics	Not necessary	**Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary (4C1) natural wood, sift-proof walls (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, solid (4H2) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plywood (1D) fibre (1G) plastics (1H1, 1H2)

P143	PACKING INSTRUCTION	P143
The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:		
Inner packagings	**Intermediate packagings**	**Outer packagings**
Bags paper, kraft plastics textile textile, rubberized **Receptacles** fibreboard metal Plastics wood **Trays, fitted with dividing partitions** plastics wood	Not necessary	**Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary (4C1) natural wood, sift-proof walls (4C2) plywood (4D) reconstituted wood (4F) fibreboard (4G) plastics, solid (4H2) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plywood (1D) fibre (1G) plastics (1H1, 1H2)

Additional requirement:

Instead of the above inner and outer packagings, composite packagings (6HH2) (plastics receptacle with outer solid plastics box) may be used.

Special packing provision:

PP76 For UN Nos. 0271, 0272, 0415 and 0491, when metal packagings are used, metal packagings shall be so constructed that the risk of explosion, by reason of increase in internal pressure from internal or external causes is prevented.

P144	PACKING INSTRUCTION	P144

The following packagings are authorized, provided the general packing provisions of **4.1.1, 4.1.3** and special packing provisions of **4.1.5** are met:

Inner packagings	Intermediate packagings	Outer packagings
Receptacles fibreboard metal Plastics wood **Dividing partitions in the outer packagings**	Not necessary	**Boxes** steel (4A) aluminium (4B) other metal (4N) natural wood, ordinary with metal liner (4C1) plywood (4D) with metal liner reconstituted wood (4F) with metal liner plastics, expanded (4H1) plastics, solid (4H2) **Drums** steel (1A1, 1A2) aluminium (1B1, 1B2) other metal (1N1, 1N2) plastics (1H1, 1H2)

Special packing provision:

PP77 For UN Nos. 0248 and 0249, packagings shall be protected against the ingress of water. When water-activated contrivances are transported unpackaged, they shall be provided with at least two independent protective features which prevent the ingress of water.

NOTE: *The packagings authorized may exceed a net mass of 400 kg (see 4.1.3.3).*

Type of packagings: Cylinders, tubes, pressure drums and bundles of cylinders

Cylinders, tubes, pressure drums and bundles of cylinders are authorised provided the special packing provisions of **4.1.6**, the provisions listed below under (1) to (9) and, when referred to in the column "Special packing provisions" of tables 1, 2 or 3, the relevant special packing provisions listed below under (10), are met.

General

(1) Pressure receptacles shall be so closed and leakproof as to prevent escape of the gases.

(2) Pressure receptacles containing toxic substances with an LC_{50} less than or equal to 200 ml/m³ (ppm) as specified in the table shall not be equipped with any pressure relief device. Pressure relief devices shall be fitted on UN pressure receptacles used for the carriage of UN No. 1013 carbon dioxide and UN No. 1070 nitrous oxide.

(3) The following three tables cover compressed gases (Table 1), liquefied and dissolved gases (Table 2) and substances not in Class 2 (Table 3). They provide:

(a) the UN number, name and description, and the classification code of the substance;

(b) the LC_{50} for toxic substances;

(c) the types of pressure receptacles authorised for the substance, shown by the letter "X";

(d) the maximum test period for periodic inspection of the pressure receptacles;

NOTE: *For pressure receptacles which make use of composite materials, the maximum test period shall be 5 years. The test period may be extended to that specified in Tables 1 and 2 (i.e. up to 10 years), if approved by the competent authority or body designated by this authority which issued the type approval.*

(e) the minimum test pressure of the pressure receptacles;

(f) the maximum working pressure of the pressure receptacles for compressed gases (where no value is given, the working pressure shall not exceed two thirds of the test pressure) or the maximum filling ratio(s) dependent on the test pressure(s) for liquefied and dissolved gases;

(g) special packing provisions that are specific to a substance.

Test pressure, filling ratios and filling requirements

(4) The minimum test pressure required for is 1 MPa (10 bar).

(5) In no case shall pressure receptacles be filled in excess of the limit permitted in the following requirements:

(a) For compressed gases, the working pressure shall be not more than two thirds of the test pressure of the pressure receptacles. Restrictions to this upper limit on working pressure are imposed by (10), special packing provision "o". In no case shall the internal pressure at 65 °C exceed the test pressure.

(b) For high pressure liquefied gases, the filling ratio shall be such that the settled pressure at 65 °C does not exceed the test pressure of the pressure receptacles.

The use of test pressures and filling ratios other than those in the table is permitted, except where (10), special packing provision "o" applies, provided that:

(i) the criterion of (10), special packing provision "r" is met when applicable; or

(ii) the above criterion is met in all other cases.

For high pressure liquefied gases and gas mixtures for which relevant data are not available, the maximum filling ratio (FR) shall be determined as follows:

$$FR = 8.5 \times 10^{-4} \times d_g \times P_h$$

where FR = maximum filling ratio
d_g = gas density (at 15 °C, 1 bar)(in kg/m³)
P_h = minimum test pressure (in bar).

(Cont'd on next page)

If the density of the gas is unknown, the maximum filling ratio shall be determined as follows:

$$FR = \frac{P_h \times MM \times 10^{-3}}{R \times 338}$$

where FR = maximum filling ratio
P_h = minimum test pressure (in bar)
MM = molecular mass (in g/mol)
R = 8.31451×10^{-2} bar.l.mol^{-1}.K^{-1} (gas constant).

For gas mixtures, the average molecular mass is to be taken, taking into account the volumetric concentrations of the various components.

(c) For low pressure liquefied gases, the maximum mass of contents per litre of water capacity shall equal 0.95 times the density of the liquid phase at 50 °C; in addition, the liquid phase shall not fill the pressure receptacle at any temperature up to 60 °C. The test pressure of the pressure receptacle shall be at least equal to the vapour pressure (absolute) of the liquid at 65 °C, minus 100 kPa (1 bar).

For low pressure liquefied gases and gas mixtures for which relevant data are not available, the maximum filling ratio shall be determined as follows:

$$FR = (0.0032 \times BP - 0.24) \times d_1$$

where FR = maximum filling ratio
BP = boiling point (in Kelvin)
d_1 = density of the liquid at boiling point (in kg/l).

(d) For UN No. 1001 acetylene, dissolved, and UN No. 3374 acetylene, solvent free, see (10), special packing provision "p".

(e) For liquefied gases charged with compressed gases, both components – the liquefied gas and the compressed gas – have to be taken into consideration in the calculation of the internal pressure in the pressure receptacle.

The maximum mass of contents per litre of water capacity shall not exceed 0.95 times the density of the liquid phase at 50 °C; in addition, the liquid phase shall not completely fill the pressure receptacle at any temperature up to 60 °C.

When filled, the internal pressure at 65 °C shall not exceed the test pressure of the pressure receptacles. The vapour pressures and volumetric expansions of all substances in the pressure receptacles shall be considered. When experimental data is not available, the following steps shall be carried out:

(i) Calculation of the vapour pressure of the liquefied gas and of the partial pressure of the compressed gas at 15 °C (filling temperature);

(ii) Calculation of the volumetric expansion of the liquid phase resulting from the heating from 15 °C to 65 °C and calculation of the remaining volume for the gaseous phase;

(iii) Calculation of the partial pressure of the compressed gas at 65 °C considering the volumetric expansion of the liquid phase;

NOTE: *The compressibility factor of the compressed gas at 15 °C and 65 °C shall be considered.*

(iv) Calculation of the vapour pressure of the liquefied gas at 65 °C;

(v) The total pressure is the sum of the vapour pressure of the liquefied gas and the partial pressure of the compressed gas at 65 °C;

(vi) Consideration of the solubility of the compressed gas at 65 °C in the liquid phase;

The test pressure of the pressure receptacle shall not be less than the calculated total pressure minus 100 kPa (1bar).

If the solubility of the compressed gas in the liquid phase is not known for the calculation, the test pressure can be calculated without taking the gas solubility (sub-paragraph (vi)) into account.

(Cont'd on next page)

(6) Other test pressure and filling ratio may be used provided they satisfy the general requirements outlined in paragraphs (4) and (5) above.

(7) (a) The filling of pressure receptacles may only be carried out by specially-equipped centres, with qualified staff using appropriate procedures.

The procedures should include checks:

- of the conformity of receptacles and accessories with this Code;
- of their compatibility with the product to be carried;
- of the absence of damage which might affect safety;
- of compliance with the degree or pressure of filling, as appropriate;
- of marks and identification.

(b) LPG to be filled in cylinders shall be of high quality; this is deemed to be fulfilled if the LPG to be filled is in compliance with the limitations on corrosiveness as specified in ISO 9162:1989.

Periodic inspections

(8) Refillable pressure receptacles shall be subjected to periodic inspections in accordance with the requirements of 6.2.1.6 and 6.2.3.5 respectively.

(9) If special provisions for certain substances do not appear in the tables below, periodic inspections shall be carried out:

(a) Every 5 years in the case of pressure receptacles intended for the carriage of gases of classification codes 1T, 1TF, 1TO, 1TC, 1TFC, 1TOC, 2T, 2TO, 2TF, 2TC, 2TFC, 2TOC, 4A, 4F and 4TC;

(b) Every 5 years in the case of pressure receptacles intended for the carriage of substances from other classes;

(c) Every 10 years in the case of pressure receptacles intended for the carriage of gases of classification codes 1A, 1O, 1F, 2A, 2O and 2F.

For pressure receptacles which make use of composite materials, the maximum test period shall be 5 years. The test period may be extended to that specified in Tables 1 and 2 (i.e. up to 10 years), if approved by the competent authority or body designated by this authority which issued the type approval.

Special packing provisions

(10) ***Material compatibility***

a: Aluminium alloy pressure receptacles shall not be used.

b: Copper valves shall not be used.

c: Metal parts in contact with the contents shall not contain more than 65 % copper.

d: When steel pressure receptacles or composite pressure receptacles with steel liners are used, only those bearing the "H" mark in accordance with 6.2.2.7.4 (p) are permitted.

(Cont'd on next page)

Requirements for toxic substances with an LC_{50} less than or equal to 200 ml/m³ (ppm)

k: Valve outlets shall be fitted with pressure retaining gas-tight plugs or caps having threads that match those of the valve outlets and made of material not liable to attack by the contents of the pressure receptacle.

Each cylinder within a bundle shall be fitted with an individual valve that shall be closed during carriage. After filling, the manifold shall be evacuated, purged and plugged.

Bundles containing UN 1045 Fluorine, compressed, may be constructed with isolation valves on groups of cylinders not exceeding 150 litres total water capacity instead of isolation valves on every cylinder.

Cylinders and individual cylinders within a bundle shall have a test pressure greater than or equal to 200 bar and a minimum wall thickness of 3.5 mm for aluminium alloy or 2 mm for steel. Individual cylinders not complying with this requirement shall be carried in a rigid outer packaging that will adequately protect the cylinder and its fittings and meeting the packing group I performance level. Pressure drums shall have a minimum wall thickness as specified by the competent authority.

Pressure receptacles shall not be fitted with a pressure relief device.

Cylinders and individual cylinders in a bundle shall be limited to a maximum water capacity of 85 litres.

Each valve shall be capable of withstanding the test pressure of the pressure receptacle and be connected directly to the pressure receptacle by either a taper thread or other means which meets the requirements of ISO 10692-2:2001.

Each valve shall either be of the packless type with non-perforated diaphragm, or be of a type which prevents leakage through or past the packing.

Carriage in capsules is not allowed.

Each pressure receptacle shall be tested for leakage after filling.

Gas specific provisions

l: UN No. 1040 ethylene oxide may also be packed in hermetically sealed glass or metal inner packagings suitably cushioned in fibreboard, wooden or metal boxes meeting the packing group I performance level. The maximum quantity permitted in any glass inner packaging is 30 g, and the maximum quantity permitted in any metal inner packaging is 200 g. After filling, each inner packaging shall be determined to be leak-tight by placing the inner packaging in a hot water bath at a temperature, and for a period of time, sufficient to ensure that an internal pressure equal to the vapour pressure of ethylene oxide at 55 °C is achieved. The maximum net mass in any outer packaging shall not exceed 2.5 kg.

m: Pressure receptacles shall be filled to a working pressure not exceeding 5 bar.

n: Cylinders and individual cylinders in a bundle shall contain not more than 5 kg of the gas. When bundles containing UN 1045 Fluorine, compressed are divided into groups of cylinders in accordance with special packing provision "k" each group shall contain not more than 5 kg of the gas.

o: In no case shall the working pressure or filling ratio shown in the tables be exceeded.

p: For UN No. 1001 acetylene, dissolved, and UN No. 3374 acetylene, solvent free: cylinders shall be filled with a homogeneous monolithic porous material; the working pressure and the quantity of acetylene shall not exceed the values prescribed in the approval or in ISO 3807-1:2000, ISO 3807-2:2000 or ISO 3807:2013, as applicable.

For UN No. 1001 acetylene, dissolved: cylinders shall contain a quantity of acetone or suitable solvent as specified in the approval (see ISO 3807-1:2000, ISO 3807-2:2000 or ISO 3807:2013 as applicable); cylinders fitted with pressure relief devices or manifolded together shall be carried vertically.

Alternatively, for UN No. 1001 acetylene, dissolved: cylinders which are not UN pressure receptacles may be filled with a non monolithic porous material; the working pressure, the quantity of acetylene and the quantity of solvent shall not exceed the values prescribed in the approval. The maximum test period for periodic inspection of the cylinders shall not exceed five years.

A test pressure of 52 bar shall be applied only to cylinders fitted with a fusible plug.

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q: Valve outlets of pressure receptacles for pyrophoric gases or flammable mixtures of gases containing more than 1 % of pyrophoric compounds shall be fitted with gas-tight plugs or caps which shall be made of material not liable to attack by the contents of the pressure receptacle. When these pressure receptacles are manifolded in a bundle, each of the pressure receptacles shall be fitted with an individual valve that shall be closed during carriage, and the outlet of the manifold valve shall be fitted with a pressure retaining gas-tight plug or cap. Gas-tight plugs or caps shall have threads that match those of the valve outlets. Carriage in capsules is not allowed.

r: The filling ratio of this gas shall be limited such that, if complete decomposition occurs, the pressure does not exceed two thirds of the test pressure of the pressure receptacle.

ra: This gas may also be packed in capsules under the following conditions:

(a) The mass of gas shall not exceed 150 g per capsule;

(b) The capsules shall be free from faults liable to impair the strength;

(c) The leakproofness of the closure shall be ensured by an additional device (cap, crown, seal, binding, etc.) capable of preventing any leakage of the closure during carriage;

(d) The capsules shall be placed in an outer packaging of sufficient strength. A package shall not weigh more than 75 kg.

s: Aluminium alloy pressure receptacles shall be:

- Equipped only with brass or stainless steel valves; and
- Cleaned for hydrocarbons contamination and not contaminated with oil. UN pressure receptacles shall be cleaned in accordance with ISO 11621:1997.

ta: Other criteria may be used for filling of welded steel cylinders intended for the carriage of substances of UN No. 1965:

(a) with the agreement of the competent authorities of the countries where the carriage is carried out; and

(b) in compliance with the provisions of a national code or standard recognised by the competent authorities.

When the criteria for filling are different from those in P200(5), the transport document shall include the statement "Carriage in accordance with packing instruction P200, special packing provision ta" and the indication of the reference temperature used for the calculation of the filling ratio.

Periodic inspection

u: The interval between periodic tests may be extended to 10 years for aluminium alloy pressure receptacles. This derogation may only be applied to UN pressure receptacles when the alloy of the pressure receptacle has been subjected to stress corrosion testing as specified in ISO 7866:2012 + Cor 1: 2014.

ua: The interval between periodic tests may be extended to 15 years for aluminium alloy cylinders and bundles of such cylinders if the provisions of paragraph (13) of this packing instruction are applied. This shall not apply to cylinders made from aluminium alloy AA 6351. For mixtures, this provision "ua" may be applied provided all the individual gases in the mixture have been allocated "ua" in Table 1 or Table 2.

v: (1) The interval between inspections for steel cylinders, other than refillable welded steel cylinders for UN Nos. 1011, 1075, 1965, 1969 or 1978, may be extended to 15 years:

(a) with the agreement of the competent authority (authorities) of the country (countries) where the periodic inspection and the carriage take place; and

(b) in accordance with the requirements of a technical code or a standard recognised by the competent authority

(2) For refillable welded steel cylinders for UN Nos. 1011, 1075, 1965, 1969 or 1978, the interval may be extended to 15 years, if the provisions of paragraph (12) of this packing instruction are applied.

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va: For seamless steel cylinders which are equipped with residual pressure valves (RPVs) (see note below) that have been designed and tested in accordance with EN ISO 15996:2005 + A1:2007 or EN ISO 15996:2017 and for bundles of seamless steel cylinders equipped with main valve(s) with a residual pressure device, tested in accordance with EN ISO 15996:2005 + A1:2007 or EN ISO 15996:2017, the interval between periodic tests may be extended to 15 years if the provisions of paragraph (13) of this packing instruction are applied. For mixtures, this provision "va" may be applied provided all the individual gases in the mixture have been allocated "va" in Table 1 or Table 2.

NOTE: *"Residual Pressure Valve" (RPV) means a closure which incorporates a residual pressure device that prevents ingress of contaminants by maintaining a positive differential between the pressure within the cylinder and the valve outlet. In order to prevent back-flow of fluids into the cylinder from a higher pressure source a "Non-Return Valve" (NRV) function shall either be incorporated into the residual pressure device or be a discrete additional device in the cylinder valve, e.g. a regulator.*

Requirements for N.O.S. entries and for mixtures

z: The construction materials of the pressure receptacles and their accessories shall be compatible with the contents and shall not react to form harmful or dangerous compounds therewith.

The test pressure and filling ratio shall be calculated in accordance with the relevant requirements of (5).

Toxic substances with an LC_{50} less than or equal to 200 ml/m³ shall not be carried in tubes, pressure drums or MEGCs and shall meet the requirements of special packing provision "k". However, UN 1975 Nitric oxide and dinitrogen tetroxide mixture may be carried in pressure drums.

For pressure receptacles containing pyrophoric gases or flammable mixtures of gases containing more than 1 % pyrophoric compounds, the requirements of special packing provision "q" shall be met.
The necessary steps shall be taken to prevent dangerous reactions (i.e. polymerisation or decomposition) during carriage. If necessary, stabilisation or addition of an inhibitor shall be required.
Mixtures containing UN No. 1911 diborane, shall be filled to a pressure such that, if complete decomposition of the diborane occurs, two thirds of the test pressure of the pressure receptacle shall not be exceeded.
Mixtures containing UN 2192 germane, other than mixtures of up to 35 % germane in hydrogen or nitrogen or up to 28 % germane in helium or argon, shall be filled to a pressure such that, if complete decomposition of the germane occurs, two thirds of the test pressure of the pressure receptacle shall not be exceeded.
Mixtures of fluorine and nitrogen with a fluorine concentration below 35 % by volume may be filled in pressure receptacles up to a maximum allowable working pressure for which the partial pressure of fluorine does not exceed 3.1 MPa (31 bar) absolute.

$$working\ pressure\ (\text{bar}) < \frac{31}{x_f} - 1$$

in which x_f = fluorine concentration in % by volume/100.

Mixtures of fluorine and inert gases with a fluorine concentration below 35 % by volume may be filled in pressure receptacles up to a maximum allowable working pressure for which the partial pressure of fluorine does not exceed 3.1 MPa (31 bar) absolute, additionally taking the coefficient of nitrogen equivalency in accordance with ISO 10156:2017 into account when calculating the partial pressure.

$$working\ pressure\ (\text{bar}) < \frac{31}{x_f}\left(x_f + K_k \times x_k\right) - 1$$

where x_f = fluorine concentration in % by volume/100;

K_k = coefficient of equivalency of an inert gas relative to nitrogen (coefficient of nitrogen equivalency);

x_k = inert gas concentration in % by volume/100.

However, the working pressure for mixtures of fluorine and inert gases shall not exceed 20 MPa (200 bar). The minimum test pressure of pressure receptacles for mixtures of fluorine and inert gases equals 1.5 times the working pressure or 20 MPa (200 bar), with the greater value to be applied.

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Requirements for substances not in Class 2

ab: Pressure receptacles shall satisfy the following conditions:

(i) The pressure test shall include an inspection of the inside of the pressure receptacles and check of accessories;

(ii) In addition resistance to corrosion shall be checked every two years by means of suitable instruments (e.g. ultrasound) and the condition of the accessories verified;

(iii) Wall thickness shall not be less than 3 mm.

ac: Tests and inspections shall be carried out under the supervision of an expert approved by the competent authority.

ad: Pressure receptacles shall satisfy the following conditions:

(i) Pressure receptacles shall be designed for a design pressure of not less than 2.1 MPa (21 bar) (gauge pressure);

(ii) In addition to the marks for refillable receptacles, the pressure receptacles shall bear the following particulars in clearly legible and durable characters:

- The UN number and the proper shipping name of the substance according to 3.1.2;
- The maximum permitted mass when filled and the tare of the pressure receptacle, including accessories fitted during filling, or the gross mass.

(11) The applicable requirements of this packing instruction are considered to have been complied with if the following standards, as relevant, are applied:

Applicable requirements	Reference	Title of document
(7)	EN 13365:2002 +A1:2005	Transportable gas cylinders – Cylinder bundles for permanent and liquefied gases (excluding acetylene) – Inspection at the time of filling
(7)	EN ISO 24431:2016	Gas cylinders – Seamless, welded and composite cylinders for compressed and liquefied gases (excluding acetylene) – Inspection at time of filling
(7) (a)	ISO 10691:2004	Gas cylinders – Refillable welded steel cylinders for liquefied petroleum gas (LPG) – Procedures for checking before, during and after filling.
(7) (a)	ISO 11755:2005	Gas cylinders – Cylinder bundles for compressed and liquefied gases (excluding acetylene) – Inspection at time of filling
(7) (a) and (10) p	EN ISO 11372:2011	Gas cylinders – Acetylene cylinders – Filling conditions and filling inspection
(7) (a) and (10) p	EN ISO 13088:2011	Gas cylinders – Acetylene cylinder bundles – Filling conditions and filling inspection
(7) and (10) ta (b)	EN 1439:2021	LPG equipment and accessories – Procedure for checking transportable refillable LPG cylinders before, during and after filling
(7) and (10) ta (b)	EN 13952:2017	LPG equipment and accessories – Filling operations for LPG cylinders
(7) and (10) ta (b)	EN 14794:2005	LPG equipment and accessories - Transportable refillable aluminium cylinders for liquefied petroleum gas (LPG) - Procedure for checking before, during and after filling

(12) An interval of 15 years for the periodic inspection of refillable welded steel cylinders may be granted in accordance with special packing provision v (2) of paragraph (10), if the following provisions are applied.

1. General provisions

1.1 For the application of this section, the competent authority shall not delegate its tasks and duties to Xb bodies (inspection bodies of type B) or IS (in-house inspection services) (for the definitions of Xb and IS, see 6.2.3.6.1).

1.2 The owner of the cylinders shall apply to the competent authority for granting the 15 year interval, and shall demonstrate that the requirements of sub-paragraphs 2, 3 and 4 are met.

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1.3 Cylinders manufactured since 1 January 1999 shall have been manufactured in conformity with the following standards:

- EN 1442; or
- EN 13322-1; or
- Annex I, parts 1 to 3 to Council Directive 84/527/EEC[a]

as applicable according to the table in 6.2.4.

Other cylinders manufactured before 1 January 2009 in conformity with this Code in accordance with a technical code accepted by the national competent authority may be accepted for a 15 year interval, if they are of equivalent safety to the provisions of this Code as applicable at the time of application.

1.4 The owner shall submit documentary evidence to the competent authority demonstrating that the cylinders comply with the provisions of sub-paragraph 1.3. The competent authority shall verify that these conditions are met.

1.5 The competent authority shall check whether the provisions of sub-paragraphs 2 and 3 are fulfilled and correctly applied. If all provisions are fulfilled, it shall authorise the 15-year interval for the cylinders. In this authorisation, the type of cylinder (as specified in the type approval) or a group of cylinders (see Note) covered shall be clearly identified. The authorisation shall be delivered to the owner; the competent authority shall keep a copy. The owner shall keep the documents for as long as the cylinders are authorised for a 15 year interval.

NOTE: *A group of cylinders is defined by the production dates of identical cylinders for a period, during which the applicable provisions of this Code and of the technical code accepted by the competent authority have not changed in their technical content. Example: Cylinders of identical design and volume having been manufactured according to the provisions of this Code as applicable between 1 January 1985 and 31 December 1988 in combination with a technical code accepted by the competent authority applicable for the same period, form one group in terms of the provisions of this paragraph.*

1.6 The competent authority shall monitor the owner of the cylinders for compliance with the provisions of this Code and the authorisation given as appropriate, but at least every three years or when changes to the procedures are introduced.

2. Operational provisions

2.1 Cylinders having been granted a 15 year interval for periodic inspection shall only be filled in filling centres applying a documented quality system to ensure that all the provisions of paragraph (7) of this packing instruction and the requirements and responsibilities of EN 1439:2021 (or until 31 December 2024, EN 1439:2017) and EN 13952:2017 are fulfilled and correctly applied.

2.2 The competent authority shall verify that these requirements are fulfilled and check this as appropriate, but at least every three years or when changes to the procedures are introduced.

2.3 The owner shall provide documentary evidence to the competent authority that the filling centre complies with the provisions of sub-paragraph 2.1.

2.4 *Reserved.*

2.5 To prevent internal corrosion, only gases of high quality with very low potential contamination shall be filled into the cylinders. This is deemed to be fulfilled, if the gases conform to the limitations on corrosiveness as specified in ISO 9162:1989.

3. Provisions for qualification and periodic inspection

3.1 Cylinders of a type or group already in use, for which a 15 year interval has been granted and to which the 15 year interval has been applied, shall be subject to a periodic inspection according to 6.2.3.5.

NOTE: *For the definition of a group of cylinders, see Note to sub-paragraph 1.5.*

3.2 If a cylinder with a 15-year interval fails the hydraulic pressure test during a periodic inspection e.g. by bursting or leakage, the owner shall investigate and produce a report on the cause of the failure and if other cylinders (e.g. of the same type or group) are affected. In the latter case, the owner shall inform the competent authority.

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[a] *Council directive on the approximation of the laws of the Member States relating to welded unalloyed steel gas cylinders, published in the Official Journal of the European Communities No. L 300 of 19.11.1984.*

3.3 If internal corrosion as defined in the standard applied (see sub-paragraph 1.3) has been detected, the cylinder shall be withdrawn from use and shall not be granted any further period for filling and carriage.

3.4 Cylinders having been granted a 15 year interval shall only be fitted with valves designed and manufactured for a minimum 15 year period of use according to EN 13152:2001 + A1:2003, EN 13153:2001 + A1:2003, EN ISO 14245:2010, EN ISO 14245:2019, EN ISO 14245:2021, EN ISO 15995:2010, EN ISO 15995:2019 or EN ISO 15995:2021. After a periodic inspection, a new valve shall be fitted to the cylinder, except that manually operated valves, which have been refurbished or inspected according to EN 14912:2022 may be re-fitted, if they are suitable for another 15 year period of use. Refurbishment or inspection shall only be carried out by the manufacturer of the valves or according to his technical instruction by an enterprise qualified for such work and operating under a documented quality system.

4. Marking

Cylinders having been granted a 15 year interval for periodic inspection in accordance with this paragraph shall additionally be marked clearly and legibly with "P15Y". This mark shall be removed if the cylinder is no longer authorised for a 15 year interval.

NOTE: *This mark shall not apply to cylinders subject to the transitional provision in 1.6.2.9, 1.6.2.10 or the provisions of special packing provision v (1) of paragraph (10) of this packing instruction.*

(13) An interval of 15 years for the periodic inspection of seamless steel and aluminium alloy cylinders and bundles of such cylinders may be granted in accordance with special packing provisions ua or va of paragraph (10), if the following provisions are applied:

1. General provisions

1.1 For the application of this paragraph, the competent authority shall not delegate its tasks and duties to Xb bodies (inspection bodies of type B) or IS (in-house inspection services) (for the definitions of Xb and IS, see 6.2.3.6.1).

1.2 The owner of the cylinders or bundles of cylinders shall apply to the competent authority for granting the 15 year interval, and shall demonstrate that the requirements of sub-paragraphs 2, 3 and 4 are met.

1.3 Cylinders manufactured since 1 January 1999 shall have been manufactured in conformity with one of the following standards:

- EN 1964-1 or EN 1964-2; or

- EN 1975; or

- EN ISO 9809-1 or EN ISO 9809-2; or

- EN ISO 7866; or

- Annex I, parts 1 to 3 to Council Directive 84/525/EEC[b] and 84/526/EEC[c]

as applicable at the time of manufacture (see also the table in 6.2.4.1).

Other cylinders manufactured before 1 January 2009 in conformity with this Code in accordance with a technical code accepted by the national competent authority may be accepted for a 15 year interval for periodic inspection, if they are of equivalent safety to the provisions of this Code as applicable at the time of application.

NOTE: *This provision is considered to be fulfilled if the cylinder has been reassessed according to the procedure for the reassessment of conformity described in Annex III of Directive 2010/35/EU of 16 June 2010 or Annex IV, Part II, of Directive 1999/36/EC of 29 April 1999.*

Cylinders and bundles of cylinders marked with the United Nations packaging symbol specified in 6.2.2.7.2 (a) shall not be granted a 15 year interval for periodic inspection.

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[b] *Council Directive on the approximation of the laws of the Member States relating to seamless, steel gas cylinders, published in the Official Journal of the European Communities No. L 300 of 19.11.1984.*

[c] *Council Directive on the approximation of the laws of the Member States relating to seamless, unalloyed aluminium and aluminium alloy gas cylinders, published in the Official Journal of the European Communities No. L 300 of 19.11.1984.*

1.4 Bundles of cylinders shall be constructed such that contact between cylinders along the longitudinal axis of the cylinders does not result in external corrosion. The supports and restraining straps shall be such as to minimise the risk of corrosion to the cylinders. Shock absorbent materials used in supports shall only be allowed if they have been treated to eliminate water absorption. Examples of suitable materials are water resistant belting and rubber.

1.5 The owner shall submit documentary evidence to the competent authority demonstrating that the cylinders comply with the provisions of sub-paragraph 1.3. The competent authority shall verify that these conditions are met.

1.6 The competent authority shall check whether the provisions of sub-paragraphs 2 and 3 are fulfilled and correctly applied. If all provisions are fulfilled, it shall authorise the 15 year interval for periodic inspection for the cylinders or bundles of cylinders. In this authorisation a group of cylinders (see NOTE below) covered shall be clearly identified. The authorisation shall be delivered to the owner; the competent authority shall keep a copy. The owner shall keep the documents for as long as the cylinders are authorised for a 15 year interval.

NOTE: *A group of cylinders is defined by the production dates of identical cylinders for a period, during which the applicable provisions of this Code and of the technical code accepted by the competent authority have not changed in their technical content. Example: Cylinders of identical design and volume having been manufactured according to the provisions of this Code applicable between 1 January 1985 and 31 December 1988 in combination with a technical code accepted by the competent authority applicable for the same period form one group in terms of the provisions of this paragraph.*

1.7 The owner shall ensure compliance with the provisions of this Code and the authorisation given as appropriate and shall demonstrate this to the competent authority on request but at least every three years or when significant changes to the procedures are introduced.

2. Operational provisions

2.1 Cylinders or bundles of cylinders having been granted a 15 year interval for periodic inspection shall only be filled in filling centres applying a documented and certified quality system to ensure that all the provisions of paragraph (7) of this packing instruction and the requirements and responsibilities of EN ISO 24431:2016 or EN 13365:2002 as applicable are fulfilled and correctly applied. The quality system, according to the ISO 9000 (series) or equivalent, shall be certified by an accredited independent body recognized by the competent authority. This includes procedures for pre- and post-fill inspections and the filling process for cylinders, bundles of cylinders and valves.

2.2 Aluminium alloy cylinders and bundles of such cylinders without RPVs having been granted a 15 year interval for periodic inspection shall be checked prior to every fill in accordance with a documented procedure which shall at least include the following:

- Open the cylinder valve or the main valve of the bundle of cylinders to check for residual pressure;
- If gas is emitted, the cylinder or bundle of cylinders may be filled;
- If no gas is emitted, the internal condition of the cylinder or bundle of cylinders shall be checked for contamination;
- If no contamination is detected, the cylinder or bundle of cylinders may be filled.

If contamination is detected corrective action is to be carried out.

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2.3 Seamless steel cylinders fitted with RPVs and bundles of seamless steel cylinders equipped with main valve(s) with a residual pressure device having been granted a 15 year interval for periodic inspection shall be checked prior to every fill in accordance with a documented procedure which shall at least include the following:

- Open the cylinder valve or bundle of cylinders main valve to check for residual pressure;
- If gas is emitted, the cylinder or bundle of cylinders may be filled;
- If no gas is emitted the functioning of the residual pressure device shall be checked;
- If the check shows that the residual pressure device has retained pressure the cylinder or bundle of cylinders may be filled;
- If the check shows that the residual pressure device has not retained pressure, the internal condition of the cylinder or bundle of cylinders shall be checked for contamination:
  - If no contamination is detected, the cylinder or bundle of cylinders may be filled following repair or replacement of the residual pressure device;
  - If contamination is detected, a corrective action shall be carried out.

2.4 To prevent internal corrosion, only gases of high quality with very low potential contamination shall be filled into cylinders or bundles of cylinders. This is deemed to be fulfilled, if the compatibility of gases/material is acceptable in accordance with EN ISO 11114-1:2020 and EN ISO 11114-2:2013, and the gas quality meets the specifications in EN ISO 14175:2008 or, for gases not covered in the standard, a minimum purity of 99.5 % by volume and a maximum moisture content of 40 ml/m³(ppm). For nitrous oxide the values shall be a minimum purity of 98 % by volume and a maximum moisture content of 70 ml/m³ (ppm).

2.5 The owner shall ensure that the requirements of 2.1 to 2.4 are fulfilled and provide documentary evidence of this to the competent authority on request, but at least every three years or when significant changes to the procedures are introduced.

2.6 *Deleted*

3. Provisions for qualification and periodic inspection

3.1 Cylinders and bundles of cylinders already in use, for which the conditions of sub-paragraph 2 have been met from the date of the last periodic inspection to the satisfaction of the competent authority, may have their inspection period extended to 15 years from the date of the last periodic inspection. Otherwise the change of test period from ten to fifteen years shall be made at the time of periodic inspection. The periodic inspection report shall indicate that this cylinder or bundle of cylinders shall be fitted with a residual pressure device as appropriate. Other documentary evidence may be accepted by the competent authority.

3.2 If a cylinder with a 15 year interval fails the pressure test by bursting or leakage or if a severe defect is detected by a non-destructive test (NDT) during a periodic inspection the owner shall investigate and produce a report on the cause of the failure and if other cylinders (e.g. of the same type or group) are affected. In the latter case, the owner shall inform the competent authority. The competent authority shall then decide on appropriate measures.

3.3 If internal corrosion and other defects as defined in the periodic inspection standards referenced in 6.2.4 have been detected, the cylinder shall be withdrawn from use and shall not be granted any further period for filling and carriage.

3.4 Cylinders or bundles of cylinders having been granted a 15 year interval for periodic inspection shall only be fitted with valves designed and tested according to EN 849 or EN ISO 10297 as applicable at the time of manufacture (see also the table in 6.2.4.1). After a periodic inspection a new valve shall be fitted, except that valves which have been refurbished or inspected according to EN ISO 22434:2022 may be re-fitted.

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4. Marking

Cylinders and bundles of cylinders having been granted a 15 year interval for periodic inspection in accordance with this paragraph shall have the date (year) of the next periodic inspection as required in section 5.2.1.6 (c) and at the same time additionally be marked clearly and legibly with "P15Y". This mark shall be removed if the cylinder or bundle of cylinders is no longer authorised for a 15 year interval for periodic inspection.

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Table 1: COMPRESSED GASES

UN No.	Name and description	Classification code	LC_{50} ml/m³	Cylinders	Tubes	Pressure drums	Bundles of cylinders	Test period, years [a]	Test pressure, bar [b]	Maximum working pressure, bar [b]	Special packing provisions
1002	AIR, COMPRESSED	1A		X	X	X	X	10			ua, va
1006	ARGON, COMPRESSED	1A		X	X	X	X	10			ua, va
1016	CARBON MONOXIDE, COMPRESSED	1TF	3760	X	X	X	X	5			u
1023	COAL GAS, COMPRESSED	1TF		X	X	X	X	5			
1045	FLUORINE, COMPRESSED	1TOC	185	X			X	5	200	30	a, k, n, o
1046	HELIUM, COMPRESSED	1A		X	X	X	X	10			ua, va
1049	HYDROGEN, COMPRESSED	1F		X	X	X	X	10			d, ua, va
1056	KRYPTON, COMPRESSED	1A		X	X	X	X	10			ua, va
1065	NEON, COMPRESSED	1A		X	X	X	X	10			ua, va
1066	NITROGEN, COMPRESSED	1A		X	X	X	X	10			ua, va
1071	OIL GAS, COMPRESSED	1TF		X	X	X	X	5			
1072	OXYGEN, COMPRESSED	1O		X	X	X	X	10			s, ua, va
1612	HEXAETHYL TETRAPHOSPHATE AND COMPRESSED GAS MIXTURE	1T		X	X	X	X	5			z
1660	NITRIC OXIDE, COMPRESSED	1TOC	115	X			X	5	225	33	k, o
1953	COMPRESSED GAS, TOXIC, FLAMMABLE, N.O.S.	1TF	≤ 5000	X	X	X	X	5			z
1954	COMPRESSED GAS, FLAMMABLE, N.O.S	1F		X	X	X	X	10			z, ua, va
1955	COMPRESSED GAS, TOXIC, N.O.S.	1T	≤ 5000	X	X	X	X	5			z
1956	COMPRESSED GAS, N.O.S.	1A		X	X	X	X	10			z, ua, va
1957	DEUTERIUM, COMPRESSED	1F		X	X	X	X	10			d, ua, va
1964	HYDROCARBON GAS MIXTURE, COMPRESSED, N.O.S.	1F		X	X	X	X	10			z, ua, va
1971	METHANE, COMPRESSED or NATURAL GAS, COMPRESSED with high methane content	1F		X	X	X	X	10			ua, va

Table 1: COMPRESSED GASES

UN No.	Name and description	Classification code	LC_{50} ml/m³	Cylinders	Tubes	Pressure drums	Bundles of cylinders	Test period, years [a]	Test pressure, bar [b]	Maximum working pressure, bar [b]	Special packing provisions
2034	HYDROGEN AND METHANE MIXTURE, COMPRESSED	1F		X	X	X	X	10			d, ua, va
2190	OXYGEN DIFLUORIDE, COMPRESSED	1TOC	2.6	X			X	5	200	30	a, k, n, o
3156	COMPRESSED GAS, OXIDIZING, N.O.S.	1O		X	X	X	X	10			z, ua, va
3303	COMPRESSED GAS, TOXIC, OXIDIZING, N.O.S.	1TO	≤ 5000	X	X	X	X	5			z
3304	COMPRESSED GAS, TOXIC, CORROSIVE, N.O.S.	1TC	≤ 5000	X	X	X	X	5			z
3305	COMPRESSED GAS, TOXIC, FLAMMABLE, CORROSIVE, N.O.S.	1TFC	≤ 5000	X	X	X	X	5			z
3306	COMPRESSED GAS, TOXIC, OXIDIZING, CORROSIVE, N.O.S.	1TOC	≤ 5000	X	X	X	X	5			z

[a] *Not applicable for pressure receptacles made of composite materials.*

[b] *Where the entries are blank, the working pressure shall not exceed two thirds of the test pressure.*

Table 2: LIQUEFIED GASES AND DISSOLVED GASES

UN No.	Name and description	Classification code	LC_{50} ml/m³	Cylinders	Tubes	Pressure drums	Bundles of cylinders	Test period, years [a]	Test pressure, bar	Filling ratio	Special packing provisions
1001	ACETYLENE, DISSOLVED	4F		X			X	10	60		c, p
1005	AMMONIA, ANHYDROUS	2TC	4000	X	X	X	X	5	29	0.54	b, ra
1008	BORON TRIFLUORIDE	2TC	864	X	X	X	X	5	225	0.715	a
									300	0.86	a
1009	BROMOTRIFLUORO-METHANE (REFRIGERANT GAS R 13B1)	2A		X	X	X	X	10	42	1.13	ra
									120	1.44	ra
									250	1.60	ra
1010	BUTADIENES, STABILIZED (1,2-butadiene) or	2F		X	X	X	X	10	10	0.59	ra
1010	BUTADIENES, STABILIZED (1,3-butadiene) or	2F		X	X	X	X	10	10	0.55	ra
1010	BUTADIENES AND HYDROCARBON MIXTURE, STABILIZED	2F		X	X	X	X	10	10	0.50	ra, v, z
1011	BUTANE	2F		X	X	X	X	10	10	0.52	ra, v
1012	BUTYLENE (Butylenes mixture) or	2F		X	X	X	X	10	10	0.50	ra, z
1012	BUTYLENE (1-Butylene) or	2F		X	X	X	X	10	10	0.53	
1012	BUTYLENE (cis-2-Butylene) or	2F		X	X	X	X	10	10	0.55	
1012	BUTYLENE (trans-2-Butylene)	2F		X	X	X	X	10	10	0.54	
1013	CARBON DIOXIDE	2A		X	X	X	X	10	190	0.68	ra, ua, va
									250	0.76	ra, ua, va
1017	CHLORINE	2TOC	293	X	X	X	X	5	22	1.25	a, ra
1018	CHLORODIFLUORO-METHANE (REFRIGERANT GAS R 22)	2A		X	X	X	X	10	27	1.03	ra
1020	CHLOROPENTAFLUORO-ETHANE (REFRIGERANT GAS R 115)	2A		X	X	X	X	10	25	1.05	ra
1021	1-CHLORO-1,2,2,2-TETRAFLUOROETHANE (REFRIGERANT GAS R 124)	2A		X	X	X	X	10	11	1.20	ra
1022	CHLOROTRIFLUORO-METHANE (REFRIGERANT GAS R 13)	2A		X	X	X	X	10	100	0.83	ra
									120	0.90	ra
									190	1.04	ra
									250	1.11	ra
1026	CYANOGEN	2TF	350	X	X	X	X	5	100	0.70	ra, u
1027	CYCLOPROPANE	2F		X	X	X	X	10	18	0.55	ra
1028	DICHLORODIFLUORO-METHANE (REFRIGERANT GAS R 12)	2A		X	X	X	X	10	16	1.15	ra
1029	DICHLOROFLUORO-METHANE (REFRIGERANT GAS R 21)	2A		X	X	X	X	10	10	1.23	ra

Table 2: LIQUEFIED GASES AND DISSOLVED GASES

UN No.	Name and description	Classification code	LC_{50} ml/m³	Cylinders	Tubes	Pressure drums	Bundles of cylinders	Test period, years [a]	Test pressure, bar	Filling ratio	Special packing provisions
1030	1,1-DIFLUOROETHANE (REFRIGERANT GAS R 152a)	2F		X	X	X	X	10	16	0.79	ra
1032	DIMETHYLAMINE, ANHYDROUS	2F		X	X	X	X	10	10	0.59	b, ra
1033	DIMETHYL ETHER	2F		X	X	X	X	10	18	0.58	ra
1035	ETHANE	2F		X	X	X	X	10	95 120 300	0.25 0.30 0.40	ra ra ra
1036	ETHYLAMINE	2F		X	X	X	X	10	10	0.61	b, ra
1037	ETHYL CHLORIDE	2F		X	X	X	X	10	10	0.80	a, ra
1039	ETHYL METHYL ETHER	2F		X	X	X	X	10	10	0.64	ra
1040	ETHYLENE OXIDE, or ETHYLENE OXIDE WITH NITROGEN up to a total pressure of 1MPa (10 bar) at 50 °C	2TF	2900	X	X	X	X	5	15	0.78	l, ra
1041	ETHYLENE OXIDE AND CARBON DIOXIDE MIXTURE with more than 9 % but not more than 87 % ethylene oxide	2F		X	X	X	X	10	190 250	0.66 0.75	ra ra
1043	FERTILIZER AMMONIATING SOLUTION with free ammonia	4A		X		X	X	5			b, z
1048	HYDROGEN BROMIDE, ANHYDROUS	2TC	2860	X	X	X	X	5	60	1.51	a, d, ra
1050	HYDROGEN CHLORIDE, ANHYDROUS	2TC	2810	X	X	X	X	5	100 120 150 200	0.30 0.56 0.67 0.74	a, d, ra a, d, ra a, d, ra a, d, ra
1053	HYDROGEN SULPHIDE	2TF	712	X	X	X	X	5	48	0.67	d, ra, u
1055	ISOBUTYLENE	2F		X	X	X	X	10	10	0.52	ra
1058	LIQUEFIED GASES, non-flammable, charged with nitrogen, carbon dioxide or air	2A		X	X	X	X	10			ra, z
1060	METHYLACETYLENE AND PROPADIENE MIXTURE, STABILIZED	2F		X	X	X	X	10			c, ra, z
	Propadiene with 1 % to 4 % methylacetylene	2F		X	X	X	X	10	22	0.52	c, ra
	Mixture P1	2F		X	X	X	X	10	30	0.49	c, ra
	Mixture P2	2F		X	X	X	X	10	24	0.47	c, ra
1061	METHYLAMINE, ANHYDROUS	2F		X	X	X	X	10	13	0.58	b, ra
1062	METHYL BROMIDE with not more than 2 % chloropicrin	2T	850	X	X	X	X	5	10	1.51	a

Table 2: LIQUEFIED GASES AND DISSOLVED GASES

UN No.	Name and description	Classification code	LC_{50} ml/m³	Cylinders	Tubes	Pressure drums	Bundles of cylinders	Test period, years [a]	Test pressure, bar	Filling ratio	Special packing provisions
1063	METHYL CHLORIDE (REFRIGERANT GAS R 40)	2F		X	X	X	X	10	17	0.81	a, ra
1064	METHYL MERCAPTAN	2TF	1350	X	X	X	X	5	10	0.78	d, ra, u
1067	DINITROGEN TETROXIDE (NITROGEN DIOXIDE)	2TOC	115	X		X	X	5	10	1.30	k
1069	NITROSYL CHLORIDE	2TC	35	X			X	5	13	1.10	k, ra
1070	NITROUS OXIDE	2O		X	X	X	X	10	180 225 250	0.68 0.74 0.75	ua, va ua, va ua, va
1075	PETROLEUM GASES, LIQUEFIED	2F		X	X	X	X	10			v, z
1076	PHOSGENE	2TC	5	X		X	X	5	20	1.23	a, k, ra
1077	PROPYLENE	2F		X	X	X	X	10	27	0.43	ra
1078	REFRIGERANT GAS, N.O.S.	2A		X	X	X	X	10			ra, z
	Mixture F1	2A		X	X	X	X	10	12	1.23	
	Mixture F2	2A		X	X	X	X	10	18	1.15	
	Mixture F3	2A		X	X	X	X	10	29	1.03	
1079	SULPHUR DIOXIDE	2TC	2520	X	X	X	X	5	12	1.23	ra
1080	SULPHUR HEXAFLUORIDE	2A		X	X	X	X	10	70 140 160	1.06 1.34 1.38	ra, ua, va ra, ua, va ra, ua, va
1081	TETRAFLUOROETHYLENE, STABILIZED	2F		X	X	X	X	10	200		m, o, ra
1082	TRIFLUOROCHLOROETHY-LENE, STABILIZED (REFRIGERANT GAS R1113)	2TF	2000	X	X	X	X	5	19	1.13	ra, u
1083	TRIMETHYLAMINE, ANHYDROUS	2F		X	X	X	X	10	10	0.56	b, ra
1085	VINYL BROMIDE, STABILIZED	2F		X	X	X	X	10	10	1.37	a, ra
1086	VINYL CHLORIDE, STABILIZED	2F		X	X	X	X	10	12	0.81	a, ra
1087	VINYL METHYL ETHER, STABILIZED	2F		X	X	X	X	10	10	0.67	ra
1581	CHLOROPICRIN AND METHYL BROMIDE MIXTURE with more than 2 % chloropicrin	2T	850	X	X	X	X	5	10	1.51	a
1582	CHLOROPICRIN AND METHYL CHLORIDE MIXTURE	2T	[d]	X	X	X	X	5	17	0.81	a
1589	CYANOGEN CHLORIDE, STABILIZED	2TC	80	X			X	5	20	1.03	k
1741	BORON TRICHLORIDE	2TC	2541	X	X	X	X	5	10	1.19	a, ra
1749	CHLORINE TRIFLUORIDE	2TOC	299	X	X	X	X	5	30	1.40	a

Table 2: LIQUEFIED GASES AND DISSOLVED GASES

UN No.	Name and description	Classification code	LC_{50} ml/m³	Cylinders	Tubes	Pressure drums	Bundles of cylinders	Test period, years [a]	Test pressure, bar	Filling ratio	Special packing provisions
1858	HEXAFLUOROPROPYLENE (REFRIGERANT GAS R 1216)	2A		X	X	X	X	10	22	1.11	ra
1859	SILICON TETRAFLUORIDE	2TC	922	X	X	X	X	5	200 300	0.74 1.10	a a
1860	VINYL FLUORIDE, STABILIZED	2F		X	X	X	X	10	250	0.64	a, ra
1911	DIBORANE	2TF	80	X			X	5	250	0.07	d, k, o
1912	METHYL CHLORIDE AND METHYLENE CHLORIDE MIXTURE	2F		X	X	X	X	10	17	0.81	a, ra
1952	ETHYLENE OXIDE AND CARBON DIOXIDE MIXTURE with not more than 9 % ethylene oxide	2A		X	X	X	X	10	190 250	0.66 0.75	ra ra
1958	1,2-DICHLORO-1,1,2,2-TETRAFLUOROETHANE (REFRIGERANT GAS R 114)	2A		X	X	X	X	10	10	1.30	ra
1959	1,1-DIFLUOROETHYLENE (REFRIGERANT GAS R 1132a)	2F		X	X	X	X	10	250	0.77	ra
1962	ETHYLENE	2F		X	X	X	X	10	225 300	0.34 0.38	
1965	HYDROCARBON GAS MIXTURE, LIQUEFIED,N.O.S	2F		X	X	X	X	10		[b]	ra, ta, v, z
	Mixture A	2F						10	10	0.50	
	Mixture A01	2F						10	15	0.49	
	Mixture A02	2F						10	15	0.48	
	Mixture A0	2F						10	15	0.47	
	Mixture A1	2F						10	20	0.46	
	Mixture B1	2F						10	25	0.45	
	Mixture B2	2F						10	25	0.44	
	Mixture B	2F						10	25	0.43	
	Mixture C	2F						10	30	0.42	
1967	INSECTICIDE GAS, TOXIC, N.O.S.	2T		X	X	X	X	5			z
1968	INSECTICIDE GAS, N.O.S.	2A		X	X	X	X	10			ra, z
1969	ISOBUTANE	2F		X	X	X	X	10	10	0.49	ra, v
1973	CHLORODIFLUOROME-THANE AND CHLOROPENTAFLUORO-ETHANE MIXTURE with fixed boiling point, with approximately 49 % chlorodifluoromethane (REFRIGERANT GAS R 502)	2A		X	X	X	X	10	31	1.01	ra

Table 2: LIQUEFIED GASES AND DISSOLVED GASES

UN No.	Name and description	Classification code	LC_{50} ml/m³	Cylinders	Tubes	Pressure drums	Bundles of cylinders	Test period, years [a]	Test pressure, bar	Filling ratio	Special packing provisions
1974	CHLORODIFLUORO-BROMOMETHANE (REFRIGERANT GAS R 12B1)	2A		X	X	X	X	10	10	1.61	ra
1975	NITRIC OXIDE AND DINITROGEN TETROXIDE MIXTURE (NITRIC OXIDE AND NITROGEN DIOXIDE MIXTURE)	2TOC	115	X		X	X	5			k, z
1976	OCTAFLUOROCYCLO-BUTANE (REFRIGERANT GAS RC 318)	2.A		X	X	X	X	10	11	1.32	ra
1978	PROPANE	2F		X	X	X	X	10	23	0.43	ra, v
1982	TETRAFLUOROMETHANE (REFRIGERANT GAS R 14)	2A		X	X	X	X	10	200 300	0.71 0.90	
1983	1-CHLORO-2,2,2-TRIFLUOROETHANE (REFRIGERANT GAS R 133a)	2A		X	X	X	X	10	10	1.18	ra
1984	TRIFLUOROMETHANE (REFRIGERANT GAS R 23)	2A		X	X	X	X	10	190 250	0.88 0.96	ra ra
2035	1,1,1-TRIFLUOROETHANE (REFRIGERANT GAS R 143a)	2F		X	X	X	X	10	35	0.73	ra
2036	XENON	2A		X	X	X	X	10	130	1.28	
2044	2,2-DIMETHYLPROPANE	2F		X	X	X	X	10	10	0.53	ra
2073	AMMONIA SOLUTION, relative density less than 0.880 at 15 °C in water,	4A									
	with more than 35 % but not more than 40 % ammonia	4A		X	X	X	X	5	10	0.80	b
	with more than 40 % but not more than 50 % ammonia	4A		X	X	X	X	5	12	0.77	b
2188	ARSINE	2TF	178	X			X	5	42	1.10	d, k
2189	DICHLOROSILANE	2TFC	314	X	X	X	X	5	10 200	0.90 1.08	a a
2191	SULPHURYL FLUORIDE	2T	3020	X	X	X	X	5	50	1.10	u
2192	GERMANE [c]	2TF	620	X	X	X	X	5	250	0.064	d, ra, r, q
2193	HEXAFLUOROETHANE (REFRIGERANT GAS R 116)	2A		X	X	X	X	10	200	1.13	
2194	SELENIUM HEXAFLUORIDE	2TC	50	X			X	5	36	1.46	k, ra
2195	TELLURIUM HEXAFLUORIDE	2TC	25	X			X	5	20	1.00	k, ra
2196	TUNGSTEN HEXAFLUORIDE	2TC	218	X	X	X	X	5	10	3.08	a, ra
2197	HYDROGEN IODIDE, ANHYDROUS	2TC	2860	X	X	X	X	5	23	2.25	a, d, ra

Table 2: LIQUEFIED GASES AND DISSOLVED GASES

UN No.	Name and description	Classification code	LC_{50} ml/m³	Cylinders	Tubes	Pressure drums	Bundles of cylinders	Test period, years [a]	Test pressure, bar	Filling ratio	Special packing provisions
2198	PHOSPHORUS PENTAFLUORIDE	2TC	261	X	X	X	X	5	200 300	0.90 1.25	
2199	PHOSPHINE [c]	2TF	20	X			X	5	225 250	0.30 0.45	d, k, q, ra d, k, q, ra
2200	PROPADIENE, STABILIZED	2F		X	X	X	X	10	22	0.50	ra
2202	HYDROGEN SELENIDE, ANHYDROUS	2TF	51	X			X	5	31	1.60	k
2203	SILANE [c]	2F		X	X	X	X	10	225 250	0.32 0.36	q q
2204	CARBONYL SULPHIDE	2TF	1700	X	X	X	X	5	30	0.87	ra, u
2417	CARBONYL FLUORIDE	2TC	360	X	X	X	X	5	200 300	0.47 0.70	
2418	SULPHUR TETRAFLUORIDE	2TC	40	X			X	5	30	0.91	a, k, ra
2419	BROMOTRIFLUORO-ETHYLENE	2F		X	X	X	X	10	10	1.19	ra
2420	HEXAFLUOROACETONE	2TC	470	X	X	X	X	5	22	1.08	ra
2421	NITROGEN TRIOXIDE	2TOC	CARRIAGE PROHIBITED								
2422	OCTAFLUOROBUT-2-ENE (REFRIGERANT GAS R 1318)	2A		X	X	X	X	10	12	1.34	ra
2424	OCTAFLUOROPROPANE (REFRIGERANT GAS R 218)	2A		X	X	X	X	10	25	1.04	ra
2451	NITROGEN TRIFLUORIDE	2O		X	X	X	X	10	200	0.50	
2452	ETHYLACETYLENE, STABILIZED	2F		X	X	X	X	10	10	0.57	c, ra
2453	ETHYL FLUORIDE (REFRIGERANT GAS R 161)	2F		X	X	X	X	10	30	0.57	ra
2454	METHYL FLUORIDE (REFRIGERANT GAS R 41)	2F		X	X	X	X	10	300	0.63	ra
2455	METHYL NITRITE	2A	CARRIAGE PROHIBITED								
2517	1-CHLORO-1,1-DIFLUOROETHANE (REFRIGERANT GAS R 142b)	2F		X	X	X	X	10	10	0.99	ra
2534	METHYLCHLOROSILANE	2TFC	2810	X	X	X	X	5			ra, z
2548	CHLORINE PENTAFLUORIDE	2TOC	122	X			X	5	13	1.49	a, k
2599	CHLOROTRIFLUORO-METHANE AND TRIFLUOROMETHANE AZEOTROPIC MIXTURE with approximately 60 % chlorotrifluoromethane (REFRIGERANT GAS R 503)	2A		X	X	X	X	10	31 42 100	0.12 0.17 0.64	ra ra ra
2601	CYCLOBUTANE	2F		X	X	X	X	10	10	0.63	ra

Table 2: LIQUEFIED GASES AND DISSOLVED GASES

UN No.	Name and description	Classification code	LC_{50} ml/m³	Cylinders	Tubes	Pressure drums	Bundles of cylinders	Test period, years [a]	Test pressure, bar	Filling ratio	Special packing provisions
2602	DICHLORODIFLUORO-METHANE AND DIFLUOROETHANE AZEOTROPIC MIXTURE with approximately 74 % dichlorodifluoromethane (REFRIGERANT GAS R 500)	2A		X	X	X	X	10	22	1.01	ra
2676	STIBINE	2TF	178	X			X	5	200	0.49	k, ra, r
2901	BROMINE CHLORIDE	2TOC	290	X	X	X	X	5	10	1.50	a
3057	TRIFLUOROACETYL CHLORIDE	2TC	10	X		X	X	5	17	1.17	k, ra
3070	ETHYLENE OXIDE AND DICHLORODIFLUORO-METHANE MIXTURE with not more than 12,5 % ethylene oxide	2A		X	X	X	X	10	18	1.09	ra
3083	PERCHLORYL FLUORIDE	2TO	770	X	X	X	X	5	33	1.21	u
3153	PERFLUORO(METHYL VINYL ETHER)	2F		X	X	X	X	10	20	0.75	ra
3154	PERFLUORO(ETHYL VINYL ETHER)	2F		X	X	X	X	10	10	0.98	ra
3157	LIQUEFIED GAS, OXIDIZING, N.O.S.	2O		X	X	X	X	10			z
3159	1,1,1,2-TETRAFLUOROETHANE (REFRIGERANT GAS R 134a)	2A		X	X	X	X	10	18	1.05	ra
3160	LIQUEFIED GAS, TOXIC, FLAMMABLE, N.O.S.	2TF	≤ 5000	X	X	X	X	5			ra, z
3161	LIQUEFIED GAS, FLAMMABLE, N.O.S.	2F		X	X	X	X	10			ra, z
3162	LIQUEFIED GAS, TOXIC, N.O.S.	2T	≤ 5000	X	X	X	X	5			z
3163	LIQUEFIED GAS, N.O.S.	2A		X	X	X	X	10			ra, z
3220	PENTAFLUOROETHANE (REFRIGERANT GAS R 125)	2A		X	X	X	X	10	49 35	0.95 0.87	ra ra
3252	DIFLUOROMETHANE (REFRIGERANT GAS R 32)	2F		X	X	X	X	10	48	0.78	ra
3296	HEPTAFLUOROPROPANE (REFRIGERANT GAS R 227)	2A		X	X	X	X	10	13	1.21	ra
3297	ETHYLENE OXIDE AND CHLOROTETRAFLUORO-ETHANE MIXTURE with not more than 8.8 % ethylene oxide	2A		X	X	X	X	10	10	1.16	ra
3298	ETHYLENE OXIDE AND PENTAFLUOROETHANE MIXTURE with not more than 7.9 % ethylene oxide	2A		X	X	X	X	10	26	1.02	ra

Table 2: LIQUEFIED GASES AND DISSOLVED GASES

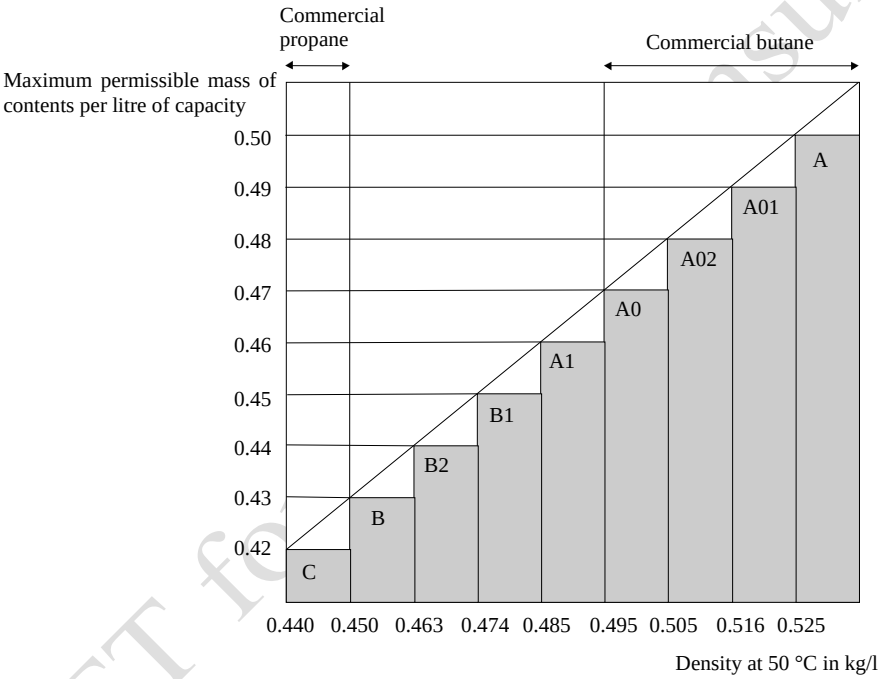
UN No.	Name and description	Classification code	LC_{50} ml/m³	Cylinders	Tubes	Pressure drums	Bundles of cylinders	Test period, years [a]	Test pressure, bar	Filling ratio	Special packing provisions
3299	ETHYLENE OXIDE AND TETRAFLUOROETHANE MIXTURE with not more than 5.6 % ethylene oxide	2A		X	X	X	X	10	17	1.03	ra
3300	ETHYLENE OXIDE AND CARBON DIOXIDE MIXTURE with more than 87 % ethylene oxide	2TF	More than 2900	X	X	X	X	5	28	0.73	ra
3307	LIQUEFIED GAS, TOXIC, OXIDIZING, N.O.S.	2TO	≤ 5000	X	X	X	X	5			z
3308	LIQUEFIED GAS, TOXIC, CORROSIVE, N.O.S.	2TC	≤ 5000	X	X	X	X	5			ra, z
3309	LIQUEFIED GAS, TOXIC, FLAMMABLE, CORROSIVE, N.O.S.	2TFC	≤ 5000	X	X	X	X	5			ra, z
3310	LIQUEFIED GAS, TOXIC, OXIDIZING, CORROSIVE, N.O.S.	2TOC	≤ 5000	X	X	X	X	5			z
3318	AMMONIA SOLUTION, relative density less than 0.880 at 15 °C in water, with more than 50 % ammonia	4TC		X	X	X	X	5			b
3337	REFRIGERANT GAS R 404A (Pentafluoroethane, 1,1,1-trifluoroethane, and 1,1,1,2-tetrafluoroethane zeotropic mixture with approximately 44 % pentafluoroethane and 52 % 1,1,1-trifluoroethane)	2A		X	X	X	X	10	36	0.82	ra
3338	REFRIGERANT GAS R 407A (Difluoromethane, pentafluoroethane, and 1,1,1,2-tetrafluoroethane zeotropic mixture with approximately 20 % difluoromethane and 40 % pentafluoroethane)	2A		X	X	X	X	10	32	0.94	ra
3339	REFRIGERANT GAS R 407B (Difluoromethane, pentafluoroethane, and 1,1,1,2-tetrafluoroethane zeotropic mixture with approximately 10 % difluoromethane and 70 % pentafluoroethane	2A		X	X	X	X	10	33	0.93	ra
3340	REFRIGERANT GAS R 407C (Difluoromethane, pentafluoroethane, and 1,1,1,2-tetrafluoroethane zeotropic mixture with approximately 23 % difluoromethane and 25 % pentafluoroethane)	2A		X	X	X	X	10	30	0.95	ra

Table 2: LIQUEFIED GASES AND DISSOLVED GASES

UN No.	Name and description	Classification code	LC_{50} ml/m³	Cylinders	Tubes	Pressure drums	Bundles of cylinders	Test period, years [a]	Test pressure, bar	Filling ratio	Special packing provisions
3354	INSECTICIDE GAS, FLAMMABLE, N.O.S	2F		X	X	X	X	10			ra, z
3355	INSECTICIDE GAS, TOXIC, FLAMMABLE, N.O.S.	2TF		X	X	X	X	5			ra, z
3374	ACETYLENE, SOLVENT FREE	2F		X			X	5	60		c, p

a *Not applicable for pressure receptacles made of composite materials.*

b *For mixtures of UN No. 1965, the maximum permissible filling mass per litre of capacity is as follows:*



c *Considered as pyrophoric.*

d *Considered to be toxic. The LC_{50} value still to be determined.*

P200	PACKING INSTRUCTION *(cont'd)*	P200

Table 3: SUBSTANCES NOT IN CLASS 2

UN No.	Name and description	Class	Classification Code	LC_{50} ml/m³	Cylinders	Tubes	Pressure drums	Bundles of cylinders	Test period, years [a]	Test pressure, bar	Filling ratio	Special packing provisions
1051	HYDROGEN CYANIDE, STABILIZED containing less than 3 % water	6.1	TF1	40	X			X	5	100	0.55	k
1052	HYDROGEN FLUORIDE, ANHYDROUS	8	CT1	1307	X		X	X	5	10	0.84	a, ab, ac
1745	BROMINE PENTAFLUORIDE	5.1	OTC	25	X		X	X	5	10	[b]	k, ab, ad
1746	BROMINE TRIFLUORIDE	5.1	OTC	50	X		X	X	5	10	[b]	k, ab, ad
2495	IODINE PENTAFLUORIDE	5.1	OTC	120	X		X	X	5	10	[b]	k, ab, ad

[a] *Not applicable for pressure receptacles made of composite materials.*

[b] *A minimum ullage of 8 % by volume is required.*

P201	PACKING INSTRUCTION	P201

This instruction applies to UN Nos. 3167, 3168 and 3169.

The following packagings are authorized:

(1) Cylinders and gas receptacles conforming to the construction, testing and filling requirements approved by the competent authority.

(2) The following combination packagings provided that the general provisions of **4.1.1** and **4.1.3** are met:

Outer packagings:

Drums (1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G);

Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);

Jerricans (3A1, 3A2, 3B1, 3B2, 3H1, 3H2).

Inner packagings:

(a) For non-toxic gases, hermetically sealed inner packagings of glass or metal with a maximum capacity of 5 litres per package;

(b) For toxic gases, hermetically sealed inner packagings of glass or metal with a maximum capacity of 1 litre per package.

Packagings shall conform to the packing group III performance level.

P202	PACKING INSTRUCTION	P202
(Reserved)		

P203	PACKING INSTRUCTION	P203

This instruction applies to Class 2 refrigerated liquefied gases.

Requirements for closed cryogenic receptacles:

(1) The special packing provisions of 4.1.6 shall be met.

(2) The requirements of Chapter 6.2 shall be met.

(3) The closed cryogenic receptacles shall be so insulated that they do not become coated with frost.

(4) Test pressure

Refrigerated liquids shall be filled in closed cryogenic receptacles with the following minimum test pressures:

(a) For closed cryogenic receptacles with vacuum insulation, the test pressure shall not be less than 1.3 times the sum of the maximum internal pressure of the filled receptacle, including during filling and discharge, plus 100 kPa (1 bar);

(b) For other closed cryogenic receptacles, the test pressure shall be not less than 1.3 times the maximum internal pressure of the filled receptacle, taking into account the pressure developed during filling and discharge.

(5) Degree of filling

For non-flammable, non-toxic refrigerated liquefied gases (classification codes 3A and 3O) the volume of liquid phase at the filling temperature and at a pressure of 100 kPa (1 bar) shall not exceed 98 % of the water capacity of the pressure receptacle.

For flammable refrigerated liquefied gases (classification code 3F) the degree of filling shall remain below the level at which, if the contents were raised to the temperature at which the vapour pressure equalled the opening pressure of the relief valve, the volume of the liquid phase would reach 98 % of the water capacity at that temperature.

(6) Pressure-relief devices

Closed cryogenic receptacles shall be fitted with at least one pressure-relief device.

(7) Compatibility

Materials used to ensure the leakproofness of the joints or for the maintenance of the closures shall be compatible with the contents. In the case of receptacles intended for the carriage of oxidizing gases (classification code 3O), these materials shall not react with these gases in a dangerous manner.

(8) Periodic inspection

(a) The periodic inspection and test frequencies of pressure relief valves in accordance with 6.2.1.6.3 shall not exceed five years.

(b) The periodic inspection and test frequencies of non-UN closed cryogenic receptacles in accordance with 6.2.3.5.2 shall not exceed 10 years.

(Cont'd on next page)

P203	PACKING INSTRUCTION *(cont'd)*	P203

Requirements for open cryogenic receptacles:

Only the following non oxidizing refrigerated liquefied gases of classification code 3A may be carried in open cryogenic receptacles: UN Nos. 1913, 1951, 1963, 1970, 1977, 2591, 3136 and 3158.

Open cryogenic receptacles shall be constructed to meet the following requirements:

(1) The receptacles shall be designed, manufactured, tested and equipped in such a way as to withstand all conditions, including fatigue, to which they will be subjected during their normal use and during normal conditions of carriage.

(2) The capacity shall be not more than 450 litres.

(3) The receptacle shall have a double wall construction with the space between the inner and outer wall being evacuated (vacuum insulation). The insulation shall prevent the formation of hoar frost on the exterior of the receptacle.

(4) The materials of construction shall have suitable mechanical properties at the service temperature.

(5) Materials which are in direct contact with the dangerous goods shall not be affected or weakened by the dangerous goods intended to be carried and shall not cause a dangerous effect, e.g. catalysing a reaction or reacting with the dangerous goods.

(6) Receptacles of glass double wall construction shall have an outer packaging with suitable cushioning or absorbent materials which withstand the pressures and impacts liable to occur under normal conditions of carriage.

(7) The receptacle shall be designed to remain in an upright position during carriage, e.g. have a base whose smaller horizontal dimension is greater than the height of the centre of gravity when filled to capacity or be mounted on gimbals.

(8) The openings of the receptacles shall be fitted with devices allowing gases to escape, preventing any splashing out of liquid, and so configured that they remain in place during carriage.

(9) Open cryogenic receptacles shall bear the following marks permanently affixed e.g. by stamping, engraving or etching:

- The manufacturer’s name and address;
- The model number or name;
- The serial or batch number;
- The UN number and proper shipping name of gases for which the receptacle is intended;
- The capacity of the receptacle in litres.

P204	PACKING INSTRUCTION	P204
	(Deleted)	

P205	PACKING INSTRUCTION	P205

This instruction applies to UN No. 3468.

(1) For metal hydride storage systems, the special packing provisions of 4.1.6 shall be met.

(2) Only pressure receptacles not exceeding 150 litres in water capacity and having a maximum developed pressure not exceeding 25 MPa are covered by this packing instruction.

(3) Metal hydride storage systems meeting the applicable requirements for the construction and testing of pressure receptacles containing gas of Chapter 6.2 are authorised for the carriage of hydrogen only.

(4) When steel pressure receptacles or composite pressure receptacles with steel liners are used, only those bearing the "H" mark, in accordance with 6.2.2.9.2 (j) shall be used.

(5) Metal hydride storage systems shall meet the service conditions, design criteria, rated capacity, type tests, batch tests, routine tests, test pressure, rated charging pressure and provisions for pressure relief devices for transportable metal hydride storage systems specified in ISO 16111:2008 or ISO 16111:2018 (Transportable gas storage devices – Hydrogen absorbed in reversible metal hydride) and their conformity and approval shall be assessed in accordance with 6.2.2.5.

(6) Metal hydride storage systems shall be filled with hydrogen at a pressure not exceeding the rated charging pressure shown in the permanent mark on the system as specified by ISO 16111:2008 or ISO 16111:2018.

(7) The periodic test requirements for a metal hydride storage system shall be in accordance with ISO 16111:2008 or ISO 16111:2018 and carried out in accordance with 6.2.2.6, and the interval between periodic inspections shall not exceed five years. See 6.2.2.4 to determine which standard is applicable at the time of periodic inspection and test.

P206	PACKING INSTRUCTION	P206

This instruction applies to UN Nos. 3500, 3501, 3502, 3503, 3504 and 3505.

Unless otherwise indicated in this Code, cylinders and pressure drums conforming to the applicable requirements of Chapter 6.2 are authorized.

(1) The special packing provisions of **4.1.6** shall be met.

(2) The maximum test period for periodic inspection shall be 5 years.

(3) Cylinders and pressure drums shall be so filled that at 50 °C the non-gaseous phase does not exceed 95 % of their water capacity and they are not completely filled at 60 °C. When filled, the internal pressure at 65 °C shall not exceed the test pressure of the cylinders and pressure drums. The vapour pressures and volumetric expansion of all substances in the cylinders and pressure drums shall be taken into account.

For liquids charged with a compressed gas both components – the liquid and the compressed gas – have to be taken into consideration in the calculation of the internal pressure in the pressure receptacle. When experimental data is not available, the following steps shall be carried out:

(a) Calculation of the vapour pressure of the liquid and of the partial pressure of the compressed gas at 15 °C (filling temperature);

(b) Calculation of the volumetric expansion of the liquid phase resulting from the heating from 15 °C to 65 °C and calculation of the remaining volume for the gaseous phase;

(c) Calculation of the partial pressure of the compressed gas at 65 °C considering the volumetric expansion of the liquid phase;

NOTE: *The compressibility factor of the compressed gas at 15 °C and 65 °C shall be considered.*

(d) Calculation of the vapour pressure of the liquid at 65 °C;

(e) The total pressure is the sum of the vapour pressure of the liquid and the partial pressure of the compressed gas at 65 °C;

(f) Consideration of the solubility of the compressed gas at 65 °C in the liquid phase.

The test pressure of the cylinders or pressure drums shall not be less than the calculated total pressure minus 100 kPa (1bar).

If the solubility of the compressed gas in the liquid phase is not known for the calculation, the test pressure can be calculated without taking the gas solubility (sub-paragraph (f)) into account.

(4) The minimum test pressure shall be in accordance with packing instruction P200 for the propellant but shall not be less than 20 bar.

Additional requirement:

Cylinders and pressure drums shall not be offered for carriage when connected with spray application equipment such as a hose and wand assembly.

Special packing provisions:

PP89 For UN Nos. 3501, 3502, 3503, 3504 and 3505, notwithstanding 4.1.6.9 (b), non-refillable cylinders used may have a water capacity in litres not exceeding 1 000 litres divided by the test pressure expressed in bars provided capacity and pressure restrictions of the construction standard comply with ISO 11118:1999, which limits the maximum capacity to 50 litres.

PP97 For fire extinguishing agents assigned to UN No. 3500 the maximum test period for periodic inspection shall be 10 years. They may be carried in tubes of a maximum water capacity of 450 *l* conforming to the applicable requirements of Chapter 6.2.

P207	PACKING INSTRUCTION	P207

This instruction applies to UN No. 1950.

The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

(a) Drums (1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G);

Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2).

Packagings shall conform to the packing group II performance level.

(b) Rigid outer packagings with a maximum net mass as follows:

Fibreboard	55 kg
Other than fibreboard	125 kg

The provisions of 4.1.1.3 need not be met.

The packagings shall be designed and constructed to prevent excessive movement of the aerosols and inadvertent discharge during normal conditions of carriage.

Special packing provision:

PP87 For UN 1950 waste aerosols carried in accordance with special provision 327, the packagings shall have a means of retaining any free liquid that might escape during carriage, e.g. absorbent material. The packagings shall be adequately ventilated to prevent the creation of dangerous atmospheres and the build-up of pressure.

Special packing provision specific to this Code:

RR6 For UN 1950 in the case of carriage by full load, metal articles may also be packed as follows: The articles shall be grouped together in units on trays and held in position with an appropriate plastics cover; these units shall be stacked and suitably secured on pallets.

P208	PACKING INSTRUCTION	P208

This instruction applies to Class 2 adsorbed gases.

(1) The following packagings are authorized provided the general packing requirements of **4.1.6.1** are met:

Cylinders specified in Chapter 6.2 and in accordance with ISO 11513:2011, ISO 11513:2019, ISO 9809-1:2010 or ISO 9809-1:2019.

(2) The pressure of each filled cylinder shall be less than 101.3 kPa at 20 °C and less than 300 kPa at 50 °C.

(3) The minimum test pressure of the cylinder shall be 21 bar.

(4) The minimum burst pressure of the cylinder shall be 94.5 bar.

(5) The internal pressure at 65 °C of the filled cylinder shall not exceed the test pressure of the cylinder.

(6) The adsorbent material shall be compatible with the cylinder and shall not form harmful or dangerous compounds with the gas to be adsorbed. The gas in combination with the adsorbent material shall not affect or weaken the cylinder or cause a dangerous reaction (e.g. a catalyzing reaction).

(7) The quality of the adsorbent material shall be verified at the time of each fill to ensure that the pressure and chemical stability requirements of this packing instruction are met each time an adsorbed gas package is offered for carriage.

(8) The adsorbent material shall not meet the criteria of any of the classes in this Code.

(9) Requirements for cylinders and closures containing toxic gases with an LC_{50} less than or equal to 200 ml/m³ (ppm) (see Table 1) shall be as follows:

(a) Valve outlets shall be fitted with pressure retaining gas-tight plugs or caps having threads matching those of the valve outlets.

(b) Each valve shall either be of the packless type with non-perforated diaphragm, or be of a type which prevents leakage through or past the packing.

(c) Each cylinder and closure shall be tested for leakage after filling.

(d) Each valve shall be capable of withstanding the test pressure of the cylinder and be directly connected to the cylinder by either a taper-thread or other means which meets the requirements of ISO 10692-2:2001.

(e) Cylinders and valves shall not be fitted with a pressure relief device.

(10) Valve outlets for cylinders containing pyrophoric gases shall be fitted with gas-tight plugs or caps having threads matching those of the valve outlets.

(11) The filling procedure shall be in accordance with Annex A of ISO 11513:2011 (applicable until 31 December 2024) or Annex A of ISO 11513:2019.

(12) The maximum period for periodic inspections shall be 5 years.

(13) Special packing provisions that are specific to a substance (see Table 1).

Material compatibility

a: Aluminium alloy cylinders shall not be used.

d: When steel cylinders are used, only those bearing the "H" mark in accordance with 6.2.2.7.4 (p) are permitted.

Gas specific provisions

r: The filling of this gas shall be limited such that, if complete decomposition occurs, the pressure does not exceed two thirds of the test pressure of the cylinder.

Material compatibility for n.o.s. adsorbed gas entries

z: The construction materials of the cylinders and their accessories shall be compatible with the contents and shall not react to form harmful or dangerous compounds therewith.

(Cont'd on next page)

P208	PACKING INSTRUCTION *(cont'd)*			P208
Table 1: ADSORBED GASES				
UN No.	Name and description	Classification code	LC_{50} ml/m³	Special packing provisions
3510	ADSORBED GAS, FLAMMABLE, N.O.S.	9F		z
3511	ADSORBED GAS, N.O.S.	9A		z
3512	ADSORBED GAS, TOXIC, N.O.S.	9T	≤ 5000	z
3513	ADSORBED GAS, OXIDIZING, N.O.S.	9O		z
3514	ADSORBED GAS, TOXIC, FLAMMABLE, N.O.S.	9TF	≤ 5000	z
3515	ADSORBED GAS, TOXIC, OXIDIZING, N.O.S.	9TO	≤ 5000	z
3516	ADSORBED GAS, TOXIC, CORROSIVE, N.O.S.	9TC	≤ 5000	z
3517	ADSORBED GAS, TOXIC, FLAMMABLE, CORROSIVE, N.O.S.	9TFC	≤ 5000	z
3518	ADSORBED GAS, TOXIC, OXIDIZING, CORROSIVE, N.O.S.	9TOC	≤ 5000	z
3519	BORON TRIFLUORIDE, ADSORBED	9TC	387	a
3520	CHLORINE, ADSORBED	9TOC	293	a
3521	SILICON TETRAFLUORIDE, ADSORBED	9TC	450	a
3522	ARSINE, ADSORBED	9TF	20	d
3523	GERMANE, ADSORBED	9TF	620	d, r
3524	PHOSPHORUS PENTAFLUORIDE, ADSORBED	9TC	190	
3525	PHOSPHINE, ADSORBED	9TF	20	d
3526	HYDROGEN SELENIDE, ADSORBED	9TF	2	

P209	PACKING INSTRUCTION	P209
This packing instruction applies to UN No. 3150 devices, small, hydrocarbon gas powered or hydrocarbon gas refills for small devices		
(1) The special packing provisions of **4.1.6** when applicable shall be met. (2) The articles shall comply with the provisions of the country in which they were filled. (3) The devices and refills shall be packed in outer packagings conforming to 6.1.4 tested and approved in accordance with Chapter 6.1 for packing group II.		

P300	PACKING INSTRUCTION	P300
This instruction applies to UN No. 3064.		
The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met: Combination packagings consisting of inner metal cans of not more than 1 litre capacity each and outer wooden boxes (4C1, 4C2, 4D or 4F) containing not more than 5 litres of solution.		
Additional requirements: 1. Metal cans shall be completely surrounded with absorbent cushioning material. 2. Wooden boxes shall be completely lined with suitable material impervious to water and nitroglycerin.		

P301	PACKING INSTRUCTION	P301

This instruction applies to UN No. 3165.

The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

(1) Aluminium pressure receptacle made from tubing and having welded heads.

Primary containment of the fuel within this receptacle shall consist of a welded aluminium bladder having a maximum internal volume of 46 litres.

The outer receptacle shall have a minimum design gauge pressure of 1 275 kPa and a minimum burst gauge pressure of 2 755 kPa.

Each receptacle shall be leak checked during manufacture and before dispatch and shall be found leakproof.

The complete inner unit shall be securely packed in non-combustible cushioning material, such as vermiculite, in a strong outer tightly closed metal packaging which will adequately protect all fittings.

Maximum quantity of fuel per primary containment and package is 42 litres.

(2) Aluminium pressure receptacle.

Primary containment of the fuel within this receptacle shall consist of a welded vapour tight fuel compartment with an elastomeric bladder having a maximum internal volume of 46 litres.

The pressure receptacle shall have a minimum design gauge pressure of 2 680 kPa and a minimum burst gauge pressure of 5 170 kPa.

Each receptacle shall be leak-checked during manufacture and before dispatch and shall be securely packed in non-combustible cushioning material such as vermiculite, in a strong outer tightly closed metal packaging which will adequately protect all fittings.

Maximum quantity of fuel per primary containment and package is 42 litres.

P302	PACKING INSTRUCTION	P302

This instruction applies to UN No. 3269.

The following combination packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

Outer packagings:

Drums (1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G);

Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);

Jerricans (3A1, 3A2, 3B1, 3B2, 3H1, 3H2);

Inner packagings:

The activator (organic peroxide) shall have a maximum quantity of 125 ml per inner packaging if liquid, and 500 g per inner packaging if solid.

The base material and the activator shall be each separately packed in inner packagings.

The components may be placed in the same outer packaging provided that they will not interact dangerously in the event of a leakage.

Packagings shall conform to the packing group II or III performance level according to the criteria for Class 3 applied to the base material.

P400	PACKING INSTRUCTION	P400

The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

(1) Pressure receptacles, provided that the general provisions of 4.1.3.6 are met. They shall be made of steel and shall be subjected to an initial test and periodic tests every 10 years at a pressure of not less than 1 MPa (10 bar, gauge pressure). During carriage, the liquid shall be under a layer of inert gas with a gauge pressure of not less than 20 kPa (0.2 bar);

(2) Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F or 4G), drums (1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1D or 1G) or jerricans (3A1, 3A2, 3B1 or 3B2) enclosing hermetically sealed metal cans with inner packagings of glass or metal, with a capacity of not more than 1 litre each, having closures with gaskets. Inner packagings shall have threaded closures or closures physically held in place by any means capable of preventing back-off or loosening of the closure by impact or vibration during carriage. Inner packagings shall be cushioned on all sides with dry, absorbent, non-combustible material in a quantity sufficient to absorb the entire contents. Inner packagings shall not be filled to more than 90 % of their capacity. Outer packagings shall have a maximum net mass of 125 kg;

(3) Steel, aluminium or metal drums (1A1, 1A2, 1B1, 1B2, 1N1 or 1N2), jerricans (3A1, 3A2, 3B1 or 3B2) or boxes (4A, 4B or 4N) with a maximum net mass of 150 kg each with hermetically sealed inner metal cans not more than 4 litre capacity each, with closures fitted with gaskets. Inner packagings shall have threaded closures or closures physically held in place by any means capable of preventing back-off or loosening of the closure by impact or vibration during carriage. Inner packagings shall be cushioned on all sides with dry, absorbent, non-combustible material in a quantity sufficient to absorb the entire contents. Each layer of inner packagings shall be separated by a dividing partition in addition to cushioning material. Inner packagings shall not be filled to more than 90 % of their capacity.

Special packing provision:

PP86 For UN Nos. 3392 and 3394, air shall be eliminated from the vapour space by nitrogen or other means.

P401	PACKING INSTRUCTION	P401

The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

(1) Pressure receptacles, provided that the general provisions of 4.1.3.6 are met. They shall be made of steel and subjected to an initial test and periodic tests every 10 years at a pressure of not less than 0.6 MPa (6 bar, gauge pressure). During carriage, the liquid shall be under a layer of inert gas with a gauge pressure of not less than 20 kPa (0.2 bar);

(2) Combination packagings:

Outer packagings:

Drums (1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G);

Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);

Jerricans (3A1, 3A2, 3B1, 3B2, 3H1, 3H2).

Inner packagings:

Glass, metal or plastics which have threaded closures with a maximum capacity of 1 litre.

Each inner packaging shall be surrounded by inert cushioning and absorbent material in a quantity sufficient to absorb the entire contents.

The maximum net mass per outer packaging shall not exceed 30 kg.

Special packing provision specific to this Code:

RR7 For UN Nos. 1183, 1242, 1295 and 2988, the pressure receptacles shall however be subjected to the tests every five years.

P402	PACKING INSTRUCTION	P402

The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

(1) Pressure receptacles, provided that the general provisions of 4.1.3.6 are met. They shall be made of steel and subjected to an initial test and periodic tests every 10 years at a pressure of not less than 0.6 MPa (6 bar, gauge pressure). During carriage, the liquid shall be under a layer of inert gas with a gauge pressure of not less than 20 kPa (0.2 bar);

(2) Combination packagings:

Outer packagings:

Drums (1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G);

Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);

Jerricans (3A1, 3A2, 3B1, 3B2, 3H1, 3H2).

Inner packagings with a maximum net mass as follows:

Glass	10 kg
Metal or plastics	15 kg

Each inner packaging shall be fitted with threaded closures.

Each inner packaging shall be surrounded by inert cushioning and absorbent material in a quantity sufficient to absorb the entire contents.

The maximum net mass per outer packaging shall not exceed 125 kg.

(3) Steel drums (1A1) with a maximum capacity of 250 litres;

(4) Composite packagings consisting of a plastics receptacle with outer steel drum or aluminium (6HA1 or 6HB1) with a maximum capacity of 250 litres.

Special packing provisions specific to this Code:

RR4 For UN No. 3130, the openings of receptacles shall be tightly closed by means of two devices in series, one of which shall be screwed or secured in an equivalent manner.

RR7 For UN No. 3129, the pressure receptacles shall however be subjected to the tests every five years.

RR8 For UN Nos. 1389, 1391, 1411, 1421, 1928, 3129, 3130, 3148 and 3482, the pressure receptacles shall however be subjected to an initial test and to periodic tests at a pressure of not less than 1 MPa (10 bar).

P403	PACKING INSTRUCTION	P403
The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:		
Combination packagings:		**Maximum net mass**
Inner packagings	**Outer packagings**	
Glass 2 kg Plastics 15 kg Metal 20 kg Inner packagings shall be hermetically sealed (e.g. by taping or by threaded closures).	**Drums**	
	steel (1A1, 1A2)	400 kg
	aluminium (1B1, 1B2)	400 kg
	other metal (1N1, 1N2)	400 kg
	plastics (1H1, 1H2)	400 kg
	plywood (1D)	400 kg
	fibre (1G)	400 kg
	Boxes	
	steel (4A)	400 kg
	aluminium (4B)	400 kg
	other metal (4N)	400 kg
	natural wood (4C1)	250 kg
	natural wood with sift proof walls (4C2)	250 kg
	plywood (4D)	250 kg
	reconstituted wood (4F)	125 kg
	fibreboard (4G)	125 kg
	expanded plastics (4H1)	60 kg
	solid plastics (4H2)	250 kg
	Jerricans	
	steel (3A1, 3A2)	120 kg
	aluminium (3B1, 3B2)	120 kg
	plastics (3H1, 3H2)	120 kg
Single packagings:		
Drums		
steel (1A1, 1A2)		250 kg
aluminium (1B1, 1B2)		250 kg
metal other than steel or aluminium (1N1, 1N2)		250 kg
plastics (1H1, 1H2)		250 kg
Jerricans		
steel (3A1, 3A2)		120 kg
aluminium (3B1, 3B2)		120 kg
plastics (3H1, 3H2)		120 kg
Composite packagings		
plastics receptacle with outer steel or aluminium drums (6HA1 or 6HB1)		250 kg
plastics receptacle with outer fibre, plastics or plywood drums (6HG1, 6HH1 or 6HD1)		75 kg
plastics receptacle with outer steel or aluminium crate or box or with outer wooden, plywood, fibreboard or solid plastics boxes (6HA2, 6HB2, 6HC, 6HD2, 6HG2 or 6HH2)		75 kg
Pressure receptacles, provided that the general provisions of 4.1.3.6 are met.		
Additional requirement: Packagings shall be hermetically sealed.		
Special packing provision: **PP83** *Deleted.*		

P404	PACKING INSTRUCTION	P404

This instruction applies to pyrophoric solids: UN Nos.: 1383, 1854, 1855, 2008, 2441, 2545, 2546, 2846, 2881, 3200, 3391 and 3393.

The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

(1) **Combination packagings**

Outer packagings: (1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G, 4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G or 4H2)

Inner packagings: Metal receptacles with a maximum net mass of 15 kg each. Inner packagings shall be hermetically sealed;

Glass receptacles, with a maximum net mass of 1 kg each, having closures with gaskets, cushioned on all sides and contained in hermetically sealed metal cans.

Inner packagings shall have threaded closures or closures physically held in place by any means capable of preventing back-off or loosening of the closure by impact or vibration during carriage.

Outer packagings shall have a maximum net mass of 125 kg.

(2) **Metal packagings:** (1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 3A1, 3A2, 3B1 and 3B2) Maximum gross mass: 150 kg;

(3) **Composite packagings:** Plastics receptacle with outer steel or aluminium drum (6HA1 or 6HB1) Maximum gross mass: 150 kg.

Pressure receptacles, provided that the general provisions of 4.1.3.6 are met.

Special packing provision:

PP86 For UN Nos. 3391 and 3393, air shall be eliminated from the vapour space by nitrogen or other means.

P405	PACKING INSTRUCTION	P405

This instruction applies to UN No. 1381.

The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

(1) For UN No. 1381, phosphorus, wet:

(a) **Combination packagings**

Outer packagings: (4A, 4B, 4N, 4C1, 4C2, 4D or 4F) Maximum net mass: 75 kg

Inner packagings:

(i) hermetically sealed metal cans, with a maximum net mass of 15 kg; or

(ii) glass inner packagings cushioned on all sides with dry, absorbent, non-combustible material in a quantity sufficient to absorb the entire contents with a maximum net mass of 2 kg; or

(b) **Drums** (1A1, 1A2, 1B1, 1B2, 1N1 or 1N2); maximum net mass: 400 kg

Jerricans (3A1 or 3B1); maximum net mass: 120 kg.

These packagings shall be capable of passing the leakproofness test specified in 6.1.5.4 at the packing group II performance level;

(2) For UN No. 1381, dry phosphorus:

(a) When fused, **drums** (1A2, 1B2 or 1N2) with a maximum net mass of 400 kg; or

(b) In projectiles or hard cased articles when carried without Class 1 components: as specified by the competent authority.

P406	PACKING INSTRUCTION	P406

The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

(1) Combination packagings

outer packagings: (4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2, 1G, 1D, 1H1, 1H2, 3H1 or 3H2)

inner packagings: water-resistant packagings;

(2) Plastics, plywood or fibreboard drums (1H2, 1D or 1G) or boxes (4A, 4B, 4N, 4C1, 4D, 4F, 4C2, 4G and 4H2) with a water resistant inner bag, plastics film lining or water resistant coating;

(3) Metal drums (1A1, 1A2, 1B1, 1B2, 1N1 or 1N2), plastics drums (1H1 or 1H2), metal jerricans (3A1, 3A2, 3B1 or 3B2), plastics jerricans (3H1 or 3H2), plastics receptacle with outer steel or aluminium drums (6HA1 or 6HB1), plastics receptacle with outer fibre, plastics or plywood drums (6HG1, 6HH1 or 6HD1), plastics receptacle with outer steel or aluminium crate or box or with outer wooden, plywood, fibreboard or solid plastics boxes (6HA2, 6HB2, 6HC, 6HD2, 6HG2 or 6HH2).

Additional requirements:

1. Packagings shall be designed and constructed to prevent the loss of water or alcohol content or the content of the phlegmatizer.

2. Packagings shall be so constructed and closed so as to avoid an explosive overpressure or pressure build-up of more than 300 kPa (3 bar).

Special packing provisions:

PP24 UN Nos. 2852, 3364, 3365, 3366, 3367, 3368 and 3369 shall not be carried in quantities of more than 500 g per package.

PP25 For UN No. 1347, the quantity carried shall not exceed 15 kg per package.

PP26 For UN Nos. 1310, 1320, 1321, 1322, 1344, 1347, 1348, 1349, 1517, 2907, 3317, 3344 and 3376 packagings shall be lead free.

PP48 For UN No. 3474, metal packagings shall not be used. Packagings of other material with a small amount of metal, for example metal closures or other metal fittings such as those mentioned in 6.1.4, are not considered metal packagings.

PP78 UN No. 3370 shall not be carried in quantities of more than 11.5 kg per package.

PP80 For UN Nos. 2907 and 3344, packagings shall meet the packing group II performance level. Packagings meeting the test criteria of packing group I shall not be used.

P407	PACKING INSTRUCTION	P407

This instruction applies to UN Nos. 1331, 1944, 1945 and 2254.

The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

Outer packagings:

Drums (1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G);

Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);

Jerricans (3A1, 3A2, 3B1, 3B2, 3H1, 3H2).

Inner packagings:

Matches shall be tightly packed in securely closed inner packagings to prevent accidental ignition under normal conditions of carriage.

The maximum gross mass of the package shall not exceed 45 kg except for fibreboard boxes which shall not exceed 30 kg.

Packagings shall conform to the packing group III performance level.

Special packing provision:

PP27 UN No. 1331, Strike-anywhere matches shall not be packed in the same outer packaging with any other dangerous goods other than safety matches or wax Vesta matches, which shall be packed in separate inner packagings. Inner packagings shall not contain more than 700 strike-anywhere matches.

P408	PACKING INSTRUCTION	P408

This instruction applies to UN No. 3292.

The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

(1) For cells:

Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G);

Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);

Jerricans (3A2, 3B2, 3H2).

There shall be sufficient cushioning material to prevent contact between cells and between cells and the internal surfaces of the outer packaging and to ensure that no dangerous movement of the cells within the outer packaging occurs in carriage.

Packagings shall conform to the packing group II performance level.

(2) Batteries may be carried unpacked or in protective enclosures (e.g. fully enclosed or wooden slatted crates). The terminals shall not support the weight of other batteries or materials packed with the batteries.

Packagings need not meet the requirements of 4.1.1.3.

NOTE: *The packagings authorized may exceed a net mass of 400 kg (see 4.1.3.3).*

Additional requirement:

Cells and batteries shall be protected against short circuit and shall be isolated in such a manner as to prevent short circuits.

P409	PACKING INSTRUCTION	P409

This instruction applies to UN Nos. 2956, 3242 and 3251.

The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

(1) Fibre drum (1G) which may be fitted with a liner or coating; maximum net mass: 50 kg;

(2) Combination packagings: Fibreboard box (4G) with a single inner plastic bag;

maximum net mass: 50 kg;

(3) Combination packagings: Fibreboard box (4G) or fibre drum (1G) with plastics inner packagings each containing a maximum of 5 kg; maximum net mass: 25 kg.

P410	PACKING INSTRUCTION	P410

The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

Combination packagings:		**Maximum net mass**	
Inner packagings	**Outer packagings**	**Packing group II**	**Packing group III**
Glass 10 kg Plastics [a] 30 kg Metal 40 kg Paper [a, b] 10 kg Fibre [a, b] 10 kg	**Drums**		
	steel (1A1, 1A2)	400 kg	400 kg
	aluminium (1B1, 1B2)	400 kg	400 kg
	other metal (1N1, 1N2)	400 kg	400 kg
	plastics (1H1, 1H2)	400 kg	400 kg
	plywood (1D)	400 kg	400 kg
	fibre (1G)[a]	400 kg	400 kg
	Boxes		
	steel (4A)	400 kg	400 kg
	aluminium (4B)	400 kg	400 kg
	other metal (4N)	400 kg	400 kg
	natural wood (4C1)	400 kg	400 kg
	natural wood with sift-proof walls (4C2)	400 kg	400 kg
	plywood (4D)	400 kg	400 kg
	reconstituted wood (4F)	400 kg	400 kg
	fibreboard (4G) [a]	400 kg	400 kg
	expanded plastics (4H1)	60 kg	60 kg
	solid plastics (4H2)	400 kg	400 kg
	Jerricans		
	steel (3A1, 3A2)	120 kg	120 kg
	aluminium (3B1, 3B2)	120 kg	120 kg
	plastics (3H1, 3H2)	120 kg	120 kg
Single packagings:			
Drums			
steel (1A1 or 1A2)		400 kg	400 kg
aluminium (1B1 or 1B2)		400 kg	400 kg
metal other than steel or aluminium (1N1 or 1N2)		400 kg	400 kg
plastics (1H1 or 1H2)		400 kg	400 kg
Jerricans			
steel (3A1 or 3A2)		120 kg	120 kg
aluminium (3B1 or 3B2)		120 kg	120 kg
plastics (3H1 or 3H2)		120 kg	120 kg
Boxes			
steel (4A) [c]		400 kg	400 kg
aluminium (4B) [c]		400 kg	400 kg
other metal (4N) [c]		400 kg	400 kg
natural wood (4C1) [c]		400 kg	400 kg
plywood (4D) [c]		400 kg	400 kg
reconstituted wood (4F) [c]		400 kg	400 kg
natural wood with sift-proof walls (4C2) [c]		400 kg	400 kg
fibreboard (4G) [c]		400 kg	400 kg
solid plastics (4H2) [c]		400 kg	400 kg
Bags			
Bags (5H3, 5H4, 5L3, 5M2) [c, d]		50 kg	50 kg

[a] *These packagings shall be sift-proof.*

[b] *These inner packagings shall not be used when the substances being carried may become liquid during carriage.*

[c] *These packagings shall not be used when the substances being carried may become liquid during carriage.*

[d] *For packing group II substances, these packagings may only be used when carried in a closed vehicle, closed wagon or closed container.*

(Cont'd on next page)

P410	PACKING INSTRUCTION *(cont'd)*	P410

Composite packagings	Maximum net mass	
	Packing group II	Packing group III
plastics receptacle with outer steel, aluminium, plywood, fibre or plastics drum (6HA1, 6HB1, 6HG1, 6HD1, or 6HH1)	400 kg	400 kg
plastics receptacle with outer steel or aluminium crate or box, or outer wooden, plywood, fibreboard or solid plastics box (6HA2, 6HB2, 6HC, 6HD2, 6HG2 or 6HH2)	75 kg	75 kg
glass receptacle with outer steel, aluminium, plywood or fibre drum (6PA1, 6PB1, 6PD1 or 6PG1) or outer steel or aluminium crate or box or with outer wooden or fibreboard box or with outer wickerwork hamper (6PA2, 6PB2, 6PC, 6PD2, or 6PG2) or with outer expanded or solid plastics packaging (6PH1 or 6PH2)	75 kg	75 kg

Pressure receptacles, provided that the general provisions of 4.1.3.6 are met.

Special packing provisions:

PP39 For UN No. 1378, for metal packagings a venting device is required.

PP40 For UN Nos. 1326, 1352, 1358, 1395, 1396, 1436, 1437, 1871, 2805 and 3182, packing group II, bags are not allowed.

PP83 *Deleted.*

P411	PACKING INSTRUCTION	P411

This instruction applies to UN No. 3270.

The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G);

Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);

Jerricans (3A2, 3B2, 3H2);

provided that explosion is not possible by reason of increased internal pressure.

The maximum net mass shall not exceed 30 kg.

P412	PACKING INSTRUCTION	P412

This instruction applies to UN No. 3527

The following combination packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

(1) Outer packagings:

Drums (1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G);

Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2)

Jerricans (3A1, 3A2, 3B1, 3B2, 3H1, 3H2);

(2) Inner packagings:

(a) The activator (organic peroxide) shall have a maximum quantity of 125 ml per inner packaging if liquid, and 500 g per inner packaging if solid.

(b) The base material and the activator shall be each separately packed in inner packagings.

The components may be placed in the same outer packaging provided that they will not interact dangerously in the event of a leakage.

Packagings shall conform to the packing group II or III performance level according to the criteria for Class 4.1 applied to the base material.

P500	PACKING INSTRUCTION	P500

This instruction applies to UN No. 3356.

The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G);

Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);

Jerricans (3A2, 3B2, 3H2).

Packagings shall conform to the packing group II performance level.

The generator(s) shall be carried in a package which meets the following requirements when one generator in the package is actuated:

(a) Other generators in the package will not be actuated;

(b) Packaging material will not ignite; and

(c) The outside surface temperature of the completed package shall not exceed 100 °C.

P501	PACKING INSTRUCTION	P501

This instruction applies to UN No. 2015.

The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

Combination packagings:	**Inner packaging maximum capacity**	**Outer packaging maximum net mass**
(1) Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4H2) or drums (1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D) or jerricans (3A1, 3A2, 3B1, 3B2, 3H1, 3H2) with glass, plastics or metal inner packagings	5 *l*	125 kg
(2) Fibreboard box (4G) or fibre drum (1G), with plastics or metal inner packagings each in a plastics bag	2 *l*	50 kg

Single packagings:	**Maximum capacity**
Drums	
steel (1A1)	250 *l*
aluminium (1B1)	*250 l*
metal other than steel or aluminium (1N1)	*250 l*
plastics (1H1)	*250 l*
Jerricans	
steel (3A1)	60 *l*
aluminium (3B1)	*60 l*
plastics (3H1)	*60 l*
Composite packagings	
plastics receptacle with outer steel or aluminium drum (6HA1, 6HB1)	250 *l*
plastics receptacle with outer fibre, plastics or plywood drum (6HG1, 6HH1, 6HD1)	250 *l*
plastics receptacle with outer steel or aluminium crate or box or plastics receptacle with outer wooden, plywood, fibreboard or solid plastics box (6HA2, 6HB2, 6HC, 6HD2, 6HG2 or 6HH2)	60 *l*
glass receptacle with outer steel, aluminium, fibre or plywood drum (6PA1, 6PB1, 6PD1 or 6PG1) or with outer steel, aluminium, wooden or fibreboard box or with outer wickerwork hamper (6PA2, 6PB2, 6PC, 6PG2 or 6PD2) or with outer expanded or solid plastics packaging (6PH1 or 6PH2).	60 *l*

Additional requirements:

1. Packagings shall have a maximum filling degree of 90 %.
2. Packagings shall be vented.

P502	PACKING INSTRUCTION	P502
The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:		
Combination packagings:		**Maximum net mass**
Inner packagings	**Outer packagings**	
Glass 5 *l*	**Drums**	
Metal 5 *l*	steel (1A1, 1A2)	125 kg
Plastics 5 *l*	aluminium (1B1, 1B2)	125 kg
	other metal (1N1, 1N2)	125 kg
	plywood (1D)	125 kg
	fibre (1G)	125 kg
	plastics (1H1, 1H2)	125 kg
	Boxes	
	steel (4A)	125 kg
	aluminium (4B)	125 kg
	other metal (4N)	125 kg
	natural wood (4C1)	125 kg
	natural wood with sift-proof walls (4C2)	125 kg
	plywood (4D)	125 kg
	reconstituted wood (4F)	125 kg
	fibreboard (4G)	125 kg
	expanded plastics (4H1)	60 kg
	solid plastics (4H2)	125 kg
Single packagings:		**Maximum capacity**
Drums		
steel (1A1)		250 *l*
aluminium (1B1)		*250 l*
plastics (1H1)		*250 l*
Jerricans		
steel (3A1)		60 *l*
aluminium (3B1)		*60 l*
plastics (3H1)		*60 l*
Composite packagings		
plastics receptacle with outer steel or aluminium drum (6HA1, 6HB1)		250 *l*
plastics receptacle with outer fibre, plastics or plywood drum (6HG1, 6HH1, 6HD1)		250 *l*
plastics receptacle with outer steel or aluminium crate or box or plastics receptacle with outer wooden, plywood, fibreboard or solid plastics box (6HA2, 6HB2, 6HC, 6HD2, 6HG2 or 6HH2)		60 *l*
glass receptacle with outer steel, aluminium, fibre or plywood drum (6PA1, 6PB1, 6PG1 or 6PD1) or with outer steel, aluminium, wooden or fibreboard box or with outer wickerwork hamper (6PA2, 6PB2, 6PC, 6PG2 or 6PD2) or with outer expanded or solid plastics packaging (6PH1 or 6PH2).		60 *l*
Special packing provision:		
PP28 For UN No. 1873, parts of packagings which are in direct contact with perchloric acid shall be constructed of glass or plastics.		

P503	PACKING INSTRUCTION	P503
The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:		
Combination packagings:		
Inner packagings	**Outer packagings**	**Maximum net mass**
Glass 5 kg	**Drums**	
Metal 5 kg	steel (1A1, 1A2)	125 kg
Plastics 5 kg	aluminium (1B1, 1B2)	125 kg
	other metal (1N1, 1N2)	125 kg
	plywood (1D)	125 kg
	fibre (1G)	125 kg
	plastics (1H1, 1H2)	125 kg
	Boxes	
	steel (4A)	125 kg
	aluminium (4B)	125 kg
	other metal (4N)	125 kg
	natural wood (4C1)	125 kg
	natural wood with sift-proof walls (4C2)	125 kg
	plywood (4D)	125 kg
	reconstituted wood (4F)	125 kg
	fibreboard (4G)	40 kg
	expanded plastics (4H1)	60 kg
	solid plastics (4H2)	125 kg
Single packagings:		
Metal drums (1A1, 1A2, 1B1, 1B2, 1N1 or 1N2) with a maximum net mass of 250 kg. Fibreboard (1G) or plywood drums (1D) fitted with inner liners with a maximum net mass of 200 kg.		

P504	PACKING INSTRUCTION	P504
The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:		
Combination packagings:		**Maximum net mass**
(1)	Glass receptacles with a maximum capacity of 5 litres in 1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G, 4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H2 outer packagings	75 kg
(2)	Plastics receptacles with a maximum capacity of 30 litres in 1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G, 4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H2 outer packagings	75 kg
(3)	Metal receptacles with a maximum capacity of 40 litres in 1G, 4F or 4G outer packagings	125 kg
(4)	Metal receptacles with a maximum capacity of 40 litres in 1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 4A, 4B, 4N, 4C1, 4C2, 4D, 4H2 outer packagings	225 kg
Single packagings:		**Maximum capacity**
Drums		
steel, non-removable head (1A1)		250 *l*
steel, removable head (1A2)		250 *l*
aluminium, non-removable head (1B1)		250 *l*
aluminium, removable head (1B2)		250 *l*
metal other than steel or aluminium, non-removable head (1N1)		250 *l*
metal other than steel or aluminium, removable head (1N2)		250 *l*
plastics, non-removable head (1H1)		250 *l*
plastics, removable head (1H2)		250 *l*
Jerricans		
steel, non-removable head (3A1)		60 *l*
steel, removable head (3A2)		60 *l*
aluminium, non-removable head (3B1)		60 *l*
aluminium, removable head (3B2)		60 *l*
plastics, non-removable head (3H1)		60 *l*
plastics, removable head (3H2)		60 *l*
Composite packagings		
plastics receptacle with outer steel or aluminium drum (6HA1, 6HB1)		250 *l*
plastics receptacle with outer fibre, plastics or plywood drum (6HG1, 6HH1, 6HD1)		120 *l*
plastics receptacle with outer steel or aluminium crate or box or plastics receptacle with outer wooden, plywood, fibreboard or solid plastics box (6HA2, 6HB2, 6HC, 6HD2, 6HG2 or 6HH2)		60 *l*
glass receptacle with outer steel, aluminium, fibre or plywood drum (6PA1, 6PB1, 6PG1 or 6PD1) or with outer steel, aluminium, wooden or fibreboard box or with outer wickerwork hamper (6PA2, 6PB2, 6PC, 6PG2 or 6PD2) or with outer expanded or solid plastics packaging (6PH1 or 6PH2).		60 *l*
Special packing provisions:		
PP10 For UN No. 2014, 2984 and 3149, the packaging shall be vented.		

P505	PACKING INSTRUCTION	P505
This instruction applies to UN No. 3375.		
The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:		
Combination packagings:	**Inner packaging maximum capacity**	**Outer packaging maximum net mass**
Boxes (4B, 4C1, 4C2, 4D, 4G, 4H2) or drums (1B2, 1G, 1N2, 1H2, 1D) or jerricans (3B2, 3H2) with glass, plastics or metal inner packagings	5 l	125 kg
Single packagings:	**Maximum capacity**	
Drums		
aluminium (1B1, 1B2)	250 l	
plastics (1H1, 1H2)	250 l	
Jerricans:		
aluminium (3B1, 3B2)	60 l	
plastics (3H1, 3H2)	60 l	
Composite packagings:		
plastics receptacle with outer aluminium drum (6HB1)	250 l	
plastics receptacle with outer fibre, plastics or plywood drum (6HG1, 6HH1, 6HD1)	250 l	
plastics receptacle with outer aluminium crate or box or plastics receptacle with outer wooden, plywood, fibreboard or solid plastics box (6HB2, 6HC, 6HD2, 6HG2 or 6HH2)	60 l	
glass receptacle with outer aluminium, fibre or plywood drum (6PB1, 6PG1, 6PD1) or with outer expanded or solid plastics plastics receptacles (6PH1 or 6PH2) or with outer aluminium crate or box or with outer wooden or fibreboard box or with outer wickerwork hamper (6PB2, 6PC, 6PG2 or 6PD2)	60 l	

P520	PACKING INSTRUCTION	P520

This instruction applies to organic peroxides of Class 5.2 and self-reactive substances of Class 4.1

The packagings listed below are authorized provided the general provisions of **4.1.1** and **4.1.3** and special provisions of **4.1.7.1** are met.

The packing methods are designated OP1 to OP8. The packing methods appropriate for the individual currently assigned organic peroxides and self-reactive substances are listed in 2.2.41.4 and 2.2.52.4. The quantities specified for each packing method are the maximum quantities authorized per package. The following packagings are authorized:

(1) Combination packagings with outer packagings comprising boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1 and 4H2), drums (1A1, 1A2, 1B1, 1B2, 1G, 1H1, 1H2 and 1D), jerricans (3A1, 3A2, 3B1, 3B2, 3H1 and 3H2);

(2) Single packagings consisting of drums (1A1, 1A2, 1B1, 1B2, 1G, 1H1, 1H2 and 1D) and jerricans (3A1, 3A2, 3B1, 3B2, 3H1 and 3H2);

(3) Composite packagings with plastics inner receptacles (6HA1, 6HA2, 6HB1, 6HB2, 6HC, 6HD1, 6HD2, 6HG1, 6HG2, 6HH1 and 6HH2).

Maximum quantity per packaging/package [a] for packing methods OP1 to OP8

Packing Method / Maximum Quantity	OP1	OP2 [a]	OP3	OP4 [a]	OP5	OP6	OP7	OP8
Maximum mass (kg) for solids and for combination packagings (liquid and solid)	0.5	0.5/10	5	5/25	25	50	50	400 [b]
Maximum contents in litres for liquids [c]	0.5	-	5	-	30	60	60	225 [d]

[a] *If two values are given, the first applies to the maximum net mass per inner packaging and the second to the maximum net mass of the complete package.*

[b] *60 kg for jerricans / 200 kg for boxes and, for solids, 400 kg in combination packagings with outer packagings comprising boxes (4C1, 4C2, 4D, 4F, 4G, 4H1 and 4H2) and with inner packagings of plastics or fibre with a maximum net mass of 25 kg.*

[c] *Viscous substances shall be treated as solids when they do not meet the criteria provided in the definition for "liquids" presented in 1.2.1.*

[d] *60 litres for jerricans.*

Additional requirements:

1. Metal packagings, including inner packagings of combination packagings and outer packagings of combination or composite packagings may only be used for packing methods OP7 and OP8.
2. In combination packagings, glass receptacles may only be used as inner packagings with maximum contents of 0.5 kg for solids or 0.5 litre for liquids.
3. In combination packagings, cushioning materials shall not be readily combustible.
4. The packaging of an organic peroxide or self-reactive substance required to bear an "EXPLOSIVE" subsidiary hazard label (model No.1, see 5.2.2.2.2) shall also comply with the provisions given in 4.1.5.10 and 4.1.5.11.

Special packing provisions:

PP21 For certain self-reactive substances of types B or C, UN Nos. 3221, 3222, 3223, 3224, 3231, 3232, 3233 and 3234, a smaller packaging than that allowed by packing methods OP5 or OP6 respectively shall be used (see 4.1.7 and 2.2.41.4).

PP22 UN No. 3241, 2-Bromo-2-nitropropane-1, 3-diol, shall be packed in accordance with packing method OP6.

P520	PACKING INSTRUCTION *(cont'd)*	P520

Special packing provisions *(cont'd)*:

PP94 Very small amounts of energetic samples of 2.1.4.3 may be carried under UN No. 3223 or UN No. 3224, as appropriate, provided that:

1. Only combination packagings with outer packagings comprising boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1 and 4H2) are used;
2. The samples are carried in microtiter plates or multi-titer plates made of plastics, glass, porcelain or stoneware as inner packaging;
3. The maximum amount per individual inner cavity does not exceed 0.01 g for solids or 0.01 ml for liquids;
4. The maximum net quantity per outer packaging is 20 g for solids or 20 ml for liquids, or in the case of mixed packing the sum of grams and millilitres does not exceed 20; and
5. When dry ice or liquid nitrogen is optionally used as a coolant for quality control measures, the requirements of 5.5.3 are complied with. Interior supports shall be provided to secure the inner packagings in their original position. The inner and outer packagings shall maintain their integrity at the temperature of the refrigerant used as well as the temperatures and the pressures which could result if refrigeration were lost.

PP95 Small amounts of energetic samples of 2.1.4.3 may be carried under UN No. 3223 or UN No. 3224, as appropriate, provided that:

1. The outer packaging consists only of corrugated fibreboard of type 4G having minimum dimensions of 60 cm (length) by 40.5 cm (width) by 30 cm (height) and minimum wall thickness of 1.3 cm;
2. The individual substance is contained in an inner packaging of glass or plastics of maximum capacity 30 ml placed in an expandable polyethylene foam matrix of at least 130 mm thickness having a density of 18 ± 1 g/l;
3. Within the foam carrier, inner packagings are segregated from each other by a minimum distance of 40 mm and from the wall of the outer packaging by a minimum distance of 70 mm. The package may contain up to two layers of such foam matrices, each carrying up to 28 inner packagings;
4. The maximum content of each inner packaging does not exceed 1 g for solids or 1 ml for liquids;
5. The maximum net quantity per outer packaging is 56 g for solids or 56 ml for liquids, or in the case of mixed packing the sum of grams and millilitres does not exceed 56; and
6. When dry ice or liquid nitrogen is optionally used as a coolant for quality control measures, the requirements of 5.5.3 are complied with. Interior supports shall be provided to secure the inner packagings in their original position. The inner and outer packagings shall maintain their integrity at the temperature of the refrigerant used as well as the temperatures and the pressures which could result if refrigeration were lost.

P600	PACKING INSTRUCTION	P600

This instruction applies to UN Nos. 1700, 2016 and 2017.

The following packagings are authorized, provided the general provisions of **4.1.1** and **4.1.3** are met:

Outer packagings (1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G, 4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H2) meeting the packing group II performance level. The articles shall be individually packaged and separated from each other using partitions, dividers, inner packagings or cushioning material to prevent inadvertent discharge during normal conditions of carriage.

Maximum net mass: 75 kg

P601	PACKING INSTRUCTION	P601

The following packagings are authorized provided the general provisions of **4.1.1** and **4.1.3** are met and the packagings are hermetically sealed:

(1) Combination packagings with a maximum gross mass of 15 kg, consisting of

- one or more glass inner packaging(s) with a maximum quantity of 1 litre each and filled to not more than 90 % of their capacity; the closure(s) of which shall be physically held in place by any means capable of preventing back-off or loosening by impact or vibration during carriage, individually placed in
- metal receptacles together with cushioning and absorbent material sufficient to absorb the entire contents of the glass inner packaging(s), further packed in
- 1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G, 4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G or 4H2 outer packagings;

(2) Combination packagings consisting of metal or plastics inner packagings not exceeding 5 litres in capacity individually packed with absorbent material sufficient to absorb the contents and inert cushioning material in 1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G, 4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G or 4H2 outer packagings with a maximum gross mass of 75 kg. Inner packagings shall not be filled to more than 90 % of their capacity. The closure of each inner packaging shall be physically held in place by any means capable of preventing back-off or loosening of the closure by impact or vibration during carriage;

(3) Packagings consisting of:

Outer packagings: Steel or plastics drums (1A1, 1A2, 1H1 or 1H2), tested in accordance with the test requirements in 6.1.5 at a mass corresponding to the mass of the assembled package either as a packaging intended to contain inner packagings, or as a single packaging intended to contain solids or liquids, and marked accordingly;

Inner packagings:

Drums and composite packagings (1A1, 1B1, 1N1, 1H1 or 6HA1) meeting the requirements of Chapter 6.1 for single packagings, subject to the following conditions:

(a) The hydraulic pressure test shall be conducted at a pressure of at least 0.3 MPa (gauge pressure);

(b) The design and production leakproofness tests shall be conducted at a test pressure of 30 kPa;

(c) They shall be isolated from the outer drum by the use of inert shock-mitigating cushioning material which surrounds the inner packaging on all sides;

(d) Their capacity shall not exceed 125 litres;

(Cont'd on next page)

(3) *Packagings consisting of: (cont'd)*

(e) Closures shall be of a screw cap type that are:

(i) physically held in place by any means capable of preventing back-off or loosening of the closure by impact or vibration during carriage; and

(ii) provided with a cap seal;

(f) The outer and inner packagings shall be subjected periodically to a leakproofness test according to (b) at intervals of not more than two and a half years;

(g) The complete packaging shall be visually inspected to the satisfaction of the competent authority at least every 3 years; and

(h) The outer and inner packaging shall bear in clearly legible and durable characters:

(i) the date (month, year) of the initial test and the latest periodic test and inspection;

(ii) the stamp of the expert who carried out the test and inspection;

(4) Pressure receptacles, provided that the general provisions of 4.1.3.6 are met. They shall be subjected to an initial test and periodic tests every 10 years at a pressure of not less than 1 MPa (10 bar) (gauge pressure). Pressure receptacles may not be equipped with any pressure relief device. Each pressure receptacle containing a toxic by inhalation liquid with an LC_{50} less than or equal to 200 ml/m³ (ppm) shall be closed with a plug or valve conforming to the following:

(a) Each plug or valve shall have a taper-threaded connection directly to the pressure receptacle and be capable of withstanding the test pressure of the pressure receptacle without damage or leakage;

(b) Each valve shall be of the packless type with non-perforated diaphragm, except that, for corrosive substances, a valve may be of the packed type with an assembly made gas-tight by means of a seal cap with gasket joint attached to the valve body or the pressure receptacle to prevent loss of substance through or past the packing;

(c) Each valve outlet shall be sealed by a threaded cap or threaded solid plug and inert gasket material;

(d) The materials of construction for the pressure receptacle, valves, plugs, outlet caps, luting and gaskets shall be compatible with each other and with the contents.

Each pressure receptacle with a wall thickness at any point of less than 2.0 mm and each pressure receptacle which does not have fitted valve protection shall be carried in an outer packaging. Pressure receptacles shall not be manifolded or interconnected.

Special packing provision:

PP82 *(Deleted)*

Special packing provisions specific to this Code:

RR3 *(Deleted)*

RR7 For UN No. 1251, the pressure receptacles shall however be subjected to the tests every five years.

RR10 UN No. 1614, when completely absorbed by an inert porous material, shall be packed in metal receptacles of a capacity of not more than 7.5 litres, placed in wooden cases in such a manner that they cannot come into contact with one another. The receptacles shall be entirely filled with the porous material which shall not shake down or form dangerous spaces even after prolonged use or under impact, even at temperatures of up to 50 °C.

P602	PACKING INSTRUCTION	P602

The following packagings are authorised provided the general provisions of **4.1.1** and **4.1.3** are met and the packagings are hermetically sealed:

(1) Combination packagings with a maximum gross mass of 15 kg, consisting of

- one or more glass inner packaging(s) with a maximum quantity of 1 litre each and filled to not more than 90 % of their capacity; the closure(s) of which shall be physically held in place by any means capable of preventing back-off or loosening by impact or vibration during carriage, individually placed in
- metal receptacles together with cushioning and absorbent material sufficient to absorb the entire contents of the glass inner packaging(s), further packed in
- 1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G, 4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G or 4H2 outer packagings;

(2) Combination packagings consisting of metal or plastics inner packagings individually packed with absorbent material sufficient to absorb the entire contents and inert cushioning material in 1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G, 4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G or 4H2 outer packagings with a maximum gross mass of 75 kg. Inner packagings shall not be filled to more than 90 % of their capacity. The closure of each inner packaging shall be physically held in place by any means capable of preventing back-off or loosening of the closure by impact or vibration during carriage. Inner packagings shall not exceed 5 litres in capacity;

(3) Drums and composite packagings (1A1, 1B1, 1N1, 1H1, 6HA1 or 6HH1), subject to the following conditions:

(a) The hydraulic pressure test shall be conducted at a pressure of at least 0.3 MPa (gauge pressure);

(b) The design and production leakproofness tests shall be conducted at a test pressure of 30 kPa; and

(c) Closures shall be of a screw cap type that are:

(i) physically held in place by any means capable of preventing back-off or loosening of the closure by impact or vibration during carriage; and

(ii) provided with a cap seal;

(4) Pressure receptacles, provided that the general provisions of 4.1.3.6 are met. They shall be subjected to an initial test and periodic tests every 10 years at a pressure of not less than 1 MPa (10 bar) (gauge pressure). Pressure receptacles may not be equipped with any pressure relief device. Each pressure receptacle containing a toxic by inhalation liquid with an LC_{50} less than or equal to 200 ml/m³ (ppm) shall be closed with a plug or valve conforming to the following:

(a) Each plug or valve shall have a taper-threaded connection directly to the pressure receptacle and be capable of withstanding the test pressure of the pressure receptacle without damage or leakage;

(b) Each valve shall be of the packless type with non-perforated diaphragm, except that, for corrosive substances, a valve may be of the packed type with an assembly made gas-tight by means of a seal cap with gasket joint attached to the valve body or the pressure receptacle to prevent loss of substance through or past the packing;

(c) Each valve outlet shall be sealed by a threaded cap or threaded solid plug and inert gasket material;

(d) The materials of construction for the pressure receptacle, valves, plugs, outlet caps, luting and gaskets shall be compatible with each other and with the contents.

Each pressure receptacle with a wall thickness at any point of less than 2.0 mm and each pressure receptacle which does not have fitted valve protection shall be carried in an outer packaging. Pressure receptacles shall not be manifolded or interconnected.

P603	PACKING INSTRUCTION	P603

This instruction applies to UN 3507.

The following packagings are authorized provided that the general provisions of **4.1.1** and **4.1.3** and the special packing provisions of **4.1.9.1.2, 4.1.9.1.4** and **4.1.9.1.7** are met:

Packagings consisting of:

(a) Metal or plastics primary receptacle(s); in

(b) Leakproof rigid secondary packaging(s); in

(c) A rigid outer packaging:

Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G);

Boxes (4A, 4B, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);

Jerricans (3A2, 3B2, 3H2).

Additional requirements:

1. Primary inner receptacles shall be packed in secondary packagings in a way that, under normal conditions of carriage, they cannot break, be punctured or leak their contents into the secondary packaging. Secondary packagings shall be secured in outer packagings with suitable cushioning material to prevent movement. If multiple primary receptacles are placed in a single secondary packaging, they shall be either individually wrapped or separated so as to prevent contact between them.

2. The contents shall comply with the provisions of 2.2.7.2.4.5.2.

3. The provisions of 6.4.4 shall be met.

Special packing provision:

In the case of fissile-excepted material, limits specified in 2.2.7.2.3.5 shall be met.

P620	PACKING INSTRUCTION	P620

This instruction applies to UN Nos. 2814 and 2900.

The following packagings are authorized provided the special packing provisions of **4.1.8** are met:

Packagings meeting the requirements of Chapter 6.3 and approved accordingly consisting of:

(a) Inner packagings comprising:

(i) leakproof primary receptacle(s);

(ii) a leakproof secondary packaging;

(iii) other than for solid infectious substances, an absorbent material in sufficient quantity to absorb the entire contents placed between the primary receptacle(s) and the secondary packaging; if multiple primary receptacles are placed in a single secondary packaging, they shall be either individually wrapped or separated so as to prevent contact between them;

(b) A rigid outer packaging:

Drums (1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G);

Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);

Jerricans (3A1, 3A2, 3B1, 3B2, 3H1, 3H2).

The smallest external dimension shall be not less than 100 mm.

Additional requirements:

1. Inner packagings containing infectious substances shall not be consolidated with inner packagings containing unrelated types of goods. Complete packages may be overpacked in accordance with the provisions of 1.2.1 and 5.1.2; such an overpack may contain dry ice.

2. Other than for exceptional consignments, e.g. whole organs which require special packaging, the following additional requirements shall apply:

   (a) Substances consigned at ambient temperatures or at a higher temperature: Primary receptacles shall be of glass, metal or plastics. Positive means of ensuring a leakproof seal shall be provided, e.g. a heat seal, a skirted stopper or a metal crimp seal. If screw caps are used, they shall be secured by positive means, e.g., tape, paraffin sealing tape or manufactured locking closure;

   (b) Substances consigned refrigerated or frozen: Ice, dry ice or other refrigerant shall be placed around the secondary packaging(s) or alternatively in an overpack with one or more complete packages marked in accordance with 6.3.3. Interior supports shall be provided to secure secondary packaging(s) or packages in position after the ice or dry ice has dissipated. If ice is used, the outer packaging or overpack shall be leakproof. If dry ice is used, the outer packaging or overpack shall permit the release of carbon dioxide gas. The primary receptacle and the secondary packaging shall maintain their integrity at the temperature of the refrigerant used;

   (c) Substances consigned in liquid nitrogen: Plastics primary receptacles capable of withstanding very low temperature shall be used. The secondary packaging shall also be capable of withstanding very low temperatures, and in most cases will need to be fitted over the primary receptacle individually. Provisions for the carriage of liquid nitrogen shall also be fulfilled. The primary receptacle and the secondary packaging shall maintain their integrity at the temperature of the liquid nitrogen;

   (d) Lyophilised substances may also be carried in primary receptacles that are flame-sealed glass ampoules or rubber-stoppered glass vials fitted with metal seals.

3. Whatever the intended temperature of the consignment, the primary receptacle or the secondary packaging shall be capable of withstanding without leakage an internal pressure producing a pressure differential of not less than 95 kPa. This primary receptacle or secondary packaging shall also be capable of withstanding temperatures in the range -40 °C to +55 °C.

4. Other dangerous goods shall not be packed in the same packaging as Class 6.2 infectious substances unless they are necessary for maintaining the viability, stabilizing or preventing degradation or neutralizing the hazards of the infectious substances. A quantity of 30 ml or less of dangerous goods included in Classes 3, 8 or 9 may be packed in each primary receptacle containing infectious substances. These small quantities of dangerous goods of Classes 3, 8 or 9 are not subject to any additional requirements of this Code when packed in accordance with this packing instruction.

5. Alternative packagings for the carriage of animal material may be authorized by the competent authority of the country in accordance with the provisions of 4.1.8.7.

P621	PACKING INSTRUCTION	P621

This instruction applies to UN No. 3291.

The following packagings are authorized provided that the general provisions of 4.1.1 except 4.1.1.15 and 4.1.3 are met:

(1) Provided that there is sufficient absorbent material to absorb the entire amount of liquid present and the packaging is capable of retaining liquids:

Drums (1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G);

Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);

Jerricans (3A1, 3A2, 3B1, 3B2, 3H1, 3H2).

Packagings shall conform to the packing group II performance level for solids.

(2) For packages containing larger quantities of liquid:

Drums (1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G);

Jerricans (3A1, 3A2, 3B1, 3B2, 3H1, 3H2);

Composites (6HA1, 6HB1, 6HG1, 6HH1, 6HD1, 6HA2, 6HB2, 6HC, 6HD2, 6HG2, 6HH2, 6PA1, 6PB1, 6PG1, 6PD1, 6PH1, 6PH2, 6PA2, 6PB2, 6PC, 6PG2 or 6PD2).

Packagings shall conform to the packing group II performance level for liquids.

Additional requirement:

Packagings intended to contain sharp objects such as broken glass and needles shall be resistant to puncture and retain liquids under the performance test conditions in Chapter 6.1.

P621A	PACKING INSTRUCTION	P621A
	(Australia)	

This instruction applies to UN 3291 Clinical Waste that is transported in cargo transport units that are dedicated to clinical waste transport, where those units consist of a vehicle with a body that is:

(a) Separate to the cabin;
(b) Totally enclosed, of strong, rigid, weatherproof construction with lockable doors; and
(c) Leakproof, bunded or configured to contain spillages

The following packagings are authorized:

Rigid packaging with a lid that is able to be secured during transport. The packages must be:

(a) designed or have a means enabling them to be easily handled or moved;

(b) strong enough to withstand manual or mechanical handling and the shocks and loadings normally encountered during transport, including trans-shipment between transport units and between transport units and warehouses;

(c) able to retain liquid under normal conditions of transport; and:

(d) easily identifiable by their colour and have the correct labelling and symbols indicating that they contain UN 3291 clinical waste.

Additional requirement:

Packages intended to contain sharp objectices such as broken glass and needles must be resistant to puncture and comply with AS 4031, AS/NZS 4261 or AS 4939, as applicable.

P622	PACKING INSTRUCTION	P622
This instruction applies to waste of UN No. 3549 carried for disposal.		
The following packagings are authorized provided the general provisions of **4.1.1** and **4.1.3** are met:		
Inner packagings	**Intermediate packagings**	**Outer packagings**
metal plastics	metal plastics	**Boxes** steel (4A) aluminium (4B) other metal (4N) plywood (4D) fibreboard (4G) plastics, solid (4H2) **Drums** steel (1A2) aluminium (1B2) other metal (1N2) plywood (1D) fibre (1G) plastics (1H2) **Jerricans** steel (3A2) aluminium (3B2) plastics (3H2)
The outer packaging shall conform to the packing group I performance level for solids.		

Additional requirements:

1. Fragile articles shall be contained in either a rigid inner packaging or a rigid intermediate packaging.
2. Inner packagings containing sharp objects such as broken glass and needles shall be rigid and resistant to puncture.
3. The inner packaging, the intermediate packaging, and the outer packaging shall be capable of retaining liquids. Outer packagings that are not capable of retaining liquids by design shall be fitted with a liner or suitable measure of retaining liquids.
4. The inner packaging and/or the intermediate packaging may be flexible. When flexible packagings are used, they shall be capable of passing the impact resistance test of at least 165 g according to ISO 7765-1:1988 “Plastics film and sheeting – Determination of impact resistance by the free-falling dart method – Part 1: Staircase methods” and the tear resistance test of at least 480 g in both parallel and perpendicular planes with respect to the length of the bag in accordance with ISO 6383-2:1983 “Plastics – Film and sheeting – Determination of tear resistance – Part 2: Elmendorf method”. The maximum net mass of each flexible inner packaging shall be 30 kg.
5. Each flexible intermediate packaging shall contain only one inner packaging.
6. Inner packagings containing a small amount of free liquid may be included in intermediate packaging provided that there is sufficient absorbent or solidifying material in the inner or intermediate packaging to absorb or solidify all the liquid content present. Suitable absorbent material which withstands the temperatures and vibrations liable to occur under normal conditions of carriage shall be used.
7. Intermediate packagings shall be secured in outer packagings with suitable cushioning and/or absorbent material.

P650	PACKING INSTRUCTION	P650

This packing instruction applies to UN No. 3373.

(1) The packaging shall be of good quality, strong enough to withstand the shocks and loadings normally encountered during carriage, including transhipment between cargo transport units and between cargo transport units and warehouses as well as any removal from a pallet or overpack for subsequent manual or mechanical handling. Packagings shall be constructed and closed to prevent any loss of contents that might be caused under normal conditions of carriage by vibration or by changes in temperature, humidity or pressure.

(2) The packaging shall consist of at least three components:

(a) a primary receptacle;

(b) a secondary packaging; and

(c) an outer packaging

of which either the secondary or the outer packaging shall be rigid.

(3) Primary receptacles shall be packed in secondary packagings in such a way that, under normal conditions of carriage, they cannot break, be punctured or leak their contents into the secondary packaging. Secondary packagings shall be secured in outer packagings with suitable cushioning material. Any leakage of the contents shall not compromise the integrity of the cushioning material or of the outer packaging.

(4) For carriage, the mark illustrated below shall be displayed on the external surface of the outer packaging on a background of a contrasting colour and shall be clearly visible and legible. The mark shall be in the form of a square set at an angle of 45° (diamond-shaped) with minimum dimensions of 50 mm by 50 mm; the width of the line shall be at least 2 mm and the letters and numbers shall be at least 6 mm high. The proper shipping name "BIOLOGICAL SUBSTANCE, CATEGORY B" in letters at least 6 mm high shall be marked on the outer packaging adjacent to the diamond-shaped mark.

(5) At least one surface of the outer packaging shall have a minimum dimension of 100 mm × 100 mm.

(6) The completed package shall be capable of successfully passing the drop test in 6.3.5.3 as specified in 6.3.5.2 at a height of 1.2 m. Following the appropriate drop sequence, there shall be no leakage from the primary receptacle(s) which shall remain protected by absorbent material, when required, in the secondary packaging.

(Cont'd on next page)

(7) For liquid substances:

(a) The primary receptacle(s) shall be leakproof;

(b) The secondary packaging shall be leakproof;

(c) If multiple fragile primary receptacles are placed in a single secondary packaging, they shall be either individually wrapped or separated to prevent contact between them;

(d) Absorbent material shall be placed between the primary receptacle(s) and the secondary packaging. The absorbent material shall be in quantity sufficient to absorb the entire contents of the primary receptacle(s) so that any release of the liquid substance will not compromise the integrity of the cushioning material or of the outer packaging;

(e) The primary receptacle or the secondary packaging shall be capable of withstanding, without leakage, an internal pressure of 95 kPa (0.95 bar).

(8) For solid substances:

(a) The primary receptacle(s) shall be siftproof;

(b) The secondary packaging shall be siftproof;

(c) If multiple fragile primary receptacles are placed in a single secondary packaging, they shall be either individually wrapped or separated to prevent contact between them;

(d) If there is any doubt as to whether or not residual liquid may be present in the primary receptacle during carriage then a packaging suitable for liquids, including absorbent materials, shall be used.

(9) Refrigerated or frozen specimens: Ice, dry ice and liquid nitrogen:

(a) When dry ice or liquid nitrogen is used as a coolant, the requirements of 5.5.3 shall apply. When used, ice shall be placed outside the secondary packagings or in the outer packaging or an overpack. Interior supports shall be provided to secure the secondary packagings in the original position. If ice is used, the outside packaging or overpack shall be leakproof.

(b) The primary receptacle and the secondary packaging shall maintain their integrity at the temperature of the refrigerant used as well as the temperatures and the pressures which could result if refrigeration were lost.

(10) When packages are placed in an overpack, the package marks required by this packing instruction shall either be clearly visible or be reproduced on the outside of the overpack.

(11) Infectious substances assigned to UN No. 3373 which are packed and packages which are marked in accordance with this packing instruction are not subject to any other requirement in this Code.

(12) Clear instructions on filling and closing such packages shall be provided by packaging manufacturers and subsequent distributors to the consignor or to the person who prepares the package (e.g. patient) to enable the package to be correctly prepared for carriage.

(13) Other dangerous goods shall not be packed in the same packaging as Class 6.2 infectious substances unless they are necessary for maintaining the viability, stabilizing or preventing degradation or neutralizing the hazards of the infectious substances. A quantity of 30 ml or less of dangerous goods included in Classes 3, 8 or 9 may be packed in each primary receptacle containing infectious substances. When these small quantities of dangerous goods are packed with infectious substances in accordance with this packing instruction no other requirements of this Code need be met.

(14) If any substance has leaked and has been spilled in a cargo transport unit, it may not be reused until after it has been thoroughly cleaned and, if necessary, disinfected or decontaminated. Any other goods and articles carried in the same cargo transport unit shall be examined for possible contamination.

Additional requirement:

Alternative packagings for the carriage of animal material may be authorized by the competent authority in accordance with the provisions of 4.1.8.7.

P800	PACKING INSTRUCTION	P800

This instruction applies to UN Nos. 2803 and 2809.

The following packagings are authorized, provided the general provisions of **4.1.1** and **4.1.3** are met:

(1) Pressure receptacles, provided that the general provisions of 4.1.3.6 are met.

(2) Steel flasks or bottles with threaded closures with a capacity not exceeding 3 *l*; or

(3) Combination packagings which conform to the following requirements:

(a) Inner packagings shall comprise glass, metal or rigid plastics intended to contain liquids with a maximum net mass of 15 kg each;

(b) The inner packagings shall be packed with sufficient cushioning material to prevent breakage;

(c) Either the inner packagings or the outer packagings shall have inner liners or bags of strong leakproof and puncture-resistant material impervious to the contents and completely surrounding the contents to prevent it from escaping from the package irrespective of its position or orientation;

(d) The following outer packagings and maximum net masses are authorized:

Outer packaging:	**Maximum net mass**
Drums	
steel (1A1, 1A2)	400 kg
metal, other than steel or aluminium (1N1, 1N2)	400 kg
plastics (1H1, 1H2)	400 kg
plywood (1D)	400 kg
fibre (1G)	400 kg
Boxes	
steel (4A)	400 kg
metal, other than steel or aluminium (4N)	400 kg
natural wood (4C1)	250 kg
natural wood with sift-proof walls (4C2)	250 kg
plywood (4D)	250 kg
reconstituted wood (4F)	125 kg
fibreboard (4G)	125 kg
expanded plastics (4H1)	60 kg
solid plastics (4H2)	125 kg

Special packing provision:

PP41 For UN No. 2803, when it is necessary to carry gallium at low temperatures in order to maintain it in a completely solid state, the above packagings may be overpack ed in a strong, water-resistant outer packaging which contains dry ice or other means of refrigeration. If a refrigerant is used, all of the above materials used in the packaging of gallium shall be chemically and physically resistant to the refrigerant and shall have impact resistance at the low temperatures of the refrigerant employed. If dry ice is used, the outer packaging shall permit the release of carbon dioxide gas.

P801	PACKING INSTRUCTION	P801

This instruction applies to UN Nos. 2794, 2795 and 3028 and used batteries of UN No. 2800.

The following packagings are authorized, provided that the provisions of **4.1.1.1, 4.1.1.2, 4.1.1.6**, and **4.1.3** are met:

(1) Rigid outer packagings, wooden slatted crates or pallets.

Additionally, the following conditions shall be met:

(a) Battery stacks shall be in tiers separated by a layer of electrically non-conductive material;

(b) Battery terminals shall not support the weight of other superimposed elements;

(c) Batteries shall be packaged or secured to prevent inadvertent movement;

(d) Batteries shall not leak under normal conditions of carriage or appropriate measures shall be taken to prevent the release of electrolyte from the package (e.g. individually packaging batteries or other equally effective methods); and

(e) Batteries shall be protected against short circuits.

(2) Stainless steel or plastics bins may also be used to carry used batteries.

Additionally, the following conditions shall be met:

(a) The bins shall be resistant to the electrolyte that was contained in the batteries;

(b) The bins shall not be filled to a height greater than the height of their sides;

(c) The outside of the bins shall be free of residues of electrolyte contained in the batteries;

(d) Under normal conditions of carriage, no electrolyte shall leak from the bins;

(e) Measures shall be taken to ensure that filled bins cannot lose their content;

(f) Measures shall be taken to prevent short circuits (e.g. batteries are discharged, individual protection of the battery terminals, etc.); and

(g) The bins shall be either:

(i) covered; or

(ii) carried in closed or sheeted vehicles, wagons or containers.

NOTE: *The packagings authorized in (1) and (2) may exceed a net mass of 400 kg (see 4.1.3.3).*

P801a	PACKING INSTRUCTION	P801a

(Deleted)

P802	PACKING INSTRUCTION	P802

The following packagings are authorized, provided the general provisions of **4.1.1** and **4.1.3** are met:

(1) Combination packagings:
Outer packagings: 1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G, 4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G or 4H2;
maximum net mass: 75 kg.
Inner packagings: glass or plastics; maximum capacity: 10 litres;

(2) Combination packagings:
Outer packagings: 1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G, 4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G or 4H2;
maximum net mass: 125 kg.
Inner packagings: metal; maximum capacity: 40 litres;

(3) Composite packagings: Glass receptacle with outer steel, aluminium or plywood drum (6PA1, 6PB1 or 6PD1) or with outer steel, aluminium or wooden box or with outer wickerwork hamper (6PA2, 6PB2, 6PC or 6PD2) or with outer solid plastics packaging (6PH2); maximum capacity: 60 litres.

(4) Steel drums (1A1) with a maximum capacity of 250 litres;

(5) Pressure receptacles, provided that the general provisions of 4.1.3.6 are met.

P803	PACKING INSTRUCTION	P803

This instruction applies to UN No. 2028.

The following packagings are authorized, provided the general provisions of **4.1.1** and **4.1.3** are met:

(1) Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G);

(2) Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H2).

Maximum net mass: 75 kg.

The articles shall be individually packaged and separated from each other using partitions, dividers, inner packagings or cushioning material to prevent inadvertent discharge during normal conditions of carriage.

P804	PACKING INSTRUCTION	P804

This instruction applies to UN No. 1744.

The following packagings are authorized provided the general provisions of **4.1.1** and **4.1.3** are met and the packagings are hermetically sealed:

(1) Combination packagings with a maximum gross mass of 25 kg, consisting of

- one or more glass inner packaging(s) with a maximum capacity of 1.3 litres each and filled to not more than 90 % of their capacity; the closure(s) of which shall be physically held in place by any means capable of preventing back-off or loosening by impact or vibration during carriage, individually placed in
- metal or rigid plastics receptacles together with cushioning and absorbent material sufficient to absorb the entire contents of the glass inner packaging(s), further packed in
- 1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G, 4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G or 4H2 outer packagings.

(2) Combination packagings consisting of metal or polyvinylidene fluoride (PVDF) inner packagings, not exceeding 5 litres in capacity individually packed with absorbent material sufficient to absorb the contents and inert cushioning material in 1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G, 4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G or 4H2 outer packagings with a maximum gross mass of 75 kg. Inner packagings shall not be filled to more than 90 % of their capacity. The closure of each inner packaging shall be physically held in place by any means capable of preventing back-off or loosening of the closure by impact or vibration during carriage;

(3) Packagings consisting of:

Outer packagings:

Steel or plastics drums (1A1, 1A2, 1H1 or 1H2) tested in accordance with the test requirements in 6.1.5 at a mass corresponding to the mass of the assembled package either as a packaging intended to contain inner packagings, or as a single packaging intended to contain solids or liquids, and marked accordingly;

Inner packagings:

Drums and composite packagings (1A1, 1B1, 1N1, 1H1 or 6HA1) meeting the requirements of Chapter 6.1 for single packagings, subject to the following conditions:

(a) The hydraulic pressure test shall be conducted at a pressure of at least 300 kPa (3 bar) (gauge pressure);

(b) The design and production leakproofness tests shall be conducted at a test pressure of 30 kPa (0.3 bar);

(c) They shall be isolated from the outer drum by the use of inert shock-mitigating cushioning material which surrounds the inner packaging on all sides;

(d) Their capacity shall not exceed 125 litres;

(e) Closures shall be of a screw type that are:

(i) Physically held in place by any means capable of preventing back-off or loosening of the closure by impact or vibration during carriage;

(ii) Provided with a cap seal;

(f) The outer and inner packagings shall be subjected periodically to an internal inspection and leakproofness test according to (b) at intervals of not more than two and a half years; and

(g) The outer and inner packagings shall bear in clearly legible and durable characters:

(i) the date (month, year) of the initial test and the latest periodic test and inspection of the inner packaging; and

(ii) the name or authorized symbol of the expert who carried out the tests and inspections;

(4) Pressure receptacles, provided that the general provisions of 4.1.3.6 are met.

(a) They shall be subjected to an initial test and periodic tests every 10 years at a pressure of not less than 1 MPa (10 bar) (gauge pressure);

(b) They shall be subjected periodically to an internal inspection and leakproofness test at intervals of not more than two and a half years;

(c) They may not be equipped with any pressure relief device;

(d) Each pressure receptacle shall be closed with a plug or valve(s) fitted with a secondary closure device; and

(e) The materials of construction for the pressure receptacle, valves, plugs, outlet caps, luting and gaskets shall be compatible with each other and with the contents.

P900	PACKING INSTRUCTION	P900
(Reserved)		

P901	PACKING INSTRUCTION	P901
This instruction applies to UN No. 3316.		
The following combination packagings are authorized provided the general provisions of **4.1.1** and **4.1.3** are met: Drums (1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G); Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2); Jerricans (3A1, 3A2, 3B1, 3B2, 3H1, 3H2). Packagings shall conform to the performance level consistent with the packing group assigned to the kit as a whole (see special provision 251 of Chapter 3.3). Where the kit contains only dangerous goods to which no packing group is assigned, packagings shall meet the packing group II performance level. Maximum quantity of dangerous goods per outer packaging: 10 kg excluding the mass of any carbon dioxide, solid (dry ice) used as a refrigerant.		
Additional requirements: Dangerous goods in kits shall be packed in inner packagings which shall be protected from other materials in the kit.		

P902	PACKING INSTRUCTION	P902
This instruction applies to UN No. 3268.		
Packaged articles: The following packagings are authorized provided the general provisions of **4.1.1** and **4.1.3** are met: Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G); Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2); Jerricans (3A2, 3B2, 3H2). Packagings shall conform to the packing group III performance level. The packagings shall be designed and constructed so as to prevent movement of the articles and inadvertent operation during normal conditions of carriage. **Unpackaged articles:** The articles may also be carried unpackaged in dedicated handling devices or cargo transport units when moved to, from, or between where they are manufactured and an assembly plant including intermediate handling locations.		
Additional requirement: Any pressure receptacle shall be in accordance with the requirements of the competent authority for the substance(s) contained therein.		

P903	PACKING INSTRUCTION	P903

This instruction applies to UN Nos. 3090 , 3091, 3480 and 3481.

For the purpose of this packing instruction, “equipment” means apparatus for which the lithium cells or batteries will provide electrical power for its operation. The following packagings are authorized provided that the general provisions of **4.1.1** and **4.1.3** are met:

(1) For cells and batteries:

Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G);

Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);

Jerricans (3A2, 3B2, 3H2).

Cells or batteries shall be packed in packagings so that the cells or batteries are protected against damage that may be caused by the movement or placement of the cells or batteries within the packaging.

Packagings shall conform to the packing group II performance level.

(2) In addition, for a cell or a battery with a gross mass of 12 kg or more employing a strong, impact resistant outer casing:

(a) Strong outer packagings;

(b) Protective enclosures (e.g., fully enclosed or wooden slatted crates); or

(c) Pallets or other handling devices.

Cells or batteries shall be secured to prevent inadvertent movement, and the terminals shall not support the weight of other superimposed elements.

Packagings need not meet the requirements of 4.1.1.3.

(3) For cells or batteries packed with equipment:

Packagings conforming to the requirements in paragraph (1) of this packing instruction, then placed with the equipment in an outer packaging; or

Packagings that completely enclose the cells or batteries, then placed with equipment in a packaging conforming to the requirements in paragraph (1) of this packing instruction.

The equipment shall be secured against movement within the outer packaging.

(4) For cells or batteries contained in equipment:

Strong outer packagings constructed of suitable material, and of adequate strength and design in relation to the packaging capacity and its intended use. They shall be constructed in such a manner as to prevent accidental operation during carriage. Packagings need not meet the requirements of 4.1.1.3.

Large equipment can be offered for carriage unpackaged or on pallets when the cells or batteries are afforded equivalent protection by the equipment in which they are contained.

When intentionally active, devices such as radio frequency identification (RFID) tags, watches and temperature loggers, which are not capable of generating a dangerous evolution of heat, may be carried in strong outer packagings.

NOTE: *For carriage in a transport chain including air carriage, these devices, when active, shall meet defined standards for electromagnetic radiation to ensure that the operation of the devices does not interfere with aircraft systems.*

(Cont'd on next page)

P903	PACKING INSTRUCTION *(cont'd)*	P903

(5) For packagings containing both cells or batteries packed with equipment and contained in equipment:

(a) For cells and batteries, packagings that completely enclose the cells or batteries, then placed with equipment in a packaging conforming to the requirements in paragraph (1) of this packing instruction; or

(b) Packagings conforming to the requirements in paragraph (1) of this packing instruction, then placed with the equipment in a strong outer packaging constructed of suitable material, and of adequate strength and design in relation to the packaging capacity and its intended use. The outer packaging shall be constructed in such a manner as to prevent accidental operation during carriage and need not meet the requirements of 4.1.1.3.

The equipment shall be secured against movement within the outer packaging.

When intentionally active, devices such as radio frequency identification (RFID) tags, watches and temperature loggers, which are not capable of generating a dangerous evolution of heat, may be carried in strong outer packagings.

NOTE: *For carriage in a transport chain including air carriage, these devices, when active, shall meet defined standards for electromagnetic radiation to ensure that the operation of the devices does not interfere with aircraft systems.*

NOTE: *The packagings authorized in (2), (4) and (5) may exceed a net mass of 400 kg (see 4.1.3.3).*

Additional requirement:

Cells or batteries shall be protected against short circuit.

P903a	PACKING INSTRUCTION	P903a
(Deleted)		

P903b	PACKING INSTRUCTION	P903b
(Deleted)		

P904	PACKING INSTRUCTION	P904

This instruction applies to UN No. 3245.

The following packagings are authorized:

(1) Packagings meeting the provisions of 4.1.1.1, 4.1.1.2, 4.1.1.4, 4.1.1.8 and 4.1.3 and so designed that they meet the construction requirements of 6.1.4. Outer packagings constructed of suitable material, and of adequate strength and design in relation to the packaging capacity and its intended use, shall be used. Where this packing instruction is used for the carriage of inner packagings of combination packagings the packaging shall be designed and constructed to prevent inadvertent discharge during normal conditions of carriage.

(2) Packagings, which need not conform to the packaging test requirements of Part 6, but conforming to the following:

(a) An inner packaging comprising:

(i) primary receptacle(s) and a secondary packaging, the primary receptacle(s) or the secondary packaging shall be leakproof for liquids or siftproof for solids;

(ii) for liquids, absorbent material placed between the primary receptacle(s) and the secondary packaging. The absorbent material shall be in a quantity sufficient to absorb the entire contents of the primary receptacle(s) so that any release of the liquid substance will not compromise the integrity of the cushioning material or of the outer packaging;

(iii) if multiple fragile primary receptacles are placed in a single secondary packaging they shall be individually wrapped or separated to prevent contact between them;

(b) An outer packaging shall be strong enough for its capacity, mass and intended use, and with a smallest external dimension of at least 100 mm.

For carriage, the mark illustrated below shall be displayed on the external surface of the outer packaging on a background of a contrasting colour and shall be clearly visible and legible. The mark shall be in the form of a square set at an angle of 45° (diamond-shaped) with each side having a length of at least 50 mm; the width of the line shall be at least 2 mm and the letters and numbers shall be at least 6 mm high.

Additional requirement:

Ice, dry ice and liquid nitrogen

When dry ice or liquid nitrogen is used as a coolant, the requirements of 5.5.3 shall apply. When used, ice shall be placed outside the secondary packagings or in the outer packaging or an overpack. Interior supports shall be provided to secure the secondary packaging in the original position. If ice is used, the outside packaging or overpack shall be leakproof.

P905	PACKING INSTRUCTION	P905

This instruction applies to UN Nos. 2990 and 3072.

Any suitable packaging is authorized, provided the general provisions of **4.1.1** and **4.1.3** are met, except that packagings need not conform to the requirements of Part 6.

NOTE: *The packagings authorized may exceed a net mass of 400 kg (see 4.1.3.3).*

When the life saving appliances are constructed to incorporate or are contained in rigid outer weatherproof casings (such as for lifeboats), they may be carried unpackaged.

Additional requirements:

1. All dangerous substances and articles contained as equipment within the appliances shall be secured to prevent inadvertent movement and in addition:

   (a) Signal devices of Class 1 shall be packed in plastics or fibreboard inner packagings;

   (b) Non-flammable, non-toxic gases shall be contained in cylinders as specified by the competent authority, which may be connected to the appliance;

   (c) Electric storage batteries (Class 8) and lithium batteries (Class 9) shall be disconnected or electrically isolated and secured to prevent any spillage of liquid; and

   (d) Small quantities of other dangerous substances (for example in Classes 3, 4.1 and 5.2) shall be packed in strong inner packagings.

2. Preparation for transport and packaging shall include provisions to prevent any accidental inflation of the appliance.

P906	PACKING INSTRUCTION	P906

This instruction applies to UN Nos. 2315, 3151, 3152 and 3432.

The following packagings are authorized, provided the general provisions of **4.1.1** and **4.1.3** are met:

(1) For liquids and solids containing or contaminated with PCBs, polyhalogenated biphenyls, polyhalogenated terphenyls or halogenated monomethyldiphenylmethanes: Packagings in accordance with packing instructions P001 or P002, as appropriate.

(2) For transformers and condensers and other articles:

   (a) Packagings in accordance with packing instructions P001 or P002. The articles shall be secured with suitable cushioning material to prevent inadvertent movement during normal conditions of carriage; or

   (b) Leakproof packagings which are capable of containing, in addition to the articles, at least 1.25 times the volume of the liquid PCBs, polyhalogenated biphenyls, polyhalogenated terphenyls or halogenated monomethyldiphenylmethanes present in them. There shall be sufficient absorbent material in the packagings to absorb at least 1.1 times the volume of liquid which is contained in the articles. In general, transformers and condensers shall be carried in leakproof metal packagings which are capable of holding, in addition to the transformers and condensers, at least 1.25 times the volume of the liquid present in them.

   NOTE: *The packagings authorized may exceed a net mass of 400 kg (see 4.1.3.3).*

Notwithstanding the above, liquids and solids not packaged in accordance with packing instructions P001 and P002 and unpackaged transformers and condensers may be carried in cargo transport units fitted with a leakproof metal tray to a height of at least 800 mm, containing sufficient inert absorbent material to absorb at least 1.1 times the volume of any free liquid.

NOTE: *The packagings authorized may exceed a net mass of 400 kg (see 4.1.3.3).*

Additional requirement:

Adequate provisions shall be taken to seal the transformers and condensers to prevent leakage during normal conditions of carriage.

P907	PACKING INSTRUCTION	P907

This instruction applies to articles, such as machinery, apparatus or devices of UN No. 3363.

If the article is constructed and designed so that the receptacles containing the dangerous goods are afforded adequate protection, an outer packaging is not required. Dangerous goods in an article shall otherwise be packed in outer packagings constructed of suitable material, and of adequate strength and design in relation to the packaging capacity and its intended use, and meeting the applicable requirements of **4.1.1.1.**

Receptacles containing dangerous goods shall conform to the general provisions in 4.1.1, except that 4.1.1.3, 4.1.1.4, 4.1.1.12 and 4.1.1.14 do not apply. For non-flammable, non-toxic gases, the inner cylinder or receptacle, its contents and filling ratio shall be to the satisfaction of the competent authority of the country in which the cylinder or receptacle is filled.

In addition, the manner in which receptacles are contained within the article shall be such that under normal conditions of carriage, damage to receptacles containing the dangerous goods is unlikely; and in the event of damage to receptacles containing solid or liquid dangerous goods, no leakage of the dangerous goods from the article is possible (a leakproof liner may be used to satisfy this requirement). Receptacles containing dangerous goods shall be so installed, secured or cushioned as to prevent their breakage or leakage and so as to control their movement within the article during normal conditions of carriage. Cushioning material shall not react dangerously with the content of the receptacles. Any leakage of the contents shall not substantially impair the protective properties of the cushioning material.

NOTE: *The packagings authorized may exceed a net mass of 400 kg (see 4.1.3.3).*

P908	PACKING INSTRUCTION	P908

This instruction applies to damaged or defective lithium ion cells and batteries and damaged or defective lithium metal cells and batteries, including those contained in equipment, of UN Nos. 3090, 3091, 3480 and 3481.

The following packagings are authorized provided the general provisions of **4.1.1** and **4.1.3** are met:

For cells and batteries and equipment containing cells and batteries:

Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G)

Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2)

Jerricans (3A2, 3B2, 3H2)

Packagings shall conform to the packing group II performance level.

1. Each damaged or defective cell or battery or equipment containing such cells or batteries shall be individually packed in inner packaging and placed inside an outer packaging. The inner packaging or outer packaging shall be leak-proof to prevent the potential release of electrolyte.
2. Each inner packaging shall be surrounded by sufficient non-combustible and electrically non-conductive thermal insulation material to protect against a dangerous evolution of heat.
3. Sealed packagings shall be fitted with a venting device when appropriate.
4. Appropriate measures shall be taken to minimize the effects of vibrations and shocks, prevent movement of the cells or batteries within the package that may lead to further damage and a dangerous condition during carriage. Cushioning material that is non-combustible and electrically non-conductive may also be used to meet this requirement.
5. Non combustibility shall be assessed according to a standard recognized in the country where the packaging is designed or manufactured.

For leaking cells or batteries, sufficient inert absorbent material shall be added to the inner or outer packaging to absorb any release of electrolyte.

A cell or battery with a net mass of more than 30 kg shall be limited to one cell or battery per outer packaging.

Additional requirement:

Cells or batteries shall be protected against short circuit.

P909	PACKING INSTRUCTION	P909

This instruction applies to UN Nos. 3090, 3091, 3480 and 3481 carried for disposal or recycling, either packed together with or packed without non-lithium batteries.

(1) Cells and batteries shall be packed in accordance with the following:

(a) The following packagings are authorized, provided that the general provisions of 4.1.1 and 4.1.3, are met:

Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G);

Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H2); and

Jerricans (3A2, 3B2, 3H2).

(b) Packagings shall conform to the packing group II performance level.

(c) Metal packagings shall be fitted with an electrically non-conductive lining material (e.g. plastics) of adequate strength for the intended use.

(2) However, lithium ion cells with a Watt-hour rating of not more than 20 Wh, lithium ion batteries with a Watt-hour rating of not more than 100 Wh, lithium metal cells with a lithium content of not more than 1 g and lithium metal batteries with an aggregate lithium content of not more than 2 g may be packed in accordance with the following:

(a) In strong outer packaging up to 30 kg gross mass meeting the general provisions of 4.1.1, except 4.1.1.3, and 4.1.3.

(b) Metal packagings shall be fitted with an electrically non-conductive lining material (e.g. plastics) of adequate strength for the intended use.

(3) For cells or batteries contained in equipment, strong outer packagings constructed of suitable material, and of adequate strength and design in relation to the packaging capacity and its intended use, may be used. Packagings need not meet the requirements of 4.1.1.3. Equipment may also be offered for carriage unpackaged or on pallets when the cells or batteries are afforded equivalent protection by the equipment in which they are contained.

(4) In addition, for cells or batteries with a gross mass of 12 kg or more employing a strong, impact resistant outer casing, strong outer packagings constructed of suitable material and of adequate strength and design in relation to the packaging's capacity and its intended use, may be used. Packagings need not meet the requirements of 4.1.1.3.

NOTE: *The packagings authorized may exceed a net mass of 400 kg (see 4.1.3.3).*

Additional requirements:

1. Cells and batteries shall be designed or packed to prevent short circuits and the dangerous evolution of heat.
2. Protection against short circuits and the dangerous evolution of heat includes, but is not limited to:
   - individual protection of the battery terminals,
   - inner packaging to prevent contact between cells and batteries,
   - batteries with recessed terminals designed to protect against short circuits, or
   - the use of an electrically non-conductive and non-combustible cushioning material to fill empty space between the cells or batteries in the packaging.
3. Cells and batteries shall be secured within the outer packaging to prevent excessive movement during carriage (e.g. by using a non-combustible and electrically non-conductive cushioning material or through the use of a tightly closed plastics bag).

P910	PACKING INSTRUCTION	P910

This instruction applies to UN Nos. 3090, 3091, 3480 and 3481 production runs consisting of not more than 100 cells or batteries and to pre-production prototypes of cells or batteries when these prototypes are carried for testing**.**

The following packagings are authorized provided that the general provisions of **4.1.1** and **4.1.3** are met:

(1) For cells and batteries, including when packed with equipment:
Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G);
Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);
Jerricans (3A2, 3B2, 3H2).

Packagings shall conform to the packing group II performance level and shall meet the following requirements:

(a) Batteries and cells, including equipment, of different sizes, shapes or masses shall be packaged in an outer packaging of a tested design type listed above provided the total gross mass of the package does not exceed the gross mass for which the design type has been tested;

(b) Each cell or battery shall be individually packed in an inner packaging and placed inside an outer packaging;

(c) Each inner packaging shall be completely surrounded by sufficient non-combustible and electrically non-conductive thermal insulation material to protect against a dangerous evolution of heat;

(d) Appropriate measures shall be taken to minimize the effects of vibration and shocks and prevent movement of the cells or batteries within the package that may lead to damage and a dangerous condition during carriage. Cushioning material that is non-combustible and electrically non-conductive may be used to meet this requirement;

(e) Non-combustibility shall be assessed according to a standard recognized in the country where the packaging is designed or manufactured;

(f) A cell or battery with a net mass of more than 30 kg shall be limited to one cell or battery per outer packaging.

(2) For cells and batteries contained in equipment:
Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G);
Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);
Jerricans (3A2, 3B2, 3H2).

Packagings shall conform to the packing group II performance level and shall meet the following requirements:

(a) Equipment of different sizes, shapes or masses shall be packaged in an outer packaging of a tested design type listed above provided the total gross mass of the package does not exceed the gross mass for which the design type has been tested;

(b) The equipment shall be constructed or packaged in such a manner as to prevent accidental operation during carriage;

(c) Appropriate measures shall be taken to minimize the effects of vibration and shocks and prevent movement of the equipment within the package that may lead to damage and a dangerous condition during carriage. When cushioning material is used to meet this requirement it shall be non-combustible and electrically non-conductive; and

(d) Non-combustibility shall be assessed according to a standard recognized in the country where the packaging is designed or manufactured.

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P910	PACKING INSTRUCTION *(cont'd)*	P910

(3) The equipment or the batteries may be carried unpackaged under conditions specified by the competent authority. Additional conditions that may be considered in the approval process include, but are not limited to:

(a) The equipment or the battery shall be strong enough to withstand the shocks and loadings normally encountered during carriage, including trans-shipment between cargo transport units and between cargo transport units and warehouses as well as any removal from a pallet for subsequent manual or mechanical handling; and

(b) The equipment or the battery shall be fixed in cradles or crates or other handling devices in such a way that it will not become loose during normal conditions of carriage.

NOTE: *The packagings authorized may exceed a net mass of 400 kg (see 4.1.3.3).*

Additional requirements

The cells and batteries shall be protected against short circuit;
Protection against short circuits includes, but is not limited to,
- individual protection of the battery terminals,
- inner packaging to prevent contact between cells and batteries,
- batteries with recessed terminals designed to protect against short circuits, or
- the use of a electrically non-conductive and non-combustible cushioning material to fill empty space between the cells or batteries in the packaging.

P911	PACKING INSTRUCTION	P911

This instruction applies to damaged or defective cells and batteries of UN Nos. 3090, 3091, 3480 and 3481 liable to rapidly disassemble, dangerously react, produce a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours under normal conditions of carriage.

The following packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

For cells and batteries and equipment containing cells and batteries:

Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G);

Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);

Jerricans (3A2, 3B2, 3H2)

The packagings shall conform to the packing group I performance level.

(1) The packaging shall be capable of meeting the following additional performance requirements in case of rapid disassembly, dangerous reaction, production of a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours of the cells or batteries:

(a) The outside surface temperature of the completed package shall not have a temperature of more than 100°C. A momentary spike in temperature up to 200 °C is acceptable;

(b) No flame shall occur outside the package;

(c) No projectiles shall exit the package;

(d) The structural integrity of the package shall be maintained; and

(e) The packagings shall have a gas management system (e.g. filter system, air circulation, containment for gas, gas tight packaging etc.), as appropriate.

(2) The additional packaging performance requirements shall be verified by a test as specified by the competent authority[a].

A verification report shall be available on request. As a minimum requirement, the cell or battery name, the cell or battery number, the mass, type, energy content of the cells or batteries, the packaging identification and the test data according to the verification method as specified by the competent authority shall be listed in the verification report.

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P911	PACKING INSTRUCTION *(cont'd)*	P911
(3)	When dry ice or liquid nitrogen is used as a coolant, the requirements of section 5.5.3 shall apply. The inner packaging and outer packaging shall maintain their integrity at the temperature of the refrigerant used as well as the temperatures and the pressures which could result if refrigeration were lost.	
Additional requirement:		
	Cells or batteries shall be protected against short circuit.	

[a] *The following criteria, as relevant, may be considered to assess the performance of the packaging:*

(a) The assessment shall be done under a quality management system (as described e.g. in section 2.2.9.1.7 (e)) allowing for the traceability of tests results, reference data and characterization models used;

(b) The list of hazards expected in case of thermal run-away for the cell or battery type, in the condition it is carried (e.g. usage of an inner packaging, state of charge (SOC), use of sufficient non-combustible, electrically non-conductive and absorbent cushioning material etc.), shall be clearly identified and quantified; the reference list of possible hazards for lithium cells or batteries (rapidly disassemble, dangerously react, produce a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours) can be used for this purpose. The quantification of these hazards shall rely on available scientific literature;

(c) The mitigating effects of the packaging shall be identified and characterized, based on the nature of the protections provided and the construction material properties. A list of technical characteristics and drawings shall be used to support this assessment (Density [$kg \cdot m^{-3}$], specific heat capacity [$J \cdot kg^{-1} \cdot K^{-1}$], heating value [$kJ \cdot kg^{-1}$], thermal conductivity [$W \cdot m^{-1} \cdot K^{-1}$], melting temperature and flammability temperature [K], heat transfer coefficient of the outer packaging [$W \cdot m^{-2} \cdot K^{-1}$], …);

(d) The test and any supporting calculations shall assess the result of a thermal run-away of the cell or battery inside the packaging in the normal conditions of carriage;

(e) In case the SOC of the cell or battery is not known, the assessment used, shall be done with the highest possible SOC corresponding to the cell or battery use conditions;

(f) The surrounding conditions in which the packaging may be used and carried shall be described (including for possible consequences of gas or smoke emissions on the environment, such as ventilation or other methods) according to the gas management system of the packaging;

(g) The tests or the model calculation shall consider the worst case scenario for the thermal run-away triggering and propagation inside the cell or battery; this scenario includes the worst possible failure in the normal carriage condition, the maximum heat and flame emissions for the possible propagation of the reaction;

(h) These scenarios shall be assessed over a period of time long enough to allow all the possible consequences to occur (e.g. 24 hours);

(i) In the case of multiple batteries and multiple items of equipment containing batteries, additional requirements such as the maximum number of batteries and items of equipment, the total maximum energy content of the batteries, and the configuration inside the package, including separations and protections of the parts, shall be considered.

4.1.4.2 Packing instructions concerning the use of IBCs

IBC01	PACKING INSTRUCTION	IBC01
The following IBCs are authorized, provided the general provisions of **4.1.1**, **4.1.2** and **4.1.3** are met: Metal (31A, 31B and 31N).		
Special packing provision specific to this Code:		
BB1	For UN No. 3130, the openings of receptacles for this substance shall be tightly closed by means of two devices in series, one of which shall be screwed or secured in an equivalent manner.	

IBC02	PACKING INSTRUCTION	IBC02

The following IBCs are authorized, provided the general provisions of **4.1.1**, **4.1.2** and **4.1.3** are met:

(1) Metal (31A, 31B and 31N);

(2) Rigid plastics (31H1 and 31H2);

(3) Composite (31HZ1).

Special packing provisions:

B5 For UN Nos. 1791, 2014, 2984 and 3149, IBCs shall be provided with a device to allow venting during carriage. The inlet to the venting device shall be sited in the vapour space of the IBC under maximum filling conditions during carriage.

B7 For UN Nos. 1222 and 1865, IBCs with a capacity greater than 450 litres are not permitted due to the substance's potential for explosion when carried in large volumes.

B8 The pure form of this substance shall not be transported in IBCs since it is known to have a vapour pressure of more than 110 kPa at 50 °C or 130 kPa at 55 °C.

B15 For UN No. 2031 with more than 55 % nitric acid, the permitted use of rigid plastics IBCs and of rigid plastics inner receptacles of composite IBCs shall be two years from their date of manufacture.

B16 For UN No. 3375, IBCs of type 31A and 31N are not allowed without competent authority approval.

Special packing provisions specific to this Code:

BB2 For UN No.1203, notwithstanding special provision 534 (see 3.3.1), IBCs shall only be used when the actual vapour pressure is not more than 110 kPa at 50 °C, or 130 kPa at 55 °C.

BB4 For UN Nos. 1133, 1139, 1197, 1210, 1263, 1266, 1286, 1287, 1306, 1866, 1993 and 1999, assigned to packing group III in accordance with 2.2.3.1.4, IBCs with a capacity greater than 450 litres are not permitted.

IBC03	PACKING INSTRUCTION	IBC03

The following IBCs are authorized, provided the general provisions of **4.1.1**, **4.1.2** and **4.1.3** are met:

(1) Metal (31A, 31B and 31N);

(2) Rigid plastics (31H1 and 31H2);

(3) Composite (31HZ1, 31HA2, 31HB2, 31HN2, 31HD2 and 31HH2).

Special packing provision:

B8 The pure form of this substance shall not be carried in IBCs since it is known to have a vapour pressure of more than 110 kPa at 50 °C or 130 kPa at 55 °C.

B19 For UN Nos. 3532 and 3534, IBCs shall be designed and constructed to permit the release of gas or vapour to prevent a build-up of pressure that could rupture the IBCs in the event of loss of stabilization.

IBC04	PACKING INSTRUCTION	IBC04

The following IBCs are authorized, provided the general provisions of **4.1.1**, **4.1.2** and **4.1.3** are met:

Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N).

IBC05	PACKING INSTRUCTION	IBC05

The following IBCs are authorized, provided the general provisions of **4.1.1**, **4.1.2** and **4.1.3** are met:

(1) Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N);

(2) Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2);

(3) Composite (11HZ1, 21HZ1 and 31HZ1).

IBC06	PACKING INSTRUCTION	IBC06

The following IBCs are authorized, provided the general provisions of **4.1.1**, **4.1.2** and **4.1.3** are met:

(1) Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N);

(2) Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2);

(3) Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2 and 31HZ1).

Additional requirement:

Where the solid may become liquid during carriage see 4.1.3.4.

Special packing provisions:

B12 For UN No. 2907, IBCs shall meet the packing group II performance level. IBCs meeting the test criteria of packing group I shall not be used.

IBC07	PACKING INSTRUCTION	IBC07

The following IBCs are authorized, provided the general provisions of **4.1.1**, **4.1.2** and **4.1.3** are met:

(1) Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N);

(2) Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2);

(3) Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2 and 31HZ1);

(4) Wooden (11C, 11D and 11F).

Additional requirements:

1. Where the solid may become liquid during carriage see 4.1.3.4.

2. Liners of wooden IBCs shall be siftproof.

Special packing provision:

B18 For UN Nos. 3531 and 3533, IBCs shall be designed and constructed to permit the release of gas or vapour to prevent a build-up of pressure that could rupture the IBCs in the event of loss of stabilization.

B20 UN No. 3550 may be carried in flexible IBCs (13H3 or 13H4) with siftproof liners to prevent any egress of dust during carriage.

IBC08	PACKING INSTRUCTION	IBC08

The following IBCs are authorized, provided the general provisions of **4.1.1**, **4.1.2** and **4.1.3** are met:

(1) Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N);

(2) Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2);

(3) Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2 and 31HZ1);

(4) Fibreboard (11G);

(5) Wooden (11C, 11D and 11F);

(6) Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 and 13M2).

Additional requirement:

Where the solid may become liquid during carriage see 4.1.3.4.

Special packing provisions:

B3 Flexible IBCs shall be sift-proof and water-resistant or shall be fitted with a sift-proof and water-restistant liner.

B4 Flexible, fibreboard or wooden IBCs shall be sift-proof and water-resistant or shall be fitted with a sift-proof and water-resistant liner.

B6 For UN Nos. 1363, 1364, 1365, 1386, 1408, 1841, 2211, 2217, 2793 and 3314, IBCs are not required to meet the IBC testing requirements of Chapter 6.5.

B13 ***NOTE:*** *For UN Nos. 1748, 2208, 2880, 3485, 3486 and 3487, carriage by sea in IBCs is prohibited according to the IMDG Code.*

Special packing provision specific to this Code:

BB3 For UN 3509, IBCs are not required to meet the requirements of 4.1.1.3.

IBCs meeting the requirements of 6.5.5, made leak tight or fitted with a leak tight and puncture resistant sealed liner or bag, shall be used.

When the only residues are solids which are not liable to become liquid at temperatures likely to be encountered during carriage, flexible IBCs may be used.

When liquid residues are present, rigid IBCs that provide a means of retention (e.g. absorbent material) shall be used.

Before being filled and handed over for carriage, every IBC shall be inspected to ensure that it is free from corrosion, contamination or other damage. Any IBC showing signs of reduced strength, shall no longer be used (minor dents and scratches are not considered as reducing the strength of the IBC).

IBCs intended for the carriage of packagings, discarded, empty, uncleaned with residues of Class 5.1 shall be so constructed or adapted that the goods cannot come into contact with wood or any other combustible material.

IBC99	PACKING INSTRUCTION	IBC99

Only IBCs which are approved for these goods by the competent authority may be used. A copy of the competent authority approval shall accompany each consignment or the transport document shall include an indication that the packaging was approved by the competent authority.

IBC100	PACKING INSTRUCTION	IBC100

This instruction applies to UN Nos. 0082, 0222, 0241, 0331 and 0332.

The following IBCs are authorized, provided the general provisions of **4.1.1**, **4.1.2** and **4.1.3** and special provisions of **4.1.5** are met:

(1) Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N);

(2) Flexible (13H2, 13H3, 13H4, 13L2, 13L3, 13L4 and 13M2);

(3) Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2);

(4) Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2).

Additional requirements:

1. IBCs shall only be used for free flowing substances.

2. Flexible IBCs shall only be used for solids.

Special packing provisions:

B3 For UN No. 0222, flexible IBCs shall be sift-proof and water resistant or shall be fitted with a sift-proof and water resistant liner.

B9 For UN No. 0082, this packing instruction may only be used when the substances are mixtures of ammonium nitrate or other inorganic nitrates with other combustible substances which are not explosive ingredients. Such explosives shall not contain nitroglycerin, similar liquid organic nitrates, or chlorates. Metal IBCs are not authorized.

B10 For UN No. 0241, this packing instruction may only be used for substances which consist of water as an essential ingredient and high proportions of ammonium nitrate or other oxidizing substances some or all of which are in solution. The other constituents may include hydrocarbons or aluminium powder, but shall not include nitro-derivatives such as trinitrotoluene. Metal IBCs are not authorized.

B17 For UN No. 0222, metal IBCs are not authorized.

IBC520	PACKING INSTRUCTION				IBC520
This instruction applies to organic peroxides and self-reactive substances of type F.					
The IBCs listed below are authorized for the formulations listed, provided the general provisions of **4.1.1**, **4.1.2** and **4.1.3** and special provisions of **4.1.7.2** are met. The formulations not listed in 2.2.41.4 or in 2.2.52.4 but listed below 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. For formulations not listed below, only IBCs which are approved by the competent authority may be used (see 4.1.7.2.2).					
UN No.	**Organic peroxide**	**Type of IBC**	**Maximum quantity (litres/kg)**	**Control Tempera-ture**	**Emergency Tempera-ture**
3109	**ORGANIC PEROXIDE, TYPE F, LIQUID**				
	tert-Butyl cumyl peroxide	31HA1	1000		
	tert-Butyl hydroperoxide, not more than 72 % with water	31A 31HA1	1 250 1 000		
	tert-Butyl peroxyacetate, not more than 32 % in diluent type A	31A 31HA1	1 250 1 000		
	tert-Butyl peroxybenzoate, not more than 32 % in diluent type A	31A	1 250		
	tert-Butyl peroxy-3,5,5-trimethylhexanoate, not more than 37 % in diluent type A	31A 31HA1	1 250 1 000		
	Cumyl hydroperoxide, not more than 90 % in diluent type A	31HA1	1 250		
	Dibenzoyl peroxide, not more than 42 % as a stable dispersion in water	31H1	1 000		
	Di-tert-butyl peroxide, not more than 52 % in diluent type A	31A 31HA1	1 250 1 000		
	1,1-Di-(tert-butylperoxy) cyclohexane, not more than 42 % in diluent type A	31H1	1 000		
	1,1-Di-(tert-butylperoxy) cyclohexane, not more than 37 % in diluent type A	31A	1 250		
	Dilauroyl peroxide, not more than 42 %, stable dispersion, in water	31HA1	1 000		
	2,5-Dimethyl-2,5-di(tert-butylperoxy)hexane, not more than 52 % in diluent type A	31HA1	1000		
	Isopropyl cumyl hydroperoxide, not more than 72 % in diluent type A	31HA1	1 250		
	p-Menthyl hydroperoxide, not more than 72 % in diluent type A	31HA1	1 250		
	Peroxyacetic acid, stabilized, not more than 17 %	31A 31H1 31H2 31HA1	1 500 1 500 1 500 1 500		
	3,6,9-Triethyl-3,6,9-trimethyl-1,4,7-triperoxonane not more than 27 % in diluent type A	31HA1	1000		
3110	**ORGANIC PEROXIDE, TYPE F, SOLID**				
	Dicumyl peroxide	31A 31H1 31HA1	2 000		

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IBC520	PACKING INSTRUCTION				IBC520
UN No.	**Organic peroxide**	**Type of IBC**	**Maximum quantity (litres/kg)**	**Control Tempera-ture**	**Emergency Tempera-ture**
3119	**ORGANIC PEROXIDE, TYPE F, LIQUID, TEMPERATURE CONTROLLED**				
	tert-Amyl peroxy-2-ethylhexanoate, not more than 62 % in diluent type A	31HA1	1000	+15 °C	+20 °C
	tert-Amyl peroxypivalate, not more than 32 % in diluent type A	31A	1 250	+10 °C	+15 °C
	tert-Amyl peroxypivalate, not more than 42 % as a stable dispersion in water	31HA1	1 000	0 °C	+10 °C
	tert-Butyl peroxy-2-ethylhexanoate, not more than 32 % in diluent type B	31HA1 31A	1 000 1 250	+30 °C +30 °C	+35 °C +35 °C
	tert-Butyl peroxyneodecanoate, not more than 32 % in diluent type A	31A	1 250	0 °C	+10 °C
	tert-Butyl peroxyneodecanoate, not more than 52 %, stable dispersion, in water	31A	1 250	-5 °C	+5 °C
	tert-Butyl peroxypivalate, not more than 27 % in diluent type B	31HA1 31A	1 000 1 250	+10 °C +10 °C	+15 °C +15 °C
	tert-Butyl peroxypivalate, not more than 42 % in a diluent type A	31HA1 31A	1 000 1 250	+10 °C +10 °C	+15 °C +15 °C
	Cumyl peroxyneodecanoate, not more than 52 %, stable dispersion, in water	31A	1 250	-15 °C	- 5 °C
	tert-Butyl peroxyneodecanoate, not more than 42 % stable dispersion, in water	31A	1 250	- 5 °C	+ 5 °C
	Di-(4-tert-butylcyclohexyl) peroxydicarbonate, not more than 42 %, stable dispersion, in water	31HA1	1 000	+30 °C	+35 °C
	Dicetyl peroxydicarbonate, not more than 42 %, stable dispersion, in water	31HA1	1 000	+30 °C	+35 °C
	Di-(2-neodecanoylperoxyisopropyl)benzene, not more than 42 %, stable dispersion, in water	31A	1 250	-15 °C	-5 °C
	3-Hydroxy-1,1-dimethylbutyl peroxyneodecanoate, not more than 52 %, stable dispersion, in water	31A	1 250	-15 °C	-5 °C
	Di-(2-ethylhexyl) peroxydicarbonate, not more than 62 %, stable dispersion, in water	31A 31HA1	1 250 1000	-20 °C -20°C	-10 °C -10°C
	Dimyristyl peroxydicarbonate, not more than 42 %, stable dispersion, in water	31HA1	1 000	+15 °C	+20 °C
	Di-(3,5,5-trimethylhexanoyl) peroxide, not more than 52 % in diluent type A	31HA1 31A	1 000 1 250	+10 °C +10 °C	+15 °C +15 °C
	Di-(3,5,5-trimethylhexanoyl) peroxide, not more than 52 %, stable dispersion, in water	31A	1 250	+10 °C	+15 °C
	1,1,3,3-Tetramethylbutyl peroxyneodecanoate, not more than 52 %, stable dispersion, in water	31A 31HA1	1 250 1 000	- 5 °C -5 °C	+ 5 °C +5 °C
	1,1,3,3-Tetramethylbutyl peroxy-2-ethylhexanoate, not more than 67 %, in diluent type A	31HA1	1000	+15 °C	+20 °C
	Dicyclohexylperoxydicarbonate, not more than 42 % as a stable dispersion, in water	31A	1 250	+10 °C	+15 °C
	Diisobutyryl peroxide, not more than 28 % as a stable dispersion in water	31HA1 31A	1 000 1 250	-20 °C -20 °C	-10 °C -10 °C
	Diisobutyryl peroxide, not more than 42 % as a stable dispersion in water	31HA1 31A	1 000 1 250	-25 °C -25 °C	-15 °C -15 °C
3120	**ORGANIC PEROXIDE, TYPE F, SOLID, TEMPERATURE CONTROLLED** No formulation listed				

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IBC520	PACKING INSTRUCTION *(cont'd)*	IBC520

Additional requirements:

1. IBCs shall be provided with a device to allow venting during carriage. The inlet to the pressure-relief device shall be sited in the vapour space of the IBC under maximum filling conditions during carriage.

2. To prevent explosive rupture of metal IBCs or composite IBCs with complete metal casing, the emergency-relief devices shall be designed to vent all the decomposition products and vapours evolved during self-accelerating decomposition or during a period of not less than one hour of fire-engulfment as calculated by the formula in 4.2.1.13.8. The control and emergency temperatures specified in this packing instruction are based on a non-insulated IBC. When consigning an organic peroxide in an IBC in accordance with this instruction, it is the responsibility of the consignor to ensure that:

   (a) the pressure and emergency relief devices installed on the IBC are designed to take appropriate account of the self-accelerating decomposition of the organic peroxide and of fire-engulfment; and
   (b) when applicable, the control and emergency temperatures indicated are appropriate, taking into account the design (e.g. insulation) of the IBC to be used.

IBC620	PACKING INSTRUCTION	IBC620

This instruction applies to UN No. 3291.

The following IBCs are authorized, provided the general provisions of **4.1.1**, except 4.1.1.15, **4.1.2** and **4.1.3** are met: Rigid, leakproof IBCs conforming to the packing group II performance level.

Additional requirements:

1. There shall be sufficient absorbent material to absorb the entire amount of liquid present in the IBC.
2. IBCs shall be capable of retaining liquids.
3. IBCs intended to contain sharp objects such as broken glass and needles shall be resistant to puncture.

4.1.4.3 Packing instructions concerning the use of large packagings

LP01	PACKING INSTRUCTION (LIQUIDS)			LP01
The following large packagings are authorized provided the general provision of **4.1.1** and **4.1.3** are met:				
Inner packagings	**Large outer packagings**	**Packing group I**	**Packing group II**	**Packing group III**
Glass 10 litres Plastics 30 litres Metal 40 litres	Steel (50A) Aluminium (50B) Metal other than steel or aluminium (50N) Rigid plastics (50H) Natural wood (50C) Plywood (50D) Reconstituted wood (50F) Rigid fibreboard (50G)	Not allowed	Not allowed	Maximum capacity: 3 m³

LP02	PACKING INSTRUCTION (SOLIDS)			LP02
The following large packagings are authorized provided the general provisions of **4.1.1** and **4.1.3** are met:				
Inner packagings	**Large outer packagings**	**Packing group I**	**Packing group II**	**Packing group III**
Glass 10 kg Plastics [b] 50 kg Metal 50 kg Paper [a, b] 50 kg Fibre [a, b] 50 kg	Steel (50A) Aluminium (50B) Metal other than steel or aluminium (50N) Rigid plastics (50H) Natural wood (50C) Plywood (50D) Reconstituted wood (50F) Rigid fibreboard (50G) Flexible plastics (51H) [c]	Not allowed	Not allowed	Maximum capacity: 3 m³
[a] *These inner packagings shall not be used when the substances being carried may become liquid during carriage.*				
[b] *These inner packagings shall be sift-proof.*				
[c] *To be used with flexible inner packagings only.*				
Special packing provisions:				
L2 *Deleted.*				
L3 ***NOTE:*** *For UN Nos. 2208 and 3486, carriage by sea in large packagings is prohibited.*				

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LP02	PACKING INSTRUCTION (SOLIDS) *(cont'd)*	LP02

Special packing provision specific to this Code:

LL1 For UN 3509, large packagings are not required to meet the requirements of 4.1.1.3.

Large packagings meeting the requirements of 6.6.4, made leak tight or fitted with a leak tight and puncture resistant sealed liner or bag, shall be used.

When the only residues are solids which are not liable to become liquid at temperatures likely to be encountered during carriage, flexible large packagings may be used.

When liquid residues are present, rigid large packagings that provide a means of retention (e.g. absorbent material) shall be used.

Before being filled and handed over for carriage, every large packaging shall be inspected to ensure that it is free from corrosion, contamination or other damage. Any large packaging showing signs of reduced strength, shall no longer be used (minor dents and scratches are not considered as reducing the strength of the large packaging).

Large packagings intended for the carriage of packagings, discarded, empty, uncleaned with residues of Class 5.1 shall be so constructed or adapted that the goods cannot come into contact with wood or any other combustible material.

LP03	PACKING INSTRUCTION	LP03

This instruction applies to UN Nos. 3537 to 3548.

(1) The following large packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

Rigid large packagings conforming to the packing group II performance level made of:

steel (50A);
aluminium (50B);
metal other than steel or aluminium (50N);
rigid plastics (50H);
natural wood (50C);
plywood (50D);
reconstituted wood (50F);
rigid fibreboard (50G).

(2) Additionally, the following conditions shall be met:

(a) Receptacles within articles containing liquids or solids shall be constructed of suitable materials and secured in the article in such a way that, under normal conditions of carriage, they cannot break, be punctured or leak their contents into the article itself or the outer packaging;

(b) Receptacles containing liquids with closures shall be packed with their closures correctly oriented. The receptacles shall in addition conform to the internal pressure test provisions of 6.1.5.5;

(c) Receptacles that are liable to break or be punctured easily, such as those made of glass, porcelain or stoneware or of certain plastics materials shall be properly secured. Any leakage of the contents shall not substantially impair the protective properties of the article or of the outer packaging;

(d) Receptacles within articles containing gases shall meet the requirements of Section 4.1.6 and Chapter 6.2 as appropriate or be capable of providing an equivalent level of protection as packing instructions P200 or P208; and

(e) Where there is no receptacle within the article, the article shall fully enclose the dangerous substances and prevent their release under normal conditions of carriage.

(3) Articles shall be packed to prevent movement and inadvertent operation during normal conditions of carriage.

LP99	PACKING INSTRUCTION	LP99
Only large packagings which are approved for these goods by the competent authority may be used. A copy of the competent authority approval shall accompany each consignment or the transport document shall include an indication that the packaging was approved by the competent authority.		

LP101	PACKING INSTRUCTION	LP101
The following packagings are authorized, provided the general provisions of **4.1.1** and **4.1.3** and special provisions of **4.1.5** are met:		
Inner packagings	**Intermediate packagings**	**Large outer packagings**
Not necessary	Not necessary	Steel (50A) Aluminium (50B) Metal other than steel or aluminium (50N) Rigid plastics (50H) Natural wood (50C) Plywood (50D) Reconstituted wood (50F) Rigid fibreboard (50G)
Special packing provision: **L1** For UN Nos. 0006, 0009, 0010, 0015, 0016, 0018, 0019, 0034, 0035, 0038, 0039, 0048, 0056, 0137, 0138, 0168, 0169, 0171, 0181, 0182, 0183, 0186, 0221, 0243, 0244, 0245, 0246, 0254, 0280, 0281, 0286, 0287, 0297, 0299, 0300, 0301, 0303, 0321, 0328, 0329, 0344, 0345, 0346, 0347, 0362, 0363, 0370, 0412, 0424, 0425, 0434, 0435, 0436, 0437, 0438, 0451, 0488, 0502 and 0510: Large and robust explosives articles, normally intended for military use, without their means of initiation or with their means of initiation containing at least two effective protective features, may be carried unpackaged. When such articles have propelling charges or are self-propelled, their ignition systems shall be protected against stimuli encountered during normal conditions of carriage. A negative result in Test Series 4 on an unpackaged article indicates that the article can be considered for carriage unpackaged. Such unpackaged articles may be fixed to cradles or contained in crates or other suitable handling devices.		

LP102	PACKING INSTRUCTION	LP102
The following packagings are authorized, provided the general provisions of **4.1.1** and **4.1.3** and special provisions of **4.1.5** are met:		
Inner packagings	**Intermediate packagings**	**Large outer packagings**
Bags water resistant **Receptacles** fibreboard metal plastics wood **Sheets** fibreboard, corrugated **Tubes** fibreboard	Not necessary	Steel (50A) Aluminium (50B) Metal other than steel or aluminium (50N) Rigid plastics (50H) Natural wood (50C) Plywood (50D) Reconstituted wood (50F) Rigid fibreboard (50G)

LP200	PACKING INSTRUCTION	LP200

This instruction applies to UN Nos. 1950 and 2037.

The following large packagings are authorized for aerosols and gas cartridges, provided that the general provisions of **4.1.1** and **4.1.3** are met:

Rigid large packagings conforming to the packing group II performance level, made of:

steel (50A);

aluminium (50B);

metal other than steel or aluminium (50N);

rigid plastics (50H);

natural wood (50C);

plywood (50D);

reconstituted wood (50F);

rigid fibreboard (50G).

Special packing provision:

L2 The large packagings shall be designed and constructed to prevent dangerous movement and inadvertent discharge during normal conditions of carriage. For waste aerosols carried in accordance with special provision 327, the large packagings shall have a means of retaining any free liquid that might escape during carriage, e.g. absorbent material. For waste aerosols and was gas cartridges carried in accordance with special provision 327, the large packagings shall be adequately ventilated to prevent the creation of dangerous atmospheres and the build-up of pressure.

LP621	PACKING INSTRUCTION	LP621

This instruction applies to UN No. 3291.

The following large packagings are authorized, provided the general provisions of **4.1.1** and **4.1.3** are met:

(1) For clinical waste placed in inner packagings: Rigid, leakproof large packagings conforming to the requirements of Chapter 6.6 for solids, at the packing group II performance level, provided there is sufficient absorbent material to absorb the entire amount of liquid present and the large packaging is capable of retaining liquids;

(2) For packages containing larger quantities of liquid: Large rigid packagings conforming to the requirements of Chapter 6.6, at the packing group II performance level, for liquids.

Additional requirement:

Large packagings intended to contain sharp objects such as broken glass and needles shall be resistant to puncture and retain liquids under the performance test conditions in Chapter 6.6.

LP622	PACKING INSTRUCTION	LP622
This instruction applies to waste of UN No. 3549 carried for disposal.		
The following large packagings are authorized provided the general provisions of **4.1.1** and **4.1.3** are met:		
Inner packagings	**Intermediate packagings**	**Outer packagings**
metal plastics	metal plastics	steel (50A) aluminium (50B) metal other than steel or aluminium (50N) plywood (50D) rigid fibreboard (50G) rigid plastics (50H)
The outer packaging shall conform to the packing group I performance level for solids.		

Additional requirements:

1. Fragile articles shall be contained in either a rigid inner packaging or a rigid intermediate packaging.
2. Inner packagings containing sharp objects such as broken glass and needles shall be rigid and resistant to puncture.
3. The inner packaging, the intermediate packaging and the outer packaging shall be capable of retaining liquids. Outer packagings that are not capable of retaining liquids by design shall be fitted with a liner or suitable measure of retaining liquids.
4. The inner packaging and/or the intermediate packaging may be flexible. When flexible packagings are used, they shall be capable of passing the impact resistance test of at least 165 g according to ISO 7765-1:1988 “Plastics film and sheeting – Determination of impact resistance by the free-falling dart method – Part 1: Staircase methods” and the tear resistance test of at least 480 g in both parallel and perpendicular planes with respect to the length of the bag in accordance with ISO 6383-2:1983 “Plastics – Film and sheeting – Determination of tear resistance – Part 2: Elmendorf method”. The maximum net mass of each flexible inner packaging shall be 30 kg.
5. Each flexible intermediate packaging shall contain only one inner packaging.
6. Inner packagings containing a small amount of free liquid may be included in intermediate packaging provided that there is sufficient absorbent or solidifying material in the inner or intermediate packaging to absorb or solidify all the liquid content present. Suitable absorbent material which withstands the temperatures and vibrations liable to occur under normal conditions of carriage shall be used.
7. Intermediate packagings shall be secured in outer packagings with suitable cushioning and/or absorbent material.

LP902	PACKING INSTRUCTION	LP902

This instruction applies to UN No. 3268.

Packaged articles:

The following packagings are authorized, provided the general provisions of 4.1.1 and 4.1.3 are met:

Rigid large packagings conforming to the packing group III performance level, made of:

steel (50A);
aluminium (50B);
metal other than steel or aluminium (50N);
rigid plastics (50H);
natural wood (50C);
plywood (50D);
reconstituted wood (50F);
rigid fibreboard (50G).

The packagings shall be designed and constructed to prevent movement of the articles and inadvertent operation during normal conditions of carriage.

Unpackaged articles:

The articles may also be carried unpackaged in dedicated handling devices or cargo transport units when moved to, from, or between where they are manufactured and an assembly plant including intermediate handling locations.

Additional requirement:

Any pressure receptacle shall be in accordance with the requirements of the competent authority for the substance(s) contained in the pressure receptacle(s).

LP903	PACKING INSTRUCTION	LP903

This instruction applies to UN Nos. 3090, 3091, 3480 and 3481.

The following large packagings are authorized for a single battery and for a single item of equipment containing batteries, provided that the general provisions of **4.1.1** and **4.1.3** are met:

Rigid large packagings conforming to the packing group II performance level, made of:

steel (50A);
aluminium (50B);
metal other than steel or aluminium (50N);
rigid plastics (50H);
natural wood (50C);
plywood (50D);
reconstituted wood (50F);
rigid fibreboard (50G).

The battery or the equipment shall be packed so that the battery or the equipment is protected against damage that may be caused by its movement or placement within the large packaging.

Additional requirement:

Batteries shall be protected against short circuit.

LP904	PACKING INSTRUCTION	LP904

This instruction applies to single damaged or defective batteries and to single items of equipment containing damaged or defective cells and batteries of UN Nos. 3090, 3091, 3480 and 3481.

The following large packagings are authorized for a single damaged or defective battery and for a single item of equipment containing damaged or defective cells and batteries, provided the general provisions of **4.1.1** and **4.1.3** are met.

For batteries and equipment containing cells and batteries:

Rigid large packagings conforming to the packing group II performance level, made of:

steel (50A)

aluminium (50B)

metal other than steel or aluminium (50N)

rigid plastics (50H)

plywood (50D)

1. The damaged or defective battery or equipment containing such cells or batteries shall be individually packed in an inner packaging and placed inside an outer packaging. The inner packaging or outer packaging shall be leak-proof to prevent the potential release of electrolyte.
2. The inner packaging shall be surrounded by sufficient non-combustible and electrically non-conductive thermal insulation material to protect against a dangerous evolution of heat.
3. Sealed packagings shall be fitted with a venting device when appropriate.
4. Appropriate measures shall be taken to minimize the effects of vibrations and shocks, prevent movement of the battery or the equipment within the package that may lead to further damage and a dangerous condition during carriage. Cushioning material that is non-combustible and electrically non-conductive may also be used to meet this requirement.
5. Non combustibility shall be assessed according to a standard recognized in the country where the packaging is designed or manufactured.

For leaking cells and batteries, sufficient inert absorbent material shall be added to the inner or outer packaging to absorb any release of electrolyte.

Additional requirement:

Cells and batteries shall be protected against short circuit**.**

LP905	PACKING INSTRUCTION	LP905

This instruction applies to UN Nos. 3090, 3091, 3480 and 3481 production runs consisting of not more than 100 cells and batteries and to pre-production prototypes of cells and batteries when these prototypes are carried for testing.

The following large packagings are authorized for a single battery and for a single item of equipment containing cells or batteries, provided that the general provisions of **4.1.1** and **4.1.3** are met:

(1) For a single battery:

Rigid large packagings conforming to the packing group II performance level, made of:

steel (50A);

aluminium (50B);

metal other than steel or aluminium (50N);

rigid plastics (50H);

natural wood (50C);

plywood (50D);

reconstituted wood (50F);

rigid fibreboard (50G).

Large packagings shall also meet the following requirements:

(a) A battery of different size, shape or mass may be packed in an outer packaging of a tested design type listed above provided the total gross mass of the package does not exceed the gross mass for which the design type has been tested;

(b) The battery shall be packed in an inner packaging and placed inside the outer packaging;

(c) The inner packaging shall be completely surrounded by sufficient non-combustible and electrically non-conductive thermal insulation material to protect against a dangerous evolution of heat;

(d) Appropriate measures shall be taken to minimize the effects of vibration and shocks and prevent movement of the battery within the package that may lead to damage and a dangerous condition during carriage. When cushioning material is used to meet this requirement it shall be non-combustible and electrically non-conductive; and

(e) Non-combustibility shall be assessed according to a standard recognized in the country where the large packaging is designed or manufactured.

(2) For a single item of equipment containing cells or batteries:

Rigid large packagings conforming to the packing group II performance level, made of:

Steel (50A);

Aluminium (50B);

Metal other than steel or aluminium (50N);

Rigid plastics (50H);

Natural wood (50C);

Plywood (50D);

Reconstituted wood (50F);

Rigid fibreboard (50G).

Large packagings shall also meet the following requirements:

(a) A single item of equipment of different size, shape or mass may be packed in an outer packaging of a tested design type listed above provided the total gross mass of the package does not exceed the gross mass for which the design type has been tested;

(b) The equipment shall be constructed or packed in such a manner as to prevent accidental operation during carriage;

(c) Appropriate measures shall be taken to minimize the effects of vibration and shocks and prevent movement of the equipment within the package that may lead to damage and a dangerous condition during carriage. When cushioning material is used to meet this requirement, it shall be non-combustible and electrically non-conductive; and

(d) Non-combustibility shall be assessed according to a standard recognized in the country where the large packaging is designed or manufactured.

Additional requirement:

Cells and batteries shall be protected against short circuit.

LP906	PACKING INSTRUCTION	LP906

This instruction applies to damaged or defective batteries of UN Nos. 3090, 3091, 3480 and 3481 liable to rapidly disassemble, dangerously react, produce a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours under normal conditions of carriage.

The following large packagings are authorized, provided that the general provisions of **4.1.1** and **4.1.3** are met:

For batteries and items of equipment containing batteries :

Rigid large packagings conforming to the packing group I performance level, made of:

steel (50A);

aluminium (50B);

metal other than steel or aluminium (50N);

rigid plastics (50H);

plywood (50D);

rigid fibreboard (50G)

(1) The large packaging shall be capable of meeting the following additional performance requirements in case of rapid disassembly, dangerous reaction, production of a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours of the battery:

(a) The outside surface temperature of the completed package shall not have a temperature of more than 100 °C. A momentary spike in temperature up to 200 °C is acceptable;

(b) No flame shall occur outside the package;

(c) No projectiles shall exit the package;

(d) The structural integrity of the package shall be maintained; and

(e) The large packagings shall have a gas management system (e.g. filter system, air circulation, containment for gas, gas tight packaging etc.), as appropriate.

(2) The additional large packaging performance requirements shall be verified by a test as specified by the competent authority[a].

A verification report shall be made available on request. As a minimum requirement, the name of the batteries, their type as defined in Section 38.3.2.3 of the Manual of Tests and Criteria, the maximum number of batteries, the total mass of batteries, the total energy content of the batteries, the large packaging identification and the test data according to the verification method as specified by the competent authority shall be listed in the verification report. A set of specific instructions describing the way to use the package shall also be part of the verification report.

(3) When dry ice or liquid nitrogen is used as a coolant, the requirements of section 5.5.3 shall apply. The inner packaging and outer packaging shall maintain their integrity at the temperature of the refrigerant used as well as the temperatures and the pressures which could result if refrigeration were lost.

(4) The specific instructions for use of the package shall be made available by the packaging manufacturers and subsequent distributors to the consignor. They shall include at least the identification of the batteries and items of equipment that may be contained inside the packaging, the maximum number of batteries contained in the package and the maximum total of the batteries' energy content, as well as the configuration inside the package, including the separations and protections used during the performance verification test.

Additional requirement:

Batteries shall be protected against short circuit.

[a] *The following criteria, as relevant, may be considered to assess the performance of the large packaging*:

(a) The assessment shall be done under a quality management system (as described e.g. in section 2.2.9.1.7 (e)) allowing for the traceability of tests results, reference data and characterization models used;

(b) The list of hazards expected in case of thermal run-away for the battery type, in the condition it is carried (e.g. usage of an inner packaging, state of charge (SOC), use of sufficient non-combustible, electrically non-conductive and absorbent cushioning material etc.), shall be clearly identified and quantified; the reference list of possible hazards for lithium batteries (rapidly disassemble, dangerously react, produce a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours) can be used for this purpose. The quantification of these hazards shall rely on available scientific literature;

(c) The mitigating effects of the large packaging shall be identified and characterized, based on the nature of the protections provided and the construction material properties. A list of technical characteristics and drawings shall be used to support this assessment (Density [kg·m⁻³], specific heat capacity [J·kg^{-1}·K^{-1}], heating value [kJ·kg^{-1}], thermal conductivity [W·m^{-1}·K^{-1}], melting temperature and flammability temperature [K], heat transfer coefficient of the outer packaging [W·m^{-2}·K^{-1}], …);

(d) The test and any supporting calculations shall assess the result of a thermal run-away of the battery inside the large packaging in the normal conditions of carriage;

(e) In case the SOC of the battery is not known, the assessment used, shall be done with the highest possible SOC corresponding to the battery use conditions;

(f) The surrounding conditions in which the large packaging may be used and carried shall be described (including for possible consequences of gas or smoke emissions on the environment, such as ventilation or other methods) according to the gas management system of the large packaging;

(g) The tests or the model calculation shall consider the worst case scenario for the thermal run-away triggering and propagation inside the battery; this scenario includes the worst possible failure in the normal carriage condition, the maximum heat and flame emissions for the possible propagation of the reaction;

(h) These scenarios shall be assessed over a period of time long enough to allow all the possible consequences to occur (e.g. 24 hours);

(i) In the case of multiple batteries and multiple items of equipment containing batteries, additional requirements such as the maximum number of batteries and items of equipment, the total maximum energy content of the batteries, and the configuration inside the package, including separations and protections of the parts, shall be considered.

4.1.4.4 *(Deleted)*

4.1.5 Special packing provisions for goods of Class 1

4.1.5.1 The general provisions of Section 4.1.1 shall be met.

4.1.5.2 All packagings for Class 1 goods shall be so designed and constructed that:

(a) They will protect the explosives, prevent them escaping and cause no increase in the risk of unintended ignition or initiation when subjected to normal conditions of carriage including foreseeable changes in temperature, humidity and pressure;

(b) The complete package can be handled safely in normal conditions of carriage; and

(c) The packages will withstand any loading imposed on them by foreseeable stacking to which they will be subject during carriage so that they do not add to the risk presented by the explosives, the containment function of the packagings is not harmed, and they are not distorted in a way or to an extent which will reduce their strength or cause instability of a stack.

4.1.5.3 All explosive substances and articles, as prepared for carriage, shall have been classified in accordance with the procedures detailed in 2.2.1.

4.1.5.4 Class 1 goods shall be packed in accordance with the appropriate packing instruction shown in Column (8) of Table A of Chapter 3.2, as detailed in 4.1.4.

4.1.5.5 Unless otherwise specified in this Code, packagings, including IBCs and large packagings, shall conform to the requirements of chapters 6.1, 6.5 or 6.6, as appropriate, and shall meet their test requirements for packing group II.

4.1.5.6 The closure device of packagings containing liquid explosives shall ensure a double protection against leakage.

4.1.5.7 The closure device of metal drums shall include a suitable gasket; if a closure device includes a screw-thread, the ingress of explosive substances into the screw-thread shall be prevented.

4.1.5.8 Packagings for water soluble substances shall be water resistant. Packagings for desensitized or phlegmatized substances shall be closed to prevent changes in concentration during carriage.

4.1.5.9 When the packaging includes a double envelope filled with water which may freeze during transport, a sufficient quantity of an anti-freeze agent shall be added to the water to prevent freezing. Anti-freeze that could create a fire hazard because of its inherent flammability shall not be used.

4.1.5.10 Nails, staples and other closure devices made of metal without protective covering shall not penetrate to the inside of the outer packaging unless the inner packaging adequately protects the explosives against contact with the metal.

4.1.5.11 Inner packagings, fittings and cushioning materials and the placing of explosive substances or articles in packages shall be accomplished in a manner which prevents the explosive substances or articles from becoming loose in the outer packaging under normal conditions of carriage. Metallic components of articles shall be prevented from making contact with metal packagings. Articles containing explosive substances not enclosed in an outer casing shall be separated from each other in order to prevent friction and impact. Padding, trays, partitioning in the inner or outer packaging, mouldings or receptacles may be used for this purpose.

4.1.5.12 Packagings shall be made of materials compatible with, and impermeable to, the explosives contained in the package, so that neither interaction between the explosives and the packaging materials, nor leakage, causes the explosive to become unsafe to carriage, or the hazard division or compatibility group to change.

4.1.5.13 The ingress of explosive substances into the recesses of seamed metal packagings shall be prevented.

4.1.5.14 Plastics packagings shall not be liable to generate or accumulate sufficient static electricity so that a discharge could cause the packaged explosive substances or articles to initiate, ignite or function.

4.1.5.15 Large and robust explosives articles, normally intended for military use, without their means of initiation or with their means of initiation containing at least two effective protective features, may be carried unpackaged. When such articles have propelling charges or are self-propelled, their ignition systems shall be protected against stimuli encountered during normal conditions of carriage. A negative result in Test Series 4 on an unpackaged article indicates that the article can be considered for carriage unpackaged. Such unpackaged articles may be fixed to cradles or contained in crates or other suitable handling, storage or launching devices in such a way that they will not become loose during normal conditions of carriage.

Where such large explosive articles are as part of their operational safety and suitability tests subjected to test regimes that meet the intentions of this Code and such tests have been successfully undertaken, the competent authority may approve such articles to be carried in accordance with this Code.

4.1.5.16 Explosive substances shall not be packed in inner or outer packagings where the differences in internal and external pressures, due to thermal or other effects, could cause an explosion or rupture of the package.

4.1.5.17 Whenever loose explosive substances or the explosive substance of an uncased or partly cased article may come into contact with the inner surface of metal packagings (1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 4A, 4B, 4N and metal receptacles), the metal packaging shall be provided with an inner liner or coating (see 4.1.1.2).

4.1.5.18 Packing instruction P101 may be used for any explosive provided the packaging has been approved by a competent authority regardless of whether the packaging complies with the packing instruction assignment in Column (8) of Table A of Chapter 3.2.

4.1.6 Special packing provisions for goods of Class 2 and goods of other classes assigned to packing instruction P200

4.1.6.1 This section provides general requirements applicable to the use of pressure receptacles and open cryogenic receptacles for the carriage of Class 2 substances and goods of other classes assigned to packing instruction P200 (e.g. UN 1051 hydrogen cyanide, stabilized). Pressure receptacles shall be constructed and closed so as to prevent any loss of contents which might be caused under normal conditions of carriage, including by vibration, or by changes in temperature, humidity or pressure (resulting from change in altitude, for example).

4.1.6.2 Parts of pressure receptacles and open cryogenic receptacles which are in direct contact with dangerous goods shall not be affected or weakened by those dangerous goods and shall not cause a dangerous

effect (e.g. catalysing a reaction or reacting with the dangerous goods) (see also table of standards at the end of this section).

4.1.6.3 Pressure receptacles, including their closures and open cryogenic receptacles, shall be selected to contain a gas or a mixture of gases according to the requirements of 6.2.1.2 and the requirements of the relevant packing instructions of 4.1.4.1. This sub-section also applies to pressure receptacles which are elements of MEGCs, tube-vehicles and tube-wagons.

4.1.6.4 A change of use of a refillable pressure receptacle shall include emptying, purging and evacuation operations to the extent necessary for safe operation (see also table of standards at the end of this section). In addition, a pressure receptacle that previously contained a Class 8 corrosive substance or a substance of another class with a corrosive subsidiary hazard shall not be authorized for the carriage of a Class 2 substance unless the necessary inspection and testing as specified in 6.2.1.6 and 6.2.3.5 respectively have been performed.

4.1.6.5 Prior to filling, the packer shall perform an inspection of the pressure receptacle or open cryogenic receptacle and ensure that the pressure receptacle or open cryogenic receptacle is authorized for the substance and, in case of a chemical under pressure, for the propellant to be carried and that the requirements have been met. Shut-off valves shall be closed after filling and remain closed during carriage. The consignor shall verify that the closures and equipment are not leaking.

NOTE: *Shut-off valves fitted to individual cylinders in bundles may be open during carriage, unless the substance carried is subject to special packing provision 'k' or 'q' in packing provision P200.*

4.1.6.6 Pressure receptacles and open cryogenic receptacles shall be filled according to the working pressures, filling ratios and provisions specified in the appropriate packing instruction for the specific substance being filled and taking into account the lowest pressure rating of any component. Service equipment having a pressure rating lower than other components shall nevertheless comply with 6.2.1.3.1. Reactive gases and gas mixtures shall be filled to a pressure such that if complete decomposition of the gas occurs, the working pressure of the pressure receptacle shall not be exceeded.

4.1.6.7 Pressure receptacles, including their closures, shall conform to the design, construction, inspection and testing requirements detailed in Chapter 6.2. When outer packagings are prescribed, the pressure receptacles and open cryogenic receptacles shall be firmly secured therein. Unless otherwise specified in the detailed packing instructions, one or more inner packagings may be enclosed in one outer packaging.

4.1.6.8 Valves and other components which are to remain connected to the valve during carriage (e.g. handling devices or adaptors) shall be designed and constructed in such a way that they are inherently able to withstand damage without release of the contents or shall be protected from damage which could cause inadvertent release of the contents of the pressure receptacle, by one of the following methods (see also table of standards at the end of this section):

(a) Valves are placed inside the neck of the pressure receptacle and protected by a threaded plug or cap;

(b) Valves are protected by caps or guards. Caps shall possess vent-holes of sufficient cross-sectional area to evacuate the gas if leakage occurs at the valves;

(c) Valves are protected by shrouds or permanent protection attachments;

(d) Pressure receptacles are carried in frames, (e.g. cylinders in bundles); or

(e) Pressure receptacles are carried in protective boxes. For UN pressure receptacles the packaging as prepared for carriage shall be capable of meeting the drop test specified in 6.1.5.3 at the packing group I performance level.

4.1.6.9 Non-refillable pressure receptacles shall:

(a) be carried in an outer packaging, such as a box or crate, or in shrink-wrapped or stretch-wrapped trays;

(b) be of a water capacity less than or equal to 1.25 litres when filled with flammable or toxic gas;

(c) not be used for toxic gases with an LC_{50} less than or equal to 200 ml/m³; and

(d) not be repaired after being put into service.

4.1.6.10 Refillable pressure receptacles, other than closed cryogenic receptacles, shall be periodically inspected according to the provisions of 6.2.1.6, or 6.2.3.5.1 for non UN receptacles, and packing instruction P200, P205, P206 or P208 as applicable. Pressure relief valves for closed cryogenic receptacles shall be subject to periodic inspections and tests according to the provisions of 6.2.1.6.3 and packing instruction P203. Pressure receptacles shall not be filled after they become due for periodic inspection but may be carried after the expiry of the time-limit for purposes of performing inspection or disposal, including the intermediate carriage operations.

4.1.6.11 Repairs shall be consistent with the fabrication and testing requirements of the applicable design and construction standards and are only permitted as indicated in the relevant periodic inspection standards specified in chapter 6.2. Pressure receptacles, other than the jacket of closed cryogenic receptacles, shall not be subjected to repairs of any of the following:

(a) weld cracks or other weld defects;

(b) cracks in walls;

(c) leaks or defects in the material of the wall, head or bottom.

4.1.6.12 Receptacles shall not be offered for filling:

(a) when damaged to such an extent that the integrity of the receptacle or its service equipment may be affected;

(b) unless the receptacle and its service equipment has been examined and found to be in good working order; and

(c) unless the required certification, retest, and filling marks are legible.

4.1.6.13 Filled receptacles shall not be offered for carriage:

(a) when leaking;

(b) when damaged to such an extent that the integrity of the receptacle or its service equipment may be affected;

(c) unless the receptacle and its service equipment has been examined and found to be in good working order; and

(d) unless the required certification, retest, and filling marks are legible.

4.1.6.14 Owners shall, on the basis of a reasoned request from the competent authority, provide it with all the information necessary to demonstrate the conformity of the pressure receptacle in a language easily understood by the competent authority. They shall cooperate with that authority, at its request, on any action taken to eliminate non-conformity of the pressure receptacles which they own.

4.1.6.15 For UN pressure receptacles, the ISO standards and EN ISO standards listed in Table 4.1.6.15.1, except EN ISO 14245 and EN ISO 15995, shall be applied. For information on which standard shall be used at the time of manufacturing the equipment, see 6.2.2.3.

For other pressure receptacles, the requirements of section 4.1.6 are considered to have been complied with if the standards in Table 4.1.6.15.1, as relevant, are applied. For information on which standards shall be used for the manufacture of valves with inherent protection, see 6.2.4.1. For information on the applicability of standards for manufacturing valve protection caps and valve guards, see Table 4.1.6.15.2.

Table 4.1.6.15.1: Standards for UN and non-UN pressure receptacles

Applicable paragraphs	Reference	Title of document
4.1.6.2	EN ISO 11114-1:2020	Gas cylinders – Compatibility of cylinder and valve materials with gas contents – Part 1: Metallic materials
	EN ISO 11114-2:2013	Gas cylinders – Compatibility of cylinder and valve materials with gas contents – Part 2: Non-metallic materials
	AS 2030.1	Gas cylinders requirements
4.1.6.4	ISO 11621:1997 or EN ISO 11621:2005	Gas cylinders – Procedures for change of gas service
	AS 2030.1	Gas cylinders requirements
4.1.6.8 Valves with inherent protection	Clause 4.6.2 of EN ISO 10297:2006 or clause 5.5.2 of EN ISO 10297:2014 or clause 5.5.2 of EN ISO 10297:2014 + A1:2017	Gas cylinders – Cylinder valves – Specification and type testing
	Clause 5.3.8 of EN 13152:2001 + A1:2003	Testing and specifications of LPG cylinder valves – Self-closing
	Clause 5.3.7 of EN 13153:2001 + A1:2003	Specifications and testing of LPG cylinder valves – Manually operated
	Clause 5.9 of EN ISO 14245:2010, clause 5.9 of EN ISO 14245:2019 or clause 5.9 of EN ISO 14245:2021	Gas cylinders – Specifications and testing of LPG cylinder valves – Self-closing
	Clause 5.10 of EN ISO 15995:2010, clause 5.9 of EN ISO 15995:2019 or clause 5.9 of EN ISO 15995:2021	Gas cylinders – Specifications and testing of LPG cylinder valves – Manually operated
	Clause 5.4.2 of EN ISO 17879:2017	Gas cylinders – Self-closing cylinder valves **–** Specification and type testing
	Clause 7.4 of EN 12205:2001 or clause 9.2.5 of EN ISO 11118:2015 or clause 9.2.5 of EN ISO 11118:2015 + A1:2020	Gas cylinders – Non-refillable metallic gas cylinders – Specification and test methods
4.1.6.8 (b)	ISO 11117:1998 or EN ISO 11117:2008 + Cor 1:2009 or EN ISO 11117:2019	Gas cylinders – Valve protection caps and guards – Design, construction and tests
	EN 962:1996 + A2:2000	Transportable gas cylinders – Valve protection caps and valve guards for industrial and medical gas cylinders – Design, construction and tests
4.1.6.8 (c)	Requirements for shrouds and permanent protection attachments used as valve protection under 4.1.6.8 (c) are given in the relevant pressure receptacle shell design standards (see 6.2.2.3 for UN pressure receptacles and 6.2.4.1 for non-UN pressure receptacles).	
4.1.6.8 (b) and (c)	ISO 16111:2008 or ISO 16111:2018	Transportable gas storage devices – Hydrogen absorbed in reversible metal hydride

Table 4.1.6.15.2: Manufacturing dates applicable to valve protection caps and guards fitted to non-UN pressure receptacles

Reference	Title of document	Applicable for manufacture
ISO 11117:1998	Gas cylinders – Valve protection caps and valve guards for industrial and medical gas cylinders – Design construction and tests	Until 31 December 2014
EN ISO 11117: 2008 + Cor 1:2009	Gas cylinders – Valve protection caps and valve guards – Design, construction and tests	Until 31 December 2024
EN ISO 11117:2019	Gas cylinders – Valve protection caps and guards – Design, construction and tests	Until further notice
EN 962:1996 +A2:2000	Transportable gas cylinders – Valve protection caps and valve guards for industrial and medical gas cylinders – Design, construction and tests	Until 31 December 2014

4.1.7 Special packing provisions for organic peroxides (Class 5.2) and self-reactive substances of Class 4.1

4.1.7.0.1 For organic peroxides, all receptacles shall be "effectively closed". Where significant internal pressure may develop in a package by the evolution of a gas, a vent may be fitted, provided the gas emitted will not cause danger, otherwise the degree of filling shall be limited. Any venting device shall be so constructed that liquid will not escape when the package is in an upright position and it shall be able to prevent ingress of impurities. The outer packaging, if any, shall be so designed as not to interfere with the operation of the venting device.

4.1.7.1 *Use of packagings (except IBCs)*

4.1.7.1.1 Packagings for organic peroxides and self-reactive substances shall conform to the requirements of Chapter 6.1 and shall meet its test requirements for packing group II.

4.1.7.1.2 The packing methods for organic peroxides and self-reactive substances are listed in packing instruction 520 and are designated OP1 to OP8. The quantities specified for each packing method are the maximum quantities authorized per package.

4.1.7.1.3 The packing methods appropriate for the individual currently assigned organic peroxides and self-reactive substances are listed in 2.2.41.4 and 2.2.52.4.

4.1.7.1.4 For new organic peroxides, new self-reactive substances or new formulations of currently assigned organic peroxides or self-reactive substances, the following procedure shall be used to assign the appropriate packing method:

(a) ORGANIC PEROXIDE, TYPE B or SELF-REACTIVE SUBSTANCE, TYPE B:

Packing method OP5 shall be assigned, provided that the organic peroxide (or self-reactive substance) satisfies the criteria of 20.4.3 (b) (resp. 20.4.2 (b)) of the Manual of Tests and Criteria in a packaging authorized by the packing method. If the organic peroxide (or self-reactive substance) can only satisfy these criteria in a smaller packaging than those authorized by packing method OP5 (viz. one of the packagings listed for OP1 to OP4), then the corresponding packing method with the lower OP number is assigned;

(b) ORGANIC PEROXIDE, TYPE C or SELF-REACTIVE SUBSTANCE, TYPE C:

Packing method OP6 shall be assigned, provided that the organic peroxide (or self-reactive substance) satisfies the criteria of 20.4.3 (c) (resp. 20.4.2 (c)) of the Manual of Tests and Criteria in a packaging authorized by the packing method. If the organic peroxide (or self-reactive substance) can only satisfy these criteria in a smaller packaging than those authorized by packing method OP6 then the corresponding packing method with the lower OP number is assigned;

(c) ORGANIC PEROXIDE, TYPE D or SELF-REACTIVE SUBSTANCE, TYPE D:

Packing method OP7 shall be assigned to this type of organic peroxide or self-reactive substance;

(d) ORGANIC PEROXIDE, TYPE E or SELF-REACTIVE SUBSTANCE, TYPE E:

Packing method OP8 shall be assigned to this type of organic peroxide or self-reactive substance;

(e) ORGANIC PEROXIDE, TYPE F or SELF-REACTIVE SUBSTANCE, TYPE F:

Packing method OP8 shall be assigned to this type of organic peroxide or self-reactive substance.

4.1.7.2 ***Use of intermediate bulk containers***

4.1.7.2.1 The currently assigned organic peroxides specifically listed in packing instruction IBC520 may be carried in IBCs in accordance with this packing instruction. IBCs shall conform to the requirements of Chapter 6.5 and shall meet its test requirements for packing group II.

4.1.7.2.2 Other organic peroxides and self-reactive substances of type F may be carried in IBCs under conditions established by the competent authority of the country of origin when, on the basis of the appropriate tests, that competent authority is satisfied that such carriage may be safely conducted. The tests undertaken shall include those necessary:

(a) To prove that the organic peroxide (or self-reactive substance) complies with the principles for classification given in 20.4.3 (f) [resp. 20.4.2 (f)] of the Manual of Tests and Criteria, exit box F of Figure 20.1 (b) of the Manual;

(b) To prove the compatibility of all materials normally in contact with the substance during carriage;

(c) To determine, when applicable, the control and emergency temperatures associated with the carriage of the product in the IBC concerned as derived from the SADT;

(d) To design, when applicable, pressure and emergency relief devices; and

(e) To determine if any special provisions are necessary for safe carriage of the substance.

4.1.7.2.3 Emergencies to be taken into account are self-accelerating decomposition and fire engulfment. To prevent explosive rupture of metal or composite IBCs with a complete metal casing, the emergency-relief devices shall be designed to vent all the decomposition products and vapours evolved during self-accelerating decomposition or during a period of not less than one hour of complete fire engulfment calculated by the equations given in 4.2.1.13.8.

4.1.8 Special packing provisions for infectious substances (Class 6.2)

4.1.8.1 Consignors of infectious substances shall ensure that packages are prepared in such a manner that they arrive at their destination in good condition and present no hazard to persons or animals during carriage.

4.1.8.2 The definitions in 1.2.1 and the general packing provisions of 4.1.1.1 to 4.1.1.17, except 4.1.1.10 to 4.1.1.12 and 4.1.1.15 apply to infectious substances packages. However, liquids shall only be filled into packagings which have an appropriate resistance to the internal pressure that may develop under normal conditions of carriage.

4.1.8.3 An itemized list of contents shall be enclosed between the secondary packaging and the outer packaging. When the infectious substances to be carried are unknown, but suspected of meeting the criteria for inclusion in Category A, the words "suspected Category A infectious substance" shall be shown, in parenthesis, following the proper shipping name on the document inside the outer packaging.

4.1.8.4 Before an empty packaging is returned to the consignor, or sent elsewhere, it shall be disinfected or sterilized to nullify any hazard and any label or mark indicating that it had contained an infectious substance shall be removed or obliterated.

4.1.8.5 Provided an equivalent level of performance is maintained, the following variations in the primary receptacles placed within a secondary packaging are allowed without the need for further testing of the completed packaging:

(a) Primary receptacles of equivalent or smaller size as compared to the tested primary receptacles may be used provided:

(i) the primary receptacles are of similar design to the primary receptacle tested (e.g. shape: round, rectangular, etc.);

(ii) the material of construction of the primary receptacles (e.g. glass, plastics, metal) offers resistance to impact and stacking forces equivalent to or better than that of the primary receptacles originally tested;

(iii) the primary receptacles have the same or smaller openings and the closure is of equivalent design (e.g. screw cap, friction lid, etc.);

(iv) sufficient additional cushioning material is used to take up empty spaces and to prevent significant movement of the primary receptacles; and

(v) primary receptacles are oriented within the secondary packagings in the same manner as in the tested package;

(b) A lesser number of the tested primary receptacles, or of the alternative types of primary receptacles identified in (a) above, may be used provided sufficient cushioning is added to fill the void space(s) and to prevent significant movement of the primary receptacles.

4.1.8.6 Paragraphs 4.1.8.1 to 4.1.8.5 only apply to infectious substances of Category A (UN Nos. 2814 and 2900). They do not apply to UN No. 3373 BIOLOGICAL SUBSTANCE, CATEGORY B (see packing instruction P650 of 4.1.4.1), nor to UN No. 3291 CLINICAL WASTE, UNSPECIFIED, N.O.S. or (BIO) MEDICAL WASTE, N.O.S. or REGULATED MEDICAL WASTE, N.O.S.

4.1.8.7 For the carriage of animal material, packagings or IBCs not specifically authorized in the applicable packing instruction shall not be used for the carriage of a substance or article unless specifically approved by the competent authority and provided:

(a) The alternative packaging complies with the general requirements of this Part;

(b) When the packing instruction indicated in Column (8) of Table A of Chapter 3.2 so specifies, the alternative packaging meets the requirements of Part 6;

(c) The competent authority of the country of origin[2] determines that the alternative packaging provides at least the same level of safety as if the substance were packed in accordance with a method specified in the particular packing instruction indicated in Column (8) of Table A of Chapter 3.2; and

(d) A copy of the competent authority approval accompanies each consignment or the transport document includes an indication that alternative packaging was approved by the competent authority.

4.1.9 Special packing provisions for radioactive material

4.1.9.1 *General*

4.1.9.1.1 Radioactive material, packagings and packages shall meet the requirements of Chapter 6.4. The quantity of radioactive material in a package shall not exceed the limits specified in 2.2.7.2.2, 2.2.7.2.4.1, 2.2.7.2.4.4, 2.2.7.2.4.5, 2.2.7.2.4.6, special provision 336 of Chapter 3.3 and 4.1.9.3.

The types of packages for radioactive materials covered by this Code, are:

(a) Excepted package (see 1.7.1.5);

(b) Industrial package Type 1 (Type IP-1 package);

(c) Industrial package Type 2 (Type IP-2 package);

(d) Industrial package Type 3 (Type IP-3 package);

(e) Type A package;

(f) Type B(U) package;

(g) Type B(M) package;

(h) Type C package.

Packages containing fissile material or uranium hexafluoride are subject to additional requirements.

4.1.9.1.2 The non-fixed contamination on the external surfaces of any package shall be kept as low as practicable and, under routine conditions of transport, shall not exceed the following limits:

(a) 4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters; and

(b) 0.4 Bq/cm² for all other alpha emitters.

These limits are applicable when averaged over any area of 300 cm² of any part of the surface.

4.1.9.1.3 A package shall not contain any items other than those that are necessary for the use of the radioactive material. The interaction between these items and the package under the conditions of carriage applicable to the design, shall not reduce the safety of the package.

4.1.9.1.4 Except as provided in 7.5.11, CV33, the level of non-fixed contamination on the external and internal surfaces of overpacks, containers, vehicles and wagons shall not exceed the limits specified in 4.1.9.1.2. This requirement does not apply to the internal surfaces of containers being used as packagings, either loaded or empty.

4.1.9.1.5 For radioactive material having other dangerous properties the package design shall take into account those properties. Radioactive material with a subsidiary hazard, packaged in packages that do not require competent authority approval, shall be carried in packagings, IBCs, tanks or bulk containers fully complying with the requirements of the relevant chapters of Part 6 as appropriate, as well as applicable requirements of chapters 4.1, 4.2 or 4.3 for that subsidiary hazard.

4.1.9.1.6 Before a packaging is first used to carry radioactive material, it shall be confirmed that it has been manufactured in conformity with the design specifications to ensure compliance with the relevant provisions of this Code and any applicable certificate of approval. The following requirements shall also be fulfilled, if applicable:

(a) If the design pressure of the containment system exceeds 35 kPa (gauge), it shall be ensured that the containment system of each packaging conforms to the approved design requirements relating to the capability of that system to maintain its integrity under that pressure;

(b) For each packaging intended for use as a Type B(U), Type B(M) or Type C package and for each packaging intended to contain fissile material, it shall be ensured that the effectiveness of its shielding and containment and, where necessary, the heat transfer characteristics and the effectiveness of the confinement system, are within the limits applicable to or specified for the approved design;

(c) For each packaging intended to contain fissile material, it shall be ensured that the effectiveness of the criticality safety features is within the limits applicable to or specified for the design and in particular where, in order to comply with the requirements of 6.4.11.1 neutron poisons are specifically included, checks shall be performed to confirm the presence and distribution of those neutron poisons.

4.1.9.1.7 Before each shipment of any package, it shall be ensured that the package contains neither:

(a) Radionuclides different from those specified for the package design; nor

(b) Contents in a form, or physical or chemical state different from those specified for the package design.

4.1.9.1.8 Before each shipment of any package, it shall be ensured that all the requirements specified in the relevant provisions of this Code and in the applicable certificates of approval have been fulfilled. The following requirements shall also be fulfilled, if applicable:

(a) It shall be ensured that lifting attachments which do not meet the requirements of 6.4.2.2 have been removed or otherwise rendered incapable of being used for lifting the package, in accordance with 6.4.2.3;

(b) Each Type B(U), Type B(M) and Type C package shall be held until equilibrium conditions have been approached closely enough to demonstrate compliance with the requirements for temperature and pressure unless an exemption from these requirements has received unilateral approval;

(c) For each Type B(U), Type B(M) and Type C package, it shall be ensured by inspection and/or appropriate tests that all closures, valves and other openings of the containment system through which the radioactive contents might escape are properly closed and, where appropriate, sealed in the manner for which the demonstrations of compliance with the requirements of 6.4.8.8 and 6.4.10.3 were made;

(d) For packages containing fissile material the measurement specified in 6.4.11.5 (b) and the tests to demonstrate closure of each package as specified in 6.4.11.8 shall be performed;

(e) For packages intended to be used for shipment after storage, it shall be ensured that all packaging components and radioactive contents have been maintained during storage in a manner such that all the requirements specified in the relevant provisions of this Code and in the applicable certificates of approval have been fulfilled.

4.1.9.1.9 The consignor shall also have a copy of any instructions with regard to the proper closing of the package and any preparation for shipment before making any shipment under the terms of the certificates.

4.1.9.1.10 Except for consignments under exclusive use, the transport index of any package or overpack shall not exceed 10, nor shall the criticality safety index of any package or overpack exceed 50.

4.1.9.1.11 Except for packages or overpacks carried under exclusive use under the conditions specified in 7.5.11, CV33 (3.5)(a), the maximum dose rate at any point on any external surface of a package or overpack shall not exceed 2 mSv/h.

4.1.9.1.12 The maximum dose rate at any point on any external surface of a package or overpack under exclusive use shall not exceed 10 mSv/h.

4.1.9.2 ***Requirements and controls for carriage of LSA material and SCO***

4.1.9.2.1 The quantity of LSA material or SCO in a single Type IP-1 package , Type IP-2 package, Type IP-3 package , or object or collection of objects, whichever is appropriate, shall be so restricted that the external dose rate at 3 m from the unshielded material or object or collection of objects does not exceed 10 mSv/h.

4.1.9.2.2 For LSA material and SCO which are or contain fissile material, which is not excepted under 2.2.7.2.3.5, the applicable requirements of 7.5.11, CV33 (4.1) and (4.2) shall be met.

4.1.9.2.3 For LSA material and SCO which are or contain fissile material, the applicable requirements of 6.4.11.1 shall be met.

4.1.9.2.4 LSA material and SCO in groups LSA-I, SCO-I and SCO-III may be carried unpackaged under the following conditions:

(a) All unpackaged material other than ores containing only naturally occurring radionuclides shall be carried in such a manner that under routine conditions of carriage there will be no escape of the radioactive contents from the vehicle or wagon nor will there be any loss of shielding;

(b) Each vehicle or wagon shall be under exclusive use, except when only carrying SCO-I on which the contamination on the accessible and the inaccessible surfaces is not greater than ten times the corresponding level according to the definition of "contamination" in 2.2.7.1.2;

(c) For SCO-I where it is suspected that non-fixed contamination exists on inaccessible surfaces in excess of the values specified in 2.2.7.2.3.2 (a)(i), measures shall be taken to ensure that the radioactive material is not released into the vehicle or wagon;

(d) Unpackaged fissile material shall meet the requirements of 2.2.7.2.3.5 I; aI(e) For SCO-III:

(i) Carriage shall be under exclusive use;

(ii) Stacking shall not be permitted;

(iii) All activities associated with the shipment, including radiation protection, emergency response and any special precautions or special administrative or operational controls that are to be employed during carriage shall be described in a transport plan. The transport plan shall demonstrate that the overall level of safety in carriage is at least equivalent to that which would be provided if the requirements of 6.4.7.14 (only for the test specified in 6.4.15.6, preceded by the tests specified in 6.4.15.2 and 6.4.15.3) had been met;

(iv) The requirements of 6.4.5.1 and 6.4.5.2 for a Type IP-2 package shall be satisfied, except that the maximum damage referred to in 6.4.15.4 may be determined based on provisions in the transport plan, and the requirements of 6.4.15.5 are not applicable;

(v) The object and any shielding are secured to the conveyance in accordance with 6.4.2.1;

(vi) The shipment shall be subject to multilateral approval.

4.1.9.2.5 LSA material and SCO, except as otherwise specified in 4.1.9.2.4, shall be packaged in accordance with the table below:

Table 4.1.9.2.5: Industrial package requirements for LSA material and SCO

Radioactive contents	Industrial package type	
	Exclusive use	Not under exclusive use
LSA-I		
Solid [a]	Type IP-1	Type IP-1
Liquid	Type IP-1	Type IP-2
LSA-II		
Solid	Type IP-2	Type IP-2
Liquid and gas	Type IP-2	Type IP-3
LSA-III	Type IP-2	Type IP-3
SCO-I [a]	Type IP-1	Type IP-1
SCO-II	Type IP-2	Type IP-2

[a] *Under the conditions specified in 4.1.9.2.4, LSA-I material and SCO-I may be carried unpackaged.*

4.1.9.3 ***Packages containing fissile material***

The contents of packages containing fissile material shall be as specified for the package design either directly in this Code or in the certificate of approval.

CHAPTER 4.2

USE OF PORTABLE TANKS AND UN MULTIPLE-ELEMENT GAS CONTAINERS (MEGCs)

NOTE 1: *For fixed tanks (tank-vehicles or tank-wagons), demountable tanks and tank-containers and tank swap bodies, with shells made of metallic materials, and tube-vehicles and tube-wagons and multiple element gas containers (MEGCs), see Chapter 4.3; for fibre-reinforced plastics tanks, see Chapter 4.4; for vacuum operated waste tanks, see Chapter 4.5.*

NOTE 2: *Portable tanks and UN MEGCs marked in accordance with the applicable provisions of Chapter 6.7 but which were approved by a competent authority not responsible for this Code may nevertheless be used for carriage under this Code.*

4.2.1 General provisions for the use of portable tanks for the carriage of substances of Class 1 and Classes 3 to 9

4.2.1.1 This section provides general provisions applicable to the use of portable tanks for the carriage of substances of Classes 1, 3, 4.1, 4.2, 4.3, 5.1, 5.2, 6.1, 6.2, 7, 8 and 9. In addition to these general provisions, portable tanks shall conform to the design, construction, inspection and testing requirements detailed in 6.7.2. Substances shall be carried in portable tanks conforming to the applicable portable tank instruction identified in Column (10) of the Table A of Chapter 3.2 and described in 4.2.5.2.6 (T1 to T23) and the portable tank special provisions assigned to each substance in Column (11) of Table A of Chapter 3.2 and described in 4.2.5.3.

4.2.1.2 During carriage, portable tanks shall be adequately protected against damage to the shell and service equipment resulting from lateral and longitudinal impact and overturning. If the shell and service equipment are so constructed as to withstand impact or overturning it need not be protected in this way. Examples of such protection are given in 6.7.2.17.5.

4.2.1.3 Certain substances are chemically unstable. They are accepted for carriage only when the necessary steps have been taken to prevent their dangerous decomposition, transformation or polymerization during carriage. To this end, care shall in particular be taken to ensure that shells do not contain any substances liable to promote these reactions.

4.2.1.4 The temperature of the outer surface of the shell excluding openings and their closures or of the thermal insulation shall not exceed 70 °C during carriage. When necessary, the shell shall be thermally insulated.

4.2.1.5 Empty portable tanks not cleaned and not gas-free shall comply with the same provisions as portable tanks filled with the previous substance.

4.2.1.6 Substances shall not be carried in the same or in adjoining compartments of shells when they may react dangerously with each other (see definition for "dangerous reaction" in 1.2.1).

4.2.1.7 The design approval certificate, the test report and the certificate showing the results of the initial inspection and test for each portable tank issued by the competent authority or its authorized body shall be retained by the authority or body and the owner. Owners shall be able to provide this documentation upon the request of any competent authority.

4.2.1.8 Unless the name of the substance(s) being carried appears on the metal plate described in 6.7.2.20.2 a copy of the certificate specified in 6.7.2.18.1 shall be made available upon the request of a competent authority or its authorized body and readily provided by the consignor, consignee or agent, as appropriate.

4.2.1.9 ***Degree of filling***

4.2.1.9.1 Prior to filling, the consignor shall ensure that the appropriate portable tank is used and that the portable tank is not filled with substances which in contact with the materials of the shell, gaskets, service equipment and any protective linings, are likely to react dangerously with them to form dangerous products or appreciably weaken these materials. The consignor may need to consult the manufacturer of the substance in conjunction with the competent authority for guidance on the compatibility of the substance with the portable tank materials.

4.2.1.9.1.1 Portable tanks shall not be filled above the extent provided in 4.2.1.9.2 to 4.2.1.9.6. The applicability of 4.2.1.9.2, 4.2.1.9.3 or 4.2.1.9.5.1 to individual substances is specified in the applicable portable tank instruction or special provisions in 4.2.5.2.6 or 4.2.5.3 and Column (10) or (11) of Table A of Chapter 3.2.

4.2.1.9.2 The maximum degree of filling (in %) for general use is determined by the formula:

$$\text{Degree of filling} = \frac{97}{1 + \alpha\,(t_r - t_f)}$$

4.2.1.9.3 The maximum degree of filling (in %) for liquids of Class 6.1 and Class 8, in packing groups I and II, and liquids with an absolute vapour pressure of more than 175 kPa (1.75 bar) at 65 °C, is determined by the formula:

$$\text{Degree of filling} = \frac{95}{1 + \alpha\,(t_r - t_f)}$$

4.2.1.9.4 In these formulae, α is the mean coefficient of cubical expansion of the liquid between the mean temperature of the liquid during filling (t_f) and the maximum mean bulk temperature during carriage (t_r) (both in °C). For liquids carried under ambient conditions α could be calculated by the formula:

$$\alpha = \frac{d_{15} - d_{50}}{35 d_{50}}$$

in which d_{15} and d_{50} are the densities of the liquid at 15 °C and 50 °C, respectively.

4.2.1.9.4.1 The maximum mean bulk temperature (t_r) shall be taken as 50 °C except that, for journeys under temperate or extreme climatic conditions, the competent authorities concerned may agree to a lower or require a higher temperature, as appropriate.

4.2.1.9.5 The provisions of 4.2.1.9.2 to 4.2.1.9.4.1 do not apply to portable tanks which contain substances maintained at a temperature above 50 °C during carriage (e.g. by means of a heating device). For portable tanks equipped with a heating device, a temperature regulator shall be used to ensure the maximum degree of filling is not more than 95 % full at any time during carriage.

4.2.1.9.5.1 The maximum degree of filling (in %) for solids carried above their melting point and for elevated temperature liquids shall be determined by the following formula:

$$\text{Degree of filling} = 95\,\frac{d_r}{d_f}$$

in which d_f and d_r are the densities of the liquid at the mean temperature of the liquid during filling and the maximum mean bulk temperature during carriage respectively.

4.2.1.9.6 Portable tanks shall not be offered for carriage:

(a) With a degree of filling, for liquids having a viscosity less than 2 680 mm²/s at 20 °C or maximum temperature of the substance during carriage in the case of the heated substance, of more than 20 % but less than 80 % unless the shells of portable tanks are divided, by partitions or surge plates, into sections of not more than 7 500 litres capacity;

(b) With residue of substances previously carried adhering to the outside of the shell or service equipment;

(c) When leaking or damaged to such an extent that the integrity of the portable tank or its lifting or securing arrangements may be affected; and

(d) Unless the service equipment has been examined and found to be in good working order.

4.2.1.9.7 Forklift pockets of portable tanks shall be closed off when the tank is filled. This provision does not apply to portable tanks which according to 6.7.2.17.4 need not be provided with a means of closing off the forklift pockets.

4.2.1.10 ***Additional provisions applicable to the carriage of Class 3 substances in portable tanks***

4.2.1.10.1 All portable tanks intended for the carriage of flammable liquids shall be closed and be fitted with relief devices in accordance with 6.7.2.8 to 6.7.2.15.

4.2.1.11 ***Additional provisions applicable to the carriage of Classes 4.1, 4.2 or 4.3 substances (other than Class 4.1 self-reactive substances) in portable tanks***

(Reserved)

NOTE: *For Class 4.1 self-reactive substances, see 4.2.1.13.1.*

4.2.1.12 ***Additional provisions applicable to the carriage of Class 5.1 substances in portable tanks***

(Reserved)

4.2.1.13 ***Additional provisions applicable to the carriage of Class 5.2 substances and Class 4.1 self-reactive substances in portable tanks***

4.2.1.13.1 Each substance shall have been tested and a report submitted to the competent authority of the country of origin for approval. Notification thereof shall be sent to the competent authority of the country of destination. The notification shall contain relevant transport information and the report with test results. The tests undertaken shall include those necessary:

(a) To prove the compatibility of all materials normally in contact with the substance during carriage;

(b) To provide data for the design of the pressure and emergency relief devices taking into account the design characteristics of the portable tank.

Any additional provision necessary for safe carriage of the substance shall be clearly described in the report.

4.2.1.13.2 The following provisions apply to portable tanks intended for the carriage of Type F organic peroxides or Type F self-reactive substances with a Self-Accelerating Decomposition Temperature (SADT) of 55 °C or more. In case of conflict these provisions prevail over those specified in Section 6.7.2. Emergencies to be taken into account are self-accelerating decomposition of the substance and fire-engulfment as described in 4.2.1.13.8.

4.2.1.13.3 The additional provisions for carriage of organic peroxides or self-reactive substances with a SADT less than 55 °C in portable tanks shall be specified by the competent authority of the country of origin. Notification thereof shall be sent to the competent authority of the country of destination.

4.2.1.13.4 The portable tank shall be designed for a test pressure of at least 0.4 MPa (4 bar).

4.2.1.13.5 Portable tanks shall be fitted with temperature sensing devices.

4.2.1.13.6 Portable tanks shall be fitted with pressure-relief devices and emergency-relief devices. Vacuum-relief devices may also be used. Pressure-relief devices shall operate at pressures determined according to both the properties of the substance and the construction characteristics of the portable tank. Fusible elements are not allowed in the shell.

4.2.1.13.7 The pressure-relief devices shall consist of spring-loaded valves fitted to prevent significant build-up within the portable tank of the decomposition products and vapours released at a temperature of 50 °C. The capacity and start-to-discharge pressure of the relief valves shall be based on the results of the tests specified in 4.2.1.13.1. The start-to-discharge pressure shall, however, in no case be such that liquid would escape from the valve(s) if the portable tank were overturned.

4.2.1.13.8 The emergency-relief devices may be of the spring-loaded or frangible types, or a combination of the two, designed to vent all the decomposition products and vapours evolved during a period of not less than one hour of complete fire-engulfment as calculated by the following formula:

$$q = 70961 \times F \times A^{0.82}$$

where:

q = heat absorption [W]

A = wetted area [m²]

F = insulation factor
= 1 for non-insulated shells, or

$$F = \frac{U\,(923 - T)}{47032} \text{ for insulated shells}$$

where:

K = heat conductivity of insulation layer [W. m^{-1}. K^{-1}]

L = thickness of insulation layer [m]

U = K/L = heat transfer coefficient of the insulation [W. m^{-2}. K^{-1}]

T = temperature of the substance at relieving conditions [K]

The start-to-discharge pressure of the emergency-relief device(s) shall be higher than that specified in 4.2.1.13.7 and based on the results of the tests referred to in 4.2.1.13.1. The emergency-relief devices shall be dimensioned in such a way that the maximum pressure in the portable tank never exceeds the test pressure of the tank.

NOTE: *An example of a method to determine the size of emergency-relief devices is given in Appendix 5 of the "Manual of Tests and Criteria".*

4.2.1.13.9 For insulated portable tanks the capacity and setting of emergency-relief device(s) shall be determined assuming a loss of insulation from 1 % of the surface area.

4.2.1.13.10 Vacuum-relief devices and spring-loaded valves shall be provided with flame arresters. Due attention shall be paid to the reduction of the relief capacity caused by the flame arrester.

4.2.1.13.11 Service equipment such as valves and external piping shall be so arranged that no substance remains in them after filling the portable tank.

4.2.1.13.12 Portable tanks may be either insulated or protected by a sun-shield. If the SADT of the substance in the portable tank is 55 °C or less, or the portable tank is constructed of aluminium, the portable tank shall be completely insulated. The outer surface shall be finished in white or bright metal.

4.2.1.13.13 The degree of filling shall not exceed 90 % at 15 °C.

4.2.1.13.14 The mark as required in 6.7.2.20.2 shall include the UN number and the technical name with the approved concentration of the substance concerned.

4.2.1.13.15 Organic peroxides and self-reactive substances specifically listed in portable tank instruction T23 in 4.2.5.2.6 may be carried in portable tanks.

4.2.1.14 ***Additional provisions applicable to the carriage of Class 6.1 substances in portable tanks***

(Reserved)

4.2.1.15 ***Additional provisions applicable to the carriage of Class 6.2 substances in portable tanks***

(Reserved)

4.2.1.16 ***Additional provisions applicable to the carriage of Class 7 substances in portable tanks***

4.2.1.16.1 Portable tanks used for the carriage of radioactive material shall not be used for the carriage of other goods.

4.2.1.16.2 The degree of filling for portable tanks shall not exceed 90 % or, alternatively, any other value approved by the competent authority.

4.2.1.17 ***Additional provisions applicable to the carriage of Class 8 substances in portable tanks***

4.2.1.17.1 Pressure-relief devices of portable tanks used for the carriage of Class 8 substances shall be inspected at intervals not exceeding one year.

4.2.1.18 ***Additional provisions applicable to the carriage of Class 9 substances in portable tanks***

(Reserved)

4.2.1.19 ***Additional provisions applicable to the carriage of solid substances carried above their melting point***

4.2.1.19.1 Solid substances carried or offered for carriage above their melting point which are not assigned a portable tank instruction in column (10) of the Table A of Chapter 3.2 or when the assigned portable tank instruction does not apply to carriage at temperatures above their melting point may be carried in portable tanks provided that the solid substances are classified in Classes 4.1, 4.2, 4.3, 5.1, 6.1, 8 or 9 and have no subsidiary hazard other than that of Class 6.1 or Class 8 and are in packing group II or III.

4.2.1.19.2 Unless otherwise indicated in the Table A of Chapter 3.2, portable tanks used for the carriage of these solid substances above their melting point shall conform to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II. A portable tank which affords an equivalent or greater level of safety may be selected according to 4.2.5.2.5. The maximum degree of filling (in %) shall be determined according to 4.2.1.9.5 (TP3).

4.2.2 General provisions for the use of portable tanks for the carriage of non-refrigerated liquefied gases and chemicals under pressure

4.2.2.1 This section provides general provisions applicable to the use of portable tanks for the carriage of non-refrigerated liquefied gases and chemicals under pressure.

4.2.2.2 Portable tanks shall conform to the design, construction, inspection and testing requirements detailed in 6.7.3. Non-refrigerated liquefied gases and chemicals under pressure shall be carried in portable tanks conforming to portable tank instruction T50 as described in 4.2.5.2.6 and any portable tank special provisions assigned to specific non-refrigerated liquefied gases in Column (11) of Table A of Chapter 3.2 and described in 4.2.5.3.

4.2.2.3 During carriage, portable tanks shall be adequately protected against damage to the shell and service equipment resulting from lateral and longitudinal impact and overturning. If the shell and service equipment are so constructed as to withstand impact or overturning it need not be protected in this way. Examples of such protection are given in 6.7.3.13.5.

4.2.2.4 Certain non-refrigerated liquefied gases are chemically unstable. They are accepted for carriage only when the necessary steps have been taken to prevent their dangerous decomposition, transformation or polymerization during carriage. To this end, care shall in particular be taken to ensure that portable tanks do not contain any non-refrigerated liquefied gases liable to promote these reactions.

4.2.2.5 Unless the name of the gas(es) being carried appears on the metal plate described in 6.7.3.16.2, a copy of the certificate specified in 6.7.3.14.1 shall be made available upon a competent authority request and readily provided by the consignor, consignee or agent, as appropriate.

4.2.2.6 Empty portable tanks not cleaned and not gas-free shall comply with the same provisions as portable tanks filled with the previous non-refrigerated liquefied gas.

4.2.2.7 ***Filling***

4.2.2.7.1 Prior to filling the portable tank shall be inspected to ensure that it is authorized for the non-refrigerated liquefied gas or the propellant of the chemical under pressure to be carried and that the portable tank is not loaded with non-refrigerated liquefied gases, or with chemicals under pressure which in contact with the materials of the shell, gaskets, service equipment and any protective linings, are likely to react dangerously with them to form dangerous products or appreciably weaken these materials. During filling, the temperature of the non-refrigerated liquefied gas or propellant of chemicals under pressure shall fall within the limits of the design temperature range.

4.2.2.7.2 The maximum mass of non-refrigerated liquefied gas per litre of shell capacity (kg/l) shall not exceed the density of the non-refrigerated liquefied gas at 50 °C multiplied by 0.95. Furthermore, the shell shall not be liquid-full at 60 °C.

4.2.2.7.3 Portable tanks shall not be filled above their maximum permissible gross mass and the maximum permissible load mass specified for each gas to be carried.

4.2.2.8 Portable tanks shall not be offered for carriage:

(a) In an ullage condition liable to produce an unacceptable hydraulic force due to surge within the shell;

(b) When leaking;

(c) When damaged to such an extent that the integrity of the tank or its lifting or securing arrangements may be affected; and

(d) Unless the service equipment has been examined and found to be in good working order.

4.2.2.9 Forklift pockets of portable tanks shall be closed off when the tank is filled. This provision does not apply to portable tanks which according to 6.7.3.13.4 need not be provided with a means of closing off the forklift pockets.

4.2.3 General provisions for the use of portable tanks for the carriage of refrigerated liquefied gases

4.2.3.1 This section provides general provisions applicable to the use of portable tanks for the carriage of refrigerated liquefied gases.

4.2.3.2 Portable tanks shall conform to the design, construction, inspection and testing requirements detailed in 6.7.4. Refrigerated liquefied gases shall be carried in portable tanks conforming to portable tank instruction T75 as described in 4.2.5.2.6 and the portable tank special provisions assigned to each substance in Column (11) of Table A of Chapter 3.2 and described in 4.2.5.3.

4.2.3.3 During carriage, portable tanks shall be adequately protected against damage to the shell and service equipment resulting from lateral and longitudinal impact and overturning. If the shell and service equipment are so constructed as to withstand impact or overturning it need not be protected in this way. Examples of such protection are provided in 6.7.4.12.5.

4.2.3.4 Unless the name of the gas(es) being carried appears on the metal plate described in 6.7.4.15.2, a copy of the certificate specified in 6.7.4.13.1 shall be made available upon a competent authority request and readily provided by the consignor, consignee or agent, as appropriate.

4.2.3.5 Empty portable tanks not cleaned and not gas-free shall comply with the same provisions as portable tanks filled with the previous substance.

4.2.3.6 *Filling*

4.2.3.6.1 Prior to filling the portable tank shall be inspected to ensure that it is authorized for the refrigerated liquefied gas to be carried and that the portable tank is not loaded with refrigerated liquefied gases which in contact with the materials of the shell, gaskets, service equipment and any protective linings, are likely to react dangerously with them to form dangerous products or appreciably weaken these materials. During filling, the temperature of the refrigerated liquefied gas shall be within the limits of the design temperature range.

4.2.3.6.2 In estimating the initial degree of filling the necessary holding time for the intended journey including any delays which might be encountered shall be taken into consideration. The initial degree of filling of the shell, except as provided for in 4.2.3.6.3 and 4.2.3.6.4, shall be such that if the contents, except helium, were to be raised to a temperature at which the vapour pressure is equal to the maximum allowable working pressure (MAWP) the volume occupied by liquid would not exceed 98 %.

4.2.3.6.3 Shells intended for the carriage of helium can be filled up to but not above the inlet of the pressure-relief device.

4.2.3.6.4 A higher initial degree of filling may be allowed, subject to approval by the competent authority, when the intended duration of carriage is considerably shorter than the holding time.

4.2.3.7 ***Actual holding time***

4.2.3.7.1 The actual holding time shall be calculated for each journey in accordance with a procedure recognized by the competent authority, on the basis of the following:

(a) The reference holding time for the refrigerated liquefied gas to be carried (see 6.7.4.2.8.1) (as indicated on the plate referred to in 6.7.4.15.1);

(b) The actual filling density;

(c) The actual filling pressure;

(d) The lowest set pressure of the pressure limiting device(s).

4.2.3.7.2 The actual holding time shall be marked either on the portable tank itself or on a metal plate firmly secured to the portable tank, in accordance with 6.7.4.15.2.

4.2.3.7.3 The date at which the actual holding time ends shall be entered in the transport document (see 5.4.1.2.2 (d)).

4.2.3.8 Portable tanks shall not be offered for carriage:

(a) In an ullage condition liable to produce an unacceptable hydraulic force due to surge within the shell;

(b) When leaking;

(c) When damaged to such an extent that the integrity of the portable tank or its lifting or securing arrangements may be affected;

(d) Unless the service equipment has been examined and found to be in good working order;

(e) Unless the actual holding time for the refrigerated liquefied gas being carried has been determined in accordance with 4.2.3.7 and the portable tank is marked in accordance with 6.7.4.15.2; and

(f) Unless the duration of carriage, after taking into consideration any delays which might be encountered, does not exceed the actual holding time.

4.2.3.9 Forklift pockets of portable tanks shall be closed off when the tank is filled. This provision does not apply to portable tanks which according to 6.7.4.12.4, need not be provided with a means of closing off the forklift pockets.

4.2.4 General provisions for the use of UN multiple-element gas containers (MEGCs)

4.2.4.1 This section provides general requirements applicable to the use of multiple-element gas containers (MEGCs) for the carriage of non-refrigerated gases referred to in 6.7.5.

4.2.4.2 MEGCs shall conform to the design, construction, inspection and testing requirements detailed in 6.7.5. The elements of MEGCs shall be periodically inspected according to the provisions set out in packing instruction P200 of 4.1.4.1 and in 6.2.1.6.

4.2.4.3 During carriage, MEGCs shall be protected against damage to the elements and service equipment resulting from lateral and longitudinal impact and overturning. If the elements and service equipment are so constructed as to withstand impact or overturning, they need not be protected in this way. Examples of such protection are given in 6.7.5.10.4.

4.2.4.4 The periodic testing and inspection requirements for MEGCs are specified in 6.7.5.12. MEGCs or their elements shall not be charged or filled after they become due for periodic inspection but may be carried after the expiry of the time limit.

4.2.4.5 ***Filling***

4.2.4.5.1 Prior to filling, the MEGC shall be inspected to ensure that it is authorized for the gas to be carried and that the applicable provisions of this Code have been met.

4.2.4.5.2 Elements of MEGCs shall be filled according to the working pressures, filling ratios and filling provisions specified in packing instruction P200 of 4.1.4.1 for the specific gas being filled into each element. In no case shall an MEGC or group of elements be filled as a unit in excess of the lowest working pressure of any given element.

4.2.4.5.3 MEGCs shall not be filled above their maximum permissible gross mass.

4.2.4.5.4 Isolation valves shall be closed after filling and remain closed during carriage. Toxic gases (gases of groups T, TF, TC, TO, TFC and TOC) shall only be carried in MEGCs where each element is equipped with an isolation valve.

4.2.4.5.5 The opening(s) for filling shall be closed by caps or plugs. The leakproofness of the closures and equipment shall be verified by the filler after filling.

4.2.4.5.6 MEGCs shall not be offered for filling:

(a) when damaged to such an extent that the integrity of the pressure receptacles or its structural or service equipment may be affected;

(b) unless the pressure receptacles and its structural and service equipment has been examined and found to be in good working order; and

(c) unless the required certification, retest, and filling marks are legible.

4.2.4.6 Charged MEGCs shall not be offered for carriage;

(a) when leaking;

(b) when damaged to such an extent that the integrity of the pressure receptacles or its structural or service equipment may be affected;

(c) unless the pressure receptacles and its structural and service equipment have been examined and found to be in good working order; and

(d) unless the required certification, retest, and filling marks are legible.

4.2.4.7 Empty MEGCs that have not been cleaned and purged shall comply with the same requirements as MEGCs filled with the previous substance.

4.2.5 Portable tank instructions and special provisions

4.2.5.1 ***General***

4.2.5.1.1 This section includes the portable tank instructions and special provisions applicable to dangerous goods authorized to be carried in portable tanks. Each portable tank instruction is identified by an alpha-numeric code (e.g. T1). Column (10) of Table A of Chapter 3.2 indicates the portable tank instruction that shall be used for each substance permitted for carriage in a portable tank. When no portable tank instruction appears in Column (10) for a specific dangerous goods entry then carriage of the substance in portable tanks is not permitted unless a competent authority approval is granted as detailed in 6.7.1.3. Portable tank special provisions are assigned to specific dangerous goods in Column (11) of Table A of Chapter 3.2. Each portable tank special provision is identified by an alpha-numeric code (e.g. TP1). A listing of the portable tank special provisions is provided in 4.2.5.3.

NOTE: *The gases authorized for carriage in MEGCs are indicated with the letter "(M)" in Column (10) of Table A of Chapter 3.2.*

4.2.5.2 ***Portable tank instructions***

4.2.5.2.1 Portable tank instructions apply to dangerous goods of Classes 1 to 9. Portable tank instructions provide specific information relevant to portable tanks provisions applicable to specific substances. These provisions shall be met in addition to the general provisions in this Chapter and the general requirements in Chapter 6.7 or Chapter 6.9.

4.2.5.2.2 For substances of Class 1 and Classes 3 to 9, the portable tank instructions indicate the applicable minimum test pressure, the minimum shell thickness, bottom opening requirements and pressure relief requirements. In portable tank instruction T23, self-reactive substances of Class 4.1 and Class 5.2 organic peroxides permitted to be carried in portable tanks are listed along with the applicable control and emergency temperatures.

4.2.5.2.3 Non-refrigerated liquefied gases are assigned to portable tank instruction T50. T50 provides the maximum allowable working pressures, the requirements for the openings below liquid level, pressure-relief requirements and maximum filling density requirements for non-refrigerated liquefied gases permitted for carriage in portable tanks.

4.2.5.2.4 Refrigerated liquefied gases are assigned to portable tank instruction T75.

4.2.5.2.5 *Determination of the appropriate portable tank instructions*

When a specific portable tank instruction is specified in Column (10) of Table A of Chapter 3.2 for a specific dangerous goods entry additional portable tanks which possess higher minimum test pressures, greater shell thicknesses, more stringent bottom opening and pressure-relief device arrangements may be used. The following guidelines apply to determining the appropriate portable tanks which may be used for carriage of particular substances:

Portable tank instruction specified	Portable tank instructions also permitted
T1	T2, T3, T4, T5, T6, T7, T8, T9, T10, T11, T12, T13, T14, T15, T16, T17, T18, T19, T20, T21, T22
T2	T4, T5, T7, T8, T9, T10, T11, T12, T13, T14, T15, T16, T17, T18, T19, T20, T21, T22
T3	T4, T5, T6, T7, T8, T9, T10, T11, T12, T13, T14, T15, T16, T17, T18, T19, T20, T21, T22
T4	T5, T7, T8, T9, T10, T11, T12, T13, T14, T15, T16, T17, T18, T19, T20, T21, T22
T5	T10, T14, T19, T20, T22
T6	T7, T8, T9, T10, T11, T12, T13, T14, T15, T16, T17, T18, T19, T20, T21, T22
T7	T8, T9, T10, T11, T12, T13, T14, T15, T16, T17, T18, T19, T20, T21, T22
T8	T9, T10, T13, T14, T19, T20, T21, T22
T9	T10, T13, T14, T19, T20, T21, T22
T10	T14, T19, T20, T22
T11	T12, T13, T14, T15, T16, T17, T18, T19, T20, T21, T22
T12	T14, T16, T18, T19, T20, T22
T13	T14, T19, T20, T21, T22
T14	T19, T20, T22
T15	T16, T17, T18, T19, T20, T21, T22
T16	T18, T19, T20, T22
T17	T18, T19, T20, T21, T22
T18	T19, T20, T22
T19	T20, T22
T20	T22
T21	T22
T22	None
T23	None

4.2.5.2.6 *Portable tank instructions*

Portable tank instructions specify the requirements applicable to a portable tank when used for the carriage of specific substances. Portable tank instructions T1 to T22 specify the applicable minimum test pressure, the minimum shell thickness in mm reference steel for shells made of metallic materials or the minimum FRP shell thickness, and the pressure-relief and bottom-opening requirements.

T1 - T22	**PORTABLE TANK INSTRUCTIONS**			**T1 - T22**
These portable tank instructions apply to liquid and solid substances of Class 1 and Classes 3 to 9. The general provisions of Section 4.2.1 and the requirements of Section 6.7.2 shall be met. The instructions for portable tanks with FRP shells apply to substances of classes 1, 3, 5.1, 6.1, 6.2, 8 and 9. Additionally, the requirements of Chapter 6.9 apply.				
Portable tank instruction	**Minimum test pressure (bar)**	**Minimum shell thickness (in mm-reference steel for shells made of metallic materials) (see 6.7.2.4)**	**Pressure-relief requirements[a] (see 6.7.2.8)**	**Bottom opening requirements[b] (see 6.7.2.6)**
T1	1.5	See 6.7.2.4.2	Normal	See 6.7.2.6.2
T2	1.5	See 6.7.2.4.2	Normal	See 6.7.2.6.3
T3	2.65	See 6.7.2.4.2	Normal	See 6.7.2.6.2
T4	2.65	See 6.7.2.4.2	Normal	See 6.7.2.6.3
T5	2.65	See 6.7.2.4.2	See 6.7.2.8.3	Not allowed
T6	4	See 6.7.2.4.2	Normal	See 6.7.2.6.2
T7	4	See 6.7.2.4.2	Normal	See 6.7.2.6.3
T8	4	See 6.7.2.4.2	Normal	Not allowed
T9	4	6 mm	Normal	Not allowed
T10	4	6 mm	See 6.7.2.8.3	Not allowed
T11	6	See 6.7.2.4.2	Normal	See 6.7.2.6.3
T12	6	See 6.7.2.4.2	See 6.7.2.8.3	See 6.7.2.6.3
T13	6	6 mm	Normal	Not allowed
T14	6	6 mm	See 6.7.2.8.3	Not allowed
T15	10	See 6.7.2.4.2	Normal	See 6.7.2.6.3
T16	10	See 6.7.2.4.2	See 6.7.2.8.3	See 6.7.2.6.3
T17	10	6 mm	Normal	See 6.7.2.6.3
T18	10	6 mm	See 6.7.2.8.3	See 6.7.2.6.3
T19	10	6 mm	See 6.7.2.8.3	Not allowed
T20	10	8 mm	See 6.7.2.8.3	Not allowed
T21	10	10 mm	Normal	Not allowed
T22	10	10 mm	See 6.7.2.8.3	Not allowed

[a] *When the word "Normal" is indicated, all the requirements of 6.7.2.8 apply except for 6.7.2.8.3.*

[b] *When this column indicates "Not allowed", bottom openings are not permitted when the substance to be carried is a liquid (see 6.7.2.6.1). When the substance to be carried is a solid at all temperatures encountered under normal conditions of carriage, bottom openings conforming to the requirements of 6.7.2.6.2 are authorized.*

T23	PORTABLE TANK INSTRUCTION							T23
This portable tank instruction applies to self-reactive substances of Class 4.1 and organic peroxides of Class 5.2. The general provisions of Section 4.2.1 and the requirements of Section 6.7.2 shall be met. The additional provisions specific to self-reactive substances of Class 4.1 and organic peroxides of Class 5.2 in 4.2.1.13 shall also be met. The formulations not listed in 2.2.41.4 or in 2.2.52.4 but listed below 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.								
UN No.	**Substance**	**Minimum test pressure (bar)**	**Minimum shell thickness (mm-reference steel)**	**Bottom opening requi-rements**	**Pressure-relief requi-rements**	**Degree of filling**	**Control tempe-rature**	**Emergency temperature**
3109	ORGANIC PEROXIDE, TYPE F, LIQUID	4	See 6.7.2.4.2	See 6.7.2.6.3	See 6.7.2.8.2 4.2.1.13.6 4.2.1.13.7 4.2.1.13.8	See 4.2.1.13.13		
	tert-Butyl hydro-peroxide[a], not more than 72 % with water							
	tert-Butyl hydro-peroxide, not more than 56 % in diluent type B[b]							
	Cumyl hydroperoxide, not more than 90 % in diluent type A							
	Di-tert-butyl peroxide, not more than 32 % in diluent type A							
	Isopropyl cumyl hydro-peroxide, not more than 72 % in diluent type A							
	p-Menthyl hydro-peroxide, not more than 72 % in diluent type A							
	Pinanyl hydro-peroxide, not more than 56 % in diluent type A							
3110	ORGANIC PEROXIDE TYPE F, SOLID	4	See 6.7.2.4.2	See 6.7.2.6.3	See 6.7.2.8.2 4.2.1.13.6 4.2.1.13.7 4.2.1.13.8	See 4.2.1.13.13		
	Dicumyl peroxide[c]							
3119	ORGANIC PEROXIDE, TYPE F, LIQUID, TEMPERATURE CONTROLLED	4	See 6.7.2.4.2	See 6.7.2.6.3	See 6.7.2.8.2 4.2.1.13.6 4.2.1.13.7 4.2.1.13.8	See 4.2.1.13.13	[d]	[d]
	tert-Amyl peroxyneodecanoate, not more than 47 % in diluent type A						-10 °C	-5 °C
	tert-Butyl peroxyacetate, not more than 32 % in diluent type B						+30 °C	+35 °C

(Cont'd on next page)

[a] *Provided that steps have been taken to achieve the safety equivalence of 65% tert-Butyl hydroperoxide and 35% water.*

[b] *Diluent type B is tert-Butyl alcohol.*

[c] *Maximum quantity per portable tank: 2000 kg.*

[d] *As approved by the competent authority.*

T23	PORTABLE TANK INSTRUCTION *(cont'd)*							T23
This portable tank instruction applies to self-reactive substances of Class 4.1 and organic peroxides of Class 5.2. The general provisions of Section 4.2.1 and the requirements of Section 6.7.2 shall be met. The additional provisions specific to self-reactive substances of Class 4.1 and organic peroxides of Class 5.2 in 4.2.1.13 shall also be met. The formulations listed below 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.								
UN No.	**Substance**	**Minimum test pressure (bar)**	**Minimum shell thickness (mm-reference steel)**	**Bottom opening requi-rements**	**Pressure-relief requi-rements**	**Degree of filling**	**Control tempe-rature**	**Emergency temperature**
3119 *(Cont'd)*	tert-Butyl peroxy-2-ethylhexanoate, not more than 32 % in diluent type B						+15 °C	+20 °C
	tert-Butyl peroxypivalate, not more than 27 % in diluent type B						+5 °C	+10 °C
	tert-Butyl peroxy-3,5,5-trimethyl-hexanoate, not more than 32 % in diluent type B						+35 °C	+40 °C
	Di-(3,5,5-trimethyl-hexanoyl) peroxide, not more than 38 % in diluent type A or type B						0 °C	+5 °C
	Peroxyacetic acid, distilled, type F, stabilized[e]						+30 °C	+35 °C
3120	ORGANIC PEROXIDE, TYPE F, SOLID, TEMPERATURE CONTROLLED	4	See 6.7.2.4.2	See 6.7.2.6.3	See 6.7.2.8.2 4.2.1.13.6 4.2.1.13.7 4.2.1.13.8	See 4.2.1.13.13	[d]	[d]
3229	SELF-REACTIVE LIQUID TYPE F	4	See 6.7.2.4.2	See 6.7.2.6.3	See 6.7.2.8.2 4.2.1.13.6 4.2.1.13.7 4.2.1.13.8	See 4.2.1.13.13		
3230	SELF-REACTIVE SOLID TYPE F	4	See 6.7.2.4.2	See 6.7.2.6.3	See 6.7.2.8.2 4.2.1.13.6 4.2.1.13.7 4.2.1.13.8	See 4.2.1.13.13		
3239	SELF-REACTIVE LIQUID TYPE F, TEMPERATURE CONTROLLED	4	See 6.7.2.4.2	See 6.7.2.6.3	See 6.7.2.8.2 4.2.1.13.6 4.2.1.13.7 4.2.1.13.8	See 4.2.1.13.13	[d]	[d]
3240	SELF-REACTIVE SOLID TYPE F, TEMPERATURE CONTROLLED	4	See 6.7.2.4.2	See 6.7.2.6.3	See 6.7.2.8.2 4.2.1.13.6 4.2.1.13.7 4.2.1.13.8	See 4.2.1.13.13	[d]	[d]

[d] *As approved by the competent authority.*

[e] *Formulation derived from distillation of peroxyacetic acid originating from peroxyacetic acid in concentration of not more than 41% with water, total active oxygen (Peroxyacetic acid+H_2O_2) ≤9.5%, which fulfils the criteria of the Manual of Tests and Criteria, paragraph 20.4.3 (f). "CORROSIVE" subsidiary hazard placard required (Model No 8, see 5.2.2.2.2).*

T50	PORTABLE TANK INSTRUCTION				T50
This portable tank instruction applies to non-refrigerated liquefied gases and chemicals under pressure (UN Nos. 3500, 3501, 3502, 3503, 3504 and 3505). The general provisions of Section 4.2.2 and the requirements of Section 6.7.3 shall be met.					
UN No.	**Non-refrigerated liquefied gases**	**Max. allowable working pressure (bar): Small; Bare; Sunshield; Insulated; respectively[a]**	**Openings below liquid level**	**Pressure- relief requirements[b] (see 6.7.3.7)**	**Maximum filling ratio**
1005	Ammonia, anhydrous	29.0 25.7 22.0 19.7	Allowed	See 6.7.3.7.3	0.53
1009	Bromotrifluoromethane (Refrigerant gas R 13B1)	38.0 34.0 30.0 27.5	Allowed	Normal	1.13
1010	Butadienes, stabilized	7.5 7.0 7.0 7.0	Allowed	Normal	0.55
1010	Butadienes and hydrocarbon mixture, stabilized	See MAWP definition in 6.7.3.1	Allowed	Normal	See 4.2.2.7
1011	Butane	7.0 7.0 7.0 7.0	Allowed	Normal	0.51
1012	Butylene	8.0 7.0 7.0 7.0	Allowed	Normal	0.53
1017	Chlorine	19.0 17.0 15.0 13.5	Not Allowed	See 6.7.3.7.3	1.25
1018	Chlorodifluoromethane (Refrigerant gas R 22)	26.0 24.0 21.0 19.0	Allowed	Normal	1.03
1020	Chloropentafluoroethane (Refrigerant gas R 115)	23.0 20.0 18.0 16.0	Allowed	Normal	1.06
1021	1-Chloro-1,2,2,2-tetrafluoroethane (Refrigerant gas R 124)	10.3 9.8 7.9 7.0	Allowed	Normal	1.20
1027	Cyclopropane	18.0 16.0 14.5 13.0	Allowed	Normal	0.53

[a] *"Small" means tanks having a shell with a diameter of 1.5 m or less; "Bare" means tanks having a shell with a diameter of more than 1.5 m without insulation or sun shield (see 6.7.3.2.12); "Sunshield" means tanks having a shell with a diameter of more than 1.5 m with sun shield (see 6.7.3.2.12); "Insulated" means tanks having a shell with a diameter of more than 1.5 m with insulation (see 6.7.3.2.12); (See definition of "Design reference temperature" in 6.7.3.1).*

[b] *The word "Normal" in the pressure relief requirements column indicates that a frangible disc as specified in 6.7.3.7.3 is not required.*

T50	PORTABLE TANK INSTRUCTION *(cont'd)*				T50
This portable tank instruction applies to non-refrigerated liquefied gases and chemicals under pressure (UN Nos. 3500, 3501, 3502, 3503, 3504 and 3505). The general provisions of Section 4.2.2 and the requirements of Section 6.7.3 shall be met.					
UN No.	**Non-refrigerated liquefied gases**	**Max. allowable working pressure (bar): Small; Bare; Sunshield; Insulated; respectively[a]**	**Openings below liquid level**	**Pressure- relief requirements[b] (see 6.7.3.7)**	**Maximum filling ratio**
1028	Dichlorodifluoromethane (Refrigerant gas R 12)	16.0 15.0 13.0 11.5	Allowed	Normal	1.15
1029	Dichlorofluoromethane (Refrigerant gas R 21)	7.0 7.0 7.0 7.0	Allowed	Normal	1.23
1030	1,1-Difluoroethane (Refrigerant gas R 152a)	16.0 14.0 12.4 11.0	Allowed	Normal	0.79
1032	Dimethylamine, anhydrous	7.0 7.0 7.0 7.0	Allowed	Normal	0.59
1033	Dimethyl ether	15.5 13.8 12.0 10.6	Allowed	Normal	0.58
1036	Ethylamine	7.0 7.0 7.0 7.0	Allowed	Normal	0.61
1037	Ethyl chloride	7.0 7.0 7.0 7.0	Allowed	Normal	0.80
1040	Ethylene oxide with nitrogen up to a total pressure of 1MPa (10 bar) at 50 °C	- - - 10.0	Not Allowed	See 6.7.3.7.3	0.78
1041	Ethylene oxide and carbon dioxide mixture with more than 9 % but not more than 87 % ethylene oxide	See MAWP definition in 6.7.3.1	Allowed	Normal	See 4.2.2.7
1055	Isobutylene	8.1 7.0 7.0 7.0	Allowed	Normal	0.52

[a] *"Small" means tanks having a shell with a diameter of 1.5 m or less; "Bare" means tanks having a shell with a diameter of more than 1.5 m without insulation or sun shield (see 6.7.3.2.12); "Sunshield" means tanks having a shell with a diameter of more than 1.5 m with sun shield (see 6.7.3.2.12); "Insulated" means tanks having a shell with a diameter of more than 1.5 m with insulation (see 6.7.3.2.12); (See definition of "Design reference temperature" in 6.7.3.1).*

[b] *The word "Normal" in the pressure relief requirements column indicates that a frangible disc as specified in 6.7.3.7.3 is not required.*

T50	PORTABLE TANK INSTRUCTION *(cont'd)*				T50
This portable tank instruction applies to non-refrigerated liquefied gases and chemicals under pressure (UN Nos. 3500, 3501, 3502, 3503, 3504 and 3505). The general provisions of Section 4.2.2 and the requirements of Section 6.7.3 shall be met.					
UN No.	**Non-refrigerated liquefied gases**	**Max. allowable working pressure (bar): Small; Bare; Sunshield; Insulated; respectively[a]**	**Openings below liquid level**	**Pressure- relief requirements[b] (see 6.7.3.7)**	**Maximum filling ratio**
1060	Methylacetylene and propadiene mixture, stabilized	28.0 24.5 22.0 20.0	Allowed	Normal	0.43
1061	Methylamine, anhydrous	10.8 9.6 7.8 7.0	Allowed	Normal	0.58
1062	Methyl bromide with not more than 2 % chloropicrin	7.0 7.0 7.0 7.0	Not Allowed	See 6.7.3.7.3	1.51
1063	Methyl chloride (Refrigerant gas R 40)	14.5 12.7 11.3 10.0	Allowed	Normal	0.81
1064	Methyl mercaptan	7.0 7.0 7.0 7.0	Not Allowed	See 6.7.3.7.3	0.78
1067	Dinitrogen tetroxide	7.0 7.0 7.0 7.0	Not Allowed	See 6.7.3.7.3	1.30
1075	Petroleum gases, liquefied	See MAWP definition in 6.7.3.1	Allowed	Normal	See 4.2.2.7
1077	Propylene	28.0 24.5 22.0 20.0	Allowed	Normal	0.43
1078	Refrigerant gas, n.o.s.	See MAWP definition in 6.7.3.1	Allowed	Normal	See 4.2.2.7
1079	Sulphur dioxide	11.6 10.3 8.5 7.6	Not Allowed	See 6.7.3.7.3	1.23
1082	Trifluorochloroethylene, stabilized (Refrigerant gas R 1113)	17.0 15.0 13.1 11.6	Not Allowed	See 6.7.3.7.3	1.13

[a] *"Small" means tanks having a shell with a diameter of 1.5 m or less; "Bare" means tanks having a shell with a diameter of more than 1.5 m without insulation or sun shield (see 6.7.3.2.12); "Sunshield" means tanks having a shell with a diameter of more than 1.5 m with sun shield (see 6.7.3.2.12); "Insulated" means tanks having a shell with a diameter of more than 1.5 m with insulation (see 6.7.3.2.12); (See definition of "Design reference temperature" in 6.7.3.1).*

[b] *The word "Normal" in the pressure relief requirements column indicates that a frangible disc as specified in 6.7.3.7.3 is not required.*

T50	PORTABLE TANK INSTRUCTION *(cont'd)*				T50
This portable tank instruction applies to non-refrigerated liquefied gases and chemicals under pressure (UN Nos. 3500, 3501, 3502, 3503, 3504 and 3505). The general provisions of Section 4.2.2 and the requirements of Section 6.7.3 shall be met.					
UN No.	**Non-refrigerated liquefied gases**	**Max. allowable working pressure (bar): Small; Bare; Sunshield; Insulated; respectively[a]**	**Openings below liquid level**	**Pressure- relief requirements[b] (see 6.7.3.7)**	**Maximum filling ratio**
1083	Trimethylamine, anhydrous	7.0 7.0 7.0 7.0	Allowed	Normal	0.56
1085	Vinyl bromide, stabilized	7.0 7.0 7.0 7.0	Allowed	Normal	1.37
1086	Vinyl chloride, stabilized	10.6 9.3 8.0 7.0	Allowed	Normal	0.81
1087	Vinyl methyl ether, stabilized	7.0 7.0 7.0 7.0	Allowed	Normal	0.67
1581	Chloropicrin and methyl bromide mixture with more than 2 % chloropicrin	7.0 7.0 7.0 7.0	Not Allowed	See 6.7.3.7.3	1.51
1582	Chloropicrin and methyl chloride mixture	19.2 16.9 15.1 13.1	Not Allowed	See 6.7.3.7.3	0.81
1858	Hexafluoropropylene (Refrigerant gas R 1216)	19.2 16.9 15.1 13.1	Allowed	Normal	1.11
1912	Methyl chloride and methylene chloride mixture	15.2 13.0 11.6 10.1	Allowed	Normal	0.81
1958	1,2-Dichloro-1,1,2,2-tetrafluoroethane (Refrigerant gas R 114)	7.0 7.0 7.0 7.0	Allowed	Normal	1.30
1965	Hydrocarbon gas, mixture liquefied, n.o.s.	See MAWP definition in 6.7.3.1	Allowed	Normal	See 4.2.2.7
1969	Isobutane	8.5 7.5 7.0 7.0	Allowed	Normal	0.49

[a] *"Small" means tanks having a shell with a diameter of 1.5 m or less; "Bare" means tanks having a shell with a diameter of more than 1.5 m without insulation or sun shield (see 6.7.3.2.12); "Sunshield" means tanks having a shell with a diameter of more than 1.5 m with sun shield (see 6.7.3.2.12); "Insulated" means tanks having a shell with a diameter of more than 1.5 m with insulation (see 6.7.3.2.12); (See definition of "Design reference temperature" in 6.7.3.1).*

[b] *The word "Normal" in the pressure relief requirements column indicates that a frangible disc as specified in 6.7.3.7.3 is not required.*

T50	PORTABLE TANK INSTRUCTION *(cont'd)*				T50
This portable tank instruction applies to non-refrigerated liquefied gases and chemicals under pressure (UN Nos. 3500, 3501, 3502, 3503, 3504 and 3505). The general provisions of Section 4.2.2 and the requirements of Section 6.7.3 shall be met.					
UN No.	**Non-refrigerated liquefied gases**	**Max. allowable working pressure (bar): Small; Bare; Sunshield; Insulated; respectively[a]**	**Openings below liquid level**	**Pressure- relief requirements[b] (see 6.7.3.7)**	**Maximum filling ratio**
1973	Chlorodifluoromethane and chloropentafluoroethane mixture with fixed boiling point, with approximately 49 % chlorodifluoromethane (Refrigerant gas R 502)	28.3 25.3 22.8 20.3	Allowed	Normal	1.05
1974	Chlorodifluorobromomethane (Refrigerant gas R 12B1)	7.4 7.0 7.0 7.0	Allowed	Normal	1.61
1976	Octafluorocyclobutane (Refrigerant gas RC 318)	8.8 7.8 7.0 7.0	Allowed	Normal	1.34
1978	Propane	22.5 20.4 18.0 16.5	Allowed	Normal	0.42
1983	1-Chloro-2,2,2-trifluoroethane (Refrigerant gas R 133a)	7.0 7.0 7.0 7.0	Allowed	Normal	1.18
2035	1,1,1-Trifluoroethane (Refrigerant gas R 143a)	31.0 27.5 24.2 21.8	Allowed	Normal	0.76
2424	Octafluoropropane (Refrigerant gas R 218)	23.1 20.8 18.6 16.6	Allowed	Normal	1.07
2517	1-Chloro-1,1-difluoroethane (Refrigerant gas R 142b)	8.9 7.8 7.0 7.0	Allowed	Normal	0.99
2602	Dichlorodifluoromethane and 1,1-difluoroethane azeotropic mixture with approximately 74 % dichlorodifluoromethane (Refrigerant gas R 500)	20.0 18.0 16.0 14.5	Allowed	Normal	1.01

[a] *"Small" means tanks having a shell with a diameter of 1.5 m or less; "Bare" means tanks having a shell with a diameter of more than 1.5 m without insulation or sun shield (see 6.7.3.2.12); "Sunshield" means tanks having a shell with a diameter of more than 1.5 m with sun shield (see 6.7.3.2.12); "Insulated" means tanks having a shell with a diameter of more than 1.5 m with insulation (see 6.7.3.2.12); (See definition of "Design reference temperature" in 6.7.3.1).*

[b] *The word "Normal" in the pressure relief requirements column indicates that a frangible disc as specified in 6.7.3.7.3 is not required.*

T50	PORTABLE TANK INSTRUCTION *(cont'd)*				T50
This portable tank instruction applies to non-refrigerated liquefied gases and chemicals under pressure (UN Nos. 3500, 3501, 3502, 3503, 3504 and 3505). The general provisions of Section 4.2.2 and the requirements of Section 6.7.3 shall be met.					
UN No.	**Non-refrigerated liquefied gases**	**Max. allowable working pressure (bar): Small; Bare; Sunshield; Insulated; respectively[a]**	**Openings below liquid level**	**Pressure- relief requirements[b] (see 6.7.3.7)**	**Maximum filling ratio**
3057	Trifluoroacetyl chloride	14.6 12.9 11.3 9.9	Not allowed	See 6.7.3.7.3	1.17
3070	Ethylene oxide and dichlorodifluoromethane mixture with not more than 12.5 % ethylene oxide	14.0 12.0 11.0 9.0	Allowed	See 6.7.3.7.3	1.09
3153	Perfluoro (methyl vinyl ether)	14.3 13.4 11.2 10.2	Allowed	Normal	1.14
3159	1,1,1,2-Tetrafluoroethane (Refrigerant gas R 134a)	17.7 15.7 13.8 12.1	Allowed	Normal	1.04
3161	Liquefied gas, flammable, n.o.s.	See MAWP definition in 6.7.3.1	Allowed	Normal	See 4.2.2.7
3163	Liquefied gas, n.o.s.	See MAWP definition in 6.7.3.1	Allowed	Normal	See 4.2.2.7
3220	Pentafluoroethane (Refrigerant gas R 125)	34.4 30.8 27.5 24.5	Allowed	Normal	0.87
3252	Difluoromethane (Refrigerant gas R 32)	43.0 39.0 34.4 30.5	Allowed	Normal	0.78
3296	Heptafluoropropane (Refrigerant gas R 227)	16.0 14.0 12.5 11.0	Allowed	Normal	1.20
3297	Ethylene oxide and chlorotetrafluoroethane mixture, with not more than 8.8 % ethylene oxide	8.1 7.0 7.0 7.0	Allowed	Normal	1.16

[a] *"Small" means tanks having a shell with a diameter of 1.5 m or less; "Bare" means tanks having a shell with a diameter of more than 1.5 m without insulation or sun shield (see 6.7.3.2.12); "Sunshield" means tanks having a shell with a diameter of more than 1.5 m with sun shield (see 6.7.3.2.12); "Insulated" means tanks having a shell with a diameter of more than 1.5 m with insulation (see 6.7.3.2.12); (See definition of "Design reference temperature" in 6.7.3.1).*

[b] *The word "Normal" in the pressure relief requirements column indicates that a frangible disc as specified in 6.7.3.7.3 is not required.*

T50	PORTABLE TANK INSTRUCTION *(cont'd)*				T50
This portable tank instruction applies to non-refrigerated liquefied gases and chemicals under pressure (UN Nos. 3500, 3501, 3502, 3503, 3504 and 3505). The general provisions of Section 4.2.2 and the requirements of Section 6.7.3 shall be met.					
UN No.	**Non-refrigerated liquefied gases**	**Max. allowable working pressure (bar): Small; Bare; Sunshield; Insulated; respectively[a]**	**Openings below liquid level**	**Pressure- relief requirements[b] (see 6.7.3.7)**	**Maximum filling ratio**
3298	Ethylene oxide and pentafluoroethane mixture, with not more than 7.9 % ethylene oxide	25.9 23.4 20.9 18.6	Allowed	Normal	1.02
3299	Ethylene oxide and tetrafluoroethane mixture, with not more than 5.6 % ethylene oxide	16.7 14.7 12.9 11.2	Allowed	Normal	1.03
3318	Ammonia solution, relative density less than 0.880 at 15 °C in water, with more than 50 % ammonia	See MAWP definition in 6.7.3.1	Allowed	See 6.7.3.7.3	See 4.2.2.7
3337	Refrigerant gas R 404A	31.6 28.3 25.3 22.5	Allowed	Normal	0.82
3338	Refrigerant gas R 407A	31.3 28.1 25.1 22.4	Allowed	Normal	0.94
3339	Refrigerant gas R 407B	33.0 29.6 26.5 23.6	Allowed	Normal	0.93
3340	Refrigerant gas R 407C	29.9 26.8 23.9 21.3	Allowed	Normal	0.95
3500	Chemical under pressure, n.o.s.	See MAWP definition in 6.7.3.1	Allowed	See 6.7.3.7.3	TP4[c]
3501	Chemical under pressure, flammable, n.o.s.	See MAWP definition in 6.7.3.1	Allowed	See 6.7.3.7.3	TP4[c]
3502	Chemical under pressure, toxic, n.o.s.	See MAWP definition in 6.7.3.1	Allowed	See 6.7.3.7.3	TP4[c]
3503	Chemical under pressure, corrosive, n.o.s.	See MAWP definition in 6.7.3.1	Allowed	See 6.7.3.7.3	TP4[c]
3504	Chemical under pressure, flammable, toxic, n.o.s.	See MAWP definition in 6.7.3.1	Allowed	See 6.7.3.7.3	TP4[c]
3505	Chemical under pressure, flammable, corrosive, n.o.s.	See MAWP definition in 6.7.3.1	Allowed	See 6.7.3.7.3	TP4[c]

[a] *"Small" means tanks having a shell with a diameter of 1.5 m or less; "Bare" means tanks having a shell with a diameter of more than 1.5 m without insulation or sun shield (see 6.7.3.2.12); "Sunshield" means tanks having a shell with a diameter of more than 1.5 m with sun shield (see 6.7.3.2.12); "Insulated" means tanks having a shell with a diameter of more than 1.5 m with insulation (see 6.7.3.2.12); (See definition of "Design reference temperature" in 6.7.3.1).*

[b] *The word "Normal" in the pressure relief requirements column indicates that a frangible disc as specified in 6.7.3.7.3 is not required.*

[c] *For UN Nos. 3500, 3501, 3502, 3503, 3504 and 3505, the degree of filling shall be considered instead of the maximum filling ratio.*

T75	PORTABLE TANK INSTRUCTION	T75
This portable tank instruction applies to refrigerated liquefied gases. The general provisions of Section 4.2.3 and the requirements of Section 6.7.4 shall be met.		

4.2.5.3 ***Portable tank special provisions***

Portable tank special provisions are assigned to certain substances to indicate provisions which are in addition to or in lieu of those provided by the portable tank instructions or the requirements in Chapter 6.7. Portable tank special provisions are identified by an alpha numeric code beginning with the letters "TP" (tank provision) and are assigned to specific substances in Column (11) of Table A of Chapter 3.2. The following is a list of the portable tank special provisions:

TP1 The degree of filling prescribed in 4.2.1.9.2 shall not be exceeded.

$$(Degree\ \text{of filling} = \frac{97}{1+\alpha\,(t_r - t_f)})$$

TP2 The degree of filling prescribed in 4.2.1.9.3 shall not be exceeded.

$$(Degree\ \text{of filling} = \frac{95}{1+\alpha\,(t_r - t_f)})$$

TP3 The maximum degree of filling (in %) for solids carried above their melting point and for elevated temperature liquids shall be determined in accordance with 4.2.1.9.5.

$$(Degree\ \text{of filling} = 95\,\frac{d_r}{d_f})$$

TP4 The degree of filling shall not exceed 90 % or, alternatively, any other value approved by the competent authority (see 4.2.1.16.2).

TP5 The degree of filling prescribed in 4.2.3.6 shall be met.

TP6 To prevent the tank bursting in any event, including fire engulfment, it shall be provided with pressure-relief devices which are adequate in relation to the capacity of the tank and to the nature of the substance carried. The device shall also be compatible with the substance.

TP7 Air shall be eliminated from the vapour space by nitrogen or other means.

TP8 The test pressure may be reduced to 1.5 bar when the flash point of the substances carried is greater than 0 °C.

TP9 A substance under this description shall only be carried in a portable tank under an approval granted by the competent authority.

TP10 A lead lining, not less than 5 mm thick, which shall be tested annually, or another suitable lining material approved by the competent authority is required. A portable tank may be offered for carriage after the date of expiry of the last lining inspection for a period not to exceed three months beyond that date, after emptying but before cleaning, for purposes of performing the next required test or inspection prior to refilling.

TP12 *(Deleted)*

TP13 *(Reserved)*

TP16 The tank shall be fitted with a special device to prevent under-pressure and excess pressure during normal carriage conditions. This device shall be approved by the competent authority.

Pressure-relief requirements are as indicated in 6.7.2.8.3 to prevent crystallization of the product in the pressure-relief valve.

TP17 Only inorganic non-combustible materials shall be used for thermal insulation of the tank.

TP18 Temperature shall be maintained between 18 °C and 40 °C. Portable tanks containing solidified methacrylic acid shall not be reheated during carriage.

TP19 At the time of construction, the minimum shell thickness determined according to 6.7.3.4 shall be increased by 3 mm as a corrosion allowance. Shell thickness shall be verified ultrasonically at intervals midway between periodic hydraulic tests and shall never be lower than the minimum shell thickness determined according to 6.7.3.4.

TP20 This substance shall only be carried in insulated tanks under a nitrogen blanket.

TP21 The shell thickness shall be not less than 8 mm. Tanks shall be hydraulically tested and internally inspected at intervals not exceeding 2.5 years.

TP22 Lubricant for joints or other devices shall be oxygen compatible.

TP23 *Deleted.*

TP24 The portable tank may be fitted with a device located under maximum filling conditions in the vapour space of the shell to prevent the build-up of excess pressure due to the slow decomposition of the substance carried. This device shall also prevent an unacceptable amount of leakage of liquid in the case of overturning or entry of foreign matter into the tank. This device shall be approved by the competent authority or its authorized body.

TP25 Sulphur trioxide 99.95 % pure and above may be carried in tanks without an inhibitor provided that it is maintained at a temperature equal to or above 32.5 °C.

TP26 When carried under heated conditions, the heating device shall be fitted outside the shell. For UN 3176 this requirement only applies when the substance reacts dangerously with water.

TP27 A portable tank having a minimum test pressure of 4 bar may be used if it is shown that a test pressure of 4 bar or less is acceptable according to the test pressure definition in 6.7.2.1.

TP28 A portable tank having a minimum test pressure of 2.65 bar may be used if it is shown that a test pressure of 2.65 bar or less is acceptable according to the test pressure definition in 6.7.2.1.

TP29 A portable tank having a minimum test pressure of 1.5 bar may be used if it is shown that a test pressure of 1.5 bar or less is acceptable according to the test pressure definition in 6.7.2.1.

TP30 This substance shall be carried in insulated tanks.

TP31 This substance may only be carried in tanks in the solid state.

TP32 For UN Nos. 0331, 0332 and 3375, portable tanks may be used subject to the following conditions:

(a) To avoid unnecessary confinement, each portable tank constructed of metal or fibre-reinforced plastics shall be fitted with a pressure-relief device that may be of the reclosing spring-loaded type, a frangible disc or a fusible element. The set to discharge or burst pressure, as applicable, shall not be greater than 2.65 bar for portable tanks with minimum test pressures greater than 4 bar.

(b) For UN 3375 only, the suitability for carriage in tanks shall be demonstrated. One method to evaluate this suitability is test 8 (d) in Test Series 8 (see Manual of Tests and Criteria, Part 1, Sub-section 18.7).

(c) Substances shall not be allowed to remain in the portable tank for any period that could result in caking. Appropriate measures shall be taken to avoid accumulation and packing of substances in the tank (e.g. cleaning, etc).

TP33 The portable tank instruction assigned for this substance applies to granular and powdered solids and to solids which are filled and discharged at temperatures above their melting point which are cooled and carried as a solid mass. For solids which are carried above their melting point, see 4.2.1.19.

TP34 Portable tanks need not be subjected to the impact test in 6.7.4.14.1 if the portable tank is marked "NOT FOR RAIL TRANSPORT" on the plate specified in 6.7.4.15.1 and also in letters of at least 10 cm high on both sides of the outer jacket.

TP35 *Deleted.*

TP36 Fusible elements in the vapour space may be used on portable tanks.

TP37, TP38 and TP39 (*Deleted)*

TP40 Portable tanks shall not be carried when connected with spray application equipment.

TP41 With the agreement of the competent authority, the 2.5 year internal examination may be waived or substituted by other test methods or inspection procedures, provided that the portable tank is dedicated to the carriage of the organometallic substances to which this tank special provision is assigned. However this examination is required when the conditions of 6.7.2.19.7 are met.

CHAPTER 4.3

USE OF FIXED TANKS (TANK-VEHICLES AND TANK-WAGONS), DEMOUNTABLE TANKS, TANK-CONTAINERS AND TANK SWAP BODIES WITH SHELLS MADE OF METALLIC MATERIALS, AND TUBE-VEHICLES AND TUBE-WAGONS AND MULTIPLE-ELEMENT GAS CONTAINERS (MEGCs)

NOTE: *For portable tanks and UN multiple-element gas containers (MEGCs) see Chapter 4.2; for fibre-reinforced plastics tanks, see Chapter 4.4; for vacuum operated waste tanks, see Chapter 4.5.*

4.3.1 Scope

4.3.1.1 Provisions which take up the whole width of the page apply both to fixed tanks (tank-vehicles), demountable tanks and tube-vehicles, and to tank-containers, tank swap bodies and MEGCs. Provisions contained in a single column apply only to:

- fixed tanks (tank-vehicles), demountable tanks and tube-vehicles (left-hand column);
- tank-containers, tank swap bodies and MEGCs (right-hand column).

4.3.1.2 These provisions apply to:

fixed tanks (tank-vehicles), demountable tanks and tube-vehicles	tank-containers, tank swap bodies and MEGCs

used for the carriage of gaseous, liquid, powdery or granular substances.

4.3.1.3 Section 4.3.2 lists the provisions applicable to fixed tanks (tank-vehicles), demountable tanks, tank-containers and tank swap bodies, intended for the carriage of substances of all classes, and to tube-vehicles and MEGCs intended for the carriage of gases of Class 2. Sections 4.3.3 and 4.3.4 contain special provisions adding to or amending the provisions of Section 4.3.2.

4.3.1.4 For requirements concerning the construction, equipment, type approval, inspections and tests and marking, see Chapter 6.8.

4.3.1.5 For transitional measures concerning the application of this Chapter, see:

1.6.3.	1.6.4.

NOTE: *1.6.3 and 1.6.4 contain transitional provisions permitting the continued use of tank vehicles, demountable tanks, and tank containers in use at the commencement of ADG 2025.*

4.3.2 Provisions applicable to all classes

4.3.2.1 *Use*

4.3.2.1.1 A substance subject to this Code may be carried in fixed tanks (tank-vehicles), demountable tanks, tube-vehicles, tank-containers, tank swap bodies and MEGCs only when provision is made for a tank code according to 4.3.3.1.1 and 4.3.4.1.1 in Column (12) of Table A in Chapter 3.2.

4.3.2.1.2 Tanks, tube-vehicles or MEGCs shall comply with either 4.3.2.1.2.1 or 4.3.2.1.2.2.

NOTE: *From ADG 2025, tanks may be designed according to Australian standards (carried over from ADG 7), or according to the requirements of ADR. 4.3.2.1.2 requires that the tank is properly designed and approved for this purpose. Approval of pressure receptacles is defined in 1.8.7.*

4.3.2.1.2.1 A tank, tube-vehicle or MEGC that is designed according to Australian Standards, as set out in section 6.8.6.6, or is otherwise approved in accordance with 6.8.6.7, may be used for the transport of dangerous goods.

The tank, tube-vehicle or MEGC shall only be used for the transport of substances for which it has been approved.

4.3.2.1.2.2 The required type of tank, battery-vehicle and MEGC is given in code form in Column (12) of Table A in Chapter 3.2. The explanations for reading the four parts of the code are given in 4.3.3.1.1 (when the substance to be carried belongs to Class 2) and in 4.3.4.1.1 (when the substance to be carried belongs to Classes 1 and 3 to 9)[1].

4.3.2.1.3 The required type according to 4.3.2.1.2.2 corresponds to the least stringent construction requirements which are acceptable for the dangerous substance in question unless otherwise prescribed in this Chapter or in Chapter 6.8. It is possible to use tanks corresponding to codes prescribing a higher minimum calculation pressure, or more stringent requirements for filling or discharge openings or for safety valves/devices (see 4.3.3.1.1 for Class 2 and 4.3.4.1.1 for Classes 3 to 9).

4.3.2.1.4 For certain substances, tanks, tube-vehicles or MEGCs are subject to additional provisions which are included as special provisions in Column (13) of Table A in Chapter 3.2.

4.3.2.1.5 Tanks, tube-vehicles and MEGCs shall not be loaded with any dangerous substances other than those for the carriage of which they have been approved according to 6.8.2.3.2 and which, in contact with the materials of the shell, gaskets, equipment and protective linings, are not liable to react dangerously with them (see "dangerous reaction" in 1.2.1), to form dangerous products or appreciably to weaken these materials[2].

4.3.2.1.6 Foodstuffs shall not be carried in tanks used for dangerous substances unless the necessary steps have been taken to prevent any harm to public health.

4.3.2.1.7 The tank record shall be retained by the owner or the operator who shall be able to provide this documentation at the request of the competent authority. The tank record shall be maintained throughout the life of the tank and retained for 15 months after the tank is taken out of service.

Should a change of owner or operator occur during the life of the tank the tank record shall be transferred without delay to the new owner or operator.

Copies of the tank record or all necessary documents shall be made available to the inspection body for tests and inspections on tanks in accordance with 6.8.2.4.5 or 6.8.3.4.18, on the occasion of periodic or exceptional inspections.

NOTE: *The tank record is defined in Chapter 6.8 and includes all records relating to the tank, including the certificate of approval issued by a competent authority.*

4.3.2.2 ***Degree of filling***

NOTE 1: *the degree of filling rules for ADG 2025 are derived from those for portable tanks, except that large compartment tanks are defined as those with one or more compartments greater than 8,600 L. The limitations on degree of filling for large compartment tanks are derived from existing Australian practice at the time ADG 2025 came into effect.*

NOTE 2: *Some substances have a special provision for tank use (TU Code) that mandates a different maximum degree of filling.*

4.3.2.2.1 The following degrees of filling shall not be exceeded in tanks intended for the carriage of liquids at ambient temperatures:

(a) The maximum degree of filling (in %) for general use is determined by the formula:

$$\text{Degree of filling} = \frac{97}{1 + \alpha\,(50 - t_F)}\ \%\ \text{of capacity}$$

[1] *An exception is made for tanks intended for the carriage of substances of classes 1, 5.2 or 7 (see 4.3.4.1.3).*

[2] *It may be necessary to consult the manufacturer of the substance and the competent authority for guidance on the compatibility of the substance with the materials of the tank, tube-vehicle or MEGC.*

(d) The maximum degree of filling (in %) for liquids of Class 6.1 and Class 8, in packing groups I and II, and liquids with an absolute vapour pressure of more than 175 kPa (1.75 bar) at 65 °C, is determined by the formula:

$$\text{Degree of filling} = \frac{95}{1 + \alpha\,(50 - t_F)} \%\ \text{of capacity}$$

NOTE: *These formulas mean that when the filling substance is at 50°C, there will be 3 % ullage remaining for (a), and 5 % ullage remaining for (b).*

4.3.2.2.2 In these formulae, α is the mean coefficient of cubical expansion of the liquid between 15 °C and 50 °C, i.e. for a maximum variation in temperature of 35 °C.

α is calculated by the formula:

$$\alpha = \frac{d_{15} - d_{50}}{35 d_{50}}$$

where d_{15} and d_{50} are the relative densities of the liquid at 15 °C and 50 °C respectively.

t_F is the mean temperature of the liquid during filling.

4.3.2.2.3 The provisions of 4.3.2.2.1 (a) to (d) above shall not apply to tanks whose contents are, by means of a heating device, maintained at a temperature above 50 °C during carriage. In this case the degree of filling at the outset shall be such, and the temperature so regulated, that the tank is not full to more than 95 % of its capacity and that the filling temperature is not exceeded, at any time during carriage.

4.3.2.2.4 Shells intended for the carriage of substances in the liquid state or liquefied gases or refrigerated liquefied gases, which are not divided by partitions or surge plates into sections of not more than 8,600 litres capacity, shall be filled to not less than 80 % or not more than 15 % of their capacity.

This provision is not applicable to:

- liquids with a kinematic viscosity at 20 °C of at least 2 680 mm²/s;
- molten substances with a kinematic viscosity at the temperature of filling of at least 2 680 mm²/s;
- UN 1963 HELIUM, REFRIGERATED, LIQUID and UN 1966 HYDROGEN, REFRIGERATED, LIQUID.

NOTE 1: *wastes in vacuum tanks are excluded from this provision by section 4.5.2.1 .*

NOTE 2: *tanks for UN 1999 TARS, LIQUID; UN 3256 ELEVATED TEMPERATURE LIQUID, FLAMMABLE, N.O.S. and UN 3257 ELEVATED TEMPERATURE LIQUID, N.O.S. in service at the commencement of ADG 2025 are provided with a transitional provision to permit tank transport in large compartment tanks.*

4.3.2.3 ***Operation***

4.3.2.3.1 The thickness of the walls of the shell shall not, throughout its use, fall below the minimum figure prescribed by the following provisions:

4.3.2.3.1.1 Where the tank, tube-vehicle or MEGC is designed according to the requirements of referenced Australian Standards, the value(s) provided by the design standards.

4.3.2.3.1.2 Where the tank, tube-vehicle or MEGC is designed according to the requirements of ADR, the following sections of ADR:

6.8.2.1.17 to 6.8.2.1.21.	6.8.2.1.17 to 6.8.1.20.

NOTE: *Where a shell has been designed with a corrosion allowance, information about this minimum thickness shall be included in the tank record.*

4.3.2.3.2 During carriage tank-containers/MEGCs shall be loaded on the carrying vehicle in such a way as to be adequately protected by the fittings of the carrying vehicle or of the tank-container/MEGC itself against lateral and longitudinal impact and against overturning[3]. If the tank-containers/MEGCs, including the service equipment, are so constructed as to withstand impact or overturning they need not be protected in this way.

4.3.2.3.3 During filling and discharge of tanks, tube-vehicles and MEGCs, appropriate measures shall be taken to prevent the release of dangerous quantities of gases and vapours. Tanks, tube-vehicles and MEGCs shall be closed so that the contents cannot spill out uncontrolled. The openings of bottom-discharge tanks shall be closed by means of screw-threaded plugs, blank flanges or other equally effective devices. After filling, the filler shall ensure that all the closures of the tanks, tube-vehicles and MEGCs are in the closed position and there is no leakage. This also applies to the upper part of the dip tube.

4.3.2.3.4 Where several closure systems are fitted in series, that nearest to the substance being carried shall be closed first.

4.3.2.3.5 No dangerous residue of the filling substance shall adhere to the outside of the tank during carriage.

4.3.2.3.6 Substances which may react dangerously with each other shall not be carried in adjoining compartments of tanks.

Substances which may react dangerously with each other may be carried in adjoining compartments of tanks, when these compartments are separated by a partition with a wall thickness equal to or greater than that of the tank itself. They may also be carried separated by an empty space or an empty compartment between loaded compartments.

4.3.2.3.7 Fixed tanks (tank-vehicles), demountable tanks, tube-vehicles, tank-containers, tank swap bodies and MEGCs may not be filled or offered for carriage after the date specified for the inspection required by 6.8.2.4.2, 6.8.2.4.3, 6.8.3.4.6, 6.8.3.4.12, 6.8.6.4.2, 6.8.6.4.3 and 6.8.7.4.12.

However, fixed tanks (tank-vehicles), demountable tanks, tube-vehicles, tank-containers, tank swap bodies and MEGCs filled prior to the date specified for the next inspection may be carried:

(a) for a period not to exceed one month after the date specified if the inspection due is a periodic inspection in accordance with 6.8.2.4.2, 6.8.3.4.6 (a), 6.8.3.4.12 and 6.8.6.4.2;

(b) unless otherwise approved by the competent authority, for a period not to exceed three months after the expiry of the date specified, if the inspection due is a periodic inspection in accordance with 6.8.2.4.2, 6.8.3.4.6 (a), 6.8.3.4.12 and 6.8.6.4.2 in order to allow the return of dangerous goods for proper disposal or recycling. Reference to this exemption shall be mentioned in the transport document;

(c) for a period not to exceed three months after the date specified, if the inspection due is an intermediate inspection in accordance with 6.8.2.4.3, 6.8.3.4.6 (b), 6.8.3.4.12 and 6.8.6.4.2.

NOTE: *this subsection does not permit a tank vehicle to be filled after the inspection date, only to be transported for inspection.*

[3] *Examples of protection of shells:*
- *protection against lateral impact may, for example, consist of longitudinal bars protecting the shell on both sides at the level of the median line;*
- *protection against overturning may, for example, consist of reinforcing rings or bars fixed transversally in relation to the frame;*
- *protection against rear impact, may, for example, consist of a bumper or frame.*

4.3.2.4 ***Empty tanks, tube-vehicles and MEGCs, uncleaned***

NOTE: *For empty tanks, tube-vehicles and MEGCs, uncleaned, special provisions TU1, TU2, TU4, TU16 and TU35 of 4.3.5 may apply.*

4.3.2.4.1 No dangerous residue of the filling substance shall adhere to the outside of the tank during carriage.

4.3.2.4.2 To be accepted for carriage, empty tanks, tube-vehicles and MEGCs, uncleaned, shall be closed in the same manner and be leakproof to the same degree as if they were full.

4.3.2.4.3 Where empty tanks, tube-vehicles and MEGCs, uncleaned, are not closed in the same manner and are not leakproof to the same degree as if they were full and where the provisions of this Code cannot be complied with, they shall be carried, with due regard to adequate safety, to the nearest suitable place where cleaning or repair can be carried out. Carriage is adequately safe if suitable measures have been taken to ensure equivalent safety commensurate with the provisions of this Code and to prevent the uncontrolled release of the dangerous goods.

Such carriage shall only take place at the direction of the competent authority or emergency services.

4.3.2.4.4 Empty fixed tanks (tank-vehicles), demountable tanks, tube-vehicles, tank-containers, tank swap bodies and MEGCs, uncleaned, may also be carried after the expiry of the periods established in 6.8.2.4.2 and 6.8.2.4.3 for undergoing the inspection.

4.3.3 Special provisions applicable to Class 2

NOTE: *These provisions do not override Australian pressure receptacle legislation. Where these values conflict, the more conservative value should prevail to the extent of any inconsistency, except where the values used are in accordance with those of the approved design and evidence is available to substantiate this,*

4.3.3.1 ***Coding and hierarchy of tanks***

NOTE 1: *The Coding and hierarchy of tanks in 4.3.3.1 only applies to tanks that were designed and approved according to the requirements of ADR.*

NOTE 2: *Tanks designed and approved using Australian Standards shall be used in accordance with the requirements of the tank approval. These codes are informative for such tanks.*

4.3.3.1.1 Coding of tanks, tube-vehicles and MEGCs

The four parts of the codes (tank codes) given in Column (12) of Table A in Chapter 3.2 have the following meanings:

Part	Description	Tank Code
1	Types of tank, tube-vehicle or MEGC	C = tank, tube-vehicle or MEGC for compressed gases; P = tank, tube-vehicle or MEGC for liquefied gases or dissolved gases; R = tank for refrigerated liquefied gases.
2	Calculation pressure	X = value of the minimum relevant test pressure according to the table in 4.3.3.2.5; or 22 = minimum calculation pressure in bar.
3	Openings (see 6.8.2.2 and 6.8.3.2)	B = tank with bottom filling or discharge openings with 3 closures; or tube-vehicle or MEGC with openings below the surface of the liquid or for compressed gases; C = tank with top filling or discharge openings with 3 closures with only cleaning openings below the surface of the liquid; D = tank with top filling or discharge openings with 3 closures; or tube-vehicle or MEGC with no openings below the surface of the liquid.
4	Safety valves/devices	N = tank, tube-vehicle or MEGC with safety valve according to 6.8.3.2.9 or 6.8.3.2.10 which is not hermetically closed; H = hermetically closed tank, tube-vehicle or MEGC (see 1.2.1);

NOTE 1: *The special provision TU17 indicated in Column (13) of Table A in Chapter 3.2 for certain gases means that the gas may only be carried in a tube-vehicle or MEGC the elements of which are composed of receptacles.*

NOTE 2: *The special provision TU40 indicated in Column (13) of Table A in Chapter 3.2 for certain gases means that the gas may only be carried in a tube-vehicle or MEGC, the elements of which are composed of seamless receptacles.*

NOTE 3: *The pressures indicated on the tank itself or on the panel shall be not less than the value of "X" or the minimum calculation pressure*.

4.3.3.1.2 Hierarchy of tanks

NOTE: *ADR provides a hierarchy of tank types that permits a more restrictive tank type than is specified to be used when transporting particular dangerous goods. This hierarchy of tanks is not included here as it is not relevant for AS 2809 tanks. ADR can be consulted for this information if required.*

4.3.3.2 ***Filling conditions and test pressures***

4.3.3.2.1 The test pressure for tanks intended for the carriage of compressed gases shall be at least 1.5 times the working pressure as defined in 1.2.1 for pressure receptacles.

4.3.3.2.2 The test pressure for tanks intended for the carriage of:

- high pressure liquefied gases; and
- dissolved gases

shall be such that, when the shell is filled to the maximum filling ratio, the pressure reached in the shell by the substance at 55 °C for tanks with thermal insulation or 65 °C for tanks without thermal insulation does not exceed the test pressure.

4.3.3.2.3 The test pressure for tanks intended for the carriage of low pressure liquefied gases will be:

(a) If the tank is equipped with thermal insulation, at least equal to the vapour pressure, reduced by 0.1 MPa (1 bar) of the liquid at 60 °C, but not less than 1 MPa (10 bar);

(b) If the tank is not equipped with thermal insulation, at least equal to the vapour pressure, reduced by 0.1 MPa (1 bar), of the liquid at 65 °C, but not less than 1 MPa (10 bar).

The maximum permissible mass of contents per litre of capacity is calculated as follows:

Maximum permissible mass of contents per litre of capacity = 0.95 × density of the liquid phase at 50 °C (in kg/l)

Moreover the vapour phase shall not disappear below 60 °C.

If the shells are not more than 1.5 m in diameter, the values of the test pressure and maximum filling ratio conforming to packing instruction P200 in 4.1.4.1 shall be applicable.

4.3.3.2.4 The test pressure for tanks intended for the carriage of refrigerated liquefied gases shall be not less than 1.3 times the maximum allowable working pressure and indicated on the tank but not less than 300 kPa (3 bar) (gauge pressure); for tanks with vacuum insulation the test pressure shall be not less than 1.3 times the maximum allowable working pressure increased by 100 kPa (1 bar).

4.3.3.2.5 Table of gases and gas mixtures which may be carried in fixed tanks (tank-vehicles), tube-vehicles, demountable tanks, tank-containers or MEGCs indicating the minimum test pressure for tanks and as far as applicable the filling ratio

In the case of gases and gas mixtures classified under n.o.s. entries, the values of the test pressure and the filling ratio shall be prescribed by the inspection body.

When tanks for compressed or high pressure liquefied gases have been subjected to a test pressure lower than shown in the table, and the tanks are fitted with thermal insulation, a lower maximum load may be prescribed by the inspection body, provided that the pressure reached in the tank by the substance at 55 °C does not exceed the test pressure stamped on the tank.

UN No.	Name	Classification code	Minimum test pressure for tanks		Maximum permissible mass of contents per litre of capacity
			With thermal insulation	Without thermal insulation	
			bar	bar	kg
1001	Acetylene, dissolved	4 F	only in tube-vehicles and MEGCs composed of receptacles		
1002	Air, compressed	1 A	see 4.3.3.2.1		
1003	Air, refrigerated liquid	3 O	see 4.3.3.2.4		
1005	Ammonia, anhydrous	2 TC	26	29	0.53
1006	Argon, compressed	1 A	see 4.3.3.2.1		
1008	Boron trifluoride	2 TC	225	225	0.715
			300	300	0.86

UN No.	Name	Classification code	Minimum test pressure for tanks		Maximum permissible mass of contents per litre of capacity
			With thermal insulation	Without thermal insulation	
			bar	bar	kg
1009	Bromotrifluoromethane (Refrigerant gas R13B1)	2 A	120		1.50
				42	1.13
				120	1.44
				250	1.60
1010	BUTADIENES, STABILIZED (1,2-butadiene) or	2 F	10	10	0.59
1010	BUTADIENES, STABILIZED (1,3-butadiene) or	2 F	10	10	0.55
1010	BUTADIENES AND HYDROCARBON, MIXTURE, STABILIZED	2 F	10	10	0.50
1011	Butane	2 F	10	10	0.51
1012	BUTYLENE (1-Butylene) or	2 F	10	10	0.53
1012	BUTYLENE (trans-2-Butylene) or	2 F	10	10	0.54
1012	BUTYLENE (cis-2-Butylene) or	2 F	10	10	0.55
1012	BUTYLENE (Butylenes mixture)	2 F	10	10	0.50
1013	Carbon dioxide	2 A	190		0.73
			225		0.78
				190	0.66
				250	0.75
1016	Carbon monoxide, compressed	1 TF	see 4.3.3.2.1		
1017	Chlorine	2 TOC	17	19	1.25
1018	Chlorodifluoromethane (Refrigerant gas R22)	2 A	24	26	1.03
1020	Chloropentafluoroethane (Refrigerant gas R115)	2 A	20	23	1.08
1021	1-chloro-1,2,2,2- tetrafluoroethane (Refrigerant gas R124)	2 A	10	11	1.2
1022	Chlorotrifluoromethane (Refrigerant gas R13)	2 A	120		0.96
			225		1.12
				100	0.83
				120	0.90
				190	1.04
				250	1.10
1023	Coal gas, compressed	TF	see 4.3.3.2.1		
1026	Cyanogen	2 TF	100	100	0.70
1027	Cyclopropane	2 F	16	18	0.53
1028	Dichlorodifluoromethane (Refrigerant gas R12)	2 A	15	16	1.15
1029	Dichlorofluoromethane (Refrigerant gas R21)	2 A	10	10	1.23
1030	1,1-difluoroethane (Refrigerant gas R152a)	2 F	14	16	0.79
1032	Dimethylamine, anhydrous	2 F	10	10	0.59
1033	Dimethyl ether	2 F	14	16	0.58
1035	Ethane	2 F	120		0.32
				95	0.25
				120	0.29
				300	0.39
1036	Ethylamine	2 F	10	10	0.61
1037	Ethyl chloride	2 F	10	10	0.8
1038	Ethylene, refrigerated liquid	3 F	see 4.3.3.2.4		
1039	Ethyl methyl ether	2 F	10	10	0.64
1040	Ethylene oxide with nitrogen up to a total pressure of 1MPa (10 bar) at 50 °C	2 TF	15	15	0.78

UN No.	Name	Classification code	Minimum test pressure for tanks		Maximum permissible mass of contents per litre of capacity
			With thermal insulation	Without thermal insulation	
			bar	bar	kg
1041	Ethylene oxide and carbon dioxide mixture, with more than 9 % but not more than 87 % ethylene oxide	2 F	24	26	0.73
1046	Helium, compressed	1 A	see 4.3.3.2.1		
1048	Hydrogen bromide, anhydrous	2 TC	50	55	1.54
1049	Hydrogen, compressed	1 F	see 4.3.3.2.1		
1050	Hydrogen chloride, anhydrous	2 TC	120		0.69
				100	0.30
				120	0.56
				150	0.67
				200	0.74
1053	Hydrogen sulphide	2 TF	45	50	0.67
1055	Isobutylene	2 F	10	10	0.52
1056	Krypton, compressed	1 A	see 4.3.3.2.1		
1058	Liquefied gases, non flammable, charged with nitrogen, carbon dioxide or air	2 A	1.5 × filling pressure see 4.3.3.2.2 or 4.3.3.2.3		
1060	Methylacetylene and propadiene mixture, stabilized:	2 F	see 4.3.3.2.2 or 4.3.3.2.3		
	mixture P1	2 F	25	28	0.49
	mixture P2	2 F	22	23	0.47
	propadiene with 1 % to 4 % methylacetylene	2 F	22	22	0.50
1061	Methylamine, anhydrous	2 F	10	11	0.58
1062	Methyl bromide with not more than 2 % chloropicrin	2 T	10	10	1.51
1063	Methyl chloride (Refrigerant gas R40)	2 F	13	15	0.81
1064	Methyl mercaptan	2 TF	10	10	0.78
1065	Neon, compressed	1 A	see 4.3.3.2.1		
1066	Nitrogen, compressed	1 A	see 4.3.3.2.1		
1067	Dinitrogen tetroxide (nitrogen dioxide)	2 TOC	only in tube-vehicles and MEGCs composed of receptacles		
1070	Nitrous oxide	2 O	225		0.78
				180	0.68
				225	0.74
				250	0.75
1071	Oil gas, compressed	1 TF	see 4.3.3.2.1		
1072	Oxygen, compressed	1 O	see 4.3.3.2.1		
1073	Oxygen, refrigerated liquid	3 O	see 4.3.3.2.4		
1075	Petroleum gases, liquefied	2 F	See 4.3.3.2.2 or 4.3.3.2.3		
1076	Phosgene	2 TC	only in tube-vehicles and MEGCs composed of receptacles		
1077	Propylene	2 F	25	27	0.43
1078	Refrigerant gases, n.o.s. such as:	2 A			
	mixture F1	2 A	10	11	1.23
	mixture F2	2 A	15	16	1.15
	mixture F3	2 A	24	27	1.03
	other mixtures	2 A	see 4.3.3.2.2 or 4.3.3.2.3		
1079	Sulphur dioxide	2 TC	10	12	1.23
1080	Sulphur hexafluoride	2 A	120		1.34
				70	1.04
				140	1.33
				160	1.37
1081	Tetrafluoroethylene, stabilized	2 F	only in tube-vehicles and MEGCs composed of seamless receptacles		
1082	Trifluorochloroethylene, stabilized (Refrigerant gas R1113)	2 TF	15	17	1.13

UN No.	Name	Classification code	Minimum test pressure for tanks		Maximum permissible mass of contents per litre of capacity
			With thermal insulation	Without thermal insulation	
			bar	bar	kg
1083	Trimethylamine, anhydrous	2 F	10	10	0.56
1085	Vinyl bromide, stabilized	2 F	10	10	1.37
1086	Vinyl chloride, stabilized	2 F	10	11	0.81
1087	Vinyl methyl ether, stabilized	2 F	10	10	0.67
1581	Chloropicrin and methyl bromide mixture with more than 2 % chloropicrin	2 T	10	10	1.51
1582	Chloropicrin and methyl chloride mixture	2 T	13	15	0.81
1612	Hexaethyl tetraphosphate and compressed gas mixture	1 T	see 4.3.3.2.1		
1749	Chlorine trifluoride	2 TOC	30	30	1.40
1858	Hexafluoropropylene (Refrigerant gas R 1216)	2A	17	19	1.11
1859	Silicon tetrafluoride	2 TC	200 300	200 300	0.74 1.10
1860	Vinyl fluoride, stabilized	2 F	120		0.58
			225		0.65
				250	0.64
1912	Methyl chloride and methylene chloride mixture	2 F	13	15	0.81
1913	Neon, refrigerated liquid	3 A	see 4.3.3.2.4		
1951	Argon, refrigerated liquid	3 A	see 4.3.3.2.4		
1952	Ethylene oxide and carbon dioxide mixture, with not more than 9 % ethylene oxide	2 A	190	190	0.66
			250	250	0.75
1953	Compressed gas, toxic, flammable, n.o.s.[a]	1 TF	see 4.3.3.2.1 or 4.3.3.2.2		
1954	Compressed gas, flammable n.o.s.	1 F	see 4.3.3.2.1 or 4.3.3.2.2		
1955	Compressed gas, toxic, n.o.s.[a]	1 T	see 4.3.3.2.1 or 4.3.3.2.2		
1956	Compressed gas, n.o.s.	1 A	see 4.3.3.2.1 or 4.3.3.2.2		
1957	Deuterium, compressed	1 F	see 4.3.3.2.1		
1958	1,2-dichloro-1,1,2,2-tetrafluoroethane (Refrigerant gas R114)	2 A	10	10	1.3

[a] *Allowed if LC_{50} equal to or greater than 200 ppm.*

UN No.	Name	Classification code	Minimum test pressure for tanks		Maximum permissible mass of contents per litre of capacity	
			With thermal insulation	Without thermal insulation		
			bar	bar	kg	
1959	1,1-difluoroethylene (Refrigerant gas R1132a)	2 F	120			0.66
			225			0.78
					250	0.77
1961	Ethane, refrigerated liquid	3 F	see 4.3.3.2.4			
1962	Ethylene	2 F	120			0.25
			225			0.36
					225	0.34
					300	0.37
1963	Helium, refrigerated liquid	3 A	see 4.3.3.2.4			
1964	Hydrocarbon gas mixture, compressed, n.o.s.	1 F	see 4.3.3.2.1 or 4.3.3.2.2			
1965	Hydrocarbon gas mixture, liquefied, n.o.s.:	2 F				
	Mixture A	2 F	10		10	0.50
	Mixture A01	2 F	12		14	0.49
	Mixture A02	2 F	12		14	0.48
	Mixture A0	2 F	12		14	0.47
	Mixture A1	2 F	16		18	0.46
	Mixture B1	2 F	20		23	0.45
	Mixture B2	2 F	20		23	0.44
	Mixture B	2 F	20		23	0.43
	Mixture C	2 F	25		27	0.42
	Other mixtures	2 F	see 4.3.3.2.2 or 4.3.3.2.3			
1966	Hydrogen, refrigerated liquid	3 F	see 4.3.3.2.4			
1967	Insecticide gas, toxic, n.o.s.[a]	2 T	see 4.3.3.2.2 or 4.3.3.2.3			
1968	Insecticide gas, n.o.s.	2 A	see 4.3.3.2.2 or 4.3.3.2.3			
1969	Isobutane	2 F	10		10	0.49
1970	Krypton, refrigerated liquid	3 A	see 4.3.3.2.4			
1971	Methane, compressed or natural gas, compressed with high methane content	1 F	see 4.3.3.2.1			
1972	Methane, refrigerated liquid or natural gas, refrigerated liquid with high methane content	3 F	see 4.3.3.2.4			
1973	Chlorodifluoromethane and chloropentafluoroethane mixture with fixed boiling point, with approximately 49 % chlorodifluoromethane (Refrigerant gas R502)	2 A	25		28	1.05
1974	Chlorodifluorobromomethane (Refrigerant gas R12B1)	2 A	10		10	1.61
1976	Octafluorocyclobutane (Refrigerant gas RC318)	2 A	10		10	1.34
1977	Nitrogen, refrigerated liquid	3 A	see 4.3.3.2.4			
1978	Propane	2 F	21		23	0.42
1982	Tetrafluoromethane (Refrigerant gas R14)	2 A	200		200	0.62
			300		300	0.94
1983	1-chloro-2,2,2-trifluoroethane (Refrigerant gas R133a)	2 A	10		10	1.18
1984	Trifluoromethane (Refrigerant gas R23)	2 A	190			0.92
			250			0.99
					190	0.87
					250	0.95
2034	Hydrogen and methane mixture, compressed	1 F	see 4.3.3.2.1			
2035	1,1,1-trifluoroethane (Refrigerant gas R143a)	2 F	28		32	0.79
2036	Xenon	2 A	120			1.30

UN No.	Name	Classification code	Minimum test pressure for tanks		Maximum permissible mass of contents per litre of capacity	
			With thermal insulation	Without thermal insulation		
			bar	bar	kg	
				13	130	1.24
2044	2,2-dimethylpropane	2 F	10		10	0.53
2073	Ammonia solutions, relative density less than 0.880 at 15 °C in water:	4 A				
	with more than 35 % and not more than 40 % ammonia	4 A	10		10	0.80
	with more than 40 % and not more than 50 % ammonia	4 A	12		12	0.77
2187	Carbon dioxide, refrigerated liquid	3 A	see 4.3.3.2.4			
2189	Dichlorosilane	2 TFC	10		10	0.90
2191	Sulfuryl fluoride	2 T	50		50	1.1
2193	Hexafluoroethane (Refrigerant gas R116)	2 A	160			1.28
			200			1.34
					200	1.10
2197	Hydrogen iodide, anhydrous	2 TC	19		21	2.25
2200	Propadiene, stabilized	2 F	18		20	0.50
2201	Nitrous oxide, refrigerated liquid	3 O	see 4.3.3.2.4			
2203	Silane[b]	2 F	225		225	0.32
			250		250	0.36
2204	Carbonyl sulphide	2 TF	27		30	0.84
2417	Carbonyl fluoride	2 TC	200		200	0.47
			300		300	0.70
2419	Bromotrifluoroethylene	2 F	10		10	1.19
2420	Hexafluoroacetone	2 TC	16		18	1.08
2422	Octafluorobut-2-ene (Refrigerant gas R1318)	2 A	10		10	1.34
2424	Octafluoropropane (Refrigerant gas R218)	2 A	21		23	1.07
2451	Nitrogen trifluoride	2 O	200		200	0.50
			300		300	0.75
2452	Ethylacetylene, stabilized	2 F	10		10	0.57
2453	Ethyl fluoride (Refrigerant gas R161)	2 F	21		25	0.57
2454	Methyl fluoride (Refrigerant gas R41)	2 F	300		300	0.36
2517	1-chloro-1,1-difluoroethane (Refrigerant gas R142b)	2 F	10		10	0.99
2591	Xenon, refrigerated liquid	3 A	see 4.3.3.2.4			
2599	Chlorotrifluoromethane and trifluoromethane, azeotropic mixture with approximately 60 % chlorotrifluoromethane (Refrigerant gas R503)	2 A	31		31	0.11
			42			0.21
			100			0.76
					42	0.20
					100	0.66
2601	Cyclobutane	2 F	10		10	0.63
2602	Dichlorodifluoromethane and difluoro-1,1 ethane, azeotropic mixture with approximately 74 % dichlorodifluoromethane (Refrigerant gas R500)	2 A	18		20	1.01
2901	Bromine chloride	2 TOC	10		10	1.50
3057	Trifluoroacetyl chloride	2 TC	13		15	1.17

[b] *Considered as pyrophoric.*

UN No.	Name	Classification code	Minimum test pressure for tanks		Maximum permissible mass of contents per litre of capacity	
			With thermal insulation	Without thermal insulation		
			bar	bar	kg	
3070	Ethylene oxide and dichlorodifluoromethane mixture with not more than 12.5 % ethylene oxide	2 A	15		16	1.09
3083	Perchloryl fluoride	2 TO	27		30	1.21
3136	Trifluoromethane, refigerated liquid	3 A	See 4.3.3.2.4			
3138	Ethylene, acetylene propylene in mixture, refrigerated liquid, containing at least 71.5 % ethylene with not more than 22.5 % acetylene and not more than 6 % propylene	3 F	see 4.3.3.2.4			
3153	Perfluoro(methyl vinyl ether)	2 F	14		15	1.14
3154	Perfluoro(ethyl vinyl ether)	2 F	10		10	0.98
3156	Compressed gas, oxidizing, n.o.s.	1 O	see 4.3.3.2.1 or 4.3.3.2.2			
3157	Liquefied gas, oxidizing, n.o.s.	2 O	see 4.3.3.2.2 or 4.3.3.2.3			
3158	Gas, refrigerated liquid, n.o.s.	3 A	see 4.3.3.2.4			
3159	1,1,1,2-tetrafluoroethane (Refrigerant gas R134a)	2 A	16		18	1.04
3160	Liquefied gas, toxic, flammable, n.o.s.[a]	2 TF	see 4.3.3.2.2 or 4.3.3.2.3			
3161	Liquefied gas, flammable, n.o.s.	2 F	see 4.3.3.2.2 or 4.3.3.2.3			
3162	Liquefied gas, toxic, n.o.s.[a]	2 T	see 4.3.3.2.2 or 4.3.3.2.3			
3163	Liquefied gas, n.o.s.	2 A	see 4.3.3.2.2 or 4.3.3.2.3			
3220	Pentafluoroethane (Refrigerant gas R125)	2 A	41		49	0.95
3252	Difluoromethane (Refrigerant gas R32)	2 F	39		43	0.78
3296	Heptafluoropropane (Refrigerant gas R227)	2 A	14		16	1.20
3297	Ethylene oxide and chlorotetrafluoroethane mixture, with not more than 8.8 % ethylene oxide	2 A	10		10	1.16
3298	Ethylene oxide and pentafluoroethane mixture, with not more than 7.9 % ethylene oxide	2 A	24		26	1.02
3299	Ethylene oxide and tetrafluoroethane mixture, with not more than 5.6 % ethylene oxide	2 A	15		17	1.03
3300	Ethylene oxide and carbon dioxide mixture, with more than 87 % ethylene oxide	2 TF	28		28	0.73
3303	Compressed gas, toxic, oxidizing, n.o.s.[a]	1 TO	see 4.3.3.2.1 or 4.3.3.2.2			
3304	Compressed gas, toxic, corrosive, n.o.s.[a]	1 TC	see 4.3.3.2.1 or 4.3.3.2.2			
3305	Compressed gas, toxic, flammable, corrosive, n.o.s.[a]	1 TFC	see 4.3.3.2.1 or 4.3.3.2.2			
3306	Compressed gas, toxic, oxidizing, corrosive, n.o.s. [a]	1 TOC	see 4.3.3.2.1 or 4.3.3.2.2			
3307	Liquefied gas, toxic, oxidizing, n.o.s.[a]	2 TO	see 4.3.3.2.2 or 4.3.3.2.3			
3308	Liquefied gas, toxic, corrosive, n.o.s.[a]	2 TC	see 4.3.3.2.2 or 4.3.3.2.3			
3309	Liquefied gas, toxic, flammable, corrosive, n.o.s.[a]	2 TFC	see 4.3.3.2.2 or 4.3.3.2.3			
3310	Liquefied gas, toxic, oxidizing, corrosive, n.o.s.[a]	2 TOC	see 4.3.3.2.2 or 4.3.3.2.3			
3311	Gas, refrigerated liquid, oxidizing, n.o.s.	3 O	see 4.3.3.2.4			
3312	Gas, refrigerated liquid, flammable, n.o.s.	3 F	see 4.3.3.2.4			

[a] *Allowed if LC_{50} equal to or greater than 200 ppm.*

UN No.	Name	Classification code	Minimum test pressure for tanks		Maximum permissible mass of contents per litre of capacity	
			With thermal insulation	Without thermal insulation		
			bar	bar	kg	
3318	Ammonia solutions, relative density less than 0.880 at 15 °C in water, with more than 50 % ammonia	4 TC	see 4.3.3.2.2			
3337	Refrigerant gas R404A	2 A	29		32	0.84
3338	Refrigerant gas R407A	2 A	28		32	0.95
3339	Refrigerant gas R407B	2 A	30		33	0.95
3340	Refrigerant gas R407C	2 A	27		30	0.95
3354	Insecticide gas, flammable, n.o.s.	2 F	see 4.3.3.2.2 or 4.3.3.2.3			
3355	Insecticide gas, toxic, flammable, n.o.s.[a]	2 TF	see 4.3.3.2.2 or 4.3.3.2.3			

[a] *Allowed if LC_{50} equal to or greater than 200 ppm.*

4.3.3.3 ***Operation***

4.3.3.3.1 When tanks, tube-vehicles or MEGCs are approved for different gases, the change of use shall include emptying, purging and evacuation operations to the extent necessary for safe operation.

4.3.3.3.2 *(Deleted)*

4.3.3.3.3 All the elements of a tube-vehicle or MEGC shall contain only one and the same gas.

4.3.3.3.4 When the external overpressure could be greater than the tank resistance to external pressure (e.g. due to low ambient temperatures), adequate measures shall be taken to protect tanks carrying low pressure liquefied gases against the risk of deformation, e.g. by filling them with nitrogen or another inert gas in order to maintain sufficient pressure inside the tank.

4.3.3.4 *(Reserved)*

4.3.3.5

The actual holding time shall be determined for each journey of a tank-container carrying a refrigerated liquefied gas on the basis of the following:

(a) The reference holding time for the refrigerated liquefied gas to be carried (see 6.8.3.4.10) as indicated on the plate referred to in 6.8.3.5.4;

(b) The actual filling density;

(c) The actual filling pressure;

(d) The lowest set pressure of the pressure limiting device(s);

(e) The deterioration of the insulation[4].

NOTE: *ISO 21014:2006 'Cryogenic vessels – Cryogenic insulation performance' details methods of determining the insulation performance of cryogenic vessels and provides a method of calculating the holding time.*

The date at which the actual holding time ends shall be entered in the transport document (see 5.4.1.2.2. (d)).

[4] *Guidance is provided in the European Industrial Gases Association (EIGA) document "Methods to prevent the premature activation of relief devices on tanks" available at www.eiga.eu.*

4.3.3.6

Tank-containers shall not be offered for carriage:

(a) In an ullage condition liable to produce an unacceptable hydraulic force due to surge within the shell;

(b) When leaking;

(c) When damaged to such an extent that the integrity of the tank-container or its lifting or securing arrangements may be affected;

(d) Unless the service equipment has been examined and found to be in good working order;

(e) Unless the actual holding time for the refrigerated liquefied gas being carried has been determined;

(f) Unless the duration of carriage, after taking into consideration any delays which might be encountered, does not exceed the actual holding time;

(g) Unless the pressure is steady and has been lowered to a level such that the actual holding time may be achieved[4].

4.3.4 Special provisions applicable to Classes 1 and 3 to 9

4.3.4.1 ***Coding, rationalized approach and hierarchy of tanks***

NOTE 1: *The coding, rationalized approach and hierarchy of tanks in 4.3.3.1 only applies to tanks that were designed and approved according to the requirements of ADR.*

NOTE 2: *Tanks designed and approved using Australian Standards shall be used in accordance with the requirements of the tank approval. These codes are informative for such tanks.*

4.3.4.1.1 Coding of tanks

The four parts of the codes (tank codes) given in Column (12) of Table A in Chapter 3.2 have the following meanings:

Part	Description	Tank code
1	Types of tank	L = tank for substances in the liquid state (liquids or solids handed over for carriage in the molten state); S = tank for substances in the solid state (powdery or granular).
2	Calculation pressure	G = minimum calculation pressure according to the general requirements of 6.8.2.1.14; or 1.5; 2.65; 4; 10; 15 or 21 = minimum calculation pressure in bar (see 6.8.2.1.14).

[4] *Guidance is provided in the European Industrial Gases Association (EIGA) document "Methods to prevent the premature activation of relief devices on tanks" available at www.eiga.eu.*

Part	Description	Tank code
3	Openings (see 6.8.2.2.2)	A = tank with bottom-filling or bottom-discharge openings with 2 closures; B = tank with bottom-filling or bottom-discharge openings with 3 closures; C = tank with top-filling and discharge openings with only cleaning openings below the surface of the liquid; D = tank with top-filling and discharge openings with no openings below the surface of the liquid.
4	Safety valves/devices	V = tank with a breather device, according to 6.8.2.2.6, but no device protecting against the propagation of a flame; or non-explosion pressure shock resistant tank ; F = tank with a breather device, according to 6.8.2.2.6, fitted with a device protecting against the propagation of a flame; or explosion pressure shock resistant tank ; N = tank without a breather device according to 6.8.2.2.6 and not hermetically closed; H = hermetically closed tank (see 1.2.1).

4.3.4.1.2 *Rationalized approach for assignment of ADR tank codes to groups of substances and hierarchy of tanks*

Tanks designed according to ADR shall be used in accordance with the requirements of ADR, including the rationalized approach and the hierarchy of tanks.

NOTE: *ADR provides a hierarchy of tank types to permit a more restrictive tank type to be used for the transport. This hierarchy of tanks is not included here as it is not relevant for AS 2809 tanks. ADR can be consulted for this information if required.*

4.3.4.1.3 The following substances and groups of substances in respect of which a "(+)" is given after the tank code in Column (12) of Table A in Chapter 3.2 are subject to special provisions where the tank is designed according to ADR. In that case the alternate use of the tanks for other substances and groups of substances is permitted only where this is specified in the certificate of type approval. Higher value tanks according to the provisions at the end of the table in 4.3.4.1.2 may be used with due regard to the special provisions indicated in Column (13) of Table A in Chapter 3.2. The requirements for these tanks are given by the following tank codes supplemented by the relevant special provisions indicated in column (13) of table A in Chapter 3.2.

Class	UN No.	Name and description	Tank code
1	0331	Explosive, blasting, Type B	S2.65AN
4.1	2448	Sulphur, molten	LGBV
	3531	Polymerizing substance, solid, stabilized, N.O.S.	SGAN
	3533	Polymerizing substance, solid, temperature controlled, N.O.S	
	3532	Polymerizing substance, liquid, stabilized, N.O.S	L4BN
	3534	Polymerizing substance, liquid, temperature controlled, N.O.S.	
4.2	1381	Phosphorus, white or yellow, dry, under water or in solution	L10DH
	2447	Phosphorus, white, molten	
4.3	1389	Alkali metal amalgam, liquid	L10BN
	1391	Alkali metal dispersion or Alkaline earth metal dispersion	
	1392	Alkaline earth metal amalgam, liquid	
	1415	Lithium	
	1420	Potassium metal alloys, liquid	
	1421	Alkali metal alloy, liquid, N.O.S.	
	1422	Potassium sodium alloys, liquid	
	1428	Sodium	

Class	UN No.	Name and description	Tank code
	2257	Potassium	
	3401	Alkali metal amalgam, solid	
	3402	Alkaline earth metal amalgam, solid	
	3403	Potassium metal alloys, solid	
	3404	Potassium sodium alloys, solid	
	3482	Alkali metal dispersion, flammable or Alkaline earth metal dispersion, flammable	
	1407	Caesium	L10CH
	1423	Rubidium	
	1402	Calcium carbide, packing group I	S2.65AN
5.1	1873	Perchloric acid with more than 50 % but not more than 72 % acid, by mass	L4DN
	2015	Hydrogen peroxide, aqueous solution, stabilized with more than 70 % hydrogen peroxide	L4DV
	2014	Hydrogen peroxide, aqueous solution with not less than 20 % but not more than 60 % hydrogen peroxide	L4BV
	2015	Hydrogen peroxide, aqueous solution, stabilized with more than 60 % hydrogen peroxide and not more than 70 % hydrogen peroxide	
	2426	Ammonium nitrate, liquid (hot concentrated solution)	
	3149	Hydrogen peroxide and peroxyacetic acid mixture, stabilized	
	3375	Ammonium nitrate emulsion, suspension or gel, intermediate for blasting explosives, liquid	LGAV
	3375	Ammonium nitrate emulsion, suspension or gel, intermediate for blasting explosives, solid	SGAV
5.2	3109	Organic peroxide, type F, liquid	L4BN
	3119	Organic peroxide, type F, liquid, temperature controlled	
	3110	Organic peroxide, type F, Solid	S4AN
	3120	Organic peroxide, type F, solid, temperature controlled	
6.1	1613	Hydrogen cyanide, aqueous solution	L15DH
	3294	Hydrogen cyanide solution in alcohol	

Class	UN No.	Name and description	Tank code
7 [a]		All substances	special tanks
		Minimum requirement for liquids	L2.65CN
		Minimum requirement for solids	S2.65AN
8	1052	Hydrogen fluoride, anhydrous	L21DH
	1744	Bromine or bromine solution	
	1790	Hydrofluoric acid with more than 85 % hydrogen fluoride	
	1791	Hypochlorite solution	L4BV
	1908	Chlorite solution	

[a] *Notwithstanding the general requirements of this paragraph, tanks used for radioactive material may also be used for the carriage of other goods provided the requirements of 5.1.3.2 are complied with.*

4.3.4.1.4 Tanks designed according to ADR intended for the carriage of liquid wastes complying with the requirements of Chapter 6.10 and equipped with two closures in accordance with 6.10.3.2, shall be assigned to tank code L4AH. If the tanks concerned are equipped for the alternate carriage of liquid and solid substances, they shall be assigned to the combined codes L4AH+S4AH.

4.3.4.2 ***General provisions***

4.3.4.2.1 Where hot substances are loaded, the temperature of the outer surface of the tank or of the thermal insulation shall not exceed 70 °C during carriage.

4.3.4.2.2 The connecting pipes between independent but interconnected tanks of a transport unit shall be empty during carriage. Flexible filling and discharge pipes which are not permanently connected to the tank shall be empty during carriage.

4.3.4.2.3 *(Reserved)*

4.3.5 Special provisions

When they are shown under an entry in Column (13) of Table of A in Chapter 3.2, the following special provisions apply:

TU1 The tanks shall not be handed over for carriage until the substance has solidified completely and been covered by an inert gas. Uncleaned empty tanks which have contained these substances shall be filled with an inert gas.

TU2 The substance shall be covered by an inert gas. Uncleaned empty tanks which have contained these substances shall be filled with an inert gas.

TU3 The inside of the shell and all parts liable to come into contact with the substance shall be kept clean. No lubricant capable of combining dangerously with the substance shall be used for pumps, valves or other devices.

TU4 During carriage, these substances shall be under a layer of inert gas, the gauge pressure of which shall not be less than 50 kPa (0.5 bar).

Uncleaned empty tanks which have contained these substances shall when handed over for carriage be filled with an inert gas at a gauge pressure of at least 50 kPa (0.5 bar).

TU5 *(Reserved)*

TU6 Not authorized for carriage in tanks, tube-vehicles and MEGCs when having a LC_{50} lower than 200 ppm.

TU7 The materials used to ensure leakproofness of the joints or for the maintenance of the closures shall be compatible with the contents.

TU8 An aluminium-alloy tank shall not be used for carriage unless the tank is reserved solely for such carriage and the acetaldehyde is free from acid.

TU9 UN No.1203 petrol (gasoline) with a vapour pressure at 50 °C of more than 110 kPa (1.1 bar) but not above 150 kPa (1.5 bar) may also be carried in tanks designed according to 6.8.2.1.14 (a) and having equipment conforming to 6.8.2.2.6.

NOTE: this special provision only applies to tanks designed according to ADR. Tanks designed according to AS 2809 are not affected by this special provision.

TU10 *(Reserved)*

TU11 During filling, the temperature of this substance shall not exceed 60 °C. A maximum filling temperature of 80 °C is allowed provided that smoulder spots are prevented and that the following conditions are met. After filling, the tanks shall be pressurized (e.g. with compressed air) to check tightness. It shall be ensured that no depressurization takes place during carriage. Before discharge, it shall be checked if pressure in the tanks is still above atmospheric. If this is not the case, an inert gas shall be introduced into the tanks prior to discharge.

TU12 In the event of a change of use, shells and equipment shall be thoroughly cleansed of all residues before and after the carriage of this substance.

TU13 Tanks shall be free from impurities at the time of filling. Service equipment such as valves and external piping shall be emptied after filling or discharging.

TU14 The protective caps of closures shall be locked during carriage.

TU15 Tanks shall not be used for the carriage of foodstuffs, articles of consumption or animal feeds.

TU16 When handed over for carriage, uncleaned empty tanks shall be filled with a protective agent fulfilling one of the following measures:

Protective agent	**Degree of filling of water**	**Additional requirements for carriage at low ambient temperatures**
Nitrogen[a]	–	
Water and nitrogen[a]	–	
Water	not less than 96 % and not more than 98 %	The water shall contain sufficient anti-freeze agent to prevent it from freezing. The anti-freeze agent shall be free from corrosive action and not liable to react with the substance.

[a] *The tank shall be filled with nitrogen in such a way that, even after cooling, the pressure at no time falls below atmospheric pressure. The tank shall be closed in such a way that no leakage of gas occurs.*

TU17 Only to be carried in tube-vehicles or MEGCs the elements of which are composed of receptacles.

TU18 The degree of filling shall remain below the level at which, if the contents were raised to a temperature at which the vapour pressure equalled the opening pressure of the safety valve, the volume of the liquid would reach 95 % of the tank's capacity at that temperature. The provision in 4.3.2.3.4 shall not apply.

TU19 Tanks may be filled to 98 % at the filling temperature and pressure. The provision in 4.3.2.3.4 shall not apply.

TU20 *(Reserved)*

TU21 The substance shall be protected by a protective agent in the following ways:

Protective agent	A layer of water in the tank	Degree of filling of the substance (including water if any) at a temperature of 60° C shall not exceed	Additional requirements for carriage at low ambient temperatures
Nitrogen[a]	–	96 %	–
Water and nitrogen[a]	–	98 %	The water shall contain sufficient anti-freeze agent to prevent it from freezing. The anti-freeze agent shall be free from corrosive action and not liable to react with the substance.
Water	not less than 12 cm	98 %	

[a] *The remaining space of the tank shall be filled with nitrogen in such a way that, even after cooling, the pressure at no time falls below atmospheric pressure. The tank shall be closed in such a way that no leakage of gas occurs.*

TU22 Tanks shall be filled to not more than 90 % of their capacity; for liquids, a space of 5 % shall remain empty when the liquid is at an average temperature of 50 °C.

TU23 The degree of filling shall not exceed 0.93 kg per litre of capacity, if filling is by mass. If filling is by volume, the degree of filling shall not exceed 85 %.

TU24 The degree of filling shall not exceed 0.95 kg per litre of capacity, if filling is by mass. If filling is by volume, the degree of filling shall not exceed 85 %.

TU25 The degree of filling shall not exceed 1.14 kg per litre of capacity, if filling is by mass. If filling is by volume, the degree of filling shall not exceed 85 %.

TU26 The degree of filling shall not exceed 85 %.

TU27 Tanks shall not be filled to more than 98 % of their capacity.

TU28 Tanks shall be filled to not more than 95 % of their capacity at a reference temperature of 15 °C.

TU29 Tanks shall be filled to not more than 97 % of their capacity and the maximum temperature after filling shall not exceed 140 °C.

TU30 Tanks shall be filled as set out in the test report for the type approval of the tank but shall be filled to not more than 90 % of their capacity.

TU31 Tanks shall not be filled to more than 1 kg per litre of capacity.

TU32 Tanks shall not be filled to more than 88 % of their capacity.

TU33 Tanks shall be filled to not less than 88 % and not more than 92 % of their capacity or to 2.86 kg per litre of capacity.

TU34 Tanks shall not be filled to more than 0.84 kg per litre of capacity.

TU35 Empty fixed tanks (tank-vehicles), empty demountable tanks and empty tank-containers, uncleaned, which have contained these substances are not subject to the requirements of this Code if adequate measures have been taken to nullify any hazard.

TU36 The degree of filling according to 4.3.2.2, at the reference temperature of 15 °C, shall not exceed 93 % of the capacity.

TU37 Carriage in tanks is limited to substances containing pathogens which are unlikely to be a serious hazard, and for which, while capable of causing serious infection on exposure, effective treatment and preventive measures are available and the risk of spread of infection is limited (i.e. moderate individual risk and low community risk).

TU38 *(Reserved)*

TU39 The suitability of the substance for carriage in tanks shall be demonstrated. The method to evaluate this suitability shall be approved by the competent authority. One method is test 8(d) in Test Series 8 (see Manual of Tests and Criteria, Part 1, sub-section 18.7).

Substances shall not be allowed to remain in the tank for any period that could result in caking. Appropriate measures shall be taken to avoid accumulation and packing of substances in the tank (e.g. cleaning etc.).

TU40 Only to be carried in tube-vehicles or MEGCs, the elements of which are composed of seamless receptacles.

TU41 (Deleted – ADR tank instruction for UN 0331 not included in this Code)

TU42 Tanks with a shell constructed of aluminium alloy, including those with a protective lining, shall only be used if the pH value of the substance is not less than 5.0 and not more than 8.0.

TU43 An empty uncleaned tank may be offered for carriage after the date of expiry of the last inspection of the lining for a period not to exceed three months beyond this date for the purposes of performing the next inspection of the lining prior to refilling (see special provision TT2 in 6.8.4 (d)).

Tanks used for this transport shall be designed in accordance with ADR, and comply with all Chapter 6.8 special provisions required by ADR (TC5 TE21 TT2 TM3 TM5).

CHAPTER 4.4

USE OF FIBRE-REINFORCED PLASTICS (FRP) TANKS, FIXED TANKS (TANK-VEHICLES), DEMOUNTABLE TANKS, TANK-CONTAINERS AND TANK SWAP BODIES

NOTE: *For portable tanks and UN multiple-element gas containers (MEGCs), see Chapter 4.2; for fixed tanks (tank-vehicles), demountable tanks, tank-containers and tank swap bodies, with shells made of metallic materials, and tube-vehicles and multiple elements gas containers (MEGCs) other than UN MEGCs, see Chapter 4.3; for vacuum operated waste containers, see Chapter 4.5.*

4.4.1 General

The carriage of dangerous substances in fibre-reinforced plastics (FRP) tanks is permitted only when the following conditions are met:

(a) The substance is classified in Class 3, 5.1, 6.1, 6.2, 8 or 9;

(b) The maximum vapour pressure (absolute pressure) at 50 °C of the substance does not exceed 110 kPa (1.1 bar);

(c) The carriage of the substance in metallic tanks is authorized according to 4.3.2.1.1;

(d) The calculation pressure specified for that substance in part 2 of the tank code given in Column (12) of Table A in Chapter 3.2 does not exceed 4 bar (see also 4.3.4.1.1); and

(e) The tank complies with the provisions of Chapter 6.13 applicable for the carriage of the substance.

4.4.2 Operation

4.4.2.1 The provisions of 4.3.2.1.5 to 4.3.2.2.4, 4.3.2.3.3 to 4.3.2.3.6, 4.3.2.4.1, 4.3.2.4.2, 4.3.4.1 and 4.3.4.2 shall apply.

4.4.2.2 The temperature of the substance carried shall not exceed, at the time of filling, the maximum service temperature indicated on the tank plate referred to in 6.13.6.

4.4.2.3 When applicable to carriage in metallic tanks, the special provisions (TU) of 4.3.5 shall also apply, as indicated in Column (13) of Table A in Chapter 3.2.

CHAPTER 4.5

USE OF VACUUM OPERATED WASTE TANKS

NOTE: *For portable tanks and UN multiple-element gas containers (MEGCs), see Chapter 4.2; for fixed tanks (tank-vehicles and tank-wagons), demountable tanks, tank-containers and tank swap bodies, with shells made of metallic materials, and tube-vehicles, tube-wagons and multiple elements gas containers (MEGCs) other than UN MEGCs, see Chapter 4.3; for fibre reinforced plastics tanks, see Chapter 4.4.*

4.5.1 Use

4.5.1.1 Wastes consisting of substances in Classes 3, 4.1, 5.1, 6.1, 6.2, 8 and 9 may be carried in vacuum-operated waste tanks conforming to Chapter 6.10 if their carriage in fixed tanks, demountable tanks, tank-containers or tank swap bodies is permitted according to Chapter 4.3. Wastes consisting of substances assigned to tank code L4BH in Column (12) of Table A of Chapter 3.2 or to another tank code permitted under the hierarchy in 4.3.4.1.2 may be carried in vacuum operated waste tanks with the letter "A" or "B" in part 3 of the tank code, as indicated in No. 9.5 of the vehicle approval certificate conforming to 9.1.3.5.

4.5.1.2 Non waste substances may be carried in vacuum-operated waste tanks under the same conditions as mentioned under 4.5.1.1.

4.5.2 Operation

4.5.2.1 The provisions of Chapter 4.3 except those of 4.3.2.2.4 and 4.3.2.3.3 apply to the carriage in vacuum operated waste tanks and are supplemented by the provisions of 4.5.2.2 to 4.5.2.6 below.

4.5.2.2 For carriage of liquids meeting the flash point criteria of Class 3, vacuum-operated waste tanks shall be filled through filling devices which discharge into the tank at a low level. Measures shall be taken to minimize the production of spray.

4.5.2.3 When discharging flammable liquids with a flash-point below 23 °C by using air pressure, the maximum allowed pressure is 100 kPa (1 bar).

4.5.2.4 The use of tanks fitted with an internal piston operating as a compartment wall is allowed only when the substances on either side of the wall (piston) do not react dangerously with each other (see 4.3.2.3.6).

4.5.2.5 *(Reserved)*

4.5.2.6 When a vacuum pump/exhauster unit which may provide a source of ignition is used to fill or discharge flammable liquids, precautions shall be taken to avoid ignition of the substance or to avoid the propagation of the effects of the ignition outside the tank itself.

CHAPTER 4.6

(Reserved)

CHAPTER 4.7

USE OF MOBILE PROCESSING UNITS (MPUs)

NOTE 1: *For packagings, see Chapter 4.1; for portable tanks, see Chapter 4.2; for fixed tanks (tank vehicles), demountable tanks, tank-containers and tank swap bodies with shells made of metallic materials, see Chapter 4.3; for fibre-reinforced plastics (FRP) tanks, see Chapter 4.4; for vacuum operated waste tanks, see Chapter 4.5.*

NOTE 2: *For requirements concerning construction, equipment, type approval, inspections and tests and marking, see Chapters 6.7, 6.8, 6.9, 6.11, 6.12 and 6.13*

NOTE 3: *Mobile processing units are also known as mobile explosives manufacturing units (MEMUs).*

4.7.1 Use

4.7.1.1 Substances of Classes 3, 5.1, 6.1 and 8 may be carried on MPUs conforming to Chapter 6.12, in portable tanks if their carriage is permitted according to Chapter 4.2; or in fixed tanks, demountable tanks, tank containers or tank swap bodies if their carriage is permitted according to Chapter 4.3; or in fibre-reinforced plastics (FRP) tanks if their carriage is permitted according to Chapter 4.4; or in bulk containers, if their carriage is permitted according to Chapter 7.3.

4.7.1.2 Subject to the approval of the competent authority (see 7.5.5.2.3) explosive substances or articles of Class 1 may be carried in packages, in special compartments conforming to section 6.12.5, if their packaging is permitted according to Chapter 4.1 and their carriage is permitted according to Chapter 7.2 and 7.5.

4.7.2 Operation

4.7.2.1 The following provisions apply for operation of tanks according to Chapter 6.12:

(a) For tanks with a capacity of 1 000 litres or more, the provisions of Chapter 4.2, Chapter 4.3, except 4.3.1.4, 4.3.2.3.1, 4.3.3 and 4.3.4, or Chapter 4.4 apply to the carriage on MPUs, and are supplemented by the provisions of 4.7.2.2, 4.7.2.3 and 4.7.2.4 below.

(b) For tanks with a capacity of less than 1 000 litres, the provisions of Chapter 4.2, Chapter 4.3, except 4.3.1.4, 4.3.2.1, 4.3.2.3.1, 4.3.3 and 4.3.4, or Chapter 4.4 apply to the carriage on MPUs, and are supplemented by the provisions of 4.7.2.2, 4.7.2.3 and 4.7.2.4 below.

4.7.2.2 The thickness of the walls of the shell shall not, throughout its use, fall below the minimum figure prescribed in the appropriate construction requirements.

4.7.2.3 Flexible discharge pipes, whether permanently connected or not, and hoppers shall be empty of mixed or sensitised explosive substances during carriage.

4.7.2.4 When applicable to carriage in tanks, the special provisions (TU) of 4.3.5 shall also apply as indicated in Column (13) of Table A in Chapter 3.2.

4.7.2.5 Operators shall ensure that the locks specified in 9.8.8 are used during carriage.

PART 5

Consignment procedures

CHAPTER 5.1

GENERAL PROVISIONS

5.1.1 Application and general provisions

This Part sets forth the provisions for dangerous goods consignments relative to marking, labelling, and documentation, and, where appropriate, authorization of consignments and advance notifications.

5.1.2 Use of overpacks and segregation devices

5.1.2.1 (a) Unless marks and labels required in Chapter 5.2, except 5.2.1.3 to 5.2.1.6, 5.2.1.7.2 to 5.2.1.7.8 and 5.2.1.10, representative of all dangerous goods in the overpack or segregation device are visible, the overpack or segregation device shall be:

(i) labelled and marked with the UN number and other marks, as required for packages in Chapter 5.2 except 5.2.1.3 to 5.2.1.6, 5.2.1.7.2 to 5.2.1.7.8 and 5.2.1.10, for each item of dangerous goods contained in the overpack or segregation device. Each applicable mark or label only needs to be applied once; and

(ii) a segregation device shall additionally be marked with the words **"SEGREGATION DEVICE"**. The lettering of the words **"SEGREGATION DEVICE"** shall be at least 12 mm high.

Labelling of overpacks containing radioactive material shall be in accordance with 5.2.2.1.11.

(b) Orientation arrows illustrated in 5.2.1.10 shall be displayed on two opposite sides of overpacks containing packages which shall be marked in accordance with 5.2.1.10.1, unless the marks remain visible.

5.1.2.2 Each package of dangerous goods contained in an overpack or segregation device shall comply with all applicable provisions of the Code. The intended function of each package shall not be impaired by the overpack or segregation device.

To ensure an overpack does not impair the function of packages:

(a) it shall be suitably shaped to allow safe stacking where it may occur and be sufficiently strong so as to provide support to loads to be stacked on top of it;

(b) it shall be sufficiently strong to withstand repeated handling;

(c) the materials used to bond the overpack together shall retain their efficiency when exposed to moisture, extremes of temperature and sunlight anticipated to be met in transport; and

(d) If intended to be lifted by mechanical means, it shall be suitable for lifting by fork lift truck or other suitable apparatus. Where they are not apparent, the safe lifting points shall be marked.

5.1.2.3 Each package bearing package orientation marks as prescribed in 5.2.1.10 and which is overpacked or placed in a large packaging or segregation device shall be oriented in accordance with such marks.

5.1.2.4 The prohibitions on mixed loading also apply to these overpacks and segregation devices.

5.1.3 Empty uncleaned packagings (including IBCs and large packagings), tanks, MPUs, vehicles and containers for carriage in bulk

5.1.3.1 Empty uncleaned packagings (including IBCs and large packagings), tanks (including tank-vehicles, battery-vehicles, demountable tanks, portable tanks, tank-containers, MEGCs), MPUs, vehicles and containers for carriage in bulk having contained dangerous goods of the different classes other than Class 7, shall be marked and labelled as if they were full.

NOTE: *For documentation, see Chapter 5.4.*

5.1.3.2 Containers, tanks, IBCs, as well as other packagings and overpacks, used for the carriage of radioactive material shall not be used for the storage or carriage of other goods unless decontaminated below the level of 0.4 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters and 0.04 Bq/cm^2 for all other alpha emitters.

5.1.4 Mixed packing

When two or more dangerous goods are packed within the same outer packaging, the package shall be labelled and marked as required for each substance or article. If the same label is required for different goods, it only needs to be applied once.

5.1.5 General provisions for Class 7

5.1.5.1 *Approval of shipments and notification*

5.1.5.1.1 *General*

In addition to the approval of package designs described in Chapter 6.4, multilateral shipment approval is also required in certain circumstances (5.1.5.1.2 and 5.1.5.1.3). In some circumstances it is also necessary to notify competent authorities of a shipment (5.1.5.1.4).

5.1.5.1.2 *Shipment approvals*

Multilateral approval shall be required for:

(a) the shipment of Type B(M) packages not conforming with the requirements of 6.4.7.5 or designed to allow controlled intermittent venting;

(b) the shipment of Type B(M) packages containing radioactive material with an activity greater than 3 000 A_1 or 3 000 A_2, as appropriate, or 1 000 TBq, whichever is the lower; and

(c) The shipment of packages containing fissile materials if the sum of the criticality safety indexes of the packages in a single vehicle or container exceeds 50;

except that a competent authority may authorize carriage into or through its country without shipment approval, by a specific provision in its design approval (see 5.1.5.2.1).

5.1.5.1.3 *Shipment approval by special arrangement*

A competent authority may approve provisions under which consignments that so not satisfy all the applicable requirements of the Code may be carried under special arrangement (see 1.7.4).

5.1.5.1.4 *Notifications*

Notification to competent authorities is required as follows:

(a) Before the first shipment of any package requiring competent authority approval, the consignor shall ensure that copies of each applicable competent authority certificate applying to that package design have been submitted to the competent authority of the country of origin of the shipment and to the competent authority of each country through or into which the consignment is to be carried. The consignor is not required to await an acknowledgement from the competent authority, nor is the competent authority required to make such acknowledgement of receipt of the certificate;

(b) For each of the following types of shipments:

(i) Type C packages containing radioactive material with an activity greater than 3 000 A_1 or 3 000 A_2, as appropriate, or 1 000 TBq, whichever is the lower;

(ii) Type B(U) packages containing radioactive material with an activity greater than 3 000 A_1 or 3 000 A_2, as appropriate, or 1 000 TBq, whichever is the lower;

(iii) Type B(M) packages;

(iv) Shipment under special arrangement;

The consignor shall notify the competent authority of the country of origin of the shipment and the competent authority of each country through or into which the consignment is to be carried. This notification shall be in the hands of each competent authority prior to the commencement of the shipment, and preferably at least 7 days in advance;

(c) The consignor is not required to send a separate notification if the required information has been included in the application for approval of shipment (see 6.4.23.2);

(d) The consignment notification shall include:

(i) sufficient information to enable the identification of the package or packages including all applicable certificate numbers and identification marks;

(ii) information on the date of shipment, the expected date of arrival and proposed routeing;

(iii) the name(s) of the radioactive material(s) or nuclide(s);

(iv) descriptions of the physical and chemical forms of the radioactive material, or whether it is special form radioactive material or low dispersible radioactive material; and

(v) the maximum activity of the radioactive contents during carriage expressed in becquerels (Bq) with an appropriate SI prefix symbol (see 1.2.2.1). For fissile material, the mass of fissile material (or of each fissile nuclide for mixtures when appropriate) in grams (g), or multiples thereof, may be used in place of activity.

5.1.5.2 ***Certificates issued by the competent authority***

5.1.5.2.1 Certificates issued by the competent authority are required for the following:

(a) Designs for:

(i) special form radioactive material;

(ii) low dispersible radioactive material;

(iii) fissile material excepted under 2.2.7.2.3.5 (f);

(iv) packages containing 0.1 kg or more of uranium hexafluoride;

(v) packages containing fissile material unless excepted by 2.2.7.2.3.5, 6.4.11.2 or 6.4.11.3;

(vi) Type B(U) packages and Type B(M) packages;

(vii) Type C packages;

(b) Special arrangements;

(c) Certain shipments (see 5.1.5.1.2);

(d) Determination of the basic radionuclide values referred to in 2.2.7.2.2.1 for individual radionuclides which are not listed in Table 2.2.7.2.2.1 (see 2.2.7.2.2.2 (a));

(e) Alternative activity limits for an exempt consignment of instruments or articles (see 2.2.7.2.2.2 (b)).

The certificates shall confirm that the applicable requirements are met, and for design approvals shall attribute to the design an identification mark.

The certificates of approval for the package design and the shipment may be combined into a single certificate.

Certificates and applications for these certificates shall be in accordance with the requirements in 6.4.23.

5.1.5.2.2 The consignor shall be in possession of a copy of each applicable certificate.

5.1.5.2.3 For package designs where it is not required that a competent authority issue a certificate of approval, the consignor shall, on request, make available for inspection by the competent authority, documentary evidence of the compliance of the package design with all the applicable requirements.

5.1.5.3 ***Determination of transport index (TI) and criticality safety index (CSI)***

5.1.5.3.1 The transport index (TI) for a package, overpack or container, or for unpackaged LSA-I or SCO-I, shall be the number derived in accordance with the following procedure:

(a) Determine the maximum radiation level in units of millisieverts per hour (mSv/h) at a distance of 1 m from the external surfaces of the package, overpack, container, or unpackaged LSA-I and SCO-I. The value determined shall be multiplied by 100 and the resulting number is the transport index. For uranium and thorium ores and their concentrates, the maximum radiation level at any point 1 m from the external surface of the load may be taken as:

0.4 mSv/h for ores and physical concentrates of uranium and thorium;

0.3 mSv/h for chemical concentrates of thorium;

0.02 mSv/h for chemical concentrates of uranium, other than uranium hexafluoride;

(b) For tanks, containers and unpackaged LSA-I and SCO-I, the value determined in step (a) above shall be multiplied by the appropriate factor from Table 5.1.5.3.1;

(c) The value obtained in steps (a) and (b) above shall be rounded up to the first decimal place (e.g. 1.13 becomes 1.2), except that a value of 0.05 or less may be considered as zero.

Table 5.1.5.3.1: Multiplication factors for tanks, containers and unpackaged LSA-I and SCO-I

Size of load [a]	Multiplication factor
size of load ≤ 1 m^2	1
1 m^2 < size of load ≤ 5 m^2	2
5 m^2 < size of load ≤ 20 m^2	3
20 m^2 < size of load	10

[a] *Largest cross-sectional area of the load being measured.*

5.1.5.3.2 The transport index for each overpack, container or vehicle shall be determined as either the sum of the TIs of all the packages contained, or by direct measurement of radiation level, except in the case of non-rigid overpacks for which the transport index shall be determined only as the sum of the TIs of all the packages.

5.1.5.3.3 The criticality safety index for each overpack or container shall be determined as the sum of the CSIs of all the packages contained. The same procedure shall be followed for determining the total sum of the CSIs in a consignment or aboard a vehicle.

5.1.5.3.4 Packages, overpacks and containers shall be assigned to either category I-WHITE, II-YELLOW or III-YELLOW in accordance with the conditions specified in Table 5.1.5.3.4 and with the following requirements:

(a) For a package, overpack or container, both the transport index and the surface radiation level conditions shall be taken into account in determining which is the appropriate category. Where the transport index satisfies the condition for one category but the surface radiation level satisfies the condition for a different category, the package, overpack or container shall be assigned to the higher category. For this purpose, category I-WHITE shall be regarded as the lowest category;

(b) The transport index shall be determined following the procedures specified in 5.1.5.3.1 and 5.1.5.3.2;

(c) If the surface radiation level is greater than 2 mSv/h, the package or overpack shall be carried under exclusive use and under the provisions of 7.5.11, CV33 (1.3) and (3.5) (a);

(d) A package carried under a special arrangement shall be assigned to category III-YELLOW except under the provisions of 5.1.5.3.5;

(e) An overpack or container which contains packages carried under special arrangement shall be assigned to category III-YELLOW except under the provisions of 5.1.5.3.5.

Table 5.1.5.3.4: Categories of packages, overpacks and containers

Conditions		
Transport index	**Maximum radiation level at any point on external surface**	**Category**
0[a]	Not more than 0.005 mSv/h	I-WHITE
More than 0 but not more than 1[a]	More than 0.005 mSv/h but not more than 0.5 mSv/h	II-YELLOW
More than 1 but not more than 10	More than 0.5 mSv/h but not more than 2 mSv/h	III-YELLOW
More than 10	More than 2 mSv/h but not more than 10 mSv/h	III-YELLOW [b]

[a] *If the measured TI is not greater than 0.05, the value quoted may be zero in accordance with 5.1.5.3.1 (c).*

[b] *Shall also be carried under exclusive use except for containers (see Table D in 7.5.11 CV33 (3.3)).*

5.1.5.3.5 In all cases of international carriage of packages requiring competent authority approval of design or shipment, for which different approval types apply in the different countries concerned by the shipment, the categorization shall be in accordance with the certificate of the country of origin of design.

5.1.5.4 ***Specific provisions for excepted packages of radioactive material of Class 7***

5.1.5.4.1 Excepted packages of radioactive material of Class 7 shall be legibly and durably marked on the outside of the packaging with:

(a) The UN number preceded by the letters "UN";

(b) An identification of either the consignor or consignee, or both; and

(c) The permissible gross mass if this exceeds 50 kg.

5.1.5.4.2 The documentation requirements of Chapter 5.4 do not apply to excepted packages of radioactive material of Class 7, except that:

(a) The UN number preceded by the letters "UN" and the name and address of the consignor and the consignee and, if relevant, the identification mark for each competent authority certificate of approval (see 5.4.1.2.5.1 (g)) shall be shown on a transport document such as a bill of lading, air waybill or CMR or CIM consignment note;

(b) If relevant, the requirements of 5.4.1.2.5.1 (g), 5.4.1.2.5.3 and 5.4.1.2.5.4 shall apply;

(c) The requirements of 5.4.2 and 5.4.4 shall apply.

5.1.5.4.3 The requirements of 5.2.1.7.8 and 5.2.2.1.11.5 shall apply if relevant.

5.1.5.5 ***Summary of approval and prior notification requirements***

NOTE 1: *Before first shipment of any package requiring competent authority approval of the design, the consignor shall ensure that a copy of the approval certificate for that design has been submitted to the competent authority of each country en route (see 5.1.5.1.4 (a)).*

NOTE 2: *Notification required if contents exceed 3×10^3 A_1, or 3×10^3 A_2, or 1 000 TBq; (see 5.1.5.1.4 (b)).*

NOTE 3: *Multilateral approval of shipment required if contents exceed 3×10^3 A_1, or 3×10^3 A_2, or 1 000 TBq, or if controlled intermittent venting is allowed (see 5.1.5.1).*

NOTE 4: *See approval and prior notification provisions for the applicable package for carrying this material.*

Subject	UN Number	Competent Authority approval required		Consignor required to notify the competent authorities of the country of origin and of the countries en route [a] before each shipment	Reference
		Country of origin	Countries en route [a]		
Calculation of unlisted A_1 and A_2 values	-	Yes	Yes	No	2.2.7.2.2.2 (a), 5.1.5.2.1 (d)
Excepted packages	2908, 2909, 2910, 2911				---
- package design		No	No	No	
- shipment		No	No	No	
LSA material [b] and SCO [b] Industrial packages types 1, 2 or 3, non fissile and fissile excepted	2912, 2913, 3321, 3322				---
- package design		No	No	No	
- shipment		No	No	No	
Type A packages [b], non fissile and fissile excepted	2915, 3332				--
- package design		No	No	No	
- shipment		No	No	No	
Type B(U) packages [b], non fissile and fissile excepted	2916				5.1.5.1.4 (b), 5.1.5.2.1 (a), 6.4.22.2
- package design		Yes	No	See Note 1	
- shipment		No	No	See Note 2	
Type B(M) packages [b], non fissile and fissile excepted	2917				5.1.5.1.4 (b), 5.1.5.2.1 (a), 5.1.5.1.2, 6.4.22.3
- package design		Yes	Yes	No	
- shipment		See Note 3	See Note 3	Yes	

[a] *Countries from, through or into which the consignment is carried.*

[b] *If the radioactive contents are fissile material which is not excepted from the provisions for packages containing fissile material, then the provisions for fissile material packages apply (see 6.4.11).*

Subject	UN Number	Competent Authority approval required		Consignor required to notify the competent authorities of the country of origin and of the countries en route [a] before each shipment	Reference
		Country of origin	Countries en route [a]		
Type C packages [b], non fissile and fissile excepted - package design - shipment	3323	 Yes No	 No No	 See Note 1 See Note 2	5.1.5.1.4 (b), 5.1.5.2.1 (a), 6.4.22.2
Packages for fissile material - package design - shipment: - sum of criticality safety indexes not more than 50 - sum of criticality safety indexes greater than 50	2977, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3333	 Yes [c] No [d] Yes	 Yes [c] No [d] Yes	 No See Note 2 See Note 2	5.1.5.2.1 (a), 5.1.5.1.2, 6.4.22.4, 6.4.22.5
Special form radioactive material - design - shipment	 - See Note 4	 Yes See Note 4	 No See Note 4	 No See Note 4	1.6.6.4, 5.1.5.2.1 (a) 6.4.22.5
Low dispersible radioactive material - design - shipment	 - See Note 4	 Yes See Note 4	 No See Note 4	 No See Note 4	5.1.5.2.1 (a), 6.4.22.5
Packages containing 0.1 kg or more of uranium hexafluoride - design - shipment	 - See Note 4	 Yes See Note 4	 No See Note 4	 No See Note 4	5.1.5.2.1 (a), 6.4.22.1
Special Arrangement - shipment	2919, 3331	 Yes	 Yes	 Yes	1.7.4.2, 5.1.5.2.1 (b), 5.1.5.1.4 (b)
Approved packages designs subjected to transitional measures	-	See 1.6.6	See 1.6.6	See Note 1	1.6.6.2, 5.1.5.1.4 (b), 5.1.5.2.1 (a), 5.1.5.1.2, 6.4.22.9
Alternative activity limits for an exempt consignment of instruments or articles	-	Yes	Yes	No	5.1.5.2.1(e), 6.4.22.7
Fissile material excepted in accordance with 2.2.7.2.3.5 (f)	-	Yes	Yes	No	5.1.5.2.1 (a) (iii), 6.4.22.6

[c] *Designs of packages for fissile material may also require approval in respect of one of the other items in the table.*

[d] *Shipments may, however, require approval in respect of one of the other items in the table.*

CHAPTER 5.2

MARKING AND LABELLING

5.2.1 Marking of packages including IBCs

NOTE 1: *For marks related to the construction, testing and approval of packagings, large packagings, gas receptacles and IBCs, see Part 6.*

NOTE 2: *In accordance with the GHS, a GHS pictogram not required by this Code should only appear in carriage as part of a complete GHS label and not independently.*

5.2.1.1 Unless provided otherwise in this Code, the proper shipping name for the dangerous goods as determined in accordance with 3.1.2 and the corresponding UN number, preceded by the letters "UN' and the name and address in Australia of the manufacturer or consignor of the dangerous goods, or their agent shall be clearly and durably marked on each package. The UN number and the letters "UN" shall be at least 12 mm high, except for packages of 30 litres capacity or less or of 30 kg maximum net mass and for cylinders of 60 litres water capacity or less, when they shall be at least 6 mm in height and except for packages of 5 litres or 5 kg or less when they shall be of an appropriate size. In the case of unpackaged articles the mark shall be displayed on the article, on its cradle or on its handling, storage or launching device.

5.2.1.2 All package marks required by this Chapter:

(a) shall be readily visible and legible;

(b) shall be able to withstand open weather exposure without a substantial reduction in effectiveness.

NOTE: *Package marks should be placed on a surface that allows them to be normally visible when stacked together for transport. 5.2.2 further requires that labels are placed next to marks on packages.*

5.2.1.3 Salvage packagings including large salvage packagings and salvage pressure receptacles shall additionally be marked with the word "**SALVAGE**". The lettering of the "**SALVAGE**" mark shall be at least 12 mm high.

5.2.1.4 Intermediate bulk containers of more than 450 litres capacity and large packagings shall be marked on two opposite sides.

5.2.1.5 *(Reserved)*

5.2.1.5 ***Additional provisions for goods of Class 1***

5.2.1.5.1 For goods of Class 1, packages shall, in addition, be clearly marked on the outside surface with:

(a) the authorised name of the explosives in the package;

(b) the word 'EXPLOSIVE' in upper case, unless it is included in the Class label;

(c) means of identifying production details for traceability purposes;

(d) the name and address in Australia of the manufacturer or consignor (or the agent of one of these) of the explosives;

(e) the net explosive quantity of the substance and the number of articles or units (e.g. boosters, plugs, cartridges, etc.) contained within.

NOTE: *the information in (a) and (d) may be omitted where it cannot reasonably practicably be determined, such as when packing waste explosives.*

5.2.1.5.2 Each package containing substances or articles of division 1.1 or 1.5 shall be marked with the date of manufacture from the factory of manufacture.

5.2.1.5.3 *Marking and labelling on inner packagings and articles*

NOTE: *This Code does not typically mandate markings on inner packagings, as this is not considered to be a matter for transport, in line with the principles of the UN Model Regulations. However, the requirements of this section are included here to support the incorporation of the Australian Explosives Code into this Code.*

5.2.1.5.3.1 Every inner packaging containing explosives shall be clearly marked on the outside surface as required by the version of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) adopted by the Model WHS Regulations as published by Safe Work Australia from time to time.

5.2.1.5.3.2 The casing of every detonator of UN 0029, 0030, 0255, 0267, 0360, 0361, 0455, 0456, 0500, 0511, 0512, or 0513 shall be marked with the word 'EXPLOSIVE' in upper case letters.

The marking shall be embossed or otherwise indelibly marked on the casing and be clearly legible. Where a package is of such irregular shape or small size that the words cannot be satisfactorily marked, the words may be attached to the article by a securely affixed tag or other suitable means.

5.2.1.5.3.3 Every wrapping enclosing a cartridge of blasting explosive, or boosters of UN 0042 or 0283, or a charge for blasting or similar purpose, shall be clearly marked on the outside surface with the word 'EXPLOSIVE' in upper case, and where there is sufficient space available, the authorised name.

5.2.1.5.4 *Marking and labelling of intermediate bulk containers*

5.2.1.5.4.1 The marking and labelling for the substance contained shall be in the form of an emergency information panel as set out in 5.3.2 on at least two sides. A panel shall be located either:

(a) above any lifting points intended or used for forklift tines; or

(b) below any lifting points intended for top lifting.

5.2.1.5.4.2 Where an IBC has a capacity of not more than 1500 L, the dimensions of the emergency information panel may have dimensions not less than half those required by 5.3.2.

5.2.1.6 ***Additional provisions for goods of Class 2***

5.2.1.6.1 Refillable receptacles shall bear the following particulars in clearly legible and durable characters:

(a) the UN number and the proper shipping name of the gas or mixture of gases, as determined in accordance with 3.1.2.

In the case of gases classified under an N.O.S. entry, only the technical name[1] of the gas has to be indicated in addition to the UN number.

In the case of mixtures, not more than the two constituents which most predominantly contribute to the hazards have to be indicated;

(b) for compressed gases filled by mass and for liquefied gases, either the maximum filling mass and the tare of the receptacle with fittings and accessories as fitted at the time of filling, or the gross mass;

(c) the date (year) of the next periodic inspection.

[1] *Instead of the technical name the use of one of the following names is permitted:*

- *for UN No. 1078 refrigerant gas, n.o.s: mixture F1, mixture F2, mixture F3;*
- *for UN No. 1060 methylacetylene and propadiene mixtures, stabilized: mixture P1, mixture P2;*
- *for UN No. 1965 hydrocarbon gas mixture, liquefied, n.o.s.: mixture A or butane, mixture A01 or butane, mixture A02 or butane, mixture A0 or butane, mixture A1, mixture B1, mixture B2, mixture B, mixture C or propane;*
- *for UN No. 1010 Butadienes, stabilized: 1,2-Butadiene, stabilized, 1,3-Butadiene, stabilized.*
- *for UN No. 1012 Butylene: 1-butylene, cis-2-butylene, trans-2-butylene, butylene mixture.*

These particulars can either be engraved or indicated on a durable information disk or label attached on the receptacle or indicated by an adherent and clearly visible mark such as by printing or by any equivalent process.

NOTE 1: *See also 6.2.2.7.*

NOTE 2: *For non refillable receptacles, see 6.2.2.8.*

5.2.1.7 ***Special marking provisions for radioactive material***

5.2.1.7.1 Each package shall be legibly and durably marked on the outside of the packaging with an identification of either the consignor or consignee, or both. Each overpack shall be legibly and durably marked on the outside of the overpack with an identification of either the consignor or consignee, or both unless these marks of all packages within the overpack are clearly visible.

5.2.1.7.2 For each package, other than excepted packages, the UN number preceded by the letters "UN" and the proper shipping name shall be legibly and durably marked on the outside of the packaging. The marking of excepted packages shall be as required by 5.1.5.4.1.

5.2.1.7.3 Each package of gross mass exceeding 50 kg shall have its permissible gross mass legibly and durably marked on the outside of the packaging.

5.2.1.7.4 Each package which conforms to:

(a) a Type IP-1 package, a Type IP-2 package or a Type IP-3 package design shall be legibly and durably marked on the outside of the packaging with "TYPE IP-1", "TYPE IP-2" or "TYPE IP-3" as appropriate;

(b) a Type A package design shall be legibly and durably marked on the outside of the packaging with "TYPE A";

(c) a Type IP-2 package, a Type IP-3 package or a Type A package design shall be legibly and durably marked on the outside of the packaging with the distinguishing sign used on vehicles in international road traffic[2] of the country of origin of design and either the name of the manufacturer or other identification of the packaging specified by the competent authority of the country of origin of design.

5.2.1.7.5 Each package which conforms to a design approved under one or more of paragraphs 1.6.6.2.1, 5.1.5.2.1, 6.4.22.1 to 6.4.22.4 and 6.4.23.4 to 6.4.23.7 shall be legibly and durably marked on the outside of the package with the following information:

(a) the identification mark allocated to that design by the competent authority;

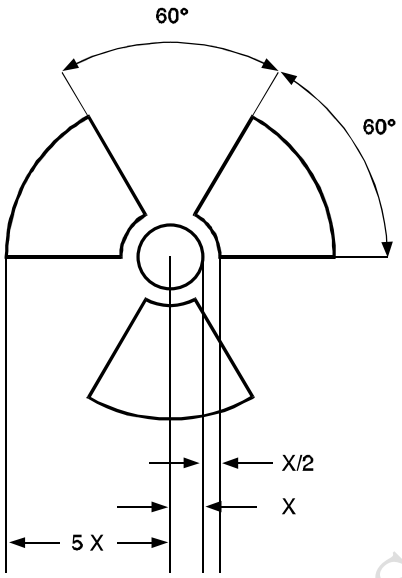
(b) a serial number to uniquely identify each packaging which conforms to that design;

(c) "Type B(U)", "Type B(M)" or "Type C", in the case of a Type B(U), Type B(M) or Type C package design.

5.2.1.7.6 Each package which conforms to a Type B(U), Type B(M) or Type C package design shall have the outside of the outermost receptacle which is resistant to the effects of fire and water plainly marked by embossing, stamping or other means resistant to the effects of fire and water with the trefoil symbol shown in the figure below.

[2] *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*

Basic trefoil symbol with proportions based on a central circle of radius X.
The minimum allowable size of X shall be 4 mm.



5.2.1.7.7 Where LSA-I or SCO-I material is contained in receptacles or wrapping materials and is carried under exclusive use as permitted by 4.1.9.2.4, the outer surface of these receptacles or wrapping materials may bear the mark "RADIOACTIVE LSA-I" or "RADIOACTIVE SCO-I", as appropriate.

5.2.1.7.8 In all cases of international carriage of packages requiring competent authority approval of design or shipment, for which different approval types apply in the different countries concerned by the shipment, marking shall be in accordance with the certificate of the country of origin of the design.

5.2.1.8 ***Special marking provisions for environmentally hazardous substances***

5.2.1.8.1 Packages containing environmentally hazardous substances meeting the criteria of 2.2.9.1.10 shall be durably marked with the environmentally hazardous substance mark shown in 5.2.1.8.3 with the exception of single packagings and combination packagings where such single packagings or inner packagings of such combination packagings have:

- a quantity of 30 *l* or less for liquids; or
- a net mass of 30 kg or less for solids.

5.2.1.8.2 The environmentally hazardous substance mark shall be located adjacent to the marks required by 5.2.1.1. The requirements of 5.2.1.2 and 5.2.1.4 shall be met.

5.2.1.8.3 The environmentally hazardous substance mark shall be as shown in Figure 5.2.1.8.3.

Figure 5.2.1.8.3

Environmentally hazardous substance mark

The mark shall be in the form of a square set at an angle of 45° (diamond-shaped). The symbol (fish and tree) shall be black on white or suitable contrasting background. The minimum dimensions shall be 100 mm x 100 mm and the minimum width of the line forming the diamond shall be 2 mm. If the size of the package so requires, the dimensions/line thickness may be reduced, provided the mark remains clearly visible. Where dimensions are not specified, all features shall be in approximate proportion to those shown.

NOTE: *The labelling provisions of 5.2.2 apply in addition to any requirement for packages to bear the environmentally hazardous substance mark.*

5.2.1.9 ***Lithium battery mark***

5.2.1.9.1 Packages containing lithium cells or batteries prepared in accordance with special provision 188 shall be marked as shown in Figure 5.2.1.9.2.

5.2.1.9.2 The mark shall indicate the UN number preceded by the letters "UN", i.e. ‘UN 3090’ for lithium metal cells or batteries or ‘UN 3480’ for lithium ion cells or batteries. Where the lithium cells or batteries are contained in, or packed with, equipment, the UN number preceded by the letters "UN", i.e. ‘UN 3091’ or ‘UN 3481’ as appropriate shall be indicated. Where a package contains lithium cells or batteries assigned to different UN numbers, all applicable UN numbers shall be indicated on one or more marks.

Figure 5.2.1.9.2

Lithium battery mark* Place for UN number(s)

The mark shall be in the form of a rectangle with hatched edging. The dimensions shall be a minimum of 100 mm wide x 100 mm high and the minimum width of the hatching shall be 5 mm. The symbol (group of batteries, one damaged and emitting flame, above the UN number for lithium ion or lithium metal batteries or cells) shall be black on white or suitable contrasting background. The hatching shall be red. If the size of the package so requires, the dimensions may be reduced to not less than 100 mm wide x 70 mm high. Where dimensions are not specified, all features shall be in approximate proportion to those shown.

5.2.1.10 ***Orientation arrows***

5.2.1.10.1 Except as provided in 5.2.1.10.2:

(a) combination packagings having inner packagings containing liquids;

(b) single packagings fitted with vents;

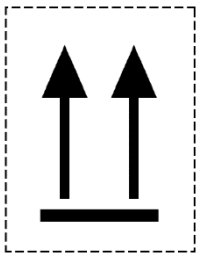
(c) closed or open cryogenic receptacles intended for the carriage of refrigerated liquefied gases; and

(d) machinery or apparatus containing liquid dangerous goods when it is required to ensure the liquid dangerous goods remain in their intended orientation (see special provision 301 of Chapter 3.3);

shall be legibly marked with package orientation arrows which are similar to the illustration shown below or with those meeting the specifications of ISO 780:1997. The orientation arrows shall appear

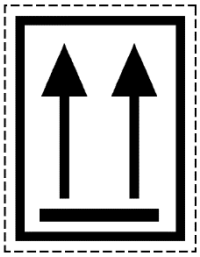
on two opposite vertical sides of the package with the arrows pointing in the correct upright direction. They shall be rectangular and of a size that is clearly visible commensurate with the size of the package. Depicting a rectangular border around the arrows is optional.

Figure 5.2.1.10.1.1



or

Figure 5.2.1.10.1.2



Two black or red arrows on white or suitable contrasting background.
The rectangular border is optional.
All features shall be in approximate proportion to those shown.

5.2.1.10.2 Orientation arrows are not required on:

(a) Outer packagings containing pressure receptacles except closed or open cryogenic receptacles;

(b) Outer packagings containing dangerous goods in inner packagings each containing not more than 120 ml, with sufficient absorbent material between the inner and outer packagings to completely absorb the liquid contents;

(c) Outer packagings containing Class 6.2 infectious substances in primary receptacles each containing not more than 50 ml;

(d) Type IP-2, type IP-3, type A, type B(U), type B(M) or type C packages containing Class 7 radioactive material;

(e) Outer packagings containing articles which are leak-tight in all orientations (e.g. alcohol or mercury in thermometers, aerosols, etc.); or

(f) Outer packagings containing dangerous goods in hermetically sealed inner packagings each containing not more than 500 ml.

5.2.1.10.3 Arrows for purposes other than indicating proper package orientation shall not be displayed on a package marked in accordance with this sub-section.

5.2.1.11 ***Multi-compartment tanks and bulk containers***

A multi-compartment tank or bulk container that contains different types of dangerous goods in different compartments shall display, at each outlet point of each compartment of the tank or container, a mark identifying the dangerous goods contained in that compartment.

5.2.2 Labelling of packages including IBCs

5.2.2.1 *Labelling provisions*

5.2.2.1.1 For each article or substance listed in Table A of Chapter 3.2, the labels shown in Column (5) shall be affixed unless otherwise provided for by a special provision in Column (6).

5.2.2.1.2 Indelible danger marks corresponding exactly to the prescribed models may be used instead of labels.

5.2.2.1.3 to 5.2.2.1.5 *(Reserved)*

5.2.2.1.6 Except as provided in 5.2.2.2.1.2, each label shall:

(a) be affixed to the same surface of the package, if the dimensions of the package allow; for packages of Class1 and 7, near the mark indicating the proper shipping name;

(b) be so placed on the package that it is not covered or obscured by any part or attachment to the packaging or any other label or marks; and

(c) be displayed next to each other when more than one label is required.

Where a package is of such an irregular shape or small size that a label cannot be satisfactorily affixed, the label may be attached to the package by a securely affixed tag or other suitable means.

5.2.2.1.7 Intermediate bulk containers of more than 450 litres capacity and large packagings shall be labelled on two opposite sides.

5.2.2.1.8 *(Reserved)*

5.2.2.1.9 *Special provisions for the labelling of self-reactive substances and organic peroxides*

(a) The label conforming to model No. 4.1 also implies that the product may be flammable and hence no label conforming to model No. 3 is required. In addition, a label conforming to model No. 1 shall be applied for self-reactive substances Type B, unless the competent authority has permitted this label to be dispensed with for a specific packaging because test data have proven that the self-reactive substance in such a packaging does not exhibit explosive behaviour.

(b) The label conforming to model No. 5.2 also implies that the product may be flammable and hence no label conforming to model No. 3 is required. In addition, the following labels shall be applied:

(i) A label conforming to model No. 1 for organic peroxides type B, unless the competent authority has permitted this label to be dispensed with for a specific packaging because test data have proven that the organic peroxide in such a packaging does not exhibit explosive behaviour;

(ii) A label conforming to model No. 8 is required when Packing Group I or II criteria of Class 8 are met.

For self-reactive substances and organic peroxides mentioned by name, the labels to be affixed are indicated in the list found in 2.2.41.4 and 2.2.52.4 respectively.

5.2.2.1.10 *Special provisions for the labelling of infectious substances packages*

In addition to the label conforming to model No. 6.2, infectious substances packages shall bear any other label required by the nature of the contents.

5.2.2.1.11 *Special provisions for the labelling of radioactive material*

5.2.2.1.11.1 Except when enlarged labels are used in accordance with 5.3.1.1.3, each package, overpack and container containing radioactive material shall bear the labels conforming to the applicable models Nos. 7A, 7B or 7C, according to the appropriate category. Labels shall be affixed to two opposite sides on the outside of the package or overpack or on the outside of all four sides of a container or tank. In addition, each package, overpack and container containing fissile material, other than fissile material excepted under the provisions of 2.2.7.2.3.5 shall bear labels conforming to model No.7E; such labels, where applicable, shall be affixed adjacent to the labels conforming to the applicable model Nos. 7A, 7B or 7C.. Labels shall not cover the marks specified in 5.2.1. Any labels which do not relate to the contents shall be removed or covered.

5.2.2.1.11.2 Each label conforming to the applicable model No. 7A, 7B or 7C shall be completed with the following information.

(a) *Contents*:

(i) except for LSA-I material, the name(s) of the radionuclide(s) as taken from Table 2.2.7.2.2.1, using the symbols prescribed therein. For mixtures of radionuclides, the most restrictive nuclides shall be listed to the extent the space on the line permits. The group of LSA or SCO shall be shown following the name(s) of the radionuclide(s). The terms "LSA-II","LSA-III", "SCO-I" and "SCO-II" shall be used for this purpose;

(ii) for LSA-I material, only the term "LSA-I" is necessary; the name of the radionuclide is not necessary;

(b) *Activity*: The maximum activity of the radioactive contents during carriage expressed in becquerels (Bq) with the appropriate SI prefix symbol (see 1.2.2.1). For fissile material, the total mass of fissile nuclides in units of grams (g), or multiples thereof, may be used in place of activity;

(c) For overpacks and containers the "contents" and "activity" entries on the label shall bear the information required in (a) and (b) above, respectively, totalled together for the entire contents of the overpack or container except that on labels for overpacks or containers containing mixed loads of packages containing different radionuclides, such entries may read "See Transport Documents";

(d) *Transport index*: The number determined in accordance with 5.1.5.3.1 and 5.1.5.3.2 (no transport index entry is required for category I-WHITE).

5.2.2.1.11.3 Each label conforming to the model No. 7E shall be completed with the criticality safety index (CSI) as stated in the certificate of approval applicable in the countries through or into which the consignment is carried and issued by the competent authority or as specified in 6.4.11.2 or 6.4.11.3.

5.2.2.1.11.4 For overpacks and containers, the label conforming to model No. 7E shall bear the sum of the criticality safety indexes of all the packages contained therein.

5.2.2.1.11.5 In all cases of international carriage of packages requiring competent authority approval of design or shipment, for which different approval types apply in the different countries concerned by the shipment, labelling shall be in accordance with the certificate of the country of origin of design.

5.2.2.1.12 *Special provisions for the labelling of articles containing dangerous goods carried as UN Nos. 3537, 3538, 3539, 3540, 3541, 3542, 3543, 3544, 3545, 3546, 3547 and 3548*

5.2.2.1.12.1 Packages containing articles or articles carried unpackaged shall bear labels according to 5.2.2.1 reflecting the hazards established according to 2.1.5. If the article contains one or more lithium batteries with, for lithium metal batteries, an aggregate lithium content of 2 g or less, and for lithium ion batteries, a Watt-hour rating of 100 Wh or less, the lithium battery mark (Figure 5.2.5) shall be affixed to the package or unpackaged article. If the article contains one or more lithium batteries with, for lithium metal batteries, an aggregate lithium content of more than 2 g and for lithium ion batteries, a Watt-hour rating of more than 100 Wh, the lithium battery label (5.2.2.2.2 No. 9A) shall be affixed to the package or unpackaged article.

5.2.2.1.12.2 When it is required to ensure articles containing liquid dangerous goods remain in their intended orientation, orientation arrows meeting 5.2.1.10.1 shall be affixed and visible on at least two opposite vertical sides of the package or of the unpackaged article where possible, with the arrows pointing in the correct upright direction.

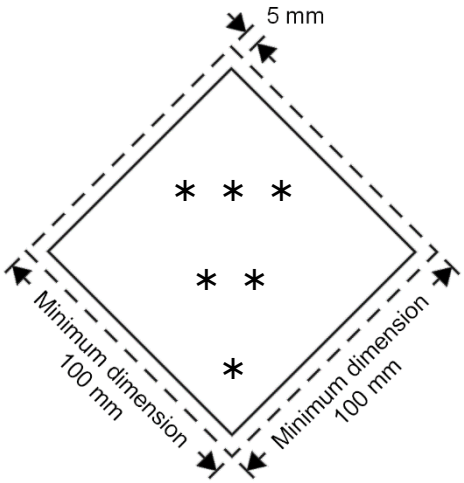
5.2.2.2 ***Provisions for labels***

5.2.2.2.1 Labels shall satisfy the provisions below and conform, in terms of colour, symbols and general format, to the models shown in 5.2.2.2.2. Corresponding models required for other modes of transport, with minor variations which do not affect the obvious meaning of the label, are also acceptable.

***NOTE*:** *Where appropriate, labels in 5.2.2.2.2 are shown with a dotted outer boundary as provided for in 5.2.2.2.1.1. This is not required when the label is applied on a background of contrasting colour.*

5.2.2.2.1.1 Labels shall be configured as shown in Figure 5.2.2.2.1.1.

Figure 5.2.2.2.1.1



Class/division label

* The class or for Classes 4.1, 4.2 and 4.3, the figure "4" or for Classes 6.1 and 6.2, the figure "6", shall be shown in the bottom corner.

** Additional text/numbers/symbol/letters shall (if mandatory) or may (if optional) be shown in this bottom half.

*** The class symbol or, for divisions 1.4, 1.5 and 1.6, the division number and for Model No 7E the word "FISSILE" shall be shown in this top half.

5.2.2.2.1.1.1 Labels shall be displayed on a background of contrasting colour, or shall have either a dotted or solid outer boundary line.

5.2.2.2.1.1.2 The label shall be in the form of a square set at an angle of 45° (diamond-shaped). The minimum dimensions shall be 100 mm x 100 mm. There shall be a line inside the edge forming the diamond which shall be parallel and approximately 5 mm from the outside of that line to the edge of the label. The line inside the edge on the upper half of the label shall be the same colour as the symbol and the line inside the edge on the lower half of the label shall be the same colour as the class or division number in the bottom corner. Where dimensions are not specified, all features shall be in approximate proportion to those shown.

5.2.2.2.1.1.3 If the size of the package so requires the dimensions may be reduced proportionally, provided the symbols and other elements of the label remain clearly visible. Dimensions for cylinders shall comply with 5.2.2.2.1.2.

5.2.2.2.1.2 Cylinders for Class 2 may, on account of their shape, orientation and securing mechanisms for carriage, bear labels representative of those specified in this section and the environmentally hazardous substance mark when appropriate, which have been reduced in size, according to the dimensions outlined in ISO 7225:2005, *"Gas cylinders - Precautionary labels"*, for display on the non-cylindrical part (shoulder) of such cylinders.

NOTE: *When the diameter of the cylinder is too small to permit the display of the reduced size labels on the non-cylindrical upper part of the cylinder, the reduced sized labels may be displayed on the cylindrical part.*

Notwithstanding the provisions of 5.2.2.1.6, labels and the environmentally hazardous substance mark (see 5.2.1.8.3) may overlap to the extent provided for by ISO 7225:2005. However, in all cases, the primary hazard label and the figures appearing on any label shall remain fully visible and the symbols recognizable.

Empty uncleaned pressure receptacles for gases of Class 2 may be carried with obsolete or damaged labels for the purposes of refilling or inspection as appropriate and the application of a new label in conformity with current regulations or for the disposal of the pressure receptacle.

5.2.2.2.1.3 With the exception of labels for Divisions 1.4, 1.5 and 1.6 of Class 1, the upper half of the label shall contain the pictorial symbol and the lower half shall contain:

(a) For Classes 1, 2, 3, 5.1, 5.2, 7, 8 and 9, the class number;

(b) For Classes 4.1, 4.2 and 4.3, the figure "4";

(c) For Classes 6.1 and 6.2, the figure "6".

However for label model No. 9A, the upper half of the label shall only contain the seven vertical stripes of the symbol and the lower half shall contain the group of batteries of the symbol and the class number.

Except for label model No. 9A, the labels may include text such as the UN number or words describing the hazard (e.g. "flammable") in accordance with 5.2.2.2.1.5 provided the text does not obscure or detract from the other required label elements.

5.2.2.2.1.4 In addition, except for Divisions 1.4, 1.5 and 1.6, labels for Class 1 shall show in the lower half, above the class number, the division number and the compatibility group letter for the substance or article. Labels for Divisions 1.4, 1.5 and 1.6 shall show in the upper half the division number, and in the lower half the class number and the compatibility group letter.

5.2.2.2.1.5 On labels other than those for material of Class 7, the optional insertion of any text (other than the class number) in the space below the symbol shall be confined to particulars indicating the nature of the hazard and precautions to be taken in handling.

***Note**: The insertion of text on labels for use in Australia is strongly encouraged.*

5.2.2.2.1.6 The symbols, text and numbers shall be clearly legible and indelible and shall be shown in black on all labels except for:

(a) The Class 8 label, where the text (if any) and class number shall appear in white;

(b) Labels with entirely green, red or blue backgrounds where they may be shown in white;

(c) The Class 5.2 label, where the symbol may be shown in white; and

(d) Labels conforming to model No. 2.1 displayed on cylinders and gas cartridges for liquefied petroleum gases, where they may be shown in the background colour of the receptacle if adequate contrast is provided.

5.2.2.2.1.7 All labels shall be able to withstand open weather exposure without a substantial reduction in effectiveness.

5.2.2.2.2 *Specimen labels*

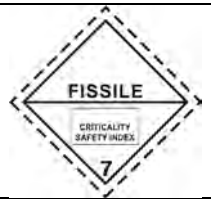
Label model No.	Division or Category	Symbol and symbol colour	Background	Figure in bottom corner (and figure colour)	Specimen labels	Note
Class 1 hazard: Explosive substances or articles						
1	Divisions 1.1, 1.2, 1.3	Exploding bomb: black	Orange	1 (black)		** Place for division – to be left blank if explosive is the subsidiary hazard * Place for compatibility group – to be left blank if explosive is the subsidiary hazard
1.4	Division 1.4	1.4: black Numerals shall be about 30 mm in height and be about 5 mm thick (for a label measuring 100 mm × 100 mm)	Orange	1 (black)		* Place for compatibility group
1.5	Division 1.5	1.5: black Numerals shall be about 30 mm in height and be about 5 mm thick (for a label measuring 100 mm × 100 mm)	Orange	1 (black)		
1.6	Division 1.6	1.6: black Numerals shall be about 30 mm in height and be about 5 mm thick (for a label measuring 100 mm × 100 mm)	Orange	1 (black)		

Label model No.	Division or Category	Symbol and symbol colour	Background	Figure in bottom corner (and figure colour)	Specimen labels	Note
Class 2 hazard: Gases						
2.1	Flammable gases	Flame: black or white (except as provided for in 5.2.2.2.1.6 d))	Red	2 (black or white) (except as provided for in 5.2.2.2.1.6 d))		-
2.2	Non-flammable, non-toxic gases	Gas cylinder: black or white	Green	2 (black or white)		-
2.3	Toxic gases	Skull and crossbones: black	White	2 (black)		-
2.5	Oxidising gases		Yellow	2 (black)		- Label model No. 2.5 is valid only for land transport within Australia. - Hazard description on label may alternatively read 'OXIDISING GAS'
Class 3 hazard: Flammable liquids						

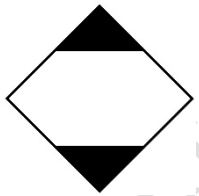
Label model No.	Division or Category	Symbol and symbol colour	Background	Figure in bottom corner (and figure colour)	Specimen labels	Note
3	-	Flame: black or white	Red	3 (black or white)		-

Label model No.	Division or Category	Symbol and symbol colour	Background	Figure in bottom corner (and figure colour)	Specimen labels	Note
Class 4.1 hazard: Flammable solids, self-reactive substances, polymerizing substances and solid desensitized explosives						
4.1	-	Flame: black	White with 7 vertical red stripes	4 (black)		-
Class 4.2 hazard: Substances liable to spontaneous combustion						
4.2	-	Flame: black	Upper half white, lower half red	4 (black)		-
Class 4.3 hazard: Substances which, in contact with water emit flammable gases						
4.3	-	Flame: black or white	Blue	4 (black or white)		-
Class 5.1 hazard: Oxidizing substances						
5.1	-	Flame over circle: black	Yellow	5.1 (black)		-
Class 5.2 hazard: Organic peroxides						

Label model No.	Division or Category	Symbol and symbol colour	Background	Figure in bottom corner (and figure colour)	Specimen labels	Note
5.2	-	Flame: black or white	Upper half red, lower half yellow	5.2 (black)		-
Class 6.1 hazard: Toxic substances						
6.1	-	Skull and crossbones: black	White	6 (black)		-
Class 6.2 hazard: Infectious substances						
6.2	-	Three crescents superimposed on a circle: black	White	6 (black)		The lower half of the label may bear the inscriptions: "INFECTIOUS SUBSTANCE" and "In the case of damage or leakage immediately notify Public Health Authority" in black colour

Label model No.	Division or Category	Symbol and symbol colour	Background	Figure in bottom corner (and figure colour)	Specimen labels	Note
Class 7 hazard: Radioactive material						
7A	Category I – WHITE	Trefoil: black	White	7 (black)		Text (mandatory), black in lower half of label: “RADIOACTIVE” “CONTENTS ...” “ACTIVITY ...” One red vertical bar shall follow the word: “RADIOACTIVE”
7B	Category II – YELLOW	Trefoil: black	Upper half yellow with white border, lower half white	7 (black)		Text (mandatory), black in lower half of label: “RADIOACTIVE” “CONTENTS ...” “ACTIVITY ...” In a black outlined box: “TRANSPORT INDEX”; Two red vertical bars shall follow the word: “RADIOACTIVE”
7C	Category III – YELLOW	Trefoil: black	Upper half yellow with white border, lower half white	7 (black)		Text (mandatory), black in lower half of label: “RADIOACTIVE” “CONTENTS ...” “ACTIVITY ...” In a black outlined box: “TRANSPORT INDEX”. Three red vertical bars shall follow the word: “RADIOACTIVE”
7E	Fissile material	-	White	7 (black)		Text (mandatory): black in upper half of label: “FISSILE”; In a black outlined box in the lower half of label: “CRITICALITY SAFETY INDEX”

Label model No.	Division or Category	Symbol and symbol colour	Background	Figure in bottom corner (and figure colour)	Specimen labels	Note
Class 8 hazard: Corrosive substances						
8	-	Liquids, spilling from two glass vessels and attacking a hand and a metal: black	Upper half white, lower half black with white border	8 (white)		-
Class 9 hazard: Miscellaneous dangerous substances and articles						
9	-	7 vertical stripes in upper half: black	White	9 underlined (black)		-
9A	-	7 vertical stripes in upper half: black; battery group, one broken and emitting flame in lower half: black	White	9 underlined (black)		-
Other						
10	Mixed Class (placard)	4 horizontal stripes: black	Orange			Permitted for use only as a Placard on cargo transport units carrying more than one class of dangerous goods. Valid only for road or rail transport within Australia.

Label model No.	Division or Category	Symbol and symbol colour	Background	Figure in bottom corner (and figure colour)	Specimen labels	Note
11	LQ Mark	2 triangles on top and bottom of the diamond: black	White			Permitted for use only on packages that meet the relevant requirements of Chapter 3.4

CHAPTER 5.3

PLACARDING AND MARKING OF CONTAINERS, BULK CONTAINERS, MEGCs, MPUs, TANK-CONTAINERS, PORTABLE TANKS, VEHICLES AND WAGONS

NOTE 1: *For marking and placarding of containers, bulk containers, MEGCs, tank-containers and portable tanks for carriage in a transport chain including a maritime journey, see also 1.1.4.2.1. If the provisions of 1.1.4.2.1 (c) are applied, only 5.3.1.3 and 5.3.2.1.1 of this Chapter are applicable.*

NOTE 2: *For placarding purposes, a pressure receptacle with an individual capacity more than 0.45 m^3 (450 L) is considered a tank-container.*

NOTE 3: *In accordance with the GHS, a GHS pictogram not required by this Code should only appear in carriage as part of a complete GHS label and not independently.*

5.3.1 Placarding

5.3.1.1 *General provisions*

5.3.1.1.1 As and when required in this section, placards shall be affixed to the exterior surface of containers, bulk containers, MEGCs, MPUs, tank-containers, portable tanks, vehicles and wagons. Placards shall correspond to the labels required in Column (5) and, where appropriate, Column (6) of Table A of Chapter 3.2 for the dangerous goods contained in the container, bulk containers, MEGC, MPU, tank-container, portable tank, vehicle or wagon and shall conform to the specifications given in 5.3.1.7. Placards shall be displayed on a background of contrasting colour, or shall have either a dotted or solid outer boundary line. The placards shall be weather-resistant and shall ensure durable marking throughout the entire journey.

5.3.1.1.2 For Class 1, compatibility groups shall not be indicated on placards if the vehicle, wagon, container or special compartments of MPUs are carrying substances or articles belonging to two or more compatibility groups. Vehicles, wagons, containers or special compartments of MPUs carrying substances or articles of different divisions shall bear only placards conforming to the model of the division of the load determined in accordance with 1.18.

Placards [for class 1] shall be reflective, meeting the specifications of Class 100 reflectivity according to AS/NZS 1906.1:2017.

5.3.1.1.3 For Class 7, the primary hazard placard shall conform to model No. 7D as specified in 5.3.1.7.2. This placard is not required for vehicles, wagons or containers carrying excepted packages and for small containers.

Where both Class 7 labels and placards would be required to be affixed to vehicles, wagons, containers, MEGCs, tank-containers or portable tanks, an enlarged label corresponding to the required label of model No. 7A, 7B or 7C may be displayed instead of placard No.7D to serve both purposes. In that case, the dimensions shall be not less than 250 mm by 250 mm.

5.3.1.1.4 For Class 9 the placard shall correspond to the label model No. 9 as in 5.2.2.2.2; label model No. 9A shall not be used for placarding purposes.

5.3.1.1.5 Containers, MEGCs, MPUs, tank-containers, portable tanks, vehicles or wagons containing goods of more than one class need not bear a subsidiary hazard placard if the hazard represented by that placard is already indicated by a primary or subsidiary hazard placard.

5.3.1.1.5.1 Where a vehicle or wagon is required to be placarded with placards representing more than one class, other than class 1 or class 7, a mixed-class placard conforming to Model No, 10 may be used. The use of a mixed-class placard is not permitted when a placard representing a single class can be used, or to represent that dangerous goods of class 1 or class 7 are loaded on the vehicle or wagon.

NOTE*: The use of the mixed class label as a placard is valid only in Australia, for road or rail transport, for the transport of dangerous goods other than class 1 or class 7.*

5.3.1.1.6 Placards which do not relate to the dangerous goods being carried, or residues thereof, shall be removed or covered. Containers, MEGCs, MPUs, tank-containers, portable tanks or vehicles free from dangerous goods shall not be placarded.

5.3.1.1.7 When the placarding is affixed to folding panels, they shall be designed and secured so that they cannot unfold or come loose from the holder during carriage (especially as a result of impacts or unintentional actions).

5.3.1.2 ***Placarding of containers, bulk containers, MEGCs, tank-containers and portable tanks***

5.3.1.2.1 The placards shall be affixed to both sides and at each end of the container, bulk container, MEGC, tank-container or portable tank and to two opposite sides in the case of flexible bulk containers. Where an emergency information panel is required by 5.3.2, placards required on the sides and rear shall be incorporated into the emergency information panel.

5.3.1.2.2 When the tank-container or portable tank has multiple compartments and carries two or more dangerous goods, the appropriate placards shall be displayed along each side at the position of the relevant compartments and one placard of each model shown on each side at both ends. If all compartments have to bear the same placards, these placards need to be displayed only once along each side and at both ends of the tank container or portable tank.

5.3.1.2.3 When the tank container or portable tank has multiple compartments and carries two or more dangerous goods and is placarded in conformance with 5.3.2.1.3 or 5.3.2.1.4, the placards prescribed in 5.3.1.2.2 need be displayed only once along each side and at both ends of the tank container or portable tank.

5.3.1.3 ***Placarding of vehicles or wagons carrying containers, bulk containers, MEGCs, tank-containers or portable tanks***

5.3.1.3.1 If the placards affixed to the containers, bulk containers, MEGCs, tank-containers or portable tanks are not visible from outside the carrying wagons, the same placards shall also be affixed to both sides of the wagon. Otherwise, no placard need be affixed on the carrying wagon.

5.3.1.3.2 If the placards affixed to the containers, bulk containers, MEGCs, tank-containers or portable tanks are not visible from outside the carrying vehicles, the same placards shall also be affixed to both sides and the front and rear of the vehicle. Otherwise, a placard need be affixed only on the front of the carrying vehicle.

5.3.1.4 ***Placarding of vehicles or wagons for carriage in bulk, tank wagons, tank-vehicles, tube-wagons, tube-vehicles, MPUs and vehicles or wagons with demountable tanks***

5.3.1.4.1 Placards shall be affixed to both sides and at the front and rear of the vehicle or to both sides of the wagon. Placards required on the sides and rear shall be incorporated into an emergency information panel complying with 5.3.2.

5.3.1.4.2 When the tank-vehicle, tank-wagon or the demountable tank carried on the vehicle or wagon has multiple compartments and carries two or more dangerous goods, the appropriate placards shall be displayed along each side at the position of the relevant compartments and one placard of each model shown on each side is required to be displayed at the rear of the vehicle. If all compartments have to bear the same placards, these placards need be displayed only once along each side and at the front and rear of the vehicle.

Where more than one placard is required for the same compartment, these placards shall be displayed adjacent to each other.

5.3.1.4.3 When the tank-vehicle, tank-wagon or the demountable tank carried on the vehicle or wagon has multiple compartments and carries two or more dangerous goods carries two or more dangerous goods and is placarded in conformance with 5.3.2.1.3 or 5.3.2.1.4, the placards prescribed in 5.3.1.4.2 need be displayed only once along each side and at both ends of the tank container or portable tank.

5.3.1.4.2 MPUs with tanks and bulk containers shall be placarded in accordance with 5.3.1.4.1 for the substances contained therein. For tanks with a capacity of less than 1 000 litres placards may be replaced by labels conforming to 5.2.2.2.

5.3.1.4.3 For MPUs carrying packages containing substances or articles of Class 1 (other than of Division 1.4, Compatibility group S), placards shall be affixed to both sides and at the rear of the MPU.

Special compartments for explosives shall be placarded in accordance with the provisions of 5.3.1.1.2. The last sentence of 5.3.1.1.2 does not apply.

5.3.1.5 ***Placarding of vehicles and wagons carrying packages only***

5.3.1.5.1 For vehicles carrying packages containing substances or articles (other than Class 1, Division 1.4, compatibility group S, or Class 7, excepted packages), placards shall be affixed to both sides and at the front and rear of the vehicle.

5.3.1.5.2 For combination vehicles, placards shall also be affixed to the front and rear of the vehicle and to both sides of each transport unit.

5.3.1.5.3 For wagons carrying packages containing substances or articles (other than Class 1, Division 1.4, compatibility group S, or Class 7, excepted packages), placards shall be affixed to both sides of the wagon.

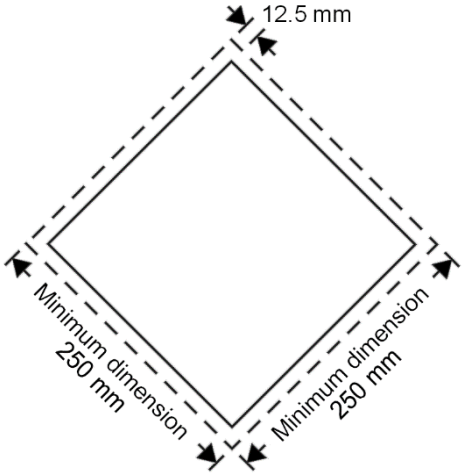
5.3.1.6 ***Placarding of empty tank-wagons, tank-vehicles, tube-wagons, tube-vehicles, MEGCs, MPUs, tank-containers, portable tanks and empty vehicles, wagons and containers for carriage in bulk***

5.3.1.6.1 Empty vehicles, tank-vehicles, tank-wagons, vehicles or wagons with demountable tanks, battery-vehicles, tube wagons, MEGCs, MPUs, tank-containers and portable tanks uncleaned and not degassed, and empty vehicles, wagons and containers for carriage in bulk, uncleaned, shall continue to display the placards required for the previous load.

5.3.1.7 ***Specifications for placards***

5.3.1.7.1 Except as provided in 5.3.1.7.2 for the Class 7 placard, and in 5.3.6.2 for the environmentally hazardous substance mark, a placard shall be configured as shown in Figure 5.3.1.7.1.

Figure 5.3.1.7.1



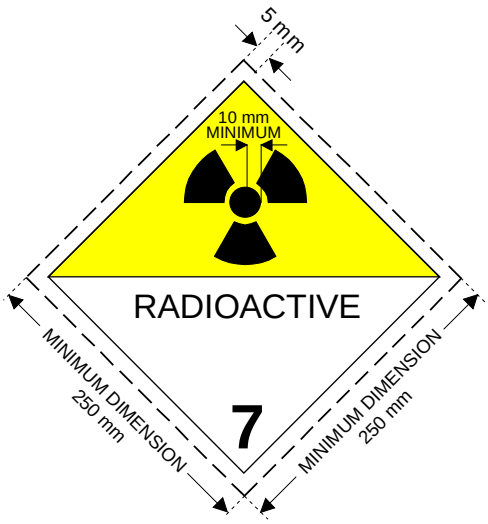
Placard (except for Class 7)

The placard shall be in the form of a square set at an angle of 45° (diamond-shaped). The minimum dimensions shall be 250 mm x 250 mm (to the edge of the placard). The line inside the edge shall be parallel and 12.5 mm from the outside of that line to the edge of the placard. The symbol and line inside the edge shall correspond in colour to the label for the class or division of the dangerous goods in question. The class or division symbol/numeral shall be positioned and sized in proportion to those prescribed in 5.2.2.2 for the corresponding class or division of the dangerous goods in question. The placard shall display the number of the class or division (and for goods in Class 1, the compatibility group letter) of the dangerous goods in question in the manner prescribed in 5.2.2.2 for the corresponding label, in digits not less than 25 mm high. Where dimensions are not specified, all features

shall be in approximate proportion to those shown. The deviations specified in 5.2.2.2.1, second sentence, 5.2.2.2.1.3, third sentence and 5.2.2.2.1.5 for danger labels also apply to placards. Where all dangerous goods in the vehicle are packed in limited quantities, the placard shall correspond to the LQ label (Model No. 11). Where more than one class placard is required, the Mixed-Class placard (Model No. 10) may be used. The use of a mixed-class placard is not permitted when a placard representing a single class can be used.

5.3.1.7.2 The Class 7 placard shall be not less than 250 mm by 250 mm with a black line running 5 mm inside the edge and parallel with it and is otherwise as shown below (Model No. 7D). The number "7" shall not be less than 25 mm high. The background colour of the upper half of the placard shall be yellow and of the lower half white, the colour of the trefoil and the printing shall be black. The use of the word "RADIOACTIVE" in the bottom half is optional to allow the use of this placard to display the appropriate UN number for the consignment.

Placard for radioactive material of Class 7



(No.7D)
Symbol (trefoil): black; Background: upper half yellow with white border, lower half white;
The lower half shall show the word "RADIOACTIVE" or alternatively, the appropriate UN Number, and the figure "7" in the bottom corner.

5.3.2 Emergency Information Panels

5.3.2.1 *General emergency information panel provisions*

5.3.2.1.1 An emergency information panel shall be displayed on the sides and rear of each:

(a) bulk container, MEGC, tank container, portable tank, tube-vehicle, tube-wagon, MPUs, tank vehicle and tank-wagon,

(b) transport unit and wagon carrying bulk containers, tanks or IBCs;

(c) vehicle or wagon transporting a load determined to be Explosives Category 3 determined in accordance with 1.1.8.

Emergency information panels are not required to be displayed on the rear of wagons.

5.3.2.1.1.1 Emergency information panels shall be securely fixed to the unit, be weather-resistant and the marking shall be durable throughout the entire journey.

5.3.2.1.1.2 Emergency information panels shall be mounted or displayed such they are:

(a) clearly visible;

(b) on a substantially vertical plane;

(c) no less than 450 mm above the ground, measured to the lower edge; and

(d) placed as close to the front of the load area as practicable, except when on a bulk container, MEGC, tank container, portable tank.

5.3.2.1.1.3 Tanks, tank vehicles or tube-vehicles having more than one compartment carrying dangerous goods may display an emergency information panel on each tank compartment or each element of tube-vehicles.

5.3.2.1.1.4 For MPUs these requirements shall only apply to tanks ~~with a capacity of 1 000 litres or more~~ and bulk containers.

5.3.2.1.1.5 Emergency information panels are not required to be displayed on the rear of a vehicle within a combination, other than the final vehicle within the combination.

5.3.2.1.2 An emergency information panel shall conform to the specifications in 5.3.2.2 and, except where 5.3.2.1.3 or 5.3.2.1.4 apply, shall include for the dangerous goods being transported:

(a) in space (a)
- the proper shipping name for the dangerous goods being transported; except that where the proper shipping name includes the expression 'N.O.S.', that expression and the names of substances which contribute to the hazard of the goods may be omitted.

(b) in space (b)
- the UN number for the dangerous goods

(c) in space (c)
- the Emergency Action Code assigned to the dangerous goods in Appendix C Emergency Action Codes

(d) in space (d)
- the expression: "IN EMERGENCY DIAL 000, POLICE or FIRE BRIGADE"

(e) in space (e)
- the placard(s) required in 5.3.1.1

(f) In space (f)
- The name of an organisation and telephone number where specialist advice concerning the dangerous goods in question can be obtained in English at any time during carriage.

5.3.2.1.3 For multi compartment tank-vehicles, multi compartment tank-wagons or transport units or wagons having more than one tank carrying Class 3 Flammable liquids, with or without a combustible liquid with a flashpoint >60° C but < 93° C and meeting the criteria for UN 3082, with no other dangerous substance, the emergency information panel prescribed in 5.3.2.1.1 and 5.3.2.1.2 shall bear the

emergency action code and the UN number, proper shipping name and placard(s) prescribed for the substance with the lowest flash-point. The Emergency Action Code for the load shall be the highest calculated for all substances in the load.

5.3.2.1.4 For tank-vehicles, tank-wagons, transport units or wagons having more than one type of dangerous goods in tanks or IBCs and not meeting 5.3.2.1.3, the emergency information panel prescribed in 5.3.2.1.1 and 5.3.2.1.2 shall conform to the following:

(a) in space (a)
- nothing, the space shall be left blank

(b) in space (b)
- the expression 'MULTI-LOAD'

(c) in space (c)
- the multi-load Emergency Action Code ascertained in accordance with Appendix C Emergency Action Codes for the combination of the dangerous goods being transported in the tank-vehicle or transport unit

(d) in space (d)
- the expression: "IN EMERGENCY DIAL 000, POLICE or FIRE BRIGADE"

(e) in space (e)
- the placard(s) required in 5.3.1.1

(f) In space (f)
- The name of an organisation and telephone number where specialist advice concerning the dangerous goods in question can be obtained in English at any time during carriage

5.3.2.1.5 Vehicles, wagons, containers and bulk containers carrying unpackaged solids or articles or packaged radioactive material with a single UN number required to be carried under exclusive use and no other dangerous goods shall in addition display on the sides of each vehicle, container or bulk container, clearly visible and substantially vertical, emergency information panels identical with those prescribed in 5.3.2.1.1. These emergency information panels shall bear the emergency action code and the UN number prescribed respectively in Appendix C Emergency Action Codes and Column (1) of table A of Chapter 3.2 for each of the substances carried in bulk in the vehicle, in the container or in the bulk container or for the packaged radioactive material when required to be carried under exclusive use in the vehicle or in the container.

5.3.2.1.6 If the emergency information panels prescribed in 5.3.2.1.1 and 5.3.2.1.5 affixed to the containers, bulk containers, tank containers, MEGCs or portable tanks are not clearly visible from outside the carrying vehicle, the same emergency information panels shall also be affixed to both sides and the rear of the vehicle and to both sides of the wagon.

5.3.2.1.7 The requirements of 5.3.2.1.1 to 5.3.2.1.6 are also applicable to empty fixed or demountable tanks, tube trailers, tube-wagons, tank-containers, portable tanks and MEGCs, uncleaned, not degassed or not decontaminated, MPUs, uncleaned as well as to empty vehicles, wagons and containers for carriage in bulk, uncleaned or not decontaminated.

5.3.2.1.8 Emergency information panels which do not relate to dangerous goods carried, or residues thereof, shall be removed or covered. Where folding panels are used, they must be secured so that they remain latched in the event of an incident.

5.3.2.1.9 *Emergency information panels for the transport of class 1*

Where the load includes substances and articles of class 1 with more than one proper shipping name:

(a) space (a) in the emergency information panel shall read "EXPLOSIVES"; and

(b) space (b) in the emergency information panel shall be left blank.

5.3.2.2 ***Specifications for emergency information panels***

5.3.2.2.1 The emergency information panels shall be of 80 cm base and of 60 cm high; they shall have a black border of 10 mm wide. The material used shall be weather-resistant and ensure durable marking. The panel shall not become detached from its mount in the event of 15 minutes' engulfment in fire. It shall

remain affixed irrespective of the orientation of the vehicle or wagon. The emergency information panels may be separated in their middle with a black horizontal line of 15 mm thickness.

If, because of an obstruction on the tank, tank-vehicle, tank-wagon, tube-trailer, tube-wagon, wagon or transport unit, it is not reasonably practicable to affix an emergency information panel as a whole, the panel may be divided vertically into two parts and affixed on either side of the obstruction.

For containers carrying dangerous solid substances in bulk and for tank-containers, MEGCs and portable tanks, the panels prescribed in 5.3.2.1.2, 5.3.2.1.4 and 5.3.2.1.5 may be replaced by a self-adhesive sheet, by paint or by any other equivalent process. This alternative marking shall conform to the specifications set in this sub-section except for the provisions concerning resistance to fire.

5.3.2.2.2 The emergency action code and the UN number shall consist of black digits 100 mm high and of 15 mm stroke thickness. Interchangeable numbers and letters on panels presenting the emergency action code and the UN number shall remain in place during carriage and irrespective of the orientation of the vehicle. The placement and dimensions of all other aspects shall be as specified in 5.3.2.2.3. All markings shall be durable and legible.

5.3.2.2.3 *Examples of Emergency Information Panels*

Figure 5.3.2.2.3 (a): Format and Colour of Emergency Information Panel

Background white.
Border and horizontal line, black, thickness as specified in Figure 5.3.2.2.3 (a)
UN number and emergency action code, black, 15 mm thickness.
Proper shipping name, black, 15 mm thickness (this may be reduced to 10 mm if displayed on two lines)
Label(s) as specified in 5.3.1.1
All measurements in millimetres

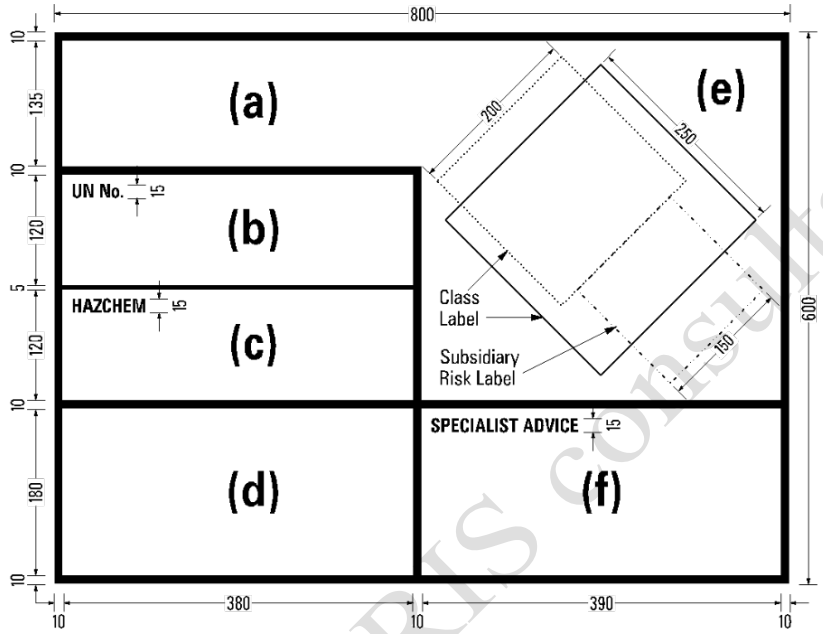


Figure 5.3.2.2.3 (b): Example of Completed Emergency Information Panel

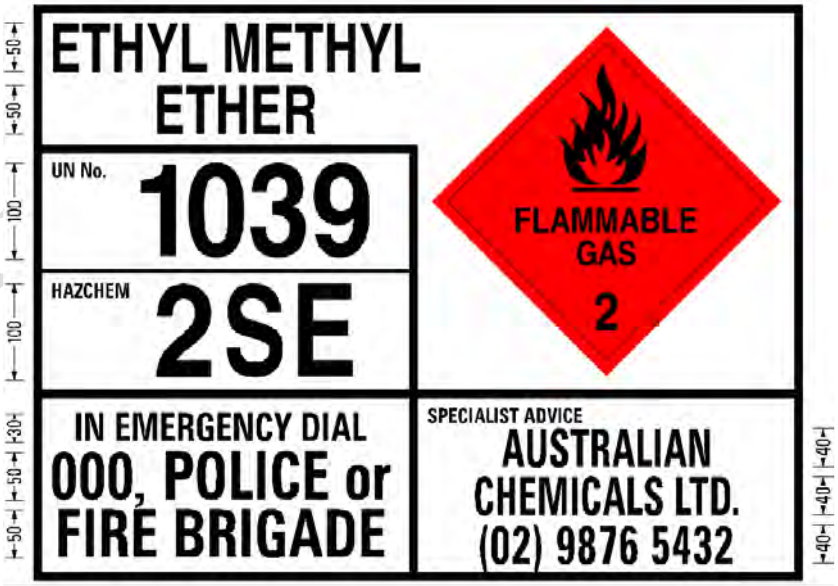
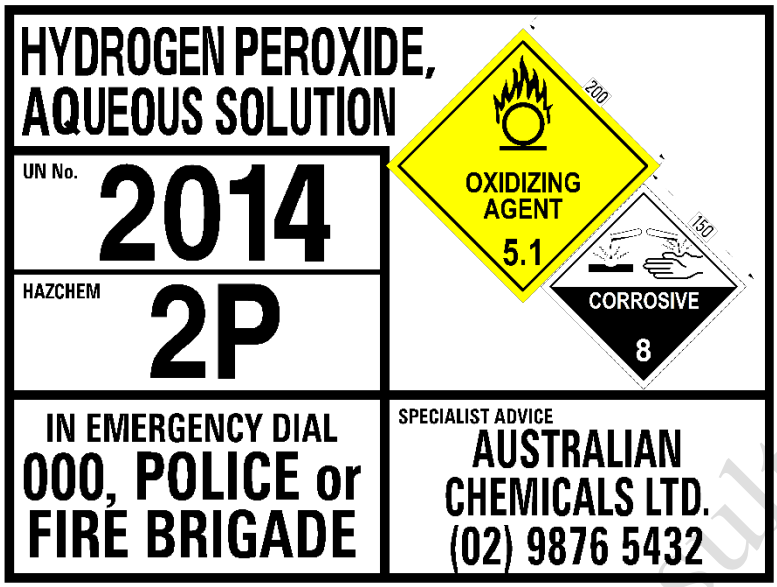


Figure 5.3.2.2.3 (c): Examples of Completed Emergency Information Panels

(i) Single subsidiary hazard



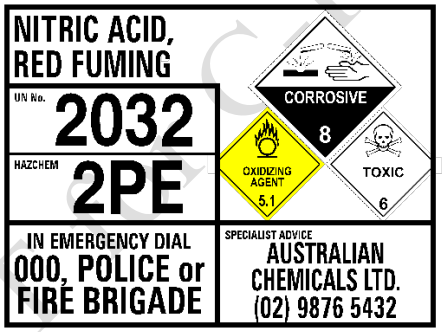
(ii) Two subsidiary hazards

Primary hazard label - 200mm

Subsidiary hazard labels - 150 mm

Permissible alternatives

A. Trimmed to fit



B. permitted to overlap borders

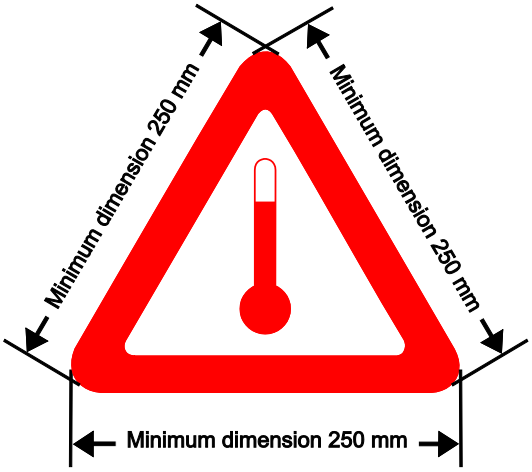
5.3.2.2.4 The permitted tolerances for dimensions specified in this sub-section are ± 10%.

5.3.2.2.5 When the emergency information panel is affixed to folding panels, they shall be designed and secured so that they cannot unfold or come loose from the holder during carriage (especially as a result of impacts or unintentional actions).

5.3.3 Elevated temperature substance mark

Tank-vehicles, tank-wagons, tank-containers, portable tanks, special vehicles or containers or specially equipped vehicles, wagons or containers containing a substance that is carried or handed over for carriage in a liquid state at or above 100 °C or in a solid state at or above 240 °C shall bear on both sides and at the rear for vehicles, and on both sides and at each end for containers, tank-containers and portable tanks, the mark shown in Figure 5.3.3.

Figure 5.3.3



Mark for carriage at elevated temperature

The mark shall be an equilateral triangle. The colour of the mark shall be red. The minimum dimension of the sides shall be 250 mm. Where dimensions are not specified, all features shall be in approximate proportion to those shown. For tank-containers or portable tanks with a capacity of not more than 3 000 litres and with an available surface area insufficient to affix the prescribed marks, the minimum dimensions of the sides may be reduced to 100 mm. The mark shall be weather-resistant and shall ensure durable marking throughout the entire journey.

5.3.4 *(Reserved)*

5.3.5 *(Reserved)*

5.3.6 Environmentally hazardous substance mark

5.3.6.1 When a placard is required to be displayed in accordance with the provisions of section 5.3.1, containers, bulk containers, MEGCs, tank-containers, portable tanks, vehicles and wagons containing environmentally hazardous substances meeting the criteria of 2.2.9.1.10 shall be marked with the environmentally hazardous substance mark shown in 5.2.1.8.3. This does not apply to the exceptions listed in 5.2.1.8.1.

5.3.6.2 The environmentally hazardous substance mark for containers, bulk containers, MEGCs, tank-containers, portable tanks, vehicles and wagons shall be as described in 5.2.1.8.3 and Figure 5.2.1.8.3, except that the minimum dimensions shall be 250 mm x 250 mm. For tank-containers or portable tanks with a capacity of not more than 3 000 litres and with an available surface area insufficient to affix the prescribed marks, the minimum dimensions may be reduced to 100 mm x 100 mm. The other provisions of section 5.3.1 concerning placards shall apply mutatis mutandis to the mark.

5.3.7 Explosives mark and detonators mark

5.3.7.1 When a placard for class 1 is required to be displayed in accordance with the provisions of section 5.3.1, vehicles and wagons shall be additionally marked with a reflective mark displaying the word “EXPLOSIVES” in red, upper case, not less than 150mm high on a white background.

The Explosives Mark shall be displayed at the front, rear of the transport unit, and on both sides of each vehicle in a combination or wagon in a train that is transporting explosives

Mark for carriage of explosives

5.3.7.2 Any detonator compartment that forms part of a mixed load of class 1 shall be additionally marked with a reflective mark displaying the word “DETONATORS” in red, upper case, not less than 150mm high on a white background.

Mark for detonator compartment

5.3.7.3 The reflectivity of these marks shall meet the specifications of Class 100 reflectivity according to AS/NZS 1906.1:2017.

CHAPTER 5.4

DOCUMENTATION

5.4.0 General

5.4.0.1 Unless otherwise specified, any carriage of goods governed by this Code shall be accompanied by the documentation prescribed in this Chapter, as appropriate.

NOTE: *For the list of documentation to be carried on board transport units, see 8.1.2.*

5.4.0.2 The use of electronic data processing (EDP) or electronic data interchange (EDI) techniques as an aid to paper documentation is permitted, provided that the procedures used for the capture, storage and processing of electronics data meet the legal requirements as regards the evidential value and availability of data during transport in a manner at least equivalent to that of paper documentation.

5.4.0.3 When the dangerous goods transport information is given to the carrier by EDP or EDI techniques, the consignor shall be able to give the information to the carrier as a paper document without delay, with the information in the sequence required by this Chapter

5.4.1 Dangerous goods transport document and related information

5.4.1.1 *General information required in the transport document*

5.4.1.1.1 The transport document(s) shall contain the following information for each dangerous substance, material or article offered for carriage:

(a) the UN number preceded by the letters "UN";

(b) the proper shipping name supplemented, when applicable (see 3.1.2.8.1) with the technical name in brackets (see 3.1.2.8.1.1), as determined in accordance with 3.1.2;

(c) - for substances and articles of Class 1: the classification code given in Column (3b) of Table A in Chapter 3.2.

When, in Column (5) of Table A in Chapter 3.2, label model numbers other than 1, 1.4, 1.5 and 1.6 are given, these label model numbers, in brackets, shall follow the classification code;

- for radioactive material of Class 7: the Class number: "7";

NOTE: *For radioactive material with a subsidiary hazard, see also special provision 172 in Chapter 3.3.*

- for lithium batteries of UN numbers 3090, 3091, 3480 and 3481: the Class number "9";

- for other substances and articles: the label model numbers given in Column (5) of Table A in Chapter 3.2 or applicable according to a special provision referred to in Column (6). When more than one label model numbers are given, the numbers following the first one shall be given in brackets. For substances and articles for which no label model is given in Column (5) of Table A in Chapter 3.2, their class according to Column (3a) shall be given instead;

(d) where assigned, the packing group for the substance which may be preceded by the letters "PG" (e.g. "PG II"), or the initials corresponding to the words "Packing Group" in the languages used according to 5.4.1.4.1;

NOTE: *For radioactive material of Class 7 with subsidiary hazards, see special provision 172 (d) in Chapter 3.3.*

(e) the number and a description of the packages when applicable. UN packaging codes may only be used to supplement the description of the kind of package (e.g. one box (4G));

NOTE: *The number, type and capacity of each inner packaging within the outer packaging of a combination packaging is not required to be indicated.*

(f) the aggregate quantity of each item of dangerous goods bearing a different UN number, proper shipping name or, when applicable, packing group (as a volume or as a gross mass, or as a net mass as appropriate);

NOTE 1: *In the case of intended application of 1.1.3.6, the total quantity and the calculated value of dangerous goods for each transport category shall be indicated in the transport document in accordance with 1.1.3.6.3 and 1.1.3.6.4.*

NOTE 2: *For dangerous goods in machinery or equipment specified in this Annex, the quantity indicated shall be the total quantity of dangerous goods contained therein in kilograms or litres as appropriate.*

(g) the name and address of the consignor, including the consignor's contact telephone number which:

(i) for dangerous goods transported in bulk containers, portable tanks, tank vehicles, tank-wagons or receptacles with a capacity of more than 500 kg(L), should be the number of the 'telephone advisory service'; or

(ii) whenever practicable, should be an Australian number at which the consignor, or a person acting on behalf of the consignor, is accessible to answer questions relating to the goods consigned, whenever the goods are being transported.

NOTE: *Goods are considered as being transported during the time from they are consigned to the time they are received by the consignee.*

(h) the name and address of the consignee(s);'

NOTE: *Where there are multiple consignees, 5.4.1.4 permits this information to be located on other documentation carried during transport.*

(i) the date the dangerous goods transport document or an electronic copy of it was prepared or given to the initial carrier;

(j) *(Reserved)*

(k) *(Reserved)*

The location and order in which the elements of information required appear in the transport document is left optional, except that (a), (b), (c) and (d) shall be shown in the order listed above (i.e. (a), (b), (c), (d)) with no information interspersed, except as provided in this Code.

Examples of such permitted dangerous goods descriptions are:

"**UN 1098 ALLYL ALCOHOL, 6.1 (3), I**" or
"**UN 1098, ALLYL ALCOHOL, 6.1 (3), PG I**"

5.4.1.1.2 The information required on a transport document shall be legible, in English, easy to identify and durable.

Although upper case is used in Chapter 3.1 and in Table A in Chapter 3.2 to indicate the elements which shall be part of the proper shipping name, and although upper and lower case are used in this Chapter to indicate the information required in the transport document, the use of upper or of lower case for entering the information in the transport document is left optional.

5.4.1.1.3 *Special provisions for wastes*

5.4.1.1.3.1 If waste containing dangerous goods (other than radioactive wastes) is being carried, the proper shipping name shall be preceded by the word "**WASTE**", unless this term is part of the proper shipping name, e.g.:

"**UN 1230 WASTE METHANOL, 3 (6.1), II**", or
"**UN 1230 WASTE METHANOL, 3 (6.1), PG II**", or
"**UN 1993 WASTE FLAMMABLE LIQUID, N.O.S. (toluene and ethyl alcohol), 3, II**", or
"**UN 1993 WASTE FLAMMABLE LIQUID, N.O.S. (toluene and ethyl alcohol), 3, PG II**".

If the provision for waste as set out in 2.1.3.5.5 is applied, the following shall be added to the dangerous goods description required in 5.4.1.1.1 (a) to (d):

"WASTE IN ACCORDANCE WITH 2.1.3.5.5" (e.g. "UN 3264, CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S., 8, II, (E), WASTE IN ACCORDANCE WITH 2.1.3.5.5").

The technical name, as prescribed in Chapter 3.3, special provision 274, need not be added.

5.4.1.1.3.2 If it is not possible to measure the exact quantity of waste at the place of loading, the quantity according to 5.4.1.1.1(f) may be estimated for the following cases under the following conditions:

(a) For packagings, a list of packagings including the type and nominal volume is added to the transport document;

(b) For containers, the estimation is based on their nominal volume and other available information (e.g. type of waste, average density, degree of filling);

(c) For vacuum-operated waste tanks, the estimation is justified (e.g. by means of an estimation provided by the consignor or by vehicle equipment).

Such estimation of the quantity is not allowed for:

- Exemptions for which the exact quantity is essential (e.g. 1.1.3.6);
- Waste containing substances mentioned in 2.1.3.5.3 or substances of Class 4.3;
- Tanks other than vacuum-operated waste tanks.

A statement shall be included in the transport document, as follows:

“QUANTITY ESTIMATED IN ACCORDANCE WITH 5.4.1.1.3.2”.

5.4.1.1.4 *(Deleted)*

5.4.1.1.5 *Special provisions for salvage packagings including large salvage packagings and salvage pressure receptacles*

When dangerous goods are carried in salvage packagings in accordance with 4.1.1.19, including large salvage packagings, larger size packagings or large packagings of appropriate type and performance level to be used as a salvage packaging, the words "**SALVAGE PACKAGING**" shall be added after the description of the goods in the transport document.

When dangerous goods are carries in salvage pressure receptacles in accordance with 4.1.1.20,” the words “**SALVAGE PRESSURE RECEPTACLE**” shall be added after the description of the goods in the transport document.

5.4.1.1.6 *Special provision for empty means of containment, uncleaned*

5.4.1.1.6.1 For empty means of containment, uncleaned, which contain the residue of dangerous goods of classes other than Class 7, the words "EMPTY, UNCLEANED" or "RESIDUE, LAST CONTAINED" shall be indicated before or after the dangerous goods description specified in 5.4.1.1.1 (a) to (d). Moreover, 5.4.1.1.1 (f) does not apply.

5.4.1.1.6.2 The special provision of 5.4.1.1.6.1 may be replaced with the provisions of 5.4.1.1.6.2.1, 5.4.1.1.6.2.2 or 5.4.1.1.6.2.3, as appropriate.

5.4.1.1.6.2.1 For empty packagings, uncleaned, which contain the residue of dangerous goods of classes other than Class 7, including empty uncleaned receptacles for gases with a capacity of not more than 1 000 litres, the particulars according to 5.4.1.1.1 (a), (b), (c), (d), (e) and (f) are replaced with "EMPTY PACKAGING", "EMPTY RECEPTACLE", "EMPTY IBC" or "EMPTY LARGE PACKAGING", as appropriate, followed by the information of the goods last loaded, as described in 5.4.1.1.1 (c).

See example as follows: "EMPTY PACKAGING, 6.1 (3)".

In addition, in such a case:

(a) If the dangerous goods last loaded are goods of Class 2, the information prescribed in 5.4.1.1.1 (c) may be replaced by the number of the Class "2";

(b) If the dangerous goods last loaded are goods of Classes 3, 4.1, 4.2, 4.3, 5.1, 5.2, 6.1, 8 or 9, the information of the goods last loaded, as described in 5.4.1.1.1 (c) may be replaced by the words “WITH RESIDUES OF [...]” followed by the class(es) and subsidiary hazard(s) corresponding to the different residues, in the class numbering order.

Example:

Empty packagings, uncleaned, having contained goods of Class 3 carried together with empty packagings, uncleaned, having contained goods of Class 8 with a Class 6.1 subsidiary hazard may be referred to in the transport document as:

"EMPTY PACKAGINGS, WITH RESIDUES OF 3, 6.1, 8".

5.4.1.1.6.2.2 For empty means of containment other than packagings, uncleaned, which contain the residue of dangerous goods of classes other than Class 7 and for empty uncleaned receptacles for gases with a capacity of more than 1 000 litres, the particulars according to 5.4.1.1.1 (a) to (d) are preceded by "EMPTY TANK-VEHICLE", "EMPTY DEMOUNTABLE TANK", "EMPTY TANK-CONTAINER", "EMPTY PORTABLE TANK", "EMPTY BATTERY-VEHICLE", "EMPTY MEGC", "EMPTY MPU", "EMPTY VEHICLE", "EMPTY CONTAINER" or "EMPTY RECEPTACLE", as appropriate, followed by the words "LAST LOAD:". Moreover, paragraph 5.4.1.1.1 (f) does not apply.

See examples as follows:

"EMPTY TANK-VEHICLE, LAST LOAD: UN 1098 ALLYL ALCOHOL, 6.1 (3), I, (C/D)" or
"EMPTY TANK-VEHICLE, LAST LOAD: UN 1098 ALLYL ALCOHOL, 6.1 (3), PG I, (C/D)".

5.4.1.1.6.2.3 When empty means of containment, uncleaned, which contain the residue of dangerous goods of classes other than Class 7, are returned to the consignor, the transport documents prepared for the full-capacity carriage of these goods may also be used. In such cases, the indication of the quantity is to be eliminated (by effacing it, striking it out or any other means) and replaced by the words "EMPTY, UNCLEANED RETURN".

5.4.1.1.6.3 (a) If empty tanks, battery- vehicles and MEGCs, uncleaned, are carried to the nearest place where cleaning or repair can be carried out in accordance with the provisions of 4.3.2.4.3, the following additional entry shall be made in the transport document: "**Carriage in accordance with 4.3.2.4.3**".

(b) If empty vehicles and containers, uncleaned, are carried to the nearest place where cleaning or repair can be carried out in accordance with the provisions of 7.5.8.1, the following additional entry shall be made in the transport document: "**Carriage in accordance with 7.5.8.1**".

5.4.1.1.6.4 For the carriage of fixed tanks (tank vehicles), demountable tanks, battery-vehicles, tank-containers and MEGCs under the conditions of 4.3.2.4.4, the following entry shall be included in the transport document: "Carriage in accordance with 4.3.2.4.4".

5.4.1.1.7 *Special provisions for carriage in a transport chain including maritime or air carriage*

For carriage in accordance with 1.1.4.2.1, a statement shall be included in the transport document, as follows: "**Carriage in accordance with 1.1.4.2.1**".

5.4.1.1.8 and 5.4.1.1.9 *(Reserved)*

5.4.1.1.10 *(Deleted)*

5.4.1.1.11 *Special provisions for the carriage of IBCs, tanks, battery-vehicles, portable tanks and MEGCs after the date of expiry of the last periodic test or inspection*

For carriage in accordance with 4.1.2.2 (b), 4.3.2.3.7 (b), 6.7.2.19.6.1 (b), 6.7.3.15.6.1 (b) or 6.7.4.14.6.1 (b), a statement to this effect shall be included in the transport document, as follows:

"CARRIAGE IN ACCORDANCE WITH 4.1.2.2 (b)",

"CARRIAGE IN ACCORDANCE WITH 4.3.2.3.7 (b)",

"CARRIAGE IN ACCORDANCE WITH 6.7.2.19.6.1 (b)",

"CARRIAGE IN ACCORDANCE WITH 6.7.3.15.6.1 (b)"; or

"CARRIAGE IN ACCORDANCE WITH 6.7.4.14.6.1 (b)" as appropriate.

5.4.1.1.12 *(Reserved)*

5.4.1.1.13 *Special provisions for carriage in multi-compartment tank-vehicles or transport units with more than one tank*

When by derogation from 5.3.2.1.2 a multi-compartment tank-vehicle or a transport unit with more than one tank is marked in accordance with 5.3.2.1.3 or 5.3.2.1.4, the substances contained in each tank or in each compartment of a tank shall be specified in the transport document.

5.4.1.1.14 *Special provisions for the carriage of substances carried under elevated temperature*

If the proper shipping name of a substance which is carried or offered for carriage in a liquid state at a temperature equal to or exceeding 100 °C, or in a solid state at a temperature equal to or exceeding 240 °C, does not convey the elevated temperature condition (for example, by using the term "MOLTEN" or "ELEVATED TEMPERATURE" as part of the proper shipping name), the word "**HOT**" shall immediately precede the proper shipping name.

5.4.1.1.15 *Special provisions for the carriage of stabilized and temperature controlled substances*

Unless already part of the proper shipping name the word "STABILIZED" shall be added to the proper shipping name if stabilization is used and the words "TEMPERATURE CONTROLLED" shall be added to the proper shipping name if stabilization is by temperature control or a combination of chemical stabilization and temperature control (see 3.1.2.6).

If the words "TEMPERATURE CONTROLLED" are part of the proper shipping name (see also 3.1.2.6), the control and emergency temperatures (see 7.1.7) shall be indicated in the transport document, as follows:

"**Control temperature: ....°C Emergency temperature**: **.... °C**"

5.4.1.1.16 *(Deleted)*

5.4.1.1.17 *Special provisions for the carriage of solids in bulk containers conforming to 6.11.4*

When solid substances are carried in bulk containers conforming to 6.11.4, the following statement shall be shown on the transport document (see NOTE at the beginning of 6.11.4):

"**Bulk container BK(x)**[1] **approved by the competent authority of…**"

5.4.1.1.18 *Special provisions for carriage of environmentally hazardous substances (aquatic environment)*

When a substance belonging to one of classes 1 to 9 meets the classification criteria of 2.2.9.1.10, the transport document shall bear the additional inscription "ENVIRONMENTALLY HAZARDOUS" or "MARINE POLLUTANT/ENVIRONMENTALLY HAZARDOUS". This additional requirement does not apply to UN Nos. 3077 and 3082 or for the exceptions listed in 5.2.1.8.1.

The inscription "MARINE POLLUTANT" (according to 5.4.1.4.3 of the IMDG Code) is acceptable for carriage in a transport chain including maritime carriage.

5.4.1.1.19 *Special provisions for carriage of packagings, discarded, empty, uncleaned (UN 3509)*

For packagings, discarded, empty, uncleaned, the proper shipping name specified in 5.4.1.1.1 (b) shall be complemented with the words "(WITH RESIDUES OF [...])" followed by the class(es) and subsidiary hazard(s) corresponding to the residues, in the class numbering order. Moreover, 5.4.1.1.1 (f) does not apply.

Example: Packagings, discarded, empty, uncleaned having contained goods of Class 4.1 packed together with packagings, discarded, empty, uncleaned having contained goods of Class 3 with a Class 6.1 subsidiary hazard should be referred to in the transport document as:

"UN 3509 PACKAGINGS, DISCARDED, EMPTY, UNCLEANED (WITH RESIDUES OF 3, 4.1, 6.1), 9".

5.4.1.1.20 *Special provisions for the carriage of substances classified in accordance with 2.1.2.8*

For carriage in accordance with 2.1.2.8, a statement shall be included in the transport document, as follows "Classified in accordance with 2.1.2.8".

5.4.1.1.21 *Additional information in the case of the application of special provisions*

Where, in accordance with a special provision in Chapter 3.3, additional information is necessary, this additional information shall be included in the transport document.

5.4.1.1.22 *(Reserved)*

5.4.1.1.23 *Special provisions for the carriage of substances carried in molten state*

When a substance, which is solid in accordance with the definition in 1.2.1, is offered for carriage in the molten state, the qualifying word “MOLTEN” shall be added as part of the proper shipping name, unless it is already part of the proper shipping name (see 3.1.2.5).

5.4.1.2 ***Additional or special information required for certain classes***

5.4.1.2.1 *Special provisions for Class 1*

(a) The transport document shall indicate the authorised name of the explosive, except in circumstances where it cannot reasonably be determined, in addition to the requirements in 5.4.1.1.1 (a)

(b) The transport document shall indicate, in addition to the requirements in 5.4.1.1.1 (f):

- for each kind of package of substances or articles, the net explosive quantity and gross mass;
- the net explosive quantity for each substance or article bearing a different UN number;
- the net explosive quantity for all substances and articles covered by the transport document;

(c) For the carriage of substances and articles assigned to an n.o.s. entry or the entry "0190 SAMPLES, EXPLOSIVE" or packed conforming to packing instruction P101 of 4.1.4.1, a copy

[1] *(x) shall be replaced with* "1" *or* "2" *as appropriate.*

of the competent authority approval with the conditions of carriage shall be attached to the transport document. It shall be drafted in English.;

(d) If normally incompatible substances and articles of class 1 are loaded together in the same vehicle and are segregated in accordance with a competent authority approval, a copy of the competent authority approval of the means of segregation, protective compartment or containment system in accordance with 7.5.2, shall be attached to the transport document.

(e) When explosive substances or articles are carried in packagings conforming to packing instruction P101, the transport document shall bear the inscription "**Packaging approved by the competent authority of ...**" (see 4.1.4.1, packing instruction P101);

(f) *(Reserved)*

(g) When fireworks of UN Nos. 0333, 0334, 0335, 0336 and 0337 are carried, the transport document shall bear the inscription:

"Classification of fireworks by the competent authority of XX with the firework reference XX/YYZZZZ".

The classification approval certificate need not be carried with the consignment, but shall be made available by the consignor to the carrier or the competent authorities for control purposes.

5.4.1.2.2 *Additional provisions for Class 2*

(a) For the carriage of mixtures (see 2.2.2.1.1) in tanks (demountable tanks, fixed tanks, portable tanks, tank-containers or elements of battery-vehicles or of MEGCs), the composition of the mixture as a percentage of the volume or as a percentage of the mass shall be given. Constituents below 1% need not be indicated (see also 3.1.2.8.1.2). The composition of the mixture need not be given when the technical names authorized by special provisions 581, 582 or 583 are used to supplement the proper shipping name;

(b) For the carriage of cylinders, tubes, pressure drums, cryogenic receptacles and bundles of cylinders under the conditions of 4.1.6.10, the following entry shall be included in the transport document: "**Carriage in accordance with 4.1.6.10**".

(c) *(Reserved)*

(d) In the case of tank-containers carrying refrigerated liquefied gases the consignor shall enter in the transport document the date at which the actual holding time ends, in the following format:

"End of holding time: ..... (DD/MM/YYYY)".

(e) For carriage of UN No. 1012, the transport document shall contain the name of the specific gas carried (see special provision 398 of Chapter 3.3) in brackets after the proper shipping name.

5.4.1.2.3 *Additional provisions for self-reactive substances and polymerizing substances of Class 4.1 and organic peroxides of Class 5.2*

5.4.1.2.3.1 For self-reactive substances or polymerizing substances of Class 4.1 and for organic peroxides of Class 5.2 that require temperature control during carriage (for self-reactive substances see 2.2.41.1.17; for polymerizing substance see 2.2.41.1.21; for organic peroxides, see 2.2.52.1.15), the control and emergency temperatures shall be indicated in the transport document, as follows:

"**Control temperature: ... °C Emergency temperature: ... °C**".

5.4.1.2.3.2 When for certain self-reactive substances of Class 4.1 and certain organic peroxides of Class 5.2 the competent authority has permitted the label conforming to model No.1 to be dispensed with for a specific packaging (see 5.2.2.1.9), a statement to this effect shall be included in the transport document, as follows:

"**The label conforming to model No. 1 is not required**".

5.4.1.2.3.3 When organic peroxides and self-reactive substances are carried under conditions where approval is required (for organic peroxides see 2.2.52.1.8, 4.1.7.2.2 and special provision TA2 of 6.8.4; for self-reactive substances see 2.2.41.1.13 and 4.1.7.2.2, a statement to his effect shall be included in the transport document, e.g. "**Carriage in accordance with 2.2.52.1.8**".

A copy of the competent authority approval with the conditions of carriage shall be attached to the transport document. It shall be drafted in English.

5.4.1.2.3.4 When a sample of an organic peroxide (see 2.2.52.1.9) or a self-reactive substance (see 2.2.41.1.15) is carried, a statement to this effect shall be included in the transport document, e.g. "**Carriage in accordance with 2.2.52.1.9**".

5.4.1.2.3.5 When self-reactive substances type G (see Manual of Tests and Criteria, Part II, paragraph 20.4.2 (g)) are carried, the following statement may be given in the transport document: "**Not a self-reactive substance of Class 4.1**".

When organic peroxides type G (see Manual of Tests and Criteria, Part II, paragraph 20.4.3 (g)) are carried, the following statement may be given in the transport document: "**Not a substance of Class 5.2**".

5.4.1.2.4 *Additional provisions for Class 6.2*

In addition to the information concerning the consignee (see 5.4.1.1.1 (h)), the name and telephone number of a responsible person shall be indicated.

5.4.1.2.5 *Additional provisions for Class 7*

5.4.1.2.5.1 The following information shall be inserted in the transport document for each consignment of Class 7 material, as applicable, in the order given and immediately after the information required under 5.4.1.1.1 (a) to (c):

(a) The name or symbol of each radionuclide or, for mixtures of radionuclides, an appropriate general description or a list of the most restrictive nuclides;

(b) A description of the physical and chemical form of the material, or a notation that the material is special form radioactive material or low dispersible radioactive material. A generic chemical description is acceptable for chemical form. For radioactive material with a subsidiary hazard, see sub-paragraph (c) of special provision 172 of Chapter 3.3;

(c) The maximum activity of the radioactive contents during carriage expressed in becquerels (Bq) with an appropriate SI prefix symbol (see 1.2.2.1). For fissile material, the mass of fissile material (or mass of each fissile nuclide for mixtures when appropriate) in grams (g), or appropriate multiples thereof, may be used in place of activity;

(d) The category of the package, i.e. I-WHITE, II-YELLOW, III-YELLOW;

(e) The transport index (categories II-YELLOW and III-YELLOW only);

(f) For fissile material:

(i) Shipped under one exception of 2.2.7.2.3.5 (a) to (f), reference to that paragraph;

(ii) Shipped under 2.2.7.2.3.5 (c) to (e), the total mass of fissile nuclides;

(iii) Contained in a package for which one of 6.4.11.2 (a) to (c) or 6.4.11.3 is applied, reference to that paragraph;

(iv) The criticality safety index, where applicable;

(g) The identification mark for each competent authority certificate of approval (special form radioactive material, low dispersible radioactive material, fissile material excepted under 2.2.7.2.3.5 (f), special arrangement, package design, or shipment) applicable to the consignment;

(h) For consignments of more than one package, the information required in 5.4.1.1.1 and in (a) to (g) above shall be given for each package. For packages in an overpack, container, or vehicle, a detailed statement of the contents of each package within the overpack, container, or vehicle and, where appropriate, of each overpack, container, or vehicle shall be included. If packages are to be removed from the overpack, container, or vehicle at a point of intermediate unloading, appropriate transport documents shall be made available;

(i) Where a consignment is required to be shipped under exclusive use, the statement "**EXCLUSIVE USE SHIPMENT**"; and

(j) For LSA-II and LSA-III substances, SCO-I and SCO-II, the total activity of the consignment as a multiple of A_2. For radioactive material for which the A_2 value is unlimited, the multiple of A_2 shall be zero.

5.4.1.2.5.2 The consignor shall provide in the transport documents a statement regarding actions, if any, that are required to be taken by the carrier. The statement shall be in the languages deemed necessary by the carrier or the authorities concerned, and shall include at least the following information:

(a) Supplementary requirements for loading, stowage, carriage, handling and unloading of the package, overpack or container including any special stowage provisions for the safe dissipation of heat (see special provision CV33 (3.2) of 7.5.11), or a statement that no such requirements are necessary;

(b) Restrictions on the mode of carriage or vehicle and any necessary routeing instructions;

(c) Emergency arrangements appropriate to the consignment.

5.4.1.2.5.3 *(Reserved)*

5.4.1.2.5.4 The applicable competent authority certificates need not necessarily accompany the consignment. The consignor shall make them available to the carrier(s) before loading and unloading.

5.4.1.3 *(Reserved*)

5.4.1.4 ***Format***

5.4.1.4.1 The document containing the information in 5.4.1.1 and 5.4.1.2 may be that already required by other regulations in force for carriage by another mode of carriage. In case of multiple consignees, the name and address of the consignees and the quantities delivered enabling the nature and quantities carried to be evaluated at any time, may be entered in other documents which are to be used or in any other documents made mandatory according to other specific regulations and which shall be on board the vehicle.

5.4.1.4.2 If by reason of the size of the load, a consignment cannot be transported in a single load, a separate document must be made out for each separate load. Furthermore, in all cases, separate transport documents shall be made out for consignments or parts of consignments which may not be loaded together on the same vehicle by reason of the prohibitions set forth in 7.5.2.

5.4.1.4.3 The information relative to the hazards of the goods to be carried (as indicated in 5.4.1.1) may be incorporated in, or combined with, an existing transport or cargo handling document. The layout of the information in the document (or the order of transmission of the corresponding data by electronic data processing (EDP) or electronic data interchange (EDI) techniques) shall be as provided in 5.4.1.1.1.

5.4.1.4.4 When an existing transport document or cargo handling document cannot be used for the purposes of dangerous goods documentation for multimodal transport, the use of documents corresponding to the example shown in 5.4.5 is considered advisable.

5.4.1.4.5 If a dangerous goods transport document consists of more than one page, the pages shall be consecutively numbered.

5.4.1.4.6 When dangerous goods are transported on a combination vehicle or train, the transport document shall indicate which dangerous goods are stowed in each vehicle or wagon forming part of the combination or train.

5.4.1.4.7 If substances and articles of class 1 are being transported with other goods (whether other dangerous goods or otherwise), the substances and articles of class 1 shall be listed first.

5.4.1.5 ***Non-dangerous goods***

5.4.1.5.1 When goods mentioned by name in Table A of Chapter 3.2, are not subject to this Code because they are considered as non-dangerous according to Part 2, the consignor may enter in the transport document a statement to that effect, e.g.: **"Not dangerous goods for the purpose of this Code'** or "**Not goods of Class ...**"

NOTE 1: *This provision may be used in particular when the consignor considers that, due to the chemical nature of the goods (e.g. solutions and mixtures) carried or to the fact that such goods are deemed dangerous for other regulatory purposes the consignment might be subject to control during the journey.*

NOTE 2: *This provision may be used for unused, pre-labelled dangerous goods packagings to avoid an inappropriate emergency response.*

5.4.1.5.2 If both dangerous goods and non-dangerous goods are listed in one document, the dangerous goods shall be listed first.

5.4.2 Container/vehicle packing certificate

If the carriage of dangerous goods in a container precedes a voyage by sea, a "container/vehicle packing certificate" conforming to section 5.4.2 of the IMDG Code[5, 6] shall be provided to the maritime carrier by those responsible for packing the container.

The functions of the transport document required under 5.4.1 and of the "container/vehicle packing certificate" as provided above may be incorporated into a single document (see for example 5.4.5). If these functions are incorporated into a single document, the inclusion in the transport document of a statement that the loading of the container or vehicle has been carried out in accordance with the applicable modal regulations together with the identification of the person responsible for the "container/vehicle packing certificate" shall be sufficient.

If the carriage of dangerous goods in a vehicle precedes a voyage by sea, a "container/vehicle packing certificate" conforming to section 5.4.2 of the IMDG Code[5, 6] may also be provided with the transport document.

[5] *Guidelines for use in practice and in training for loading goods in transport units have also been drawn up by the International Maritime Organization (IMO), the International Labour Organization (ILO) and the United Nations Economic Commission for Europe (UNECE) and have been published by IMO ("IMO/ILO/UNECE Code of Practice for Packing of Cargo Transport Units (CTU Code)").*

[6] *Section 5.4.2 of the IMDG Code (Amendment 40-20) requires the following:*

*"**5.4.2 Container/vehicle packing certificate***

5.4.2.1 When dangerous goods are packed or loaded into any container or vehicle, those responsible for packing the container or vehicle shall provide a "container/vehicle packing certificate" specifying the container/vehicle identification number(s) and certifying that the operation has been carried out in accordance with the following conditions:

.1 The container/vehicle was clean, dry and apparently fit to receive the goods;

.2 Packages, which need to be segregated in accordance with applicable segregation requirements, have not been packed together onto or in the container/vehicle [unless approved by the competent authority concerned in accordance with 7.3.4.1 (of the IMDG Code)];

.3 All packages have been externally inspected for damage, and only sound packages have been loaded;

.4 Drums have been stowed in an upright position, unless otherwise authorized by the competent authority, and all goods have been properly loaded, and, where necessary, adequately braced with securing material to suit the mode(s) of transport for the intended journey;

.5 Goods loaded in bulk have been evenly distributed within the container/vehicle;

.6 For consignments including goods of class 1, other than division 1.4, the container/vehicle is structurally serviceable in accordance with 7.1.2 (of the IMDG Code);

.7 The container/vehicle and packages are properly marked, labelled, and placarded, as appropriate;

.8 When substances presenting a risk of asphyxiation are used for cooling or conditioning purposes (such as dry ice (UN 1845) or nitrogen, refrigerated liquid (UN 1977) or argon, refrigerated liquid (UN 1951)), the container/vehicle is externally marked in accordance with 5.5.3.6 (of the IMDG Code); and

.9 A dangerous goods transport document, as indicated in 5.4.1 (of the IMDG Code) has been received for each dangerous goods consignment loaded in the container/vehicle.

***NOTE**: The container/vehicle packing certificate is not required for portable tanks*

5.4.2.2 The information required in the dangerous goods transport document and the container/vehicle packing certificate may be incorporated into a single document; if not, these documents shall be attached. If the information is incorporated into a single document, the document shall include a signed declaration such as "It is declared that the packing of the goods into the container/vehicle has been carried out in accordance with the applicable provisions". This declaration shall be dated and the person signing this declaration shall be identified on the document. Facsimile signatures are acceptable where applicable laws and regulations recognize the legal validity of facsimile signatures.

5.4.2.3 If the container/vehicle packing certificate is presented to the carrier by means of EDP or EDI transmission techniques, the signature(s) may be electronic signature(s) or may be replaced by the name(s) (in capitals) of the person authorized to sign.

5.4.2.4 When the container/vehicle packing certificate is given to a carrier by EDP or EDI techniques and subsequently the dangerous goods are transferred to a carrier that requires a paper container/vehicle packing certificate, the carrier shall ensure that the paper document indicates "Original received electronically" and the name of the signatory shall be shown in capital letters.[a] *Not required for danger label numbers 1, 1.4, 1.5, 1.6, 2.1, 2.2 and 2.3.*

5.4.3 Emergency information and instructions in writing

5.4.3.1 *Instructions in writing*

5.4.3.1.1 As an aid during an accident emergency situation that may occur or arise during carriage, instructions in writing in the form specified in 5.4.3.1.4 shall be carried in the vehicle crew's cab and shall be readily available.

5.4.3.1.2 These instructions shall be provided by the carrier to the vehicle crew in language(s) that each member can read and understand before the commencement of the journey. The carrier shall ensure that each member of the vehicle crew concerned understands and is capable of carrying out the instructions properly.

5.4.3.1.3 Before the start of the journey, the members of the vehicle crew shall inform themselves of the dangerous goods loaded and consult the instructions in writing for details on actions to be taken in the event of an accident or emergency.

5.4.3.1.4 The instructions in writing shall correspond to the following four page model as regards its form and contents.

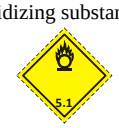
INSTRUCTIONS IN WRITING ACCORDING TO ADR

Actions in the event of an accident or emergency

In the event of an accident or emergency that may occur or arise during carriage, the members of the vehicle crew shall take the following actions where safe and practicable to do so:

- Apply the braking system, stop the engine and isolate the battery by activating the master switch where available;
- Avoid sources of ignition, in particular, do not smoke, use electronic cigarettes or similar devices or switch on any electrical equipment;
- Inform the appropriate emergency services, giving as much information about the incident or accident and substances involved as possible;
- Put on the warning vest and place the self-standing warning signs as appropriate;
- Keep the transport documents readily available for responders on arrival;
- Do not walk into or touch spilled substances and avoid inhalation of fumes, smoke, dusts and vapours by staying up wind;
- Where appropriate and safe to do so, use the fire extinguishers to put out small/initial fires in tyres, brakes and engine compartments;
- Fires in load compartments shall not be tackled by members of the vehicle crew;
- Where appropriate and safe to do so, use on-board equipment to prevent leakages into the aquatic environment or the sewage system and to contain spillages;
- Move away from the vicinity of the accident or emergency, advise other persons to move away and follow the advice of the emergency services;
- Remove any contaminated clothing and used contaminated protective equipment and dispose of it safely.

Additional guidance to members of the vehicle crew on the hazard characteristics of dangerous goods by class and on actions subject to prevailing circumstances		
Danger labels and placards	**Hazard characteristics**	**Additional guidance**
(1)	**(2)**	**(3)**
Explosive substances and articles  1 1.5 1.6	May have a range of properties and effects such as mass detonation; projection of fragments; intense fire/heat flux; formation of bright light, loud noise or smoke. Sensitive to shocks and/or impacts and/or heat.	Take cover but stay away from windows.
Explosive substances and articles  1.4	Slight risk of explosion and fire.	Take cover.
Flammable gases  2.1	Risk of fire. Risk of explosion. May be under pressure. Risk of asphyxiation. May cause burns and/or frostbite. Containments may explode when heated.	Take cover. Keep out of low areas.
Non-flammable, non-toxic gases  2.2	Risk of asphyxiation. May be under pressure. May cause frostbite. Containments may explode when heated.	Take cover. Keep out of low areas.
Toxic gases  2.3	Risk of intoxication. May be under pressure. May cause burns and/or frostbite. Containments may explode when heated.	Use emergency escape mask. Take cover. Keep out of low areas.
Flammable liquids  3	Risk of fire. Risk of explosion. Containments may explode when heated.	Take cover. Keep out of low areas.
Flammable solids, self-reactive substances, polymerizing substances and solid desensitized explosives  4.1	Risk of fire. Flammable or combustible, may be ignited by heat, sparks or flames. May contain self-reactive substances that are liable to exothermic decomposition in the case of heat supply, contact with other substances (such as acids, heavy-metal compounds or amines), friction or shock. This may result in the evolution of harmful and flammable gases or vapours or self-ignition. Containments may explode when heated. Risk of explosion of desensitized explosives after loss of desensitizer.	
Substances liable to spontaneous combustion  4.2	Risk of fire by spontaneous combustion if packages are damaged or contents are spilled. May react vigorously with water	
Substances which, in contact with water, emit flammable gases  4.3	Risk of fire and explosion in contact with water.	Spilled substances should be kept dry by covering the spillages.

Additional guidance to members of the vehicle crew on the hazard characteristics of dangerous goods by class and on actions subject to prevailing circumstances		
Danger labels and placards	**Hazard characteristics**	**Additional guidance**
(1)	**(2)**	**(3)**
Oxidizing substances  5.1	Risk of vigorous reaction, ignition and explosion in contact with combustible or flammable substances.	Avoid mixing with flammable or combustible substances (e.g. sawdust).
Organic peroxides  5.2	Risk of exothermic decomposition at elevated temperatures, contact with other substances (such as acids, heavy-metal compounds or amines), friction or shock. This may result in the evolution of harmful and flammable gases or vapours or self-ignition.	Avoid mixing with flammable or combustible substances (e.g. sawdust).
Toxic substances  6.1	Risk of intoxication by inhalation, skin contact or ingestion. Risk to the aquatic environment or the sewerage system.	Use emergency escape mask.
Infectious substances  6.2	Risk of infection. May cause serious disease in humans or animals. Risk to the aquatic environment or the sewerage system.	
Radioactive material  7A 7B  7C 7D	Risk of intake and external radiation.	Limit time of exposure.
Fissile material  7E	Risk of nuclear chain reaction.	
Corrosive substances  8	Risk of burns by corrosion. May react vigorously with each other, with water and with other substances. Spilled substance may evolve corrosive vapours. Risk to the aquatic environment or the sewerage system.	
Miscellaneous dangerous substances and articles   9 9A	Risk of burns. Risk of fire. Risk of explosion. Risk to the aquatic environment or the sewerage system.	

NOTE 1: *For dangerous goods with multiple risks and for mixed loads, each applicable entry shall be observed.*
NOTE 2: *Additional guidance shown in column (3) of the table may be adapted to reflect the classes of dangerous goods to be carried and their means of transport.*

Additional guidance to members of the vehicle crew on the hazard characteristics of dangerous goods, indicated by marks, and on actions subject to prevailing circumstances		
Mark	**Hazard characteristics**	**Additional guidance**
(1)	**(2)**	**(3)**
 Environmentally hazardous substances	Risk to the aquatic environment or the sewerage system	
 Elevated temperature substances	Risk of burns by heat.	Avoid contact with hot parts of the transport unit and the spilled substance.

Equipment for personal and general protection
to carry out general actions and hazard specific emergency actions
to be carried on board the transport unit in accordance with section 8.1.5 of ADR

The following equipment shall be carried on board the transport unit:

- for each vehicle, a wheel chock of a size suited to the maximum mass of the vehicle and to the diameter of the wheel;
- two self-standing warning signs;
- eye rinsing liquid[a]; and

for each member of the vehicle crew

- a warning vest;
- portable lighting apparatus;
- a pair of protective gloves; and
- eye protection.

Additional equipment required for certain classes:

- an emergency escape mask for each member of the vehicle crew shall be carried on board the transport unit for danger label numbers 2.3 or 6.1;
- a shovel[b];
- a drain seal[b];
- a collecting container[b].

[a] *Not required for danger label numbers 1, 1.4, 1.5, 1.6, 2.1, 2.2 and 2.3.*

[b] *Only required for solids and liquids with danger label numbers 3, 4.1, 4.3, 8 or 9.*

5.4.3.2 ***Emergency information***

5.4.3.2.1 *Definitions*

Emergency procedure guide, in relation to particular dangerous goods, is a guide outlining procedures to be taken in the event of an emergency involving the goods which is either:

(a) in the form, or substantially in the form, of the relevant guide from the ANZ-ERG, provided that all relevant information referred to in that guide, e.g. information in Table 1, is included

(b) in a form approved by a Competent Authority in relation to goods of that kind.

Emergency procedure guide, in relation to vehicle fire, means a guide outlining procedures to be taken in the event of a fire on a road vehicle which is either:

(a) in the form, or substantially in the form of Vehicle Fire Guide 00 in the ANZ-ERG;

(b) in a form approved by a Competent Authority.

5.4.3.2.2 Emergency information in the form specified in 5.4.3.2.1 shall be carried in the vehicle crew's cab and shall be readily available.

5.4.3.2.3 The emergency information shall be provided by the carrier to the vehicle crew before the commencement of the journey.

5.4.3.2.4 Emergency information shall be in the form of:

(a) the Australian & New Zealand Emergency Response Guidebook (ANZ-ERG), as current at the time this edition of the ADG Code comes into force or a subsequent version;

(b) an emergency procedure guide for the dangerous goods transported on the vehicle and the emergency procedure guide in relation to vehicle fire; or

(c) for use on trains transporting dangerous goods, the rail operator's Dangerous Goods Emergency Instructions for train crews which provides contact numbers for dangerous goods emergencies.

5.4.4 Retention of dangerous goods transport information

5.4.4.1 The consignor and the carrier shall retain a copy of the dangerous goods transport document and additional information and documentation as specified in this Code, for a minimum period of three months.

5.4.4.2 When the documents are kept electronically or in a computer system, the consignor and the carrier shall be able to reproduce them in a printed form.

5.4.5 Example of a multimodal dangerous goods form

Example of a form which may be used as a combined dangerous goods declaration and container packing certificate for multimodal carriage of dangerous goods.

MULTIMODAL DANGEROUS GOODS FORM

1. Shipper / Consignor /Sender	2. Transport document number	
	3. Page 1 of Pages	4. Shipper's reference
		5. Freight Forwarder's reference
6. Consignee	7. Carrier (to be completed by the carrier)	
	SHIPPER'S DECLARATION I hereby declare that the contents of this consignment are fully and accurately described below by the proper shipping name, and are classified, packaged, marked and labeled /placarded and are in all respects in proper condition for transport according to the applicable international and national governmental regulations.	
8. This shipment is within the limitations prescribed for: (Delete non-applicable) PASSENGER AND CARGO AIRCRAFT / CARGO AIRCRAFT ONLY	9. Additional handling information	
10. Vessel / flight no. and date / 11. Port / place of loading		
12. Port / place of discharge / 13. Destination		

14. Shipping marks	* Number and kind of packages; description of goods	Gross mass (kg)	Net mass	Cube (m^3)

15. Container identification No./ vehicle registration No.	16. Seal number (s)	17. Container/vehicle size & type	18. Tare (kg)	19. Total gross mass (including tare) (kg)

CONTAINER/VEHICLE PACKING CERTIFICATE I hereby declare that the goods described above have been packed/loaded into the container/vehicle identified above in accordance with the applicable provisions ** **MUST BE COMPLETED AND SIGNED FOR ALL CONTAINER/VEHICLE LOADS BY PERSON RESPONSIBLE FOR PACKING/LOADING**	21.RECEIVING ORGANISATION RECEIPT Received the above number of packages/containers/trailers in apparent good order and condition unless stated hereon: RECEIVING ORGANISATION REMARKS:	
20. Name of company	Haulier's name	22. Name of company (OF SHIPPER PREPARING THIS NOTE)
Name / Status of declarant	Vehicle reg. no.	Name / Status of declarant
Place and date	Signature and date	Place and date
Signature of declarant	DRIVER'S SIGNATURE	Signature of declarant

* FOR DANGEROUS GOODS: you must specify: UN no., proper shipping name, hazard class, packing group (where assigned) and any other element of information required under applicable national and international regulations

BLACK HATCHINGS BLACK HATCHINGS BLACK HATCHINGS BLACK HATCHINGS BLACK HATCHINGS BLACK HATCHINGS BLACK HATCHINGS BLACK HATCHINGS BLACK HATCHINGS BLACK HATCHINGS BLACK HATCHINGS BLACK HATCHINGS BLACK

*** See 5.4.2.*

MULTIMODAL DANGEROUS GOODS FORM

Continuation Sheet

1. Shipper / Consignor /Sender	2. Transport document number	
	3. Page 1 of Pages	4. Shipper's reference
		5. Freight Forwarder's reference

14. Shipping marks	* Number and kind of packages; description of goods	Gross mass (kg)	Net mass	Cube (m^3)

* FOR DANGEROUS GOODS: you must specify: UN no., proper shipping name, hazard class, packing group (where assigned) and any other element of information required under applicable national and international regulations

CHAPTER 5.5

SPECIAL PROVISIONS

5.5.1 *(Deleted)*

5.5.2 Special provisions applicable to fumigated cargo transport units (UN 3359)

5.5.2.1 ***General***

5.5.2.1.1 Fumigated cargo transport units (UN 3359) containing no other dangerous goods are not subject to any provisions of this Code other than those of this section.

5.5.2.1.2 When the fumigated cargo transport unit is loaded with dangerous goods in addition to the fumigant, any provision of this Code relevant to these goods (including placarding, marking and documentation) applies in addition to the provisions of this section.

5.5.2.1.3 Only cargo transport units that can be closed in such a way that the escape of gas is reduced to a minimum shall be used for the carriage of cargo under fumigation.

5.5.2.2 ***Training***

Persons engaged in the handling of fumigated cargo transport units shall be trained commensurate with their responsibilities.

5.5.2.3 ***Marking and placarding***

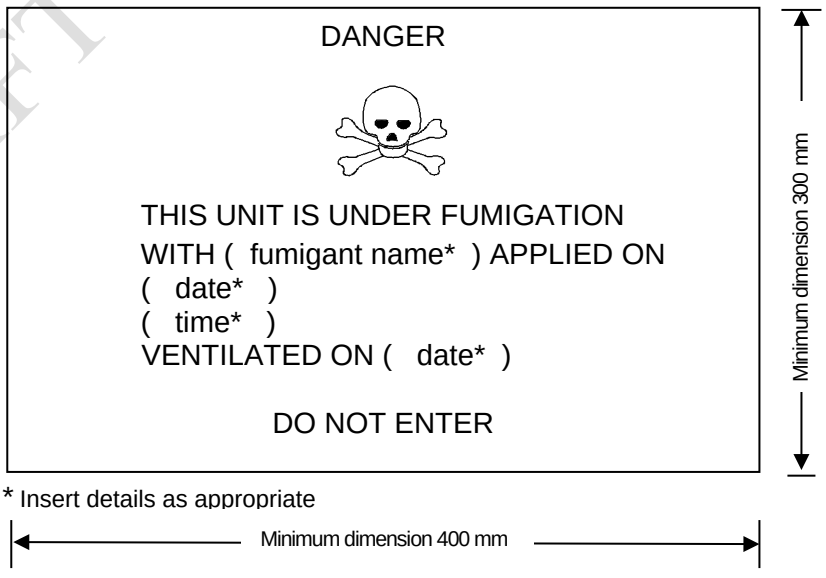
5.5.2.3.1 A fumigated cargo transport unit shall be marked with a warning mark, as specified in 5.5.2.3.2, affixed at each access point in a location where it will be easily seen by persons opening or entering the cargo transport unit. This mark shall remain on the cargo transport unit until the following provisions are met:

(a) The fumigated cargo transport unit has been ventilated to remove harmful concentrations of fumigant gas; and

(b) The fumigated goods or materials have been unloaded.

5.5.2.3.2 The fumigation warning mark shall be as shown in Figure 5.5.2.3.2.

Figure 5.5.2.3.2



Fumigation warning mark

The mark shall be a rectangle. The minimum dimensions shall be 400 mm wide x 300 mm high and the minimum width of the outer line shall be 2 mm. The mark shall be in black print on a white background with lettering not less than 25 mm high. Where dimensions are not specified, all features shall be in approximate proportion to those shown.

5.5.2.3.3 If the fumigated cargo transport unit has been completely ventilated either by opening the doors of the unit or by mechanical ventilation after fumigation, the date of ventilation shall be marked on the fumigation warning mark.

5.5.2.3.4 When the fumigated cargo transport unit has been ventilated and unloaded, the fumigation warning mark shall be removed.

5.5.2.3.5 Placards conforming to model No. 9 (see 5.2.2.2.2) shall not be affixed to a fumigated cargo transport unit except as required for other Class 9 substances or articles packed therein.

5.5.2.4 ***Documentation***

5.5.2.4.1 Documents associated with the carriage of cargo transport units that have been fumigated and have not been completely ventilated before carriage shall include the following information:

- "UN 3359, fumigated cargo transport unit, 9", or "UN 3359, fumigated cargo transport unit, Class 9";
- The date and time of fumigation; and
- The type and amount of the fumigant used.

These particulars shall be in English

5.5.2.4.2 The documents may be in any form, provided they contain the information required in 5.5.2.4.1. This information shall be easy to identify, legible and durable.

5.5.2.4.3 Instructions for disposal of any residual fumigant including fumigation devices (if used) shall be provided.

5.5.2.4.4 A document is not required when the fumigated cargo transport unit has been completely ventilated and the date of ventilation has been marked on the warning mark (see 5.5.2.3.3 and 5.5.2.3.4).

5.5.3 Special provisions applicable to the carriage of dry ice (UN 1845) and to packages and vehicles and wagons and containers containing substances presenting a risk of asphyxiation when used for cooling or conditioning purposes (such as dry ice (UN 1845) or nitrogen, refrigerated liquid (UN 1977) or argon, refrigerated liquid (UN 1951) or nitrogen)

NOTE*: In the context of this section the term "conditioning" may be used in a broader scope and includes protection.*

5.5.3.1 ***Scope***

5.5.3.1.1 This section is not applicable to substances which may be used for cooling or conditioning purposes when carried as a consignment of dangerous goods, except for the carriage of dry ice (UN No. 1845). When they are carried as a consignment, these substances shall be carried under the relevant entry of Table A of Chapter 3.2 in accordance with the associated conditions of carriage.

For UN No. 1845, the conditions of carriage specified in this section, except 5.5.3.3.1, apply for all kinds of carriage, as a coolant, conditioner, or as a consignment. For the carriage of UN No. 1845, no other provisions of this Code apply.

5.5.3.1.2 This section is not applicable to gases in cooling cycles.

5.5.3.1.3 Dangerous goods used for cooling or conditioning tanks or MEGCs during carriage are not subject to this section.

5.5.3.1.4 Vehicles, wagons and containers containing substances used for cooling or conditioning purposes include vehicles, wagons and containers containing substances used for cooling or conditioning

purposes inside packages as well as vehicles, wagons and containers with unpackaged substances used for cooling or conditioning purposes.

5.5.3.1.5 Sub-sections 5.5.3.6 and 5.5.3.7 only apply when there is an actual risk of asphyxiation in the vehicle, wagon or container. It is for the participants concerned to assess this risk, taking into consideration the hazards presented by the substances being used for cooling or conditioning, the amount of substance to be carried, the duration of the journey, the types of containment to be used and the gas concentration limits given in the note to 5.5.3.3.3.

5.5.3.2 ***General***

5.5.3.2.1 Vehicles, wagons and containers in which dry ice (UN 1845) is carried or containing substances used for cooling or conditioning purposes (other than fumigation) during carriage are not subject to any provisions of this Code other than those of this section.

5.5.3.2.2 When dangerous goods are loaded in vehicles, wagons or containers containing substances used for cooling or conditioning purposes any provisions of this Code relevant to these dangerous goods apply in addition to the provisions of this section.

5.5.3.2.3 *(Reserved)*

5.5.3.2.4 Persons engaged in the handling or carriage of vehicles, wagons and containers in which dry ice (UN a845) is carried or containing substances used for cooling or conditioning purposes shall be trained commensurate with their responsibilities.

5.5.3.3 ***Packages containing dry ice (UN 1845) or a coolant or conditioner***

5.5.3.3.1 Packaged dangerous goods requiring cooling or conditioning assigned to packing instructions P203, P620, P650, P800, P901 or P904 of 4.1.4.1 shall meet the appropriate requirements of that packing instruction.

5.5.3.3.2 For packaged dangerous goods requiring cooling or conditioning assigned to other packing instructions, the packages shall be capable of withstanding very low temperatures and shall not be affected or significantly weakened by the coolant or conditioner. Packages shall be designed and constructed to permit the release of gas to prevent a build-up of pressure that could rupture the packaging. The dangerous goods shall be packed in such a way as to prevent movement after the dissipation of any coolant or conditioner.

5.5.3.3.3 Packages containing dry ice (UN 1845) or a coolant or conditioner shall be carried in well ventilated vehicles, wagons and containers. Marking according to 5.5.3.6 is not required in this case.

Ventilation is not required, and marking according to 5.5.3.6 is required, if:

- gas exchange between the load compartment and the driver’s cab or accessible compartments during carriage is prevented; or

- the load compartment is insulated, refrigerated or mechanically refrigerated equipment and separated from the driver’s cab.

NOTE: *In this context "well ventilated" means there is an atmosphere where the carbon dioxide concentration is below 0.5% by volume and the oxygen concentration is above 19.5% by volume.*

5.5.3.4 ***Marking of packages containing dry ice (UN 1845) or a coolant or conditioner***

5.5.3.4.1 Packages containing dry ice (UN 1845) as a consignment shall be marked “CARBON DIOXIDE, SOLID” or “DRY ICE”; packages containing dangerous goods used for cooling or conditioning shall be marked with the name indicated in Column (2) of Table A of Chapter 3.2 of these dangerous goods followed by the words "AS COOLANT" or "AS CONDITIONER" as appropriate in English.

5.5.3.4.2 The marks shall be durable, legible and placed in such a location and of such a size relative to the package as to be readily visible.

5.5.3.5 ***Vehicles, wagons and containers containing unpackaged dry ice***

5.5.3.5.1 If dry ice in unpackaged form is used, it shall not come into direct contact with the metal structure of a vehicle, wagon or container to avoid embrittlement of the metal. Measures shall be taken to provide adequate insulation between the dry ice and the vehicle, wagon or container by providing a minimum of 30 mm separation (e.g. by using suitable low heat conducting materials such as timber planks, pallets etc).

5.5.3.5.2 Where dry ice is placed around packages, measures shall be taken to ensure that packages remain in the original position during carriage after the dry ice has dissipated.

5.5.3.6 ***Marking of vehicles, wagons and containers***

5.5.3.6.1 Vehicles, wagons and containers containing dry ice (UN 1845) or dangerous goods used for cooling or conditioning purposes that are not well ventilated shall be marked with a warning mark, as specified in 5.5.3.6.2, affixed at each access point in a location where it will be easily seen by persons opening or entering the vehicle or container. This mark shall remain on the vehicle, wagon or container until the following provisions are met:

(a) The vehicle, wagon or container has been well ventilated to remove harmful concentrations of dry ice (UN 1845) or coolant or conditioner; and

(b) The dry ice (UN 1845) or cooled or conditioned goods have been unloaded.

As long as the vehicle, wagon or container is marked, the necessary precautions have to be taken before entering it. The necessity of ventilating through the cargo doors or other means (e.g. forced ventilation) has to be evaluated and included in training of the involved persons.

5.5.3.6.2 The warning mark shall be as shown in Figure 5.5.3.6.2.

Figure 5.5.3.6.2

Asphyxiation warning mark for vehicles and containers

* Insert the name indicated in Column (2) of Table A of Chapter 3.2 or the name of the asphyxiant gas used as the coolant/conditioner. The lettering shall be in capitals, all be on one line and shall be at least 25 mm high. If the length of the proper shipping name is too long to fit in the space provided, the lettering may be reduced to the maximum size possible to fit. For example: "CARBON DIOXIDE, SOLID".

** Insert "AS COOLANT" or "AS CONDITIONER" as appropriate. The lettering shall be in capitals, all be on one line and be at least 25 mm high.

The mark shall be a rectangle. The minimum dimensions shall be 150 mm wide x 250 mm high. The word "WARNING" shall be in red or white and be at least 25 mm high. Where dimensions are not specified, all features shall be in approximate proportion to those shown.

The word "WARNING" and the words "AS COOLANT" or "AS CONDITIONER", as appropriate, shall be in English.

5.5.3.7 ***Documentation***

5.5.3.7.1 Documents (such as a bill of lading, cargo manifest or CMR/CIM consignment note) associated with the carriage of vehicles, wagons or containers containing or having contained dry ice (UN 1845) or substances used for cooling or conditioning purposes and have not been completely ventilated before carriage shall include the following information:

(a) The UN number preceded by the letters "UN"; and

(b) The name indicated in Column (2) of Table A of Chapter 3.2 followed, where appropriate, by the words "AS COOLANT" or "AS CONDITIONER" in English.

For example: UN 1845, CARBON DIOXIDE, SOLID, AS COOLANT.

5.5.3.7.2 The transport document may be in any form, provided it contains the information required in 5.5.3.7.1. This information shall be easy to identify, legible and durable.

5.5.4 Dangerous goods contained in equipment in use or intended for use during carriage, attached to or placed in packages, overpacks, containers or load compartments

5.5.4.1 Dangerous goods (e.g. lithium batteries, fuel cell cartridges) contained in equipment such as data loggers and cargo tracking devices, attached to or placed in packages, overpacks, containers or load compartments are not subject to any provisions of this Code other than the following:

(a) the equipment shall be in use or intended for use during carriage;

(b) the contained dangerous goods (e.g. lithium batteries, fuel cell cartridges) shall meet the applicable construction and test requirements specified in this Code; and

(c) the equipment shall be capable of withstanding the shocks and loadings normally encountered during carriage.

5.5.4.2 When such equipment containing dangerous goods is carried as a consignment, the relevant entry of Table A of Chapter 3.2 shall be used and all applicable provisions of this Code shall apply.

PART 6

Requirements for the construction and testing of packagings, intermediate bulk containers (IBCs), large packagings, tanks and bulk containers and segregation devices

CHAPTER 6.1

REQUIREMENTS FOR THE CONSTRUCTION AND TESTING OF PACKAGINGS

6.1.1 General

6.1.1.1 The requirements of this Chapter do not apply to:

(a) Packages containing radioactive material of Class 7, unless otherwise provided (see 4.1.9);

(b) Packages containing infectious substances of Class 6.2, unless otherwise provided (see Note under the heading of Chapter 6.3 and packing instructions P621, P621a and P622 of 4.1.4.1);

(c) Pressure receptacles containing gases of Class 2;

(d) Packages whose net mass exceeds 400 kg;

(e) Packagings for liquids, other than combination packagings, with a capacity exceeding 450 litres.

6.1.1.2 The requirements for packagings in 6.1.4 are based on packagings currently used. In order to take into account progress in science and technology, there is no objection to the use of packagings having specifications different from those in 6.1.4, provided that they are equally effective, acceptable to the competent authority and able to successfully fulfil the requirements described in 6.1.1.3 and 6.1.5. Methods of testing other than those described in this Chapter are acceptable, provided they are equivalent, and are recognized by the competent authority.

6.1.1.3 Every packaging intended to contain liquids shall successfully undergo a suitable leakproofness test. This test is part of a quality assurance programme as stipulated in 6.1.1.4 which shows the capability of meeting the appropriate test level indicated in 6.1.5.4.3:

(a) Before it is first used for carriage;

(b) After remanufacturing or reconditioning, before it is re-used for carriage;

For this test, packagings need not have their own closures fitted.

The inner receptacle of composite packagings may be tested without the outer packaging provided the test results are not affected.

This test is not necessary for inner packagings of combination packagings;

6.1.1.4 Packagings shall be manufactured, reconditioned and tested under a quality assurance programme which satisfies the competent authority in order to ensure that each packaging meets the requirements of this Chapter.

NOTE: *ISO 16106:2020 "Transport packages for dangerous goods – Dangerous goods packagings, intermediate bulk containers (IBCs) and large packagings – Guidelines for the application of ISO 9001" provides acceptable guidance on procedures which may be followed.*

6.1.1.5 Manufacturers and subsequent distributors of packagings shall provide information regarding procedures to be followed and a description of the types and dimensions of closures (including required gaskets) and any other components needed to ensure that packages as presented for carriage are capable of passing the applicable performance tests of this Chapter.

6.1.2 Code for designating types of packagings

6.1.2.1 The code consists of:

(a) An Arabic numeral indicating the kind of packaging, e.g. drum, jerrican, etc., followed by;

(b) A capital letter(s) in Latin characters indicating the nature of the material, e.g. steel, wood, etc., followed where necessary by;

(c) An Arabic numeral indicating the category of packaging within the kind to which the packaging belongs.

6.1.2.2 In the case of composite packagings, two capital letters in Latin characters are used in sequence in the second position of the code. The first indicates the material of the inner receptacle and the second that of the outer packaging.

6.1.2.3 In the case of combination packagings only the code number for the outer packaging is used.

6.1.2.4 The letters "T", "V" or "W" may follow the packaging code. The letter "T" signifies a salvage packaging conforming to the requirements of 6.1.5.1.11. The letter "V" signifies a special packaging conforming to the requirements of 6.1.5.1.7. The letter "W" signifies that the packaging, although of the same type indicated by the code, is manufactured to a specification different to that in 6.1.4 and is considered equivalent under the requirements of 6.1.1.2.

6.1.2.5 The following numerals shall be used for the kinds of packaging:

l. Drum
2. (Reserved)
3. Jerrican
4. Box
5. Bag
6. Composite packaging

6.1.2.6 The following capital letters shall be used for the types of material:

A. Steel (all types and surface treatments)
B. Aluminium
C. Natural wood
D. Plywood
F. Reconstituted wood
G. Fibreboard
H. Plastics material
L. Textile
M. Paper, multiwall
N. Metal (other than steel or aluminium)
P. Glass, porcelain or stoneware

NOTE: Plastics material *is taken to include other polymeric materials such as rubber.*

6.1.2.7 The following table indicates the codes to be used for designating types of packagings depending on the kind of packagings, the material used for their construction and their category; it also refers to the sub-sections to be consulted for the appropriate requirements:

Kind	Material	Category	Code	Sub-section
1. Drums	A. Steel	non-removable head	1A1	6.1.4.1
		removable head	1A2	
	B. Aluminium	non-removable head	1B1	6.1.4.2
		removable head	1B2	
	D. Plywood		1D	6.1.4.5
	G. Fibre		1G	6.1.4.7
	H. Plastics	non-removable head	1H1	6.1.4.8
		removable head	1H2	
	N. Metal, other than steel or aluminium	non-removable head	1N1	6.1.4.3
		removable head	1N2	
2. *(Reserved)*				
3. Jerricans	A. Steel	non-removable head	3A1	6.1.4.4
		removable head	3A2	
	B. Aluminium	non-removable head	3B1	6.1.4.4
		removable head	3B2	
	H. Plastics	non-removable head	3H1	6.1.4.8
		removable head	3H2	
4. Boxes	A. Steel		4A	6.1.4.14
	B. Aluminium		4B	6.1.4.14
	C. Natural wood	ordinary	4C1	6.1.4.9
		with sift-proof walls	4C2	
	D. Plywood		4D	6.1.4.10
	F. Reconstituted wood		4F	6.1.4.11
	G. Fibreboard		4G	6.1.4.12
	H. Plastics	expanded	4H1	6.1.4.13
		solid	4H2	
	N. Metal, other than steel or aluminium		4N	6.1.4.14
5. Bags	H. Woven plastics	without inner liner or coating	5H1	6.1.4.16
		sift-proof	5H2	
		water resistant	5H3	
	H. Plastics film		5H4	6.1.4.17
	L. Textile	without inner liner or coating	5L1	6.1.4.15
		sift-proof	5L2	
		water resistant	5L3	
	M. Paper	multiwall	5M1	6.1.4.18
		multiwall, water resistant	5M2	

Kind	Material	Category	Code	Sub-section
6. Composite packagings	H. Plastics receptacle	with outer steel drum	6HA1	
		with outer steel crate or box	6HA2	
		with outer aluminium drum	6HB1	
		with outer aluminium crate or box	6HB2	
		with outer wooden box	6HC	
		with outer plywood drum	6HD1	6.1.4.19
		with outer plywood box	6HD2	
		with outer fibre drum	6HG1	
		with outer fibreboard box	6HG2	
		with outer plastics drum	6HH1	
		with outer solid plastics box	6HH2	
	P. Glass, porcelain or stoneware receptacle	with outer steel drum	6PA1	
		with outer steel crate or box	6PA2	
		with outer aluminium drum	6PB1	
		with outer aluminium crate or box	6PB2	
		with outer wooden box	6PC	
		with outer plywood drum	6PD1	
		with outer wickerwork hamper	6PD2	6.1.4.20
		with outer fibre drum	6PG1	
		with outer fibreboard box	6PG2	
		with outer expanded plastics packaging	6PH1	
		with outer solid plastics packaging	6PH2	

6.1.3 Marking

NOTE 1: *The marks indicate that the packaging which bears them correspond to a successfully tested design type and that it complies with the requirements of this Chapter which are related to the manufacture, but not to the use, of the packaging. In itself, therefore, the mark does not necessarily confirm that the packaging may be used for any substance: generally the type of packaging (e.g. steel drum), its maximum capacity and/or mass, and any special requirements are specified for each substance in Table A of Chapter 3.2.*

NOTE 2: *The marks are intended to be of assistance to packaging manufacturers, reconditioners, packaging users, carriers and regulatory authorities. In relation to the use of a new packaging, the original marks are a means for its manufacturer(s) to identify the type and to indicate those performance test regulations that have been met.*

NOTE 3: *The marks do not always provide full details of the test levels, etc., and these may need to be taken further into account, e.g. by reference to a test certificate, to test reports or to a register of successfully tested packagings. For example, a packaging having an X or Y mark may be used for substances to which a packing group having a lesser degree of danger has been assigned with the relevant maximum permissible value of the relative density*[1] *determined by taking into account the factor 1.5 or 2.25 indicated in the packaging test requirements in 6.1.5 as appropriate, i.e. packing group I packaging tested for products of relative density 1.2 could be used as a packing group II packaging for products of relative density 1.8 or a packing group III packaging for products of relative density 2.7, provided of course that all the performance criteria can still be met with the higher relative density product.*

6.1.3.1 Each packaging intended for use according to this Code shall bear marks on a non-removable component which are durable, legible and placed in a location and of such a size relative to the

[1] *Relative density (d) is considered to be synonymous with Specific Gravity (SG) and is used throughout this text.*

packaging as to be readily visible. For packages with a gross mass of more than 30 kg, the marks or a duplicate thereof shall appear on the top or on a side of the packaging. Letters, numerals and symbols shall be at least 12 mm high, except for packagings of 30 *l* capacity or less or of 30 kg maximum net mass, when they shall be at least 6 mm in height and except for packagings of 5 *l* capacity or less or of 5 kg maximum net mass when they shall be of an appropriate size.

The marks shall show:

(a) The United Nations packaging symbol  .

This symbol shall not be used for any purpose other than certifying that a packaging, a flexible bulk container, a portable tank or a MEGC complies with the relevant requirements in Chapter 6.1, 6.2, 6.3, 6.5, 6.6, 6.7 or 6.11.

(b) The code designating the type of packaging according to 6.1.2;

(c) A code in two parts:

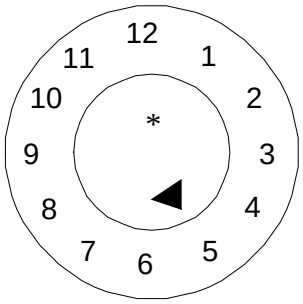
(i) a letter designating the packing group(s) for which the design type has been successfully tested:

X for packing groups I, II and III;
Y for packing groups II and III;
Z for packing group III only;

(ii) the relative density, rounded off to the first decimal, for which the design type has been tested for packagings without inner packagings intended to contain liquids; this may be omitted when the relative density does not exceed 1.2. For packagings intended to contain solids or inner packagings, the maximum gross mass in kilograms.

(d) Either the letter "S" denoting that the packaging is intended for the carriage of solids or inner packagings or, for packagings (other than combination packagings) intended to contain liquids, the hydraulic test pressure which the packaging was shown to withstand in kPa rounded down to the nearest 10 kPa.

(e) The last two digits of the year during which the packaging was manufactured. Packagings of types 1H and 3H shall also be appropriately marked with the month of manufacture; this may be marked on the packaging in a different place from the remainder of the marks. An appropriate method is:



* *The last two digits of the year of manufacture may be displayed at that place. In such a case and when the clock is placed adjacent to the UN design type mark, the indication of the year in the mark may be waived. However, when the clock is not placed adjacent to the UN design type mark, the two digits of the year in the mark and in the clock shall be identical.*

NOTE: *Other methods that provide the minimum required information in a durable, visible and legible form are also acceptable.*

(f) The State authorizing the allocation of the mark, indicated by the distinguishing sign used on vehicles in international road traffic[2];

(g) The name of the manufacturer or other identification of the packaging specified by the competent authority.

6.1.3.2 In addition to the durable marks prescribed in 6.1.3.1, every new metal drum of a capacity greater than 100 litres shall bear the marks described in 6.1.3.1 (a) to (e) on the bottom, with an indication of the nominal thickness of at least the metal used in the body (in mm, to 0.1 mm), in permanent form (e.g. embossed). When the nominal thickness of either head of a metal drum is thinner than that of the body, the nominal thickness of the top head, body, and bottom head shall be marked on the bottom in permanent form (e.g. embossed), for example "1.0-1.2-1.0" or "0.9-1.0-1.0". Nominal thickness of metal shall be determined according to the appropriate ISO or Australian standard, for example ISO 3574:1999 or AS/NZS 1595 for steel. The marks indicated in 6.1.3.1 (f) and (g) shall not be applied in a permanent form except as provided in 6.1.3.5.

6.1.3.3 Every packaging other than those referred to in 6.1.3.2 liable to undergo a reconditioning process shall bear the marks indicated in 6.1.3.1 (a) to (e) in a permanent form. Marks are permanent if they are able to withstand the reconditioning process (e.g. embossed). For packagings other than metal drums of a capacity greater than 100 litres, these permanent marks may replace the corresponding durable marks prescribed in 6.1.3.1.

6.1.3.4 For remanufactured metal drums, if there is no change to the packaging type and no replacement or removal of integral structural components, the required marks need not be permanent. Every other remanufactured metal drum shall bear the marks in 6.1.3.1 (a) to (e) in a permanent form (e.g. embossed) on the top head or side.

6.1.3.5 Metal drums made from materials (e.g. stainless steel) designed to be reused repeatedly may bear the marks indicated in 6.1.3.1 (f) and (g) in a permanent form (e.g. embossed).

6.1.3.6 The marks in accordance with 6.1.3.1 are valid for only one design type or series of design types. Different surface treatments may fall within the same design type.

A "series of design types" means packagings of the same structural design, wall thickness, material and cross-section, which differ only in their lesser design heights from the design type approved.

The closures of receptacles shall be identifiable as those referred to in the test report.

6.1.3.7 Marks shall be applied in the sequence of the sub-paragraphs in 6.1.3.1; each mark required in these sub-paragraphs and when appropriate sub-paragraphs (h) to (j) of 6.1.3.8 shall be clearly separated, e.g. by a slash or space, so as to be easily identifiable. For examples, see 6.1.3.11.

Any additional marks authorized by a competent authority shall still enable the other marks required in 6.1.3.1 to be correctly identified.

6.1.3.8 After reconditioning a packaging, the reconditioner shall apply to it a durable marking showing, in sequence, durable marks showing:

(h) The State in which the reconditioning was carried out, indicated by the distinguishing sign used on vehicles in international road traffic[2];

(i) The name of the reconditioner or other identification of the packaging specified by the competent authority;

(j) The year of reconditioning; the letter "R"; and, for every packaging successfully passing the leakproofness test in 6.1.1.3, the additional letter "L".

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[2] *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*

[2] *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*

6.1.3.9 When, after reconditioning, the marks required by 6.1.3.1 (a) to (d) no longer appear on the top head or the side of a metal drum, the reconditioner also shall apply them in a durable form followed by 6.1.3.8 (h), (i) and (j). These marks shall not identify a greater performance capability than that for which the original design type had been tested and marked.

6.1.3.10 Packagings manufactured with recycled plastics material as defined in 1.2.1 shall be marked "REC". This mark shall be placed near the marks prescribed in 6.1.3.1.

6.1.3.11 ***Examples for marking NEW packagings***

 4G/Y145/S/02 NL/VL823	as in 6.1.3.1 (a) (i), (b), (c), (d) and (e) as in 6.1.3.1 (f) and (g)	For a new fibreboard box
 1A1/Y1.4/150/98 NL/VL824	as in 6.1.3.1 (a) (i), (b), (c), (d) and (e) as in 6.1.3.1 (f) and (g)	For a new steel drum to contain liquids
 1A2/Y150/S/01 NL/VL825	as in 6.1.3.1 (a) (i), (b), (c), (d) and (e) as in 6.1.3.1 (f) and (g)	For a new steel drum to contain solids, or inner packagings
 4HW/Y136/S/98 NL/VL826	as in 6.1.3.1 (a) (i), (b), (c), (d) and (e) as in 6.1.3.1 (f) and (g)	For a new plastics box of equivalent specification
 1A2/Y/100/01 USA/MM5	as in 6.1.3.1 (a) (i), (b), (c), (d) and (e) as in 6.1.3.1 (f) and (g)	For a remanufactured steel drum to contain liquids

6.1.3.12 Examples for marking RECONDITIONED packagings

 1A1/Y1.4/150/97 NL/RB/01 RL	as in 6.1.3.1 (a) (i), (b), (c), (d) and (e) as in 6.1.3.8 (h), (i) and (j)
 1A2/Y150/S/99 USA/RB/00 R	as in 6.1.3.1 (a) (i), (b), (c), (d) and (e) as in 6.1.3.8 (h), (i) and (j)

6.1.3.13 Example for marking SALVAGE packagings

 1A2T/Y300/S/01 USA/abc	as in 6.1.3.1 (a) (i), (b), (c), (d) and (e) as in 6.1.3.1 (f) and (g)

NOTE: *The marking, for which examples are given in 6.1.3.11, 6.1.3.12 and 6.1.3.13 may be applied in a single line or in multiple lines provided the correct sequence is respected.*

6.1.3.14 Where a packaging conforms to one or more than one tested packaging design type, including one or more than one tested IBC or large packaging design type, the packaging may bear more than one mark to indicate the relevant performance test requirements that have been met. Where more than one mark appears on a packaging, the marks shall appear in close proximity to one another and each mark shall appear in its entirety.

6.1.3.15 Certification

By affixing marks in accordance with 6.1.3.1, it is certified that mass-produced packagings correspond to the approved design type and that the requirements referred to in the approval have been met.

6.1.4 Requirements for packagings

6.1.4.0 General requirements

Any permeation of the substance contained in the packaging shall not constitute a danger under normal conditions of carriage.

6.1.4.1 Steel drums

1A1 non-removable head
1A2 removable head

6.1.4.1.1 Body and heads shall be constructed of steel sheet of a suitable type and of adequate thickness in relation to the capacity of the drum and to its intended use.

NOTE: *In the case of carbon steel drums, "suitable" steels are identified in ISO 3573:1999 "Hot rolled carbon steel sheet of commercial and drawing qualities" and ISO 3574:1999 "Cold-reduced carbon steel sheet of commercial and drawing qualities". For carbon steel drums below 100 litres "suitable" steels in addition to the above standards are also identified in ISO 11949:1995 "Cold-reduced electrolytic tinplate", ISO 11950:1995 "Cold-reduced electrolytic chromium/chromium oxide-coated steel" and ISO 11951:1995 "Cold-reduced blackplate in coil form for the production of tinplate or electrolytic chromium/chromium oxide-coated steel".*

6.1.4.1.2 Body seams shall be welded on drums intended to contain more than 40 litres of liquid. Body seams shall be mechanically seamed or welded on drums intended to contain solids or 40 litres or less of liquids.

6.1.4.1.3 Chimes shall be mechanically seamed or welded. Separate reinforcing rings may be applied.

6.1.4.1.4 The body of a drum of a capacity greater than 60 litres shall, in general, have at least two expanded rolling hoops or, alternatively, at least two separate rolling hoops. If there are separate rolling hoops they shall be fitted tightly on the body and so secured that they cannot shift. Rolling hoops shall not be spot welded.

6.1.4.1.5 Openings for filling, emptying and venting in the bodies or heads of non-removable head (1A1) drums shall not exceed 7 cm in diameter. Drums with larger openings are considered to be of the removable head type (1A2). Closures for openings in the bodies and heads of drums shall be so designed and applied that they will remain secure and leakproof under normal conditions of carriage. Closure flanges may be mechanically seamed or welded in place. Gaskets or other sealing elements shall be used with closures, unless the closure is inherently leakproof.

6.1.4.1.6 Closure devices for removable head (1A2) drums shall be so designed and applied that they will remain secure and drums will remain leakproof under normal conditions of carriage. Gaskets or other sealing elements shall be used with all removable heads.

6.1.4.1.7 If materials used for body, heads, closures and fittings are not in themselves compatible with the contents to be carried, suitable internal protective coatings or treatments shall be applied. These coatings or treatments shall retain their protective properties under normal conditions of carriage.

6.1.4.1.8 Maximum capacity of drum: 450 litres.

6.1.4.1.9 Maximum net mass: 400 kg.

6.1.4.2 Aluminium drums

1B1 non-removable head
1B2 removable head

6.1.4.2.1 Body and heads shall be constructed of aluminium at least 99 % pure or of an aluminium base alloy. Material shall be of a suitable type and of adequate thickness in relation to the capacity of the drum and to its intended use.

6.1.4.2.2 All seams shall be welded. Chime seams, if any, shall be reinforced by the application of separate reinforcing rings.

6.1.4.2.3 The body of a drum of a capacity greater than 60 litres shall, in general, have at least two expanded rolling hoops or, alternatively, at least two separate rolling hoops. If there are separate rolling hoops they shall be fitted tightly on the body and so secured that they cannot shift. Rolling hoops shall not be spot welded.

6.1.4.2.4 Openings for filling, emptying and venting in the bodies or heads of non-removable head (1B1) drums shall not exceed 7 cm in diameter. Drums with larger openings are considered to be of the removable

head type (1B2). Closures for openings in the bodies and heads of drums shall be so designed and applied that they will remain secure and leakproof under normal conditions of carriage. Closure flanges shall be welded in place so that the weld provides a leakproof seam. Gaskets or other sealing elements shall be used with closures, unless the closure is inherently leakproof.

6.1.4.2.5 Closure devices for removable head (1B2) drums shall be so designed and applied that they will remain secure and drums will remain leakproof under normal conditions of carriage. Gaskets or other sealing elements shall be used with all removable heads.

6.1.4.2.6 If materials used for body, heads, closures and fittings are not in themselves compatible with the contents to be carried, suitable internal protective coatings or treatments shall be applied. These coatings or treatments shall retain their protective properties under normal conditions of carriage.

6.1.4.2.7 Maximum capacity of drum: 450 litres.

6.1.4.2.8 Maximum net mass: 400 kg.

6.1.4.3 Drums of metal other than aluminium or steel

1N1 non-removable head
1N2 removable head

6.1.4.3.1 The body and heads shall be constructed of a metal or of a metal alloy other than steel or aluminium. Material shall be of a suitable type and of adequate thickness in relation to the capacity of the drum and to its intended use.

6.1.4.3.2 Chime seams, if any, shall be reinforced by the application of separate reinforcing rings. All seams, if any, shall be joined (welded, solded, etc.) in accordance with the technical state of the art for the used metal or metal alloy.

6.1.4.3.3 The body of a drum of a capacity greater than 60 litres shall, in general, have at least two expanded rolling hoops or, alternatively, at least two separate rolling hoops. If there are separate rolling hoops they shall be fitted tightly on the body and so secured that they cannot shift. Rolling hoops shall not be spot welded.

6.1.4.3.4 Openings for filling, emptying and venting in the bodies or heads of non-removable head (1N1) drums shall not exceed 7 cm in diameter. Drums with larger openings are considered to be of the removable head type (1N2). Closures for openings in the bodies and heads of drums shall be so designed and applied that they will remain secure and leakproof under normal conditions of carriage. Closure flanges shall be joined in place (welded, solded, etc.) in accordance with the technical state of the art for the used metal or metal alloy so that the seam join is leakproof. Gaskets or other sealing elements shall be used with closures, unless the closure is inherently leakproof.

6.1.4.3.5 Closure devices for removable head (1N2) drums shall be so designed and applied that they will remain secure and drums will remain leakproof under normal conditions of carriage. Gaskets or other sealing elements shall be used with all removable heads.

6.1.4.3.6 If materials used for body, heads, closures and fittings are not in themselves compatible with the contents to be carried, suitable internal protective coatings or treatments shall be applied. These coatings or treatments shall retain their protective properties under normal conditions of carriage.

6.1.4.3.7 Maximum capacity of drum: 450 litres.

6.1.4.3.8 Maximum net mass: 400 kg.

6.1.4.4 Steel or aluminium jerricans

3A1 steel, non-removable head
3A2 steel, removable head
3B1 aluminium, non-removable head
3B2 aluminium, removable head

6.1.4.4.1 Body and heads shall be constructed of steel sheet, of aluminium at least 99 % pure or of an aluminium base alloy. Material shall be of a suitable type and of adequate thickness in relation to the capacity of the jerrican and to its intended use.

6.1.4.4.2 Chimes of steel jerricans shall be mechanically seamed or welded. Body seams of steel jerricans intended to contain more than 40 litres of liquid shall be welded. Body seams of steel jerricans intended to contain 40 litres or less shall be mechanically seamed or welded. For aluminium jerricans, all seams shall be welded. Chime seams, if any, shall be reinforced by the application of a separate reinforcing ring.

6.1.4.4.3 Openings in non-removable head jerricans (3A1 and 3B1) shall not exceed 7 cm in diameter. Jerricans with larger openings are considered to be of the removable head type (3A2 and 3B2). Closures shall be so designed that they will remain secure and leakproof under normal conditions of carriage. Gaskets or other sealing elements shall be used with closures, unless the closure is inherently leakproof.

6.1.4.4.4 If materials used for body, heads, closures and fittings are not in themselves compatible with the contents to be carried, suitable internal protective coatings or treatments shall be applied. These coatings or treatments shall retain their protective properties under normal conditions of carriage.

6.1.4.4.5 Maximum capacity of jerrican: 60 litres.

6.1.4.4.6 Maximum net mass: 120 kg.

6.1.4.5 Plywood drums

1D

6.1.4.5.1 The wood used shall be well seasoned, commercially dry and free from any defect likely to lessen the effectiveness of the drum for the purpose intended. If a material other than plywood is used for the manufacture of the heads, it shall be of a quality equivalent to the plywood.

6.1.4.5.2 At least two-ply plywood shall be used for the body and at least three-ply plywood for the heads; the plies shall be firmly glued together by a water resistant adhesive with their grain crosswise.

6.1.4.5.3 The body and heads of the drum and their joins shall be of a design appropriate to the capacity of the drum and to its intended use.

6.1.4.5.4 In order to prevent sifting of the contents, lids shall be lined with kraft paper or some other equivalent material which shall be securely fastened to the lid and extend to the outside along its full circumference.

6.1.4.5.5 Maximum capacity of drum: 250 litres.

6.1.4.5.6 Maximum net mass: 400 kg.

6.1.4.6 *(Deleted)*

6.1.4.7 Fibre drums

1G

6.1.4.7.1 The body of the drum shall consist of multiple plies of heavy paper or fibreboard (without corrugations) firmly glued or laminated together and may include one or more protective layers of bitumen, waxed kraft paper, metal foil, plastics material, etc.

6.1.4.7.2 Heads shall be of natural wood, fibreboard, metal, plywood, plastics or other suitable material and may include one or more protective layers of bitumen, waxed kraft paper, metal foil, plastics material, etc.

6.1.4.7.3 The body and heads of the drum and their joins shall be of a design appropriate to the capacity of the drum and to its intended use.

6.1.4.7.4 The assembled packaging shall be sufficiently water resistant so as not to delaminate under normal conditions of carriage.

6.1.4.7.5 Maximum capacity of drum: 450 litres.

6.1.4.7.6 Maximum net mass: 400 kg.

6.1.4.8 Plastics drums and jerricans

1H1 drums, non-removable head
1H2 drums, removable head
3H1 jerricans, non-removable head
3H2 jerricans, removable head

6.1.4.8.1 The packaging shall be manufactured from suitable plastics material and be of adequate strength in relation to its capacity and intended use. Except for recycled plastics material as defined in 1.2.1, no used material other than production residues or regrind from the same manufacturing process may be used. The packaging shall be adequately resistant to ageing and to degradation caused either by the substance contained or by ultra-violet radiation. Any permeation of the substance contained in the package, or recycled plastics material used to produce new packaging, shall not constitute a danger under normal conditions of carriage.

6.1.4.8.2 If protection against ultra-violet radiation is required, it shall be provided by the addition of carbon black or other suitable pigments or inhibitors. These additives shall be compatible with the contents and remain effective throughout the life of the packaging. Where use is made of carbon black, pigments or inhibitors other than those used in the manufacture of the tested design type, retesting may be waived if the carbon black content does not exceed 2 % by mass or if the pigment content does not exceed 3 % by mass; the content of inhibitors of ultra-violet radiation is not limited.

6.1.4.8.3 Additives serving purposes other than protection against ultra-violet radiation may be included in the composition of the plastics material provided that they do not adversely affect the chemical and physical properties of the material of the packaging. In such circumstances, retesting may be waived.

6.1.4.8.4 The wall thickness at every point of the packaging shall be appropriate to its capacity and intended use, taking into account the stresses to which each point is liable to be exposed.

6.1.4.8.5 Openings for filling, emptying and venting in the bodies or heads of non-removable head drums (1H1) and jerricans (3H1) shall not exceed 7 cm in diameter. Drums and jerricans with larger openings are considered to be of the removable head type (1H2 and 3H2). Closures for openings in the bodies or heads of drums and jerricans shall be so designed and applied that they will remain secure and leakproof under normal conditions of carriage. Gaskets or other sealing elements shall be used with closures unless the closure is inherently leakproof.

6.1.4.8.6 Closure devices for removable head drums and jerricans (1H2 and 3H2) shall be so designed and applied that they will remain secure and leakproof under normal conditions of carriage. Gaskets shall be used with all removable heads unless the drum or jerrican design is such that, where the removable head is properly secured, the drum or jerrican is inherently leakproof.

6.1.4.8.7 The maximum permissible permeability for flammable liquids shall be 0.008 g/l.h at 23 °C (see 6.1.5.7).

6.1.4.8.8 *(Deleted)*

6.1.4.8.9 Maximum capacity of drums and jerricans: 1H1, 1H2: 450 litres
3H1, 3H2: 60 litres.

6.1.4.8.10 Maximum net mass: 1H1, 1H2: 400 kg
3H1, 3H2: 120 kg.

6.1.4.9 Boxes of natural wood

4C1 ordinary
4C2 with sift-proof walls

6.1.4.9.1 The wood used shall be well seasoned, commercially dry and free from defects that would materially lessen the strength of any part of the box. The strength of the material used and the method of construction shall be appropriate to the capacity and intended use of the box. The tops and bottoms may be made of water resistant reconstituted wood such as hardboard, particle board or other suitable type.

6.1.4.9.2 Fastenings shall be resistant to vibration experienced under normal conditions of carriage. End grain nailing shall be avoided whenever practicable. Joins which are likely to be highly stressed shall be made using clenched or annular ring nails or equivalent fastenings.

6.1.4.9.3 Box 4C2: each part shall consist of one piece or be equivalent thereto. Parts are considered equivalent to one piece when one of the following methods of glued assembly is used: Lindermann joint, tongue and groove joint, ship lap or rabbet joint or butt joint with at least two corrugated metal fasteners at each joint.

6.1.4.9.4 Maximum net mass: 400 kg.

6.1.4.10 Plywood boxes

4D

6.1.4.10.1 Plywood used shall be at least 3-ply. It shall be made from well seasoned rotary cut, sliced or sawn veneer, commercially dry and free from defects that would materially lessen the strength of the box. The strength of the material used and the method of construction shall be appropriate to the capacity and intended use of the box. All adjacent plies shall be glued with water resistant adhesive. Other suitable materials may be used together with plywood in the construction of boxes. Boxes shall be firmly nailed or secured to corner posts or ends or be assembled by equally suitable devices.

6.1.4.10.2 Maximum net mass: 400 kg.

6.1.4.11 Reconstituted wood boxes

4F

6.1.4.11.1 The walls of boxes shall be made of water resistant reconstituted wood such as hardboard, particle board or other suitable type. The strength of the material used and the method of construction shall be appropriate to the capacity of the boxes and to their intended use.

6.1.4.11.2 Other parts of the boxes may be made of other suitable material.

6.1.4.11.3 Boxes shall be securely assembled by means of suitable devices.

6.1.4.11.4 Maximum net mass: 400 kg.

6.1.4.12 Fibreboard boxes

4G

6.1.4.12.1 Strong and good quality solid or double-faced corrugated fibreboard (single or multiwall) shall be used, appropriate to the capacity of the box and to its intended use. The water resistance of the outer surface shall be such that the increase in mass, as determined in a test carried out over a period of 30 minutes by the Cobb method of determining water absorption, is not greater than 155 g/m² - see ISO 535:l991. It shall have proper bending qualities. Fibreboard shall be cut, creased without scoring, and slotted so as to permit assembly without cracking, surface breaks or undue bending. The fluting of corrugated fibreboard shall be firmly glued to the facings.

6.1.4.12.2 The ends of boxes may have a wooden frame or be entirely of wood or other suitable material. Reinforcements of wooden battens or other suitable material may be used.

6.1.4.12.3 Manufacturing joins in the body of boxes shall be taped, lapped and glued, or lapped and stitched with metal staples. Lapped joins shall have an appropriate overlap.

6.1.4.12.4 Where closing is effected by gluing or taping, a water resistant adhesive shall be used.

6.1.4.12.5 Boxes shall be designed so as to provide a good fit to the contents.

6.1.4.12.6 Maximum net mass: 400 kg.

6.1.4.13 Plastics boxes

4H1 expanded plastics boxes
4H2 solid plastics boxes

6.1.4.13.1 The box shall be manufactured from suitable plastics material and be of adequate strength in relation to its capacity and intended use. Except for recycled plastics material as defined in 1.2.1, no used material other than production residues or regrind from the same manufacturing process may be used. The box

shall be adequately resistant to ageing and to degradation caused either by the substance contained or by ultra-violet radiation.

6.1.4.13.2 An expanded plastics box shall comprise two parts made of a moulded expanded plastics material, a bottom section containing cavities for the inner packagings and a top section covering and interlocking with the bottom section. The top and bottom sections shall be designed so that the inner packagings fit snugly. The closure cap for any inner packaging shall not be in contact with the inside of the top section of this box.

6.1.4.13.3 For dispatch, an expanded plastics box shall be closed with a self-adhesive tape having sufficient tensile strength to prevent the box from opening. The adhesive tape shall be weather resistant and its adhesive compatible with the expanded plastics material of the box. Other closing devices at least equally effective may be used.

6.1.4.13.4 For solid plastics boxes, protection against ultra-violet radiation, if required, shall be provided by the addition of carbon black or other suitable pigments or inhibitors. These additives shall be compatible with the contents and remain effective throughout the life of the box. Where use is made of carbon black, pigments or inhibitors other than those used in the manufacture of the tested design type, retesting may be waived if the carbon black content does not exceed 2 % by mass or if the pigment content does not exceed 3 % by mass; the content of inhibitors of ultra-violet radiation is not limited.

6.1.4.13.5 Additives serving purposes other than protection against ultra-violet radiation may be included in the composition of the plastics material provided that they do not adversely affect the chemical or physical properties of the material of the box. In such circumstances, retesting may be waived.

6.1.4.13.6 Solid plastics boxes shall have closure devices made of a suitable material of adequate strength and so designed as to prevent the box from unintentional opening.

6.1.4.13.7 *(Deleted)*

6.1.4.13.8 Maximum net mass 4H1: 60 kg
4H2: 400 kg.

6.1.4.14 Steel, aluminium or other metal boxes

4A steel boxes
4B aluminium boxes
4N metal, other than steel or aluminium, boxes

6.1.4.14.1 The strength of the metal and the construction of the box shall be appropriate to the capacity of the box and to its intended use.

6.1.4.14.2 Boxes shall be lined with fibreboard or felt packing pieces or shall have an inner liner or coating of suitable material, as required. If a double seamed metal liner is used, steps shall be taken to prevent the ingress of substances, particularly explosives, into the recesses of the seams.

6.1.4.14.3 Closures may be of any suitable type; they shall remain secured under normal conditions of carriage.

6.1.4.14.4 Maximum net mass: 400 kg.

6.1.4.15 Textile bags

5L1 without inner liner or coating
5L2 sift-proof
5L3 water resistant

6.1.4.15.1 The textiles used shall be of good quality. The strength of the fabric and the construction of the bag shall be appropriate to the capacity of the bag and to its intended use.

6.1.4.15.2 Bags, sift-proof, 5L2: the bag shall be made sift-proof, for example by the use of:

(a) paper bonded to the inner surface of the bag by a water resistant adhesive such as bitumen; or

(b) plastics film bonded to the inner surface of the bag; or

(c) one or more inner liners made of paper or plastics material.

6.1.4.15.3 Bags, water resistant, 5L3: to prevent the entry of moisture the bag shall be made waterproof, for example by the use of:

(a) separate inner liners of water resistant paper (e.g. waxed kraft paper, tarred paper or plastics-coated kraft paper); or

(b) plastics film bonded to the inner surface of the bag; or

(c) one or more inner liners made of plastics material.

6.1.4.15.4 Maximum net mass: 50 kg.

6.1.4.16 Woven plastics bags

5H1 without inner liner or coating
5H2 sift-proof
5H3 water resistant

6.1.4.16.1 Bags shall be made from stretched tapes or monofilaments of a suitable plastics material. The strength of the material used and the construction of the bag shall be appropriate to the capacity of the bag and to its intended use.

6.1.4.16.2 If the fabric is woven flat, the bags shall be made by sewing or some other method ensuring closure of the bottom and one side. If the fabric is tubular, the bag shall be closed by sewing, weaving or some other equally strong method of closure.

6.1.4.16.3 Bags, sift-proof, 5H2: the bag shall be made sift-proof, for example by means of:

(a) paper or a plastics film bonded to the inner surface of the bag; or

(b) one or more separate inner liners made of paper or plastics material.

6.1.4.16.4 Bags, water resistant, 5H3: to prevent the entry of moisture, the bag shall be made waterproof, for example by means of:

(a) separate inner liners of water resistant paper (e.g. waxed kraft paper, double-tarred kraft paper or plastics-coated kraft paper); or

(b) plastics film bonded to the inner or outer surface of the bag; or

(c) one or more inner plastics liners.

6.1.4.16.5 Maximum net mass: 50 kg.

6.1.4.17 Plastics film bags

5H4

6.1.4.17.1 Bags shall be made of a suitable plastics material. The strength of the material used and the construction of the bag shall be appropriate to the capacity of the bag and to its intended use. Joins and closures shall withstand pressures and impacts liable to occur under normal conditions of carriage.

6.1.4.17.2 Maximum net mass: 50 kg.

6.1.4.18 Paper bags

5M1 multiwall
5M2 multiwall, water resistant

6.1.4.18.1 Bags shall be made of a suitable kraft paper or of an equivalent paper with at least three plies, the middle ply of which may be net-cloth and adhesive bonding to the outer paper plies. The strength of the paper and the construction of the bags shall be appropriate to the capacity of the bag and to its intended use. Joins and closures shall be sift-proof.

6.1.4.18.2 Bags 5M2: to prevent the entry of moisture, a bag of four plies or more shall be made waterproof by the use of either a water resistant ply as one of the two outermost plies or a water resistant barrier made of a suitable protective material between the two outermost plies; a bag of three plies shall be made waterproof by the use of a water resistant ply as the outermost ply. Where there is a danger of the substance contained reacting with moisture or where it is packed damp, a waterproof ply or barrier, such as double-tarred kraft paper, plastics-coated kraft paper, plastics film bonded to the inner surface of the bag, or one or more inner plastics liners, shall also be placed next to the substance. Joins and closures shall be waterproof.

6.1.4.18.3 Maximum net mass: 50 kg.

6.1.4.19 Composite packagings (plastics material)

6HA1	plastics receptacle with outer steel drum
6HA2	plastics receptacle with outer steel crate or box
6HB1	plastics receptacle with outer aluminium drum
6HB2	plastics receptacle with outer aluminium crate or box
6HC	plastics receptacle with outer wooden box
6HD1	plastics receptacle with outer plywood drum
6HD2	plastics receptacle with outer plywood box
6HG1	plastics receptacle with outer fibre drum
6HG2	plastics receptacle with outer fibreboard box
6HH1	plastics receptacle with outer plastics drum
6HH2	plastics receptacle with outer solid plastics box

6.1.4.19.1 Inner receptacle

6.1.4.19.1.1 The requirements of 6.1.4.8.1 and 6.1.4.8.4 to 6.1.4.8.7 apply to plastics inner receptacles.

6.1.4.19.1.2 The plastics inner receptacle shall fit snugly inside the outer packaging, which shall be free of any projection that might abrade the plastics material.

6.1.4.19.1.3 Maximum capacity of inner receptacle:

6HA1, 6HB1, 6HD1, 6HG1, 6HH1:	250 litres
6HA2, 6HB2, 6HC, 6HD2, 6HG2, 6HH2:	60 litres.

6.1.4.19.1.4 Maximum net mass:

6HA1, 6HB1, 6HD1, 6HG1, 6HH1:	400 kg
6HA2, 6HB2, 6HC, 6HD2, 6HG2, 6HH2:	75 kg.

6.1.4.19.2 Outer packaging

6.1.4.19.2.1 Plastics receptacle with outer steel or aluminium drum 6HA1 or 6HB1; the relevant requirements of 6.1.4.1 or 6.1.4.2, as appropriate, apply to the construction of the outer packaging.

6.1.4.19.2.2 Plastics receptacle with outer steel or aluminium crate or box 6HA2 or 6HB2; the relevant requirements of 6.1.4.14 apply to the construction of the outer packaging.

6.1.4.19.2.3 Plastics receptacle with outer wooden box 6HC; the relevant requirements of 6.1.4.9 apply to the construction of the outer packaging.

6.1.4.19.2.4 Plastics receptacle with outer plywood drum 6HD1; the relevant requirements of 6.1.4.5 apply to the construction of the outer packaging.

6.1.4.19.2.5 Plastics receptacle with outer plywood box 6HD2; the relevant requirements of 6.1.4.10 apply to the construction of the outer packaging.

6.1.4.19.2.6 Plastics receptacle with outer fibre drum 6HG1; the requirements of 6.1.4.7.1 to 6.1.4.7.4 apply to the construction of the outer packaging.

6.1.4.19.2.7 Plastics receptacle with outer fibreboard box 6HG2; the relevant requirements of 6.1.4.12 apply to the construction of the outer packaging.

6.1.4.19.2.8 Plastics receptacle with outer plastics drum 6HH1; the requirements of 6.1.4.8.1 to 6.1.4.8.6 apply to the construction of the outer packaging.

6.1.4.19.2.9 Plastics receptacles with outer solid plastics box (including corrugated plastics material) 6HH2; the requirements of 6.1.4.13.1 and 6.1.4.13.4 to 6.1.4.13.6 apply to the construction of the outer packaging.

6.1.4.20 Composite packagings (glass, porcelain or stoneware)

6PA1	receptacle with outer steel drum
6PA2	receptacle with outer steel crate or box
6PB1	receptacle with outer aluminium drum
6PB2	receptacle with outer aluminium crate or box
6PC	receptacle with outer wooden box
6PD1	receptacle with outer plywood drum
6PD2	receptacle with outer wickerwork hamper
6PG1	receptacle with outer fibre drum
6PG2	receptacle with outer fibreboard box
6PH1	receptacle with outer expanded plastics packaging
6PH2	receptacle with outer solid plastics packaging

6.1.4.20.1 Inner receptacle

6.1.4.20.1.1 Receptacles shall be of a suitable form (cylindrical or pear-shaped) and be made of good quality material free from any defect that could impair their strength. The walls shall be sufficiently thick at every point and free from internal stresses.

6.1.4.20.1.2 Screw-threaded plastics closures, ground glass stoppers or closures at least equally effective shall be used as closures for receptacles. Any part of the closure likely to come into contact with the contents of the receptacle shall be resistant to those contents. Care shall be taken to ensure that the closures are so fitted as to be leakproof and are suitably secured to prevent any loosening during carriage. If vented closures are necessary, they shall comply with 4.1.1.8.

6.1.4.20.1.3 The receptacle shall be firmly secured in the outer packaging by means of cushioning and/or absorbent materials.

6.1.4.20.1.4 Maximum capacity of receptacle: 60 litres.

6.1.4.20.1.5 Maximum net mass: 75 kg.

6.1.4.20.2 Outer packaging

6.1.4.20.2.1 Receptacle with outer steel drum 6PA1; the relevant requirements of 6.1.4.1 apply to the construction of the outer packaging. The removable lid required for this type of packaging may nevertheless be in the form of a cap.

6.1.4.20.2.2 Receptacle with outer steel crate or box 6PA2; the relevant requirements of 6.1.4.14 apply to the construction of the outer packaging. For cylindrical receptacles the outer packaging shall, when upright, rise above the receptacle and its closure. If the crate surrounds a pear-shaped receptacle and is of matching shape, the outer packaging shall be fitted with a protective cover (cap).

6.1.4.20.2.3 Receptacle with outer aluminium drum 6PB1; the relevant requirements of 6.1.4.2 apply to the construction of the outer packaging.

6.1.4.20.2.4 Receptacle with outer aluminium crate or box 6PB2; the relevant requirements of 6.1.4.14 apply to the construction of the outer packaging.

6.1.4.20.2.5 Receptacle with outer wooden box 6PC; the relevant requirements of 6.1.4.9 apply to the construction of the outer packaging.

6.1.4.20.2.6 Receptacle with outer plywood drum 6PD1; the relevant requirements of 6.1.4.5 apply to the construction of the outer packaging.

6.1.4.20.2.7 Receptacle with outer wickerwork hamper 6PD2. The wickerwork hamper shall be properly made with material of good quality. It shall be fitted with a protective cover (cap) so as to prevent damage to the receptacle.

6.1.4.20.2.8 Receptacle with outer fibre drum 6PG1; the relevant requirements of 6.1.4.7.1 to 6.1.4.7.4 apply to the construction of the outer packaging.

6.1.4.20.2.9 Receptacle with outer fibreboard box 6PG2; the relevant requirements of 6.1.4.12 apply to the construction of the outer packaging.

6.1.4.20.2.10 Receptacle with outer expanded plastics or solid plastics packaging (6PH1 or 6PH2); the materials of both outer packagings shall meet the relevant requirements of 6.1.4.13. Outer solid plastics packaging shall be manufactured from high density polyethylene or some other comparable plastics material. The removable lid for this type of packaging may nevertheless be in the form of a cap.

6.1.4.21 Combination packagings

The relevant requirements of section 6.1.4 for the outer packagings to be used, are applicable.

NOTE: *For the inner and outer packagings to be used, see the relevant packing instructions in Chapter 4.1.*

6.1.5 Test requirements for packagings

6.1.5.1 Performance and frequency of tests

6.1.5.1.1 The design type of each packaging shall be tested as provided in 6.1.5 in accordance with procedures established by the competent authority allowing the allocation of the mark and shall be approved by this competent authority.

6.1.5.1.2 Each packaging design type shall successfully pass the tests prescribed in this Chapter before being used. A packaging design type is defined by the design, size, material and thickness, manner of construction and packing, but may include various surface treatments. It also includes packagings which differ from the design type only in their lesser design height.

6.1.5.1.3 Tests shall be repeated on production samples at intervals established by the competent authority. For such tests on paper or fibreboard packagings, preparation at ambient conditions is considered equivalent to the requirements of 6.1.5.2.3.

6.1.5.1.4 Tests shall also be repeated after each modification which alters the design, material or manner of construction of a packaging.

6.1.5.1.5 The competent authority may permit the selective testing of packagings that differ only in minor respects from a tested type, e.g. smaller sizes of inner packagings or inner packagings of lower net mass; and packagings such as drums, bags and boxes which are produced with small reductions in external dimension(s).

6.1.5.1.6 *(Reserved)*

NOTE: *For the conditions for using different inner packagings in an outer packaging and permissible variations in inner packagings, see 4.1.1.5.1. These conditions do not limit the use of inner packagings when applying 6.1.5.1.7.*

6.1.5.1.7 Articles or inner packagings of any type for solids or liquids may be assembled and carried without testing in an outer packaging under the following conditions:

(a) The outer packaging shall have been successfully tested in accordance with 6.1.5.3 with fragile (e.g. glass) inner packagings containing liquids using the packing group I drop height;

(b) The total combined gross mass of inner packagings shall not exceed one half the gross mass of inner packagings used for the drop test in (a) above;

(c) The thickness of cushioning material between inner packagings and between inner packagings and the outside of the packaging shall not be reduced below the corresponding thicknesses in the originally tested packaging; and if a single inner packaging was used in the original test, the thicknesses of cushioning between inner packagings shall not be less than the thickness of cushioning between the outside of the packaging and the inner packaging in the original test. If either fewer or smaller inner packagings are used (as compared to the inner packagings used in the drop test), sufficient additional cushioning material shall be used to take up void spaces;

(d) The outer packaging shall have passed successfully the stacking test in 6.1.5.6 while empty. The total mass of identical packages shall be based on the combined mass of inner packagings used for the drop test in (a) above;

(e) Inner packagings containing liquids shall be completely surrounded with a sufficient quantity of absorbent material to absorb the entire liquid contents of the inner packagings;

(f) If the outer packaging is intended to contain inner packagings for liquids and is not leakproof, or is intended to contain inner packagings for solids and is not siftproof, a means of containing any liquid or solid contents in the event of leakage shall be provided in the form of a leakproof liner, plastics bag or other equally efficient means of containment. For packagings containing liquids, the absorbent material required in (e) above shall be placed inside the means of containing the liquid contents;

(g) Packagings shall be marked in accordance with 6.1.3 as having been tested to packing group I performance for combination packagings. The marked gross mass in kilograms shall be the sum of the mass of the outer packaging plus one half of the mass of the inner packaging(s) as used for the drop test referred to in (a) above. Such a package mark shall also contain a letter "V" as described in 6.1.2.4.

6.1.5.1.8 The competent authority may at any time require proof, by tests in accordance with this section, that serially-produced packagings meet the requirements of the design type tests. For verification purposes records of such tests shall be maintained.

6.1.5.1.9 If an inner treatment or coating is required for safety reasons, it shall retain its protective properties even after the tests.

6.1.5.1.10 Provided the validity of the test results is not affected and with the approval of the competent authority, several tests may be made on one sample.

6.1.5.1.11 Salvage packagings

Salvage packagings (see 1.2.1) shall be tested and marked in accordance with the requirements applicable to packing group II packagings intended for the carriage of solids or inner packagings, except as follows:

(a) The test substance used in performing the tests shall be water, and the packagings shall be filled to not less than 98 % of their maximum capacity. It is permissible to use additives, such as bags of lead shot, to achieve the requisite total package mass so long as they are placed so that the test results are not affected. Alternatively, in performing the drop test, the drop height may be varied in accordance with 6.1.5.3.5 (b);

(b) Packagings shall, in addition, have been successfully subjected to the leakproofness test at 30 kPa, with the results of this test reflected in the test report required by 6.1.5.8; and

(c) Packagings shall be marked with the letter "T" as described in 6.1.2.4.

6.1.5.2 Preparation of packagings for testing

6.1.5.2.1 Tests shall be carried out on packagings prepared as for carriage including, with respect to combination packagings, the inner packagings used. Inner or single receptacles or packagings other than bags shall be filled to not less than 98 % of their maximum capacity for liquids or 95 % for solids. Bags shall be filled to the maximum mass at which they may be used. For combination packagings where the inner packaging is designed to carry liquids and solids, separate testing is required for both liquid and solid contents. The substances or articles to be carried in the packagings may be replaced by other substances or articles except where this would invalidate the results of the tests. For solids, when another substance is used it shall have the same physical characteristics (mass, grain size, etc.) as the substance to be

carried. It is permissible to use additives, such as bags of lead shot, to achieve the requisite total package mass, so long as they are placed so that the test results are not affected.

6.1.5.2.2 In the drop tests for liquids, when another substance is used, it shall be of similar relative density and viscosity to those of the substance being carried. Water may also be used for the liquid drop test under the conditions in 6.1.5.3.5.

6.1.5.2.3 Paper or fibreboard packagings shall be conditioned for at least 24 hours in an atmosphere having a controlled temperature and relative humidity (r.h.). There are three options, one of which shall be chosen. The preferred atmosphere is 23 ± 2 °C and 50 % ± 2 % r.h. The two other options are 20 ± 2 °C and 65 % ± 2 % r.h. or 27 ± 2 °C and 65 % ± 2 % r.h.

NOTE: *Average values shall fall within these limits. Short-term fluctuations and measurement limitations may cause individual measurements to vary by up to ± 5 % relative humidity without significant impairment of test reproducibility.*

6.1.5.2.4 *(Reserved)*

6.1.5.2.5 To check that their chemical compatibility with the liquids is sufficient, plastics drums and jerricans in accordance with 6.1.4.8 and if necessary composite packagings (plastics material) in accordance with 6.1.4.19 shall be subjected to storage at ambient temperature for six months, during which time the test samples shall be kept filled with the goods they are intended to carry.

For the first and last 24 hours of storage, the test samples shall be placed with the closure downwards. However, packagings fitted with a vent shall be so placed on each occasion for five minutes only. After this storage the test samples shall undergo the tests prescribed in 6.1.5.3 to 6.1.5.6.

When it is known that the strength properties of the plastics material of the inner receptacles of composite packagings (plastics material) are not significantly altered by the action of the filling substance, it shall not be necessary to check that the chemical compatibility is sufficient.

A significant alteration in strength properties means:

(a) distinct embrittlement; or

(b) a considerable decrease in elasticity, unless related to a not less than proportionate increase in the elongation under load.

Where the behaviour of the plastics material has been established by other means, the above compatibility test may be dispensed with. Such procedures shall be at least equivalent to the above compatibility test and be recognized by the competent authority.

NOTE: *For plastics drums and jerricans and composite packagings (plastics material) made of polyethylene, see also 6.1.5.2.6 below.*

6.1.5.2.6 For polyethylene drums and jerricans in accordance with 6.1.4.8 and if necessary, polyethylene composite packagings in accordance with 6.1.4.19, chemical compatibility with filling liquids assimilated in accordance with 4.1.1.21 may be verified as follows with standard liquids (see 6.1.6).

The standard liquids are representative for the processes of deterioration on polyethylene, as there are softening through swelling, cracking under stress, molecular degradation and combinations thereof. The sufficient chemical compatibility of the packagings may be verified by storage of the required test samples for three weeks at 40 °C with the appropriate standard liquid(s); where this standard liquid is water, storage in accordance with this procedure is not required. Storage is not required either for test samples which are used for the stacking test in case of the standard liquids "wetting solution" and "acetic acid".

For the first and last 24 hours of storage, the test samples shall be placed with the closure downwards. However, packagings fitted with a vent shall be so placed on each occasion for five minutes only. After this storage, the test samples shall undergo the tests prescribed in 6.1.5.3 to 6.1.5.6.

The compatibility test for tert-Butyl hydroperoxide with more than 40 % peroxide content and peroxyacetic acids of Class 5.2 shall not be carried out using standard liquids. For these substances, sufficient chemical compatibility of the test samples shall be verified during a storage period of six months at ambient temperature with the substances they are intended to carry.

Results of the procedure in accordance with this paragraph from polyethylene packagings can be approved for an equal design type, the internal surface of which is fluorinated.

6.1.5.2.7 For packagings made of polyethylene, as specified in 6.1.5.2.6, which have passed the test in 6.1.5.2.6, filling substances other than those assimilated in accordance with 4.1.1.21 may also be approved. Such approval shall be based on laboratory tests verifying that the effect of such filling substances on the test specimens is less than that of the appropriate standard liquid(s) taking into account the relevant processes of deterioration. The same conditions as those set out in 4.1.1.21.2 shall apply with respect to relative density and vapour pressure.

6.1.5.2.8 Provided that the strength properties of the plastics inner packagings of a combination packaging are not significantly altered by the action of the filling substance, proof of chemical compatibility is not necessary. A significant alteration in strength properties means:

(a) Distinct embrittlement;

(b) A considerable decrease in elasticity, unless related to a not less than proportionate increase in elastic elongation.

6.1.5.3 ***Drop test*** [3]

6.1.5.3.1 Number of test samples (per design type and manufacturer) and drop orientation

For other than flat drops the centre of gravity shall be vertically over the point of impact.

Where more than one orientation is possible for a given drop test, the orientation most likely to result in failure of the packaging shall be used.

Packaging	**No. of test samples**	**Drop orientation**
(a) Steel drums Aluminium drums Drums of metal other than steel or aluminium Steel jerricans Aluminium jerricans Plywood drums Fibre drums Plastics drums and jerricans Composite packagings which are in the shape of a drum	Six (three for each drop)	First drop (using three samples): the packaging shall strike the target diagonally on the chime or, if the packaging has no chime, on a circumferential seam or an edge. Second drop (using the other three samples): the packaging shall strike the target on the weakest part not tested by the first drop, for example a closure or, for some cylindrical drums, the welded longitudinal seam of the drum body
(b) Boxes of natural wood Plywood boxes Reconstituted wood boxes Fibreboard boxes Plastics boxes Steel or aluminium boxes Composite packagings which are in the shape of a box	Five (one for each drop)	First drop: flat on the bottom Second drop: flat on the top Third drop: flat on the long side Fourth drop: flat on the short side Fifth drop: on a corner
(c) Bags - single-ply with a side seam	Three (three drops per bag)	First drop: flat on a wide face Second drop: flat on a narrow face Third drop: on an end of the bag
(d) Bags - single-ply without a side seam, or multi-ply	Three (two drops per bag)	First drop: flat on a wide face Second drop: on an end of the bag

[3] *See ISO Standard 2248.*

6.1.5.3.2 Special preparation of test samples for the drop test

The temperature of the test sample and its contents shall be reduced to –18 °C or lower for the following packagings:

(a) Plastics drums (see 6.1.4.8);

(b) Plastics jerricans (see 6.1.4.8);

(c) Plastics boxes other than expanded plastics boxes (see 6.1.4.13);

(d) Composite packagings (plastics material) (see 6.1.4.19); and

(e) Combination packagings with plastics inner packagings, other than plastics bags intended to contain solids or articles.

Where test samples are prepared in this way, the conditioning in 6.1.5.2.3 may be waived. Test liquids shall be kept in the liquid state by the addition of anti-freeze if necessary.

6.1.5.3.3 Removable head packagings for liquids shall not be dropped until at least 24 hours after filling and closing to allow for any possible gasket relaxation.

6.1.5.3.4 *Target*

The target shall be a non-resilient and horizontal surface and shall be:

- Integral and massive enough to be immovable;
- Flat with a surface kept free from local defects capable of influencing the test results;
- Rigid enough to be non-deformable under test conditions and not liable to become damaged by the tests; and
- Sufficiently large to ensure that the test package falls entirely upon the surface.

6.1.5.3.5 Drop height

For solids and liquids, if the test is performed with the solid or liquid to be carried or with another substance having essentially the same physical characteristics:

Packing Group I	Packing Group II	Packing Group III
1.8 m	1.2 m	0.8 m

For liquids in single packagings and for inner packagings of combination packagings, if the test is performed with water:

NOTE: *The term water includes water/antifreeze solutions with a minimum specific gravity of 0.95 for testing at - 18 °C.*

(a) where the substances to be carried have a relative density not exceeding 1.2:

Packing Group I	Packing Group II	Packing Group III
1.8 m	1.2 m	0.8 m

(b) where the substances to be carried have a relative density exceeding 1.2, the drop height shall be calculated on the basis of the relative density (d) of the substance to be carried, rounded up to the first decimal, as follows:

Packing Group I	Packing Group II	Packing Group III
d × 1.5 (m)	d × 1.0 (m)	d × 0.67 (m)

6.1.5.3.6 Criteria for passing the test

6.1.5.3.6.1 Each packaging containing liquid shall be leakproof when equilibrium has been reached between the internal and external pressures, however for inner packagings of combination packagings it is not necessary that the pressures be equalized.

6.1.5.3.6.2 Where a packaging for solids undergoes a drop test and its upper face strikes the target, the test sample passes the test if the entire contents are retained by an inner packaging or inner receptacle (e.g. a plastics bag), even if the closure while retaining its containment function, is no longer sift-proof.

6.1.5.3.6.3 The packaging or outer packaging of a composite or combination packaging shall not exhibit any damage liable to affect safety during carriage. Inner receptacles, inner packagings, or articles shall remain completely within the outer packaging and there shall be no leakage of the filling substance from the inner receptacle(s) or inner packaging(s).

6.1.5.3.6.4 Neither the outermost ply of a bag nor an outer packaging may exhibit any damage liable to affect safety during carriage.

6.1.5.3.6.5 A slight discharge from the closure(s) upon impact is not considered to be a failure of the packaging provided that no further leakage occurs.

6.1.5.3.6.6 No rupture is permitted in packagings for goods of Class 1 which would permit the spillage of loose explosive substances or articles from the outer packaging.

6.1.5.4 Leakproofness test

The leakproofness test shall be performed on all design types of packagings intended to contain liquids; however, this test is not required for inner packagings of combination packagings;

6.1.5.4.1 *Number of test samples:* three test samples per design type and manufacturer.

6.1.5.4.2 *Special preparation of test samples for the test*: either vented closures shall be replaced by similar non-vented closures or the vent shall be sealed.

6.1.5.4.3 *Test method and pressure to be applied*: the packagings including their closures shall be restrained under water for 5 minutes while an internal air pressure is applied, the method of restraint shall not affect the results of the test.

The air pressure (gauge) to be applied shall be:

Packing Group I	Packing Group II	Packing Group III
Not less than 30 kPa (0.3 bar)	Not less than 20 kPa (0.2 bar)	Not less than 20 kPa (0.2 bar)

Other methods at least equally effective may be used.

6.1.5.4.4 *Criterion for passing the test*: there shall be no leakage.

6.1.5.5 Internal pressure (hydraulic) test

6.1.5.5.1 *Packagings to be tested*

The internal pressure (hydraulic) test shall be carried out on all design types of metal, plastics and composite packagings intended to contain liquids. This test is not required for inner packagings of combination packagings.

6.1.5.5.2 *Number of test samples*: three test samples per design type and manufacturer.

6.1.5.5.3 *Special preparation of packagings for testing*: either vented closures shall be replaced by similar non-vented closures or the vent shall be sealed.

6.1.5.5.4 *Test method and pressure to be applied*: metal packagings and composite packagings (glass, porcelain or stoneware), including their closures, shall be subjected to the test pressure for 5 minutes. Plastics packagings and composite packagings (plastics material) including their closures shall be subjected to the test pressure for 30 minutes. This pressure is the one to be included in the mark required

by 6.1.3.1 (d). The manner in which the packagings are supported shall not invalidate the test. The test pressure shall be applied continuously and evenly; it shall be kept constant throughout the test period. The hydraulic pressure (gauge) applied, as determined by any one of the following methods, shall be:

(a) not less than the total gauge pressure measured in the packaging (i.e. the vapour pressure of the filling liquid and the partial pressure of the air or other inert gases, minus 100 kPa) at 55 °C, multiplied by a safety factor of 1.5; this total gauge pressure shall be determined on the basis of a maximum degree of filling in accordance with 4.1.1.4 and a filling temperature of 15 °C; or

(b) not less than 1.75 times the vapour pressure at 50 °C of the liquid to be carried, minus 100 kPa but with a minimum test pressure of 100 kPa; or

(c) not less than 1.5 times the vapour pressure at 55 °C of the liquid to be carried, minus 100 kPa but with a minimum test pressure of 100 kPa.

6.1.5.5.5 In addition, packagings intended to contain liquids of packing group I shall be tested to a minimum test pressure of 250 kPa (gauge) for a test period of 5 or 30 minutes depending upon the material of construction of the packaging.

6.1.5.5.6 *Criterion for passing the test*: no packaging may leak.

6.1.5.6 Stacking test

All design types of packagings other than bags shall be subjected to a stacking test.

6.1.5.6.1 *Number of test samples*: three test samples per design type and manufacturer.

6.1.5.6.2 *Test method*: the test sample shall be subjected to a force applied to the top surface of the test sample equivalent to the total weight of identical packages which might be stacked on it during carriage; where the contents of the test sample are liquids with relative density different from that of the liquid to be carried, the force shall be calculated in relation to the latter. The minimum height of the stack including the test sample shall be 3 metres. The duration of the test shall be 24 hours except that plastics drums, jerricans, and composite packagings 6HH1 and 6HH2 intended for liquids shall be subjected to the stacking test for a period of 28 days at a temperature of not less than 40 °C.

For the test in accordance with 6.1.5.2.5, the original filling substance shall be used. For the test in accordance with 6.1.5.2.6, a stacking test shall be carried out with a standard liquid.

6.1.5.6.3 *Criteria for passing the test*: no test sample shall leak. In composite packagings or combination packagings, there shall be no leakage of the filling substance from the inner receptacle or inner packaging. No test sample shall show any deterioration which could adversely affect transport safety or any distortion liable to reduce its strength or cause instability in stacks of packages. Plastics packagings shall be cooled to ambient temperature before the assessment.

6.1.5.7 Supplementary permeability test for plastics drums and jerricans in accordance with 6.1.4.8 and for composite packagings (plastics material) in accordance with 6.1.4.19 intended for the carriage of liquids having a flash-point ≤ 60 °C, other than 6HA1 packagings

Polyethylene packagings need be subjected to this test only if they are to be approved for the carriage of benzene, toluene, xylene or mixtures and preparations containing those substances.

6.1.5.7.1 *Number of test samples:* three packagings per design type and manufacturer.

6.1.5.7.2 *Special preparation of the test sample for the test:* the test samples are to be pre-stored with the original filling substance in accordance with 6.1.5.2.5, or, for polyethylene packagings, with the standard liquid mixture of hydrocarbons (white spirit) in accordance with 6.1.5.2.6.

6.1.5.7.3 *Test method:* the test samples filled with the substance for which the packaging is to be approved shall be weighed before and after storage for 28 days at 23 °C and 50 % relative atmospheric humidity. For polyethylene packagings, the test may be carried out with the standard liquid mixture of hydrocarbons (white spirit) in place of benzene, toluene or xylene.

6.1.5.7.4 *Criterion for passing the test:* permeability shall not exceed 0.008 g/l.h.

6.1.5.8 Test Report

6.1.5.8.1 A test report containing at least the following particulars shall be drawn up and shall be available to the users of the packaging:

1. Name and address of the test facility;
2. Name and address of applicant (where appropriate);
3. A unique test report identification;
4. Date of the test report;
5. Manufacturer of the packaging;
6. Description of the packaging design type (e.g. dimensions, materials, closures, thickness, etc.), including method of manufacture (e.g. blow moulding) and which may include drawing(s) and/or photograph(s);
7. Maximum capacity;
8. Characteristics of test contents, e.g. viscosity and relative density for liquids and particle size for solids. For plastics packagings subject to the internal pressure test in 6.1.5.5, the temperature of the water used;
9. Test descriptions and results;
10. The test report shall be signed with the name and status of the signatory.

6.1.5.8.2 The test report shall contain statements that the packaging prepared as for carriage was tested in accordance with the appropriate requirements of this section and that the use of other packaging methods or components may render it invalid. A copy of the test report shall be available to the competent authority.

6.1.6 Standard liquids for verifying the chemical compatibility testing of polyethylene packagings, including IBCs, in accordance with 6.1.5.2.6 and 6.5.6.3.5, respectively

6.1.6.1 The following standard liquids shall be used for this plastics material.

(a) ***Wetting Solution*** for substances causing severe cracking in polyethylene under stress, in particular for all solutions and preparations containing wetting agents.

An aqueous solution of 1 % of alkyl benzene sulphonate, or an aqueous solution of 5 % nonylphenol ethoxylate which has been preliminary stored for at least 14 days at a temperature of 40 °C before being used for the first time for the tests, shall be used. The surface tension of this solution shall be 31 to 35 mN/m at 23 °C.

The stacking test shall be carried out on the basis of a relative density of not less than 1.20.

A compatibility test with acetic acid is not required if adequate chemical compatibility is proved with a wetting solution.

For filling substances causing cracking in polyethylene under stress which is resistant to the wetting solution, adequate chemical compatibility may be proved after preliminary storing for three weeks at 40 °C in accordance with 6.1.5.2.6, but with the original filling matter;

(b) ***Acetic acid*** for substances and preparations causing cracking in polyethylene under stress, in particular for monocarboxylic acids and monovalent alcohols.

Acetic acid in 98 to 100 % concentration shall be used.

Relative density = 1.05.

The stacking test shall be carried out on the basis of a relative density not less than 1.1.

In the case of filling substances causing polyethylene to swell more than acetic acid and to such an extent that the polyethylene mass is increased by up to 4 %, adequate chemical compatibility may be proved after preliminary storing for three weeks at 40 °C, in accordance with 6.1.5.2.6 but with the original filling matter;

(c) ***Normal butyl acetate/normal butyl acetate-saturated wetting solution*** for substances and preparations causing polyethylene to swell to such an extent that the polyethylene mass is increased by about 4 % and at the same time causing cracking under stress, in particular for phyto-sanitary products, liquid paints and esters. Normal butyl acetate in 98 to 100 % concentration shall be used for preliminary storage in accordance with 6.1.5.2.6.

For the stacking test in accordance with 6.1.5.6, a test liquid consisting of a 1 to 10 % aqueous wetting solution mixed with 2 % normal butyl acetate conforming to (a) above shall be used.

The stacking test shall be carried out on the basis of a relative density not less than 1.0.

In the case of filling substances causing polyethylene to swell more than normal butyl acetate and to such an extent that the polyethylene mass is increased by up to 7.5 %, adequate chemical compatibility may be proved after preliminary storing for three weeks at 40 °C, in accordance with 6.1.5.2.6 but with the original filling matter;

(d) ***Mixture of hydrocarbons (white spirit)*** for substances and preparations causing polyethylene to swell, in particular for hydrocarbons, esters and ketones.

A mixture of hydrocarbons having a boiling range 160 °C to 220 °C, relative density 0.78-0.80, flash-point > 50 °C and an aromatic content 16 % to 21 % shall be used.

The stacking test shall be carried out on the basis of a relative density not less than 1.0.

In the case of filling substances causing polyethylene to swell to such an extent that the polyethylene mass is increased by more than 7.5 %, adequate chemical compatibility may be proved after preliminary storing for three weeks at 40 °C, in accordance with 6.1.5.2.6 but with the original filling matter;

(e) ***Nitric acid*** for all substances and preparations having an oxidizing effect on polyethylene and causing molecular degradation identical to or less than 55 % nitric acid.

Nitric acid in a concentration of not less than 55 % shall be used.

The stacking test shall be carried out on the basis of a relative density of not less than 1.4.

In the case of filling substances more strongly oxidizing than 55 % nitric acid or causing degradation of the molecular mass proceed in accordance with 6.1.5.2.5.

The period of use shall be determined in such cases by observing the degree of damage (e.g. two years for nitric acid in not less than 55 % concentration);

(f) ***Water*** for substances which do not attack polyethylene in any of the cases referred to under (a) to (e), in particular for inorganic acids and lyes, aqueous saline solutions, polyvalent alcohols and organic substances in aqueous solution.

The stacking test shall be carried out on the basis of a relative density of not less than 1.2.

A design type test with water is not required if adequate chemical compatibility is proved with wetting solution or nitric acid.

CHAPTER 6.2

REQUIREMENTS FOR THE CONSTRUCTION AND TESTING OF PRESSURE RECEPTACLES, AEROSOL DISPENSERS, SMALL RECEPTACLES CONTAINING GAS (GAS CARTRIDGES) AND FUEL CELL CARTRIDGES CONTAINING LIQUEFIED FLAMMABLE GAS

NOTE: *Aerosol dispensers, small receptacles containing gas (gas cartridges) and fuel cell cartridges containing liquefied flammable gas are not subject to the requirements of 6.2.1 to 6.2.5.*

6.2.1 General requirements

6.2.1.1 Design and construction

6.2.1.1.1 Pressure receptacles shall be designed, manufactured, tested and equipped in such a way as to withstand all conditions, including fatigue, to which they will be subjected during normal conditions of carriage and intended use.

6.2.1.1.2 *(Reserved)*

6.2.1.1.3 In no case shall the minimum wall thickness be less than that specified in the design and construction technical standards.

6.2.1.1.4 For welded pressure receptacles, only metals of weldable quality shall be welded.

6.2.1.1.5 The test pressure of pressure receptacle shells and bundles of cylinders shall be in accordance with packing instruction P200 of 4.1.4.1, or, for a chemical under pressure, with packing instruction P206 of 4.1.4.1. The test pressure for closed cryogenic receptacles shall be in accordance with packing instruction P203 of 4.1.4.1. The test pressure of a metal hydride storage system shall be in accordance with packing instruction P205 of 4.1.4.1. The test pressure of a cylinder shell for an adsorbed gas shall be in accordance with packing instruction P208 of 4.1.4.1.

6.2.1.1.6 Cylinders or cylinder shells assembled in bundles shall be structurally supported and held together as a unit. Cylinders or cylinder shells shall be secured in a manner that prevents movement in relation to the structural assembly and movement that would result in the concentration of harmful local stresses. Manifold assemblies (e.g. manifold, valves, and pressure gauges) shall be designed and constructed such that they are protected from impact damage and forces normally encountered in carriage. Manifolds shall have at least the same test pressure as the cylinders. For toxic liquefied gases, each cylinder shell shall have an isolation valve to ensure that each pressure receptacle can be filled separately and that no interchange of cylinder contents can occur during carriage.

NOTE: *Toxic liquefied gases have the classification codes 2T, 2TF, 2TC, 2TO, 2TFC or 2TOC.*

6.2.1.1.7 Contact between dissimilar metals which could result in damage by galvanic action shall be avoided.

6.2.1.1.8 *Additional requirements for the construction of closed cryogenic receptacles for refrigerated liquefied gases*

6.2.1.1.8.1 The mechanical properties of the metal used shall be established for each pressure receptacle, including the impact strength and the bending coefficient.

NOTE: *With regard to the impact strength, sub-section 6.8.5.3 gives details of test requirements which may be used.*

6.2.1.1.8.2 The pressure receptacles shall be thermally insulated. The thermal insulation shall be protected against impact by means of a jacket. If the space between the inner vessel and the jacket is evacuated of air (vacuum-insulation), the jacket shall be designed to withstand without permanent deformation an external pressure of at least 100 kPa (1 bar) calculated in accordance with a recognised technical code or a calculated critical collapsing pressure of not less than 200 kPa (2 bar) gauge pressure. If the jacket is so closed as to be gas-tight (e.g. in the case of vacuum-insulation), a device shall be provided to prevent any dangerous pressure from developing in the insulating layer in the event of inadequate gas-

tightness of the inner vessel or its service equipment. The device shall prevent moisture from penetrating into the insulation.

6.2.1.1.8.3 Closed cryogenic receptacles intended for the carriage of refrigerated liquefied gases having a boiling point below –182 °C at atmospheric pressure shall not include materials which may react with oxygen or oxygen enriched atmospheres in a dangerous manner, when located in parts of the thermal insulation where there is a risk of contact with oxygen or with oxygen enriched liquid.

6.2.1.1.8.4 Closed cryogenic receptacles shall be designed and constructed with suitable lifting and securing arrangements.

6.2.1.1.9 *Additional requirements for the construction of acetylene cylinders*

Cylinder shells for UN 1001 acetylene, dissolved, and UN 3374 acetylene, solvent free, shall be filled with a porous material, uniformly distributed, of a type that conforms to the requirements and testing specified by a standard or technical code recognised by the competent authority and which:

(a) Is compatible with the cylinder shell and does not form harmful or dangerous compounds either with the acetylene or with the solvent in the case of UN 1001; and

(b) Is capable of preventing the spread of decomposition of the acetylene in the porous material.

In the case of UN 1001, the solvent shall be compatible with those parts of the cylinder that are in contact with it.

6.2.1.2 Materials

6.2.1.2.1 Construction materials of pressure receptacles which are in direct contact with dangerous goods shall not be affected or weakened by the dangerous goods intended to be carried and shall not cause a dangerous effect e.g. catalysing a reaction or reacting with the dangerous goods.

6.2.1.2.2 Pressure receptacles shall be made of the materials specified in the design and construction technical standards and the applicable packing instruction for the substances intended for carriage in the pressure receptacle. The materials shall be resistant to brittle fracture and to stress corrosion cracking as indicated in the design and construction technical standards.

6.2.1.3 Service equipment

6.2.1.3.1 Service equipment subjected to pressure, excluding porous, absorbent or adsorbent material, pressure relief devices, pressure gauges or indicators, shall be designed and constructed so that the burst pressure is at least 1.5 times the test pressure of the pressure receptacle.

6.2.1.3.2 Service equipment shall be configured or designed to prevent damage and unintended opening that could result in the release of the pressure receptacle contents during normal conditions of handling and carriage. All closures shall be protected in the same manner as is required for valves in 4.1.6.8. Manifold piping leading to shut-off valves shall be sufficiently flexible to protect the shut-off valves and the piping from shearing or releasing the pressure receptacle contents.

6.2.1.3.3 Pressure receptacles which are not capable of being handled manually or rolled, shall be fitted with handling devices (skids, rings, straps) ensuring that they can be safely handled by mechanical means and so arranged as not to impair the strength of, nor cause undue stresses in, the pressure receptacle.

6.2.1.3.4 Individual pressure receptacles shall be equipped with pressure relief devices as specified in packing provision P200 (2) or P205 of 4.1.4.1 or in 6.2.1.3.6.4 and 6.2.1.3.6.5. Pressure-relief devices shall be designed to prevent the entry of foreign matter, the leakage of gas and the development of any dangerous excess pressure. When fitted, pressure relief devices on manifolded horizontal pressure receptacles filled with flammable gas shall be arranged to discharge freely to the open air in such a manner as to prevent any impingement of escaping gas upon the pressure receptacle itself under normal conditions of carriage.

6.2.1.3.5 Pressure receptacles whose filling is measured by volume shall be provided with a level indicator.

6.2.1.3.6 *Additional requirements for closed cryogenic receptacles*

6.2.1.3.6.1 Each filling and discharge opening in a closed cryogenic receptacle used for the carriage of flammable refrigerated liquefied gases shall be fitted with at least two mutually independent shut-off devices in series, the first being a stop-valve, the second being a cap or equivalent device.

6.2.1.3.6.2 For sections of piping which can be closed at both ends and where liquid product can be trapped, a method of automatic pressure-relief shall be provided to prevent excess pressure build-up within the piping.

6.2.1.3.6.3 Each connection on a closed cryogenic receptacle shall be clearly marked to indicate its function (e.g. vapour or liquid phase).

6.2.1.3.6.4 Pressure-relief devices

6.2.1.3.6.4.1 Every closed cryogenic receptacle shall be provided with at least one pressure-relief device. The pressure-relief device shall be of the type that will resist dynamic forces including surge.

6.2.1.3.6.4.2 Closed cryogenic receptacles may, in addition, have a frangible disc in parallel with the spring loaded device(s) in order to meet the requirements of 6.2.1.3.6.5.

6.2.1.3.6.4.3 Connections to pressure-relief devices shall be of sufficient size to enable the required discharge to pass unrestricted to the pressure-relief device.

6.2.1.3.6.4.4 All pressure-relief device inlets shall under maximum filling conditions be situated in the vapour space of the closed cryogenic receptacle and the devices shall be so arranged as to ensure that the escaping vapour is discharged unrestrictedly.

6.2.1.3.6.5 Capacity and setting of pressure-relief devices

NOTE: *In relation to pressure-relief devices of closed cryogenic receptacles, maximum allowable working pressure (MAWP) means the maximum effective gauge pressure permissible at the top of a loaded closed cryogenic receptacle in its operating position including the highest effective pressure during filling and discharge.*

6.2.1.3.6.5.1 The pressure-relief device shall open automatically at a pressure not less than the MAWP and be fully open at a pressure equal to 110 % of the MAWP. It shall, after discharge, close at a pressure not lower than 10 % below the pressure at which discharge starts and shall remain closed at all lower pressures.

6.2.1.3.6.5.2 Frangible discs shall be set to rupture at a nominal pressure which is the lower of either the test pressure or 150 % of the MAWP.

6.2.1.3.6.5.3 In the case of the loss of vacuum in a vacuum-insulated closed cryogenic receptacle the combined capacity of all pressure-relief devices installed shall be sufficient so that the pressure (including accumulation) inside the closed cryogenic receptacle does not exceed 120 % of the MAWP.

6.2.1.3.6.5.4 The required capacity of the pressure-relief devices shall be calculated in accordance with an established technical code recognized by the competent authority[1].

6.2.1.4 Approval of pressure receptacles

6.2.1.4.1 The conformity of pressure receptacles shall be assessed at time of manufacture as required by the competent authority. The technical documentation shall include full specifications on design and construction, and full documentation on the manufacturing and testing.

6.2.1.4.2 Quality assurance systems shall conform to the requirements of the competent authority.

6.2.1.4.3 Pressure receptacle shells and the inner vessels of closed cryogenic receptacles shall be inspected, tested and approved by an inspection body.

[1] *See for example CGA Publications S-1.2-2003 "Pressure Relief Device Standards-Part 2-Cargo and Portable Tanks for Compressed Gases" and S-1.1-2003 "Pressure Relief Device Standards-Part 1-Cylinders for Compressed Gases".*

6.2.1.4.4 For refillable cylinders, pressure drums and tubes the conformity assessment of the shell and the closure(s) may be carried out separately. In these cases, an additional assessment of the final assembly is not required.

For bundles of cylinders, the cylinder shells and the valve(s) may be assessed separately, but an additional assessment of the complete assembly is required.

For closed cryogenic receptacles, the inner vessels and the closures may be assessed separately, but an additional assessment of the complete assembly is required.

For acetylene cylinders, conformity assessment shall comprise either:

(a) One assessment of conformity covering both the cylinder shell and the contained porous material; or

(b) A separate assessment of conformity for the empty cylinder shell and an additional assessment of conformity covering the cylinder shell with the contained porous material.

6.2.1.4.5 A pressure receptacle is considered to be approved when the type approval procedures in 1.8.7.1.6 have been followed.

6.2.1.5 Initial inspection and test

6.2.1.5.1 New pressure receptacles, other than closed cryogenic receptacles, metal hydride storage systems and bundles of cylinders, shall be subjected to testing and inspection during and after manufacture in accordance with the applicable design standards or recognised technical codes including the following:

On an adequate sample of pressure receptacle shells:

(a) Testing of the mechanical characteristics of the material of construction;

(b) Verification of the minimum wall thickness;

(c) Verification of the homogeneity of the material for each manufacturing batch;

(d) Inspection of the external and internal conditions;

(e) Inspection of the threads used to fit closures;

(f) Verification of the conformance with the design standard;

For all pressure receptacle shells:

(g) A hydraulic pressure test. Pressure receptacles shall meet the acceptance criteria specified in the design and construction technical standard or technical code;

NOTE: *With the agreement of the competent authority, the hydraulic pressure test may be replaced by a test using a gas, where such an operation does not entail any danger.*

(h) Inspection and assessment of manufacturing defects and either repairing them or rendering the pressure receptacle shells unserviceable. In the case of welded pressure receptacle shells, particular attention shall be paid to the quality of the welds;

(i) An inspection of the marks on the pressure receptacle shells;

(j) In addition, cylinder shells intended for the carriage of UN No. 1001 acetylene, dissolved, and UN No. 3374 acetylene, solvent free, shall be inspected to ensure proper installation and condition of the porous material and, if applicable, the quantity of solvent.

On an adequate sample of closures:

(k) Verification of materials;

(*l*) Verification of dimensions;

(m) Verification of cleanliness;

(n) Inspection of completed assembly;

(o) Verification of the presence of marks.

For all closures:

(p) Testing for leakproofness.

6.2.1.5.2 Closed cryogenic receptacles shall be subjected to testing and inspection during and after manufacture in accordance with the applicable design standards or recognized technical codes including the following:

On an adequate sample of inner vessels:

(a) Testing of the mechanical characteristics of the material of construction;

(b) Verification of the minimum wall thickness;

(c) Inspection of the external and internal conditions;

(d) Verification of the conformance with the design standard or technical code;

(e) Inspection of welds by radiographic, ultrasonic or other suitable non-destructive test method according to the applicable design and construction standard or technical code.

For all inner vessels:

(f) A hydraulic pressure test. The inner vessel shall meet the acceptance criteria specified in the design and construction technical standard or technical code;

NOTE: *With the agreement of the competent authority, the hydraulic pressure test may be replaced by a test using a gas, where such an operation does not entail any danger.*

(g) Inspection and assessment of manufacturing defects and either repairing them or rendering the inner vessel unserviceable;

(h) An inspection of the marks.

On an adequate sample of closures:

(i) Verification of materials;

(j) Verification of dimensions;

(k) Verification of cleanliness;

(*l*) Inspection of completed assembly;

(m) Verification of the presence of marks.

For all closures:

(n) Testing for leakproofness.

On an adequate sample of completed closed cryogenic receptacles:

(o) Testing the satisfactory operation of service equipment;

(p) Verification of the conformance with the design standard or technical code.

For all completed closed cryogenic receptacles:

(q) Testing for leakproofness.

6.2.1.5.3 For metal hydride storage systems, it shall be verified that the inspections and tests specified in 6.2.1.5.1 (a), (b), (c), (d), (e) if applicable, (f), (g), (h) and (i) have been performed on an adequate sample of the pressure receptacle shells used in the metal hydride storage system. In addition, on an adequate sample

of metal hydride storage systems, the inspections and tests specified in 6.2.1.5.1 (c) and (f) shall be performed, as well as 6.2.1.5.1 (e), if applicable, and inspection of the external conditions of the metal hydride storage system.

Additionally, all metal hydride storage systems shall undergo the initial inspections and tests specified in 6.2.1.5.1 (h) and (i), as well as a leakproofness test and a test of the satisfactory operation of the service equipment.

6.2.1.5.4 For bundles of cylinders the cylinder shells and closures shall be subjected to initial inspection and tests specified in 6.2.1.5.1. An adequate sample of frames shall be proof load tested to two times the maximum gross weight of the bundles of cylinders.

Additionally, all manifolds of bundle of cylinders shall undergo a hydraulic pressure test and all the completed bundles of cylinders shall undergo a leakproofness test.

NOTE: *With the agreement of the competent authority, the hydraulic pressure test may be replaced by a test using a gas, where such an operation does not entail any danger.*

6.2.1.5.5 A pressure receptacle is considered to have complied with the procedures in 6.2.1.5 when the initial inspection and test procedures in 1.8.7.1.6 have been followed.

6.2.1.6 Periodic inspection and test

6.2.1.6.1 Refillable pressure receptacles, other than cryogenic receptacles, shall be subjected to periodic inspections and tests by a body authorised by the competent authority, in accordance with the following:

(a) Check of the external conditions of the pressure receptacle and verification of the equipment and the external marks;

(b) Check of the internal conditions of the pressure receptacle (e.g. internal inspection, verification of minimum wall thickness);

(c) Checking of the threads either:

(i) if there is evidence of corrosion; or

(ii) if the closures or other service equipment are removed;

(d) A hydraulic pressure test of the pressure receptacle shell and, if necessary, verification of the characteristics of the material by suitable tests;

(e) Check of service equipment, if to be reintroduced into service. This check may be carried out separately from the inspection of the pressure receptacle shell; and

(f) A leakproofness test of bundles of cylinders after reassembly.

NOTE 1: *With the agreement of the competent authority, the hydraulic pressure test may be replaced by a test using a gas, where such an operation does not entail any danger.*

NOTE 2: *For seamless steel cylinder shells and tube shells the check of 6.2.1.6.1 (b) and hydraulic pressure test of 6.2.1.6.1 (d) may be replaced by a procedure conforming to ISO 16148:2016 "Gas cylinders – Refillable seamless steel gas cylinders and tubes – Acoustic emission examination (AT) and follow-up ultrasonic examination (UT) for periodic inspection and testing".*

NOTE 3: *The check of internal conditions of 6.2.1.6.1 (b) and the hydraulic pressure test of 6.2.1.6.1 (d) may be replaced by ultrasonic examination carried out in accordance with ISO 18119:2018 for seamless steel and seamless aluminium alloy cylinder shells.*

NOTE 4: *For bundles of cylinders the hydraulic test specified in (d) above shall be carried out on the cylinder shells and on the manifolds.*

NOTE 5: *For the periodic inspection and test frequencies, see packing instruction P200 of 4.1.4.1 or, for a chemical under pressure, packing instruction P206 of 4.1.4.1.*

6.2.1.6.2 Cylinders intended for the carriage of UN No. 1001 acetylene, dissolved and UN No. 3374 acetylene, solvent free, shall be examined only as specified in 6.2.1.6.1 (a), (c) and (e). In addition the condition of the porous material (e.g. cracks, top clearance, loosening, settlement) shall be examined.

6.2.1.6.3 Pressure relief valves for closed cryogenic receptacles shall be subject to periodic inspections and tests.

6.2.1.6.4 A pressure receptacle is considered to have been subjected to appropriate periodic inspection and test procedures when the periodic inspection and test procedures in 1.8.7.1.6 have been followed.

6.2.1.7 Requirements for manufacturers

6.2.1.7.1 The manufacturer shall be technically able and shall possess all resources required for the satisfactory manufacture of pressure receptacles; this relates in particular to qualified personnel:

(a) To supervise the entire manufacturing process;

(b) To carry out joining of materials; and

(c) To carry out the relevant tests.

6.2.1.7.2 A proficiency test of the manufacturers of pressure receptacle shells and the inner vessels of closed cryogenic receptacle shall in all instances be carried out by an inspection body approved by the competent authority of the country of approval. Proficiency testing of manufacturers of closures shall be carried out if the competent authority requires it. This test shall be carried out either during design type approval or during production inspection and certification.

6.2.1.8 Requirements for inspection bodies

6.2.1.8.1 Inspection bodies shall be independent from manufacturing enterprises and competent to perform the tests, inspections and approvals required.

6.2.2 Requirements for UN pressure receptacles

In addition to the general requirements of section 6.2.1, UN pressure receptacles shall comply with the requirements of this section, including the standards, as applicable. Manufacture of new pressure receptacles or service equipment according to any particular standard in 6.2.2.1 and 6.2.2.3 is not permitted after the date shown in the right hand column of the tables.

NOTE 1: *UN pressure receptacles constructed according to standards applicable at the date of manufacture may continue in use subject to the periodic inspection provisions of this Code.*

NOTE 2: *When EN ISO versions of the following ISO standards are available, they may be used to fulfil the requirements of 6.2.2.1, 6.2.2.2, 6.2.2.3 and 6.2.2.4.*

6.2.2.1 Design, construction and initial inspection and test

6.2.2.1.1 The following standards apply for the design, construction, and initial inspection and test of refillable UN cylinder shells, except that inspection requirements related to the conformity assessment system and approval shall be in accordance with 6.2.2.5:

Reference	Title	Applicable for manufacture
ISO 9809-1:1999	Gas cylinders – Refillable seamless steel gas cylinders – Design, construction and testing – Part 1: Quenched and tempered steel cylinders with tensile strength less than 1 100 MPa ***NOTE:*** *The note concerning the F factor in section 7.3 of this standard shall not be applied for UN cylinders.*	Until 31 December 2018
ISO 9809-1:2010	Gas cylinders -- Refillable seamless steel gas cylinders -- Design, construction and testing -- Part 1: Quenched and tempered steel cylinders with tensile strength less than 1 100 MPa	Until 31 December 2026

Reference	Title	Applicable for manufacture
ISO 9809-1:2019	Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 1: Quenched and tempered steel cylinders and tubes with tensile strength less than 1 100 MPa	Until further notice
ISO 9809-2:2000	Gas cylinders – Refillable seamless steel gas cylinders – Design, construction and testing – Part 2: Quenched and tempered steel cylinders with tensile strength greater than or equal to 1 100 MPa	Until 31 December 2018
ISO 9809-2:2010	Gas cylinders – Refillable seamless steel gas cylinders – Design, construction and testing – Part 2: Quenched and tempered steel cylinders with tensile strength greater than or equal to 1 100 MPa	Until 31 December 2026
ISO 9809-2:2019	Gas cylinders – Design, construction and testing of refillable seamless steel gas cylinders and tubes – Part 2: Quenched and tempered steel cylinders and tubes with tensile strength greater than or equal to 1 100 MPa	Until further notice
ISO 9809-3:2000	Gas cylinders – Refillable seamless steel gas cylinders – Design, construction and testing – Part 3: Normalized steel cylinders	Until 31 December 2018
ISO 9809-3:2010	Gas cylinders -- Refillable seamless steel gas cylinders -- Design, construction and testing -- Part 3: Normalized steel cylinders	Until 31 December 2026
ISO 9809-3:2019	Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 3: Normalized steel cylinders and tubes	Until further notice
ISO 9809-4:2014	Gas cylinders – Refillable seamless steel gas cylinders – Design, construction and testing – Part 4: Stainless steel cylinders with an Rm value of less than 1 100 MPa	Until further notice
ISO 7866:1999	Gas cylinders – Refillable seamless aluminium alloy gas cylinders – Design, construction and testing ***NOTE:*** *The note concerning the F factor in section 7.2 of this standard shall not be applied for UN cylinders. Aluminium alloy 6351A – T6 or equivalent shall not be authorised.*	Until 31 December 2020
ISO 7866: 2012 + Cor 1:2014	Gas cylinders – Refillable seamless aluminium alloy gas cylinders – Design, construction and testing ***NOTE:*** *Aluminium alloy 6351A or equivalent shall not be used.*	Until further notice
ISO 4706:2008	Gas cylinders – Refillable welded steel cylinders – Test pressure 60 bar and below	Until further notice
ISO 18172-1:2007	Gas cylinders – Refillable welded stainless steel cylinders – Part 1: Test pressure 6 MPa and below	Until further notice
ISO 20703:2006	Gas cylinders – Refillable welded aluminium-alloy cylinders – Design, construction and testing	Until further notice
ISO 11119-1:2002	Gas cylinders of composite construction – Specification and test methods – Part 1: Hoop wrapped composite gas cylinders	Until 31 December 2020
ISO 11119-1:2012	Gas cylinders – Refillable composite gas cylinders and tubes – Design, construction and testing – Part 1: Hoop wrapped fibre reinforced composite gas cylinders and tubes up to 450 l	Until further notice
ISO 11119-2:2002	Gas cylinders of composite construction – Specification and test methods – Part 2: Fully wrapped fibre reinforced composite gas cylinders with load-sharing metal liners	Until 31 December 2020
ISO 11119-2:2012 + Amd 1:2014	Gas cylinders – Refillable composite gas cylinders and tubes – Design, construction and testing – Part 2: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 l with load-sharing metal liners	Until further notice

Reference	Title	Applicable for manufacture
ISO 11119-3:2002	Gas cylinders of composite construction – Specification and test methods – Part 3: Fully wrapped fibre reinforced composite gas cylinders with non-load-sharing metallic or non-metallic liners ***NOTE:*** *This standard shall not be used for linerless cylinders manufactured from two parts joined together.*	Until 31 December 2020
ISO 11119-3:2013	Gas cylinders – Refillable composite gas cylinders and tubes – Design, construction and testing – Part 3: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 l with non-load-sharing metallic or non-metallic liners ***NOTE:*** *This standard shall not be used for linerless cylinders manufactured from two parts joined together.*	Until further notice
ISO 11119-4: 2016	Gas cylinders – Refillable composite gas cylinders – Design, construction and testing – Part 4: Fully wrapped fibre reinforced composite gas cylinders up to 150 *l* with load-sharing welded metallic liners	Until further notice

NOTE 1: *In the above referenced standards composite cylinder shells shall be designed for a design life of not less than 15 years..*

NOTE 2: *Composite cylinder shells with a design life longer than 15 years shall not be filled after 15 years from the date of manufacture, unless the design has successfully passed a service life test programme. The programme shall be part of the initial design type approval and shall specify inspections and tests to demonstrate that composite cylinder shells manufactured accordingly remain safe to the end of their design life. The service life test programme and the results shall be approved by the competent authority of the country of approval that is responsible for the initial approval of the cylinder design. The service life of a composite cylinder shell shall not be extended beyond its initial approved design life.*

6.2.2.1.2 The following standards apply for the design, construction, and initial inspection and test of UN tube shells, except that inspection requirements related to the conformity assessment system and approval shall be in accordance with 6.2.2.5:

Reference	Title	Applicable for manufacture
ISO 11120:1999	Gas cylinders – Refillable seamless steel tubes for compressed gas transport, of water capacity between 150 *l* and 3 000 *l* – Design, construction and testing ***NOTE:*** *The note concerning the F factor in section 7.1 of this standard shall not be applied for UN tubes.*	Until 31 December 2022
ISO 11120:2015	Gas cylinders – Refillable seamless steel tubes of water capacity between 150 *l* and 3 000 *l* – Design, construction and testing	Until further notice
ISO 11119-1:2012	Gas cylinders – Refillable composite gas cylinders and tubes – Design, construction and testing – Part 1: Hoop wrapped fibre reinforced composite gas cylinders and tubes up to 450 *l*	Until further notice
ISO 11119-2:2012 + Amd 1:2014	Gas cylinders – Refillable composite gas cylinders and tubes – Design, construction and testing – Part 2: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 *l* with load-sharing metal liners	Until further notice
ISO 11119-3:2013	Gas cylinders – Refillable composite gas cylinders and tubes – Design, construction and testing – Part 3: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 *l* with non-load-sharing metallic or non-metallic liners ***NOTE:*** *This standard shall not be used for linerless cylinders manufactured from two parts joined together.*	Until further notice

Reference	Title	Applicable for manufacture
ISO 11515: 2013	Gas cylinders – Refillable composite reinforced tubes of water capacity between 450 *l* and 3 000 *l* – Design, construction and testing	Until 31 December 2026
ISO 11515:2013 + Amd 1:2018	Gas cylinders – Refillable composite reinforced tubes of water capacity between 450 l and 3000 l – Design, construction and testing	Until further notice
ISO 9809-1:2019	Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 1: Quenched and tempered steel cylinders and tubes with tensile strength less than 1 100 MPa	Until further notice
ISO 9809-2:2019	Gas cylinders – Design, construction and testing of refillable seamless steel gas cylinders and tubes – Part 2: Quenched and tempered steel cylinders and tubes with tensile strength greater than or equal to 1 100 MPa	Until further notice
ISO 9809-3:2019	Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 3: Normalized steel cylinders and tubes	Until further notice

NOTE 1: *In the above referenced standards composite tube shells shall be designed for a design life of not less than 15 years.*

NOTE 2: *Composite tube shells with a design life longer than 15 years shall not be filled after 15 years from the date of manufacture, unless the design has successfully passed a service life test programme. The programme shall be part of the initial design type approval and shall specify inspections and tests to demonstrate that composite tube shells manufactured accordingly remain safe to the end of their design life. The service life test programme and the results shall be approved by the competent authority of the country of approval that is responsible for the initial approval of the tube design. The service life of a composite tube shell shall not be extended beyond its initial approved design life.*

6.2.2.1.3 The following standards apply for the design, construction and initial inspection and test of UN acetylene cylinders, except that inspection requirements related to the conformity assessment system and approval shall be in accordance with 6.2.2.5:

For the cylinder shell:

Reference	Title	Applicable for manufacture
ISO 9809-1:1999	Gas cylinders – Refillable seamless steel gas cylinders – Design, construction and testing – Part 1: Quenched and tempered steel cylinders with tensile strength less than 1 100 MPa ***NOTE:*** *The note concerning the F factor in section 7.3 of this standard shall not be applied for UN cylinders.*	Until 31 December 2018
ISO 9809-1:2010	Gas cylinders – Refillable seamless steel gas cylinders – Design, construction and testing – Part 1: Quenched and tempered steel cylinders with tensile strength less than 1 100 MPa	Until 31 December 2026
ISO 9809-1:2019	Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 1: Quenched and tempered steel cylinders and tubes with tensile strength less than 1 100 MPa	Until further notice
ISO 9809-3:2000	Gas cylinders – Refillable seamless steel gas cylinders – Design, construction and testing – Part 3: Normalized steel cylinders	Until 31 December 2018
ISO 9809-3:2010	Gas cylinders – Refillable seamless steel gas cylinders – Design, construction and testing – Part 3: Normalized steel cylinders	Until 31 December 2026
ISO 9809-3:2019	Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 3: Normalized steel cylinders and tubes	Until further notice

Reference	Title	Applicable for manufacture
ISO 4706:2008	Gas cylinders – Refillable welded steel cylinders – Test pressure 60 bar and below	Until further notice
ISO 7866:2012 + Cor 1:2014	Gas cylinders – Refillable seamless aluminium alloy gas cylinders – Design, construction and testing ***NOTE:*** *Aluminium alloy 6351A or equivalent shall not be used.*	Until further notice

For the acetylene cylinder including the porous material:

Reference	Title	Applicable for manufacture
ISO 3807-1:2000	Cylinders for acetylene – Basic requirements – Part 1: Cylinders without fusible plugs	Until 31 December 2020
ISO 3807-2:2000	Cylinders for acetylene – Basic requirements – Part 2: Cylinders with fusible plugs	Until 31 December 2020
ISO 3807:2013	Gas cylinders – Acetylene cylinders – Basic requirements and type testing	Until further notice

6.2.2.1.4 The following standard applies for the design, construction, and initial inspection and test of UN closed cryogenic receptacles, except that inspection requirements related to the conformity assessment system and approval shall be in accordance with 6.2.2.5:

Reference	Title	Applicable for manufacture
ISO 21029-1:2004	Cryogenic vessels – Transportable vacuum insulated vessels of not more than 1 000 *l* volume – Part 1: Design, fabrication, inspection and tests	Until 31 December 2026
ISO 21029-1:2018 + Amd 1:2019	Cryogenic vessels – Transportable vacuum insulated vessels of not more than 1 000 litres volume – Part 1: Design, fabrication, inspection and tests	Until further notice

6.2.2.1.5 The following standard applies for the design, construction, and initial inspection and test of UN metal hydride storage systems, except that inspection requirements related to the conformity assessment system and approval shall be in accordance with 6.2.2.5:

Reference	Title	Applicable for manufacture
ISO 16111:2008	Transportable gas storage devices – Hydrogen absorbed in reversible metal hydride	Until 31 December 2026
ISO 16111:2018	Transportable gas storage devices – Hydrogen absorbed in reversible metal hydride	Until further notice

6.2.2.1.6 The following standard applies to the design, construction and initial inspection and test of UN bundles of cylinders. Each cylinder in a UN bundle of cylinders shall be a UN cylinder or UN cylinder shell complying with the requirements of 6.2.2. The inspection requirements related to the conformity assessment system and approval for UN bundles of cylinders shall be in accordance with 6.2.2.5.

Reference	Title	Applicable for manufacture
ISO 10961:2010	Gas cylinders – Cylinder bundles – Design, manufacture, testing and inspection	Until 31 December 2026
ISO 10961:2019	Gas cylinders – Cylinder bundles – Design, manufacture, testing and inspection	Until further notice

NOTE: *Changing one or more cylinders or cylinder shells of the same design type, including the same test pressure, in an existing UN bundle of cylinders does not require a new conformity assessment of the existing bundle. Service equipment of the bundle of cylinders can also be replaced without requiring a new conformity assessment if it complies with the design type approval.*

6.2.2.1.7 The following standards apply to the design, construction and initial inspection and test of UN cylinders for adsorbed gases except that the inspection requirements related to the conformity assessment system and approval shall be in accordance with 6.2.2.5.

Reference	Title	Applicable for manufacture
ISO 11513:2011	Gas cylinders – Refillable welded steel cylinders containing materials for sub-atmospheric gas packaging (excluding acetylene) – Design, construction, testing, use and periodic inspection	Until 31 December 2026
ISO 11513:2019	Gas cylinders – Refillable welded steel cylinders containing materials for sub-atmospheric gas packaging (excluding acetylene) – Design, construction, testing, use and periodic inspection	Until further notice
ISO 9809-1:2010	Gas cylinders – Refillable seamless steel gas cylinders – Design, construction and testing – Part 1: Quenched and tempered steel cylinders with tensile strength less than 1 100 MPa	Until 31 December 2026
ISO 9809-1:2019	Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 1: Quenched and tempered steel cylinders and tubes with tensile strength less than 1 100 MPa	Until further notice

6.2.2.1.8 The following standards apply for the design, construction and initial inspection and test of UN pressure drums, except that inspection requirements related to the conformity assessment system and approval shall be in accordance with 6.2.2.5:

Reference	Title	Applicable for Manufacture
ISO 21172-1:2015	Gas cylinders – Welded steel pressure drums up to 3 000 litres capacity for the transport of gases – Design and construction – Part 1: Capacities up to 1 000 litres NOTE: Irrespective of section 6.3.3.4 of this standard, welded steel gas pressure drums with dished ends convex to pressure may be used for the carriage of corrosive substances provided all applicable requirements of this Code are met.	Until 31 December 2026
ISO 21172-1:2015 + Amd 1:2018	Gas cylinders – Welded steel pressure drums up to 3 000 litres capacity for the transport of gases – Design and construction – Part 1: Capacities up to 1 000 litres	Until further notice
ISO 4706:2008	Gas cylinders – Refillable welded steel cylinders – Test pressure 60 bar and below	Until further notice
ISO 18172-1:2007	Gas cylinders – Refillable welded stainless steel cylinders – Part 1: Test pressure 6 MPa and below	Until further notice

6.2.2.1.9 The following standards apply to the design, construction and initial inspection and test of non-refillable UN cylinders except that the inspection requirements related to the conformity assessment system and approval shall be in accordance with 6.2.2.5.

Reference	Title	Applicable for Manufacture
ISO 11118:1999	Gas cylinders – Non-refillable metallic gas cylinders – Specification and test methods	Until 31 December 2020
ISO 13340:2001	Transportable gas cylinders – Cylinder valves for non-refillable cylinders – Specification and prototype testing	Until 31 December 2020
ISO 11118:2015	Gas cylinders – Non-refillable metallic gas cylinders – Specification and test methods	Until 31 December 2026
ISO 11118:2015 +Amd.1:2019	Gas cylinders - Non-refillable metallic gas cylinders - Specification and test methods	Until further notice

6.2.2.2 Materials

In addition to the material requirements specified in the design and construction standards, and any restrictions specified in the applicable packing instruction for the gas(es) to be carried (e.g. packing instruction P200 or P205 of 4.1.4.1), the following standards apply to material compatibility:

Reference	Title
ISO 11114-1:2012 + A1:2017	Gas cylinders – Compatibility of cylinder and valve materials with gas contents – Part 1: Metallic materials
ISO 11114-2:2013	Gas cylinders – Compatibility of cylinder and valve materials with gas contents – Part 2: Non-metallic materials

6.2.2.3 Closures and their protection

The following standards apply to the design, construction, and initial inspection and test of closures and their protection:

Reference	Title	Applicable for manufacture
ISO 11117:1998	Gas cylinders – Valve protection caps and valve guards for industrial and medical gas cylinders – Design, construction and tests	Until 31 December 2014
ISO 11117:2008 + Cor 1:2009	Gas cylinders − Valve protection caps and valve guards − Design, construction and tests	Until 31 December 2026
ISO 11117:2019	Gas cylinders – Valve protection caps and guards – Design, construction and tests	Until further notice
ISO 10297:1999	Gas cylinders – Refillable gas cylinder valves – Specification and type testing	Until 31 December 2008
ISO 10297:2006	Gas cylinders – Refillable gas cylinder valves – Specification and type testing	Until 31 December 2020
ISO 10297:2014	Gas cylinders – Cylinder valves – Specification and type testing	Until 31 December 2022
ISO 10297:2014 + A1:2017	Gas cylinders – Cylinder valves – Specification and type testing	Until further notice
ISO 13340:2001	Transportable gas cylinders – Cylinder valves for non-refillable cylinders – Specification and prototype testing	Until 31 December 2020
ISO 14246:2014	Gas cylinders – Cylinder valves – Manufacturing tests and examination	Until 31 December 2024
ISO 14246:2014 + A1:2017	Gas cylinders – Cylinder valves – Manufacturing tests and examinations	Until further notice
ISO 17871:2015	Gas cylinders – Quick-release cylinders valves- Specification and type testing ***NOTE:*** *This standard shall not be used for flammable gases.*	Until 31 December 2026
ISO 17871:2020	Gas cylinders – Quick-release cylinder valves – Specification and type testing.	Until further notice
ISO 17879:2017	Gas cylinders – Self-closing cylinder valves – Specification and type testing ***NOTE:*** *This standard shall not be applied to self-closing valves in acetylene cylinders.*	Until further notice

For UN metal hydride storage systems, the requirements specified in the following standard apply to closures and their protection:

Reference	Title	Applicable for manufacture
ISO 16111:2008	Transportable gas storage devices – Hydrogen absorbed in reversible metal hydride	Until 31 December 2026
ISO 16111:2018	Transportable gas storage devices – Hydrogen absorbed in reversible metal hydride	Until further notice

6.2.2.4 Periodic inspection and test

The following standards apply to the periodic inspection and testing of UN cylinders and their closures:

Reference	Title	Applicable
ISO 6406:2005	Periodic inspection and testing of seamless steel gas cylinders	Until 31 December 2024
ISO 18119:2018	Gas cylinders – Seamless steel and seamless aluminium-alloy gas cylinders and tubes – Periodic inspection and testing	Until further notice
ISO 10460:2005	Gas cylinders – Welded carbon-steel gas cylinders – Periodic inspection and testing ***NOTE:*** *The repair of welds described in clause 12.1 of this standard shall not be permitted. Repairs described in clause 12.2 require the approval of the competent authority which approved the periodic inspection and test body in accordance with 6.2.2.6.*	Until 31 December 2024
ISO 10460:2018	Gas cylinders – Welded aluminium-alloy, carbon and stainless steel gas cylinders – Periodic inspection and testing.	Until further notice
ISO 10461:2005 + A1:2006	Seamless aluminium-alloy gas cylinders – Periodic inspection and testing	Until 31 December 2024
ISO 10462:2013	Gas cylinders – Acetylene cylinders – Periodic inspection and maintenance	Until 31 December 2024
ISO 10462:2013 + Amd1:2019	Gas cylinders – Acetylene cylinders – Periodic inspection and maintenance	Until further notice
ISO 11513:2011	Gas cylinders – Refillable welded steel cylinders containing materials for sub-atmospheric gas packaging (excluding acetylene) – Design, construction, testing, use and periodic inspection	Until 31 December 2024
ISO 11513:2019	Gas cylinders – Refillable welded steel cylinders containing materials for sub-atmospheric gas packaging (excluding acetylene) – Design, construction, testing, use and periodic inspection	Until further notice
ISO 11623:2015	Gas cylinders – Composite construction – Periodic inspection and testing	Until further notice
ISO 22434:2006	Transportable gas cylinders – Inspection and maintenance of cylinder valves ***NOTE:*** *These requirements may be met at times other than at the periodic inspection and test of UN cylinders*	Until further notice
ISO 20475:2018	Gas cylinders – Cylinder bundles – Periodic inspection and testing	Until further notice
ISO 23088:2020	Gas cylinders – Periodic inspection and testing of welded steel pressure drums — Capacities up to 1 000 l	Until further notice

The following standard applies to the periodic inspection and testing of UN metal hydride storage systems:

Reference	Title	Applicable
ISO 16111:2008	Transportable gas storage devices – Hydrogen absorbed in reversible metal hydride	Until 31 December 2024
ISO 16111:2018	Transportable gas storage devices – Hydrogen absorbed in reversible metal hydride	Until further notice

6.2.2.5 Conformity assessment system and approval for manufacture of pressure receptacles

6.2.2.5.0 Definitions

For the purposes of this sub-section:

Conformity assessment system means a system for competent authority approval of a manufacturer, by pressure receptacle design type approval, approval of manufacturer's quality system and approval of inspection bodies;

Design type means a pressure receptacle design as specified by a particular pressure receptacle standard;

Verify means confirm by examination or provision of objective evidence that specified requirements have been fulfilled.

NOTE: *In this subsection when separate assessment is used, the term pressure receptacle shall refer to pressure receptacle, pressure receptacle shell, inner vessel of the closed cryogenic receptacle or closure, as appropriate.*

6.2.2.5.1 The requirements of 6.2.2.5 shall be used for the conformity assessments of pressure receptacles. Paragraph 6.2.1.4.4 gives details of which parts of pressure receptacles may be conformity assessed separately. However, the requirements of 6.2.2.5 may be replaced by requirements specified by the competent authority in the following cases:

(a) Conformity assessment of closures;

(b) Conformity assessment of the complete assembly of bundles of cylinders provided the cylinder shells have been conformity assessed in accordance with the requirements of 6.2.2.5; and

(c) Conformity assessment of the complete assembly of closed cryogenic receptacles provided the inner vessel has been conformity assessed in accordance with the requirements of 6.2.2.5.

6.2.2.5.2 General requirements

Competent authority

6.2.2.5.2.1 The competent authority that approves the pressure receptacle shall approve the conformity assessment system for the purpose of ensuring that pressure receptacles conform to the requirements of this Code. In instances where the competent authority that approves a pressure receptacle is not the competent authority in the country of manufacture, the marks of the approval country and the country of manufacture shall be indicated in the pressure receptacle marks (see 6.2.2.7 and 6.2.2.8).

The competent authority of the country of approval shall supply, upon request, evidence demonstrating compliance to this conformity assessment system to its counterpart in a country of use.

6.2.2.5.2.2 The competent authority may delegate its functions in this conformity assessment system in whole or in part.

6.2.2.5.2.3 The competent authority shall ensure that a current list of approved inspection bodies and their identity marks and approved manufacturers and their identity marks is available.

Inspection body

6.2.2.5.2.4 The inspection body shall be approved by the competent authority for the inspection of pressure receptacles and shall:

(a) Have a staff with an organizational structure, capable, trained, competent, and skilled, to satisfactorily perform its technical functions;

(b) Have access to suitable and adequate facilities and equipment;

(c) Operate in an impartial manner and be free from any influence which could prevent it from doing so;

(d) Ensure commercial confidentiality of the commercial and proprietary activities of the manufacturer and other bodies;

(e) Maintain clear demarcation between actual inspection body functions and unrelated functions;

(f) Operate a documented quality system;

(g) Ensure that the tests and inspections specified in the relevant pressure receptacle standard and this Code are performed; and

(h) Maintain an effective and appropriate report and record system in accordance with 6.2.2.5.6.

6.2.2.5.2.5 The inspection body shall perform design type approval, pressure receptacle production testing and inspection, and certification to verify conformity with the relevant pressure receptacle standard (see 6.2.2.5.4 and 6.2.2.5.5).

Manufacturer

6.2.2.5.2.6 The manufacturer shall:

(a) Operate a documented quality system in accordance with 6.2.2.5.3;

(b) Apply for design type approvals in accordance with 6.2.2.5.4;

(c) Select an inspection body from the list of approved inspection bodies maintained by the competent authority in the country of approval; and

(d) Maintain records in accordance with 6.2.2.5.6.

Testing laboratory

6.2.2.5.2.7 The testing laboratory shall have:

(a) Staff with an organizational structure, sufficient in number, competence, and skill; and

(b) Suitable and adequate facilities and equipment to perform the tests required by the manufacturing standard to the satisfaction of the inspection body.

6.2.2.5.3 Manufacturer's quality system

6.2.2.5.3.1 The quality system shall contain all the elements, requirements, and provisions adopted by the manufacturer. It shall be documented in a systematic and orderly manner in the form of written policies, procedures and instructions.

The contents shall in particular include adequate descriptions of:

(a) The organizational structure and responsibilities of personnel with regard to design and product quality;

(b) The design control and design verification techniques, processes, and procedures that will be used when designing the pressure receptacles;

(c) The relevant pressure receptacle manufacturing, quality control, quality assurance and process operation instructions that will be used;

(d) Quality records, such as inspection reports, test data and calibration data;

(e) Management reviews to ensure the effective operation of the quality system arising from the audits in accordance with 6.2.2.5.3.2;

(f) The process describing how customer requirements are met;

(g) The process for control of documents and their revision;

(h) The means for control of non-conforming pressure receptacles, purchased components, in-process and final materials; and

(i) Training programmes and qualification procedures for relevant personnel.

6.2.2.5.3.2 Audit of the quality system

The quality system shall be initially assessed to determine whether it meets the requirements in 6.2.2.5.3.1 to the satisfaction of the competent authority.

The manufacturer shall be notified of the results of the audit. The notification shall contain the conclusions of the audit and any corrective actions required.

Periodic audits shall be carried out, to the satisfaction of the competent authority, to ensure that the manufacturer maintains and applies the quality system. Reports of the periodic audits shall be provided to the manufacturer.

6.2.2.5.3.3 Maintenance of the quality system

The manufacturer shall maintain the quality system as approved in order that it remains adequate and efficient.

The manufacturer shall notify the competent authority that approved the quality system, of any intended changes. The proposed changes shall be evaluated in order to determine whether the amended quality system will still satisfy the requirements in 6.2.2.5.3.1.

6.2.2.5.4 Approval process

Initial design type approval

6.2.2.5.4.1 The initial design type approval shall consist of approval of the manufacturer's quality system and approval of the pressure receptacle design to be produced. An application for an initial design type approval shall meet the requirements of 6.2.2.5.4.2 to 6.2.2.5.4.6 and 6.2.2.5.4.9.

6.2.2.5.4.2 A manufacturer desiring to produce pressure receptacles in accordance with a pressure receptacle standard and this Code shall apply for, obtain, and retain a design type approval certificate issued by the competent authority in the country of approval for at least one pressure receptacle design type in accordance with the procedure given in 6.2.2.5.4.9. This certificate shall, on request, be submitted to the competent authority of the country of use.

6.2.2.5.4.3 An application shall be made for each manufacturing facility and shall include:

(a) The name and registered address of the manufacturer and in addition, if the application is submitted by an authorised representative, its name and address;

(b) The address of the manufacturing facility (if different from the above);

(c) The name and title of the person(s) responsible for the quality system;

(d) The designation of the pressure receptacle and the relevant pressure receptacle standard;

(e) Details of any refusal of approval of a similar application by any other competent authority;

(f) The identity of the inspection body for design type approval;

(g) Documentation on the manufacturing facility as specified under 6.2.2.5.3.1; and

(h) The technical documentation required for design type approval, which shall enable verification of the conformity of the pressure receptacles with the requirements of the relevant pressure receptacle design standard. The technical documentation shall cover the design and method of manufacture and shall contain, as far as is relevant for assessment, at least the following:

(i) pressure receptacle design standard, design and manufacturing drawings, showing components and subassemblies, if any;

(ii) descriptions and explanations necessary for the understanding of the drawings and intended use of the pressure receptacles;

(iii) a list of the standards necessary to fully define the manufacturing process;

(iv) design calculations and material specifications; and

(v) design type approval test reports, describing the results of examinations and tests carried out in accordance with 6.2.2.5.4.9.

6.2.2.5.4.4 An initial audit in accordance with 6.2.2.5.3.2 shall be performed to the satisfaction of the competent authority.

6.2.2.5.4.5 If the manufacturer is denied approval, the competent authority shall provide written detailed reasons for such denial.

6.2.2.5.4.6 Following approval, changes to the information submitted under 6.2.2.5.4.3 relating to the initial approval shall be provided to the competent authority.

Subsequent design type approvals

6.2.2.5.4.7 An application for a subsequent design type approval shall meet the requirements of 6.2.2.5.4.8 and 6.2.2.5.4.9, provided a manufacturer is in the possession of an initial design type approval. In such a case, the manufacturer's quality system according to 6.2.2.5.3 shall have been approved during the initial design type approval and shall be applicable for the new design.

6.2.2.5.4.8 The application shall include:

(a) The name and address of the manufacturer and in addition, if the application is submitted by an authorised representative, its name and address;

(b) Details of any refusal of approval of a similar application by any other competent authority;

(c) Evidence that initial design type approval has been granted; and

(d) The technical documentation, as described in 6.2.2.5.4.3 (h).

Procedure for design type approval

6.2.2.5.4.9 The inspection body shall:

(a) Examine the technical documentation to verify that:

(i) the design is in accordance with the relevant provisions of the standard, and

(ii) the prototype lot has been manufactured in conformity with the technical documentation and is representative of the design;

(b) Verify that the production inspections have been carried out as required in accordance with 6.2.2.5.5;

(c) As required by the pressure receptacle standard or technical code, carry out or supervise the tests of pressure receptacles as required for design type approval;

(d) Perform or have performed the examinations and tests specified in the pressure receptacle standard to determine that:

(i) the standard has been applied and fulfilled, and

(ii) the procedures adopted by the manufacturer meet the requirements of the standard; and

(e) Ensure that the various type approval examinations and tests are correctly and competently carried out.

After prototype testing has been carried out with satisfactory results and all applicable requirements of 6.2.2.5.4 have been satisfied, a design type approval certificate shall be issued, which shall include the name and address of the manufacturer, results and conclusions of the examination, and the necessary data for identification of the design type. If it was not possible to evaluate exhaustively the compatibility of the materials of construction with the contents of the pressure receptacle when the certificate was issued, a statement that compatibility assessment was not completed shall be included in the design type approval certificate.

If the manufacturer is denied a design type approval, the competent authority shall provide written detailed reasons for such denial.

6.2.2.5.4.10 Modifications to approved design types

The manufacturer shall either:

(a) Inform the issuing competent authority of modifications to the approved design type, where such modifications do not constitute a new design, as specified in the pressure receptacle standard; or

(b) Request a subsequent design type approval where such modifications constitute a new design according to the relevant pressure receptacle standard. This additional approval shall be given in the form of an amendment to the original design type approval certificate.

6.2.2.5.4.11 Upon request, the competent authority shall communicate to any other competent authority, information concerning design type approval, modifications of approvals and withdrawn approvals.

6.2.2.5.5 Production inspection and certification

General requirements

An inspection body, or its delegate, shall carry out the inspection and certification of each pressure receptacle. The inspection body selected by the manufacturer for inspection and testing during production may be different from the inspection body used for the design type approval testing.

Where it can be demonstrated to the satisfaction of the inspection body that the manufacturer has trained competent inspectors, independent of the manufacturing operations, inspection may be performed by those inspectors. In such a case, the manufacturer shall maintain training records of the inspectors.

The inspection body shall verify that the inspections by the manufacturer, and tests performed on those pressure receptacles, fully conform to the standard and the requirements of this Code. Should non-conformance in conjunction with this inspection and testing be determined, the permission to have inspection performed by the manufacturer's inspectors may be withdrawn.

The manufacturer shall, after approval by the inspection body, make a declaration of conformity with the certified design type. The application of the pressure receptacle certification marks shall be considered a declaration that the pressure receptacle complies with the applicable pressure receptacle standards and the requirements of this conformity assessment system and this Code. The inspection body shall affix or delegate the manufacturer to affix the pressure receptacle certification marks and the registered mark of the inspection body to each approved pressure receptacle.

A certificate of compliance, signed by the inspection body and the manufacturer, shall be issued before the pressure receptacles are filled.

6.2.2.5.6 *Records*

Design type approval and certificate of compliance records shall be retained by the manufacturer and the inspection body for not less than 20 years.

6.2.2.6 Approval system for periodic inspection and test of pressure receptacles

6.2.2.6.1 Definition

For the purposes of this section:

Approval system means a system for competent authority approval of a body performing periodic inspection and test of pressure receptacles (hereinafter referred to as "periodic inspection and test body"), including approval of that body's quality system.

6.2.2.6.2 General requirements

Competent authority

6.2.2.6.2.1 The competent authority shall establish an approval system for the purpose of ensuring that the periodic inspection and test of pressure receptacles conform to the requirements of this Code. In instances where the competent authority that approves a body performing periodic inspection and test of a pressure receptacle is not the competent authority of the country approving the manufacture of the pressure receptacle, the marks of the approval country of periodic inspection and test shall be indicated in the pressure receptacle marks (see 6.2.2.7).

The competent authority of the country of approval for the periodic inspection and test shall supply, upon request, evidence demonstrating compliance to this approval system including the records of the periodic inspection and test to its counterpart in a country of use.

The competent authority of the country of approval may terminate the approval certificate referred to in 6.2.2.6.4.1, upon evidence demonstrating non-compliance with the approval system.

6.2.2.6.2.2 The competent authority may delegate its functions in this approval system, in whole or in part.

6.2.2.6.2.3 The competent authority shall ensure that a current list of approved periodic inspection and test bodies and their identity marks is available.

Periodic inspection and test body

6.2.2.6.2.4 The periodic inspection and test body shall be approved by the competent authority and shall:

(a) Have a staff with an organizational structure, capable, trained, competent, and skilled, to satisfactorily perform its technical functions;

(b) Have access to suitable and adequate facilities and equipment;

(c) Operate in an impartial manner and be free from any influence which could prevent it from doing so;

(d) Ensure commercial confidentiality;

(e) Maintain clear demarcation between actual periodic inspection and test body functions and unrelated functions;

(f) Operate a documented quality system accordance with 6.2.2.6.3;

(g) Apply for approval in accordance with 6.2.2.6.4;

(h) Ensure that the periodic inspections and tests are performed in accordance with 6.2.2.6.5; and

(i) Maintain an effective and appropriate report and record system in accordance with 6.2.2.6.6.

6.2.2.6.3 Quality system and audit of the periodic inspection and test body

6.2.2.6.3.1 Quality system

The quality system shall contain all the elements, requirements, and provisions adopted by the periodic inspection and test body. It shall be documented in a systematic and orderly manner in the form of written policies, procedures, and instructions.

The quality system shall include:

(a) A description of the organizational structure and responsibilities;

(b) The relevant inspection and test, quality control, quality assurance, and process operation instructions that will be used;

(c) Quality records, such as inspection reports, test data, calibration data and certificates;

(d) Management reviews to ensure the effective operation of the quality system arising from the audits performed in accordance with 6.2.2.6.3.2;

(e) A process for control of documents and their revision;

(f) A means for control of non-conforming pressure receptacles; and

(g) Training programmes and qualification procedures for relevant personnel.

6.2.2.6.3.2 Audit

The periodic inspection and test body and its quality system shall be audited in order to determine whether it meets the requirements of this Code to the satisfaction of the competent authority.

An audit shall be conducted as part of the initial approval process (see 6.2.2.6.4.3). An audit may be required as part of the process to modify an approval (see 6.2.2.6.4.6).

Periodic audits shall be conducted, to the satisfaction of the competent authority, to ensure that the periodic inspection and test body continues to meet the requirements of this Code.

The periodic inspection and test body shall be notified of the results of any audit. The notification shall contain the conclusions of the audit and any corrective actions required.

6.2.2.6.3.3 Maintenance of the quality system

The periodic inspection and test body shall maintain the quality system as approved in order that it remains adequate and efficient.

The periodic inspection and test body shall notify the competent authority that approved the quality system, of any intended changes, in accordance with the process for modification of an approval in 6.2.2.6.4.6.

6.2.2.6.4 Approval process for periodic inspection and test bodies

Initial approval

6.2.2.6.4.1 A body desiring to perform periodic inspection and test of pressure receptacles in accordance with a pressure receptacle standard and this Code shall apply for, obtain, and retain an approval certificate issued by the competent authority.

This written approval shall, on request, be submitted to the competent authority of a country of use.

6.2.2.6.4.2 An application shall be made for each periodic inspection and test body and shall include:

(a) The name and address of the periodic inspection and test body and, if the application is submitted by an authorised representative, its name and address;

(b) The address of each facility performing periodic inspection and test;

(c) The name and title of the person(s) responsible for the quality system;

(d) The designation of the pressure receptacles, the periodic inspection and test methods, and the relevant pressure receptacle standards met by the quality system;

(e) Documentation on each facility, the equipment, and the quality system as specified under 6.2.2.6.3.1;

(f) The qualifications and training records of the periodic inspection and test personnel; and

(g) Details of any refusal of approval of a similar application by any other competent authority.

6.2.2.6.4.3 The competent authority shall:

(a) Examine the documentation to verify that the procedures are in accordance with the requirements of the relevant pressure receptacle standards and this Code; and

(b) Conduct an audit in accordance with 6.2.2.6.3.2 to verify that the inspections and tests are carried out as required by the relevant pressure receptacle standards and this Code, to the satisfaction of the competent authority.

6.2.2.6.4.4 After the audit has been carried out with satisfactory results and all applicable requirements of 6.2.2.6.4 have been satisfied, an approval certificate shall be issued. It shall include the name of the periodic inspection and test body, the registered mark, the address of each facility, and the necessary data for identification of its approved activities (e.g. designation of pressure receptacles, periodic inspection and test method and pressure receptacle standards).

6.2.2.6.4.5 If the periodic inspection and test body is denied approval, the competent authority shall provide written detailed reasons for such denial.

Modifications to periodic inspection and test body approvals

6.2.2.6.4.6 Following approval, the periodic inspection and test body shall notify the issuing competent authority of any modifications to the information submitted under 6.2.2.6.4.2 relating to the initial approval.

The modifications shall be evaluated in order to determine whether the requirements of the relevant pressure receptacle standards and this Code will be satisfied. An audit in accordance with 6.2.2.6.3.2 may be required. The competent authority shall accept or reject these modifications in writing, and an amended approval certificate shall be issued as necessary.

6.2.2.6.4.7 Upon request, the competent authority shall communicate to any other competent authority, information concerning initial approvals, modifications of approvals, and withdrawn approvals.

6.2.2.6.5 *Periodic inspection and test and certification*

The application of the periodic inspection and test marks to a pressure receptacle shall be considered a declaration that the pressure receptacle complies with the applicable pressure receptacle standards and the requirements of this Code. The periodic inspection and test body shall affix the periodic inspection and test marks, including its registered mark, to each approved pressure receptacle (see 6.2.2.7.7).

A record certifying that a pressure receptacle has passed the periodic inspection and test shall be issued by the periodic inspection and test body, before the pressure receptacle is filled.

6.2.2.6.6 *Records*

The periodic inspection and test body shall retain records of pressure receptacle periodic inspection and tests (both passed and failed) including the location of the test facility, for not less than 15 years.

The owner of the pressure receptacle shall retain an identical record until the next periodic inspection and test unless the pressure receptacle is permanently removed from service.

6.2.2.7 Marking of refillable UN pressure receptacles

NOTE: *Marking requirements for UN metal hydride storage systems are given in 6.2.2.9, marking requirements for UN bundles of cylinders are given in 6.2.2.10 and marking requirements for closures are given in 6.2.2.11.*

6.2.2.7.1 Refillable UN pressure receptacle shells and closed cryogenic receptacles shall be marked clearly and legibly with certification, operational and manufacturing marks. These marks shall be permanently affixed (e.g. stamped, engraved, or etched). The marks shall be on the shoulder, top end or neck of the pressure receptacle shell or on a permanently affixed component of the pressure receptacle (e.g. welded collar or corrosion resistant plate welded on the outer jacket of a closed cryogenic receptacle). Except for the UN packaging symbol, the minimum size of the marks shall be 5 mm for pressure receptacles with a diameter greater than or equal to 140 mm and 2.5 mm for pressure receptacles with a diameter less than 140 mm. The minimum size of the UN packaging symbol shall be 10 mm for pressure receptacles with a diameter greater than or equal to 140 mm and 5 mm for pressure receptacles with a diameter less than 140 mm.

6.2.2.7.2 The following certification marks shall be applied:

(a) The United Nations packaging symbol  .

This symbol shall not be used for any purpose other than certifying that a packaging, a flexible bulk container, a portable tank or a MEGC complies with the relevant requirements in Chapter 6.1, 6.2, 6.3, 6.5, 6.6, 6.7 or 6.11. This symbol shall not be used for pressure receptacles which only conform to the requirements of 6.2.3 to 6.2.5 (see 6.2.3.9);

(b) The technical standard (e.g. ISO 9809-1) used for design, manufacture and testing;

NOTE: *For acetylene cylinders the standard ISO 3807 shall also be marked.*

(c) The character(s) identifying the country of approval as indicated by the distinguishing sign used on vehicles in international road traffic[2];

NOTE: *For the purpose of this mark the country of approval means the country of the competent authority that authorized the initial inspection and test of the individual receptacle at the time of manufacture.*

(d) The identity mark or stamp of the inspection body that is registered with the competent authority of the country authorizing the marking;

(e) The date of the initial inspection, the year (four digits) followed by the month (two digits) separated by a slash (i.e. "/");

NOTE: *When an acetylene cylinder is conformity assessed in accordance with 6.2.1.4.4 (b) and the inspection bodies for the cylinder shell and the acetylene cylinder are different, their respective marks (d) are required. Only the initial inspection date (e) of the completed acetylene cylinder is required. If the country of approval of the inspection body responsible for the initial inspection and test is different, a second mark (c) shall be applied.*

6.2.2.7.3 The following operational marks shall be applied:

(f) The test pressure in bar, preceded by the letters "PH" and followed by the letters "BAR";

(g) The mass of the empty pressure receptacle including all permanently attached integral parts (e.g. neck ring, foot ring, etc.) in kilograms, followed by the letters "KG". This mass shall not include the mass of closure(s), valve protection cap or valve guard, any coating or porous material for acetylene. The mass shall be expressed to three significant figures rounded up to the last digit. For cylinders of less than 1 kg, the mass shall be expressed to two significant figures rounded up to the last digit. In the case of pressure receptacles for UN No. 1001 acetylene, dissolved and UN No. 3374 acetylene, solvent free, at least one decimal shall be shown after the decimal point and two digits for pressure receptacles of less than 1 kg;

(h) The minimum guaranteed wall thickness of the pressure receptacle in millimetres followed by the letters "MM". This mark is not required for pressure receptacles with a water capacity less than or equal to 1 litre or for composite cylinders or for closed cryogenic receptacles;

(i) In the case of pressure receptacles for compressed gases, UN No. 1001 acetylene, dissolved, and UN No. 3374 acetylene, solvent free, the working pressure in bar, preceded by the letters "PW". In the case of closed cryogenic receptacles, the maximum allowable working pressure preceded by the letters "MAWP";

NOTE: *When a cylinder shell is intended for use as an acetylene cylinder (including the porous material), the working pressure mark is not required until the acetylene cylinder is completed*

(j) In the case of pressure receptacles for liquefied gases, refrigerated liquefied gases and dissolved gases, the water capacity in litres expressed to three significant figures rounded down to the last

[2] *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*

digit, followed by the letter "L". If the value of the minimum or nominal water capacity is an integer, the figures after the decimal point may be neglected;

(k) In the case of cylinders for UN No. 1001 acetylene, dissolved:

(i) the tare in kilograms consisting of the total of the mass of the empty cylinder shell, the service equipment (including porous material) not removed during filling, any coating, the solvent and the saturation gas expressed to three significant figures rounded down to the last digit followed by the letters "KG". At least one decimal shall be shown after the decimal point. For pressure receptacles of less than 1 kg, the mass shall be expressed to two significant figures rounded down to the last digit;

(ii) the identity of the porous material (e.g.: name or trademark); and

(iii) the total mass of the filled acetylene cylinder in kilograms followed by the letters "KG";

(*l*) In the case of cylinders for UN No. 3374 acetylene, solvent free:

(i) the tare in kilograms consisting of the total of the mass of the empty cylinder shell, the service equipment (including porous material) not removed during filling and any coating expressed to three significant figures rounded down to the last digit followed by the letters "KG". At least one decimal shall be shown after the decimal point. For pressure receptacles of less than 1 kg, the mass shall be expressed to two significant figures rounded down to the last digit;

(ii) the identity of the porous material (e.g.: name or trademark); and

(iii) the total mass of the filled acetylene cylinder in kilograms followed by the letters "KG".

6.2.2.7.4 The following manufacturing marks shall be applied:

(m) Identification of the cylinder thread (e.g. 25E). This mark is not required for closed cryogenic receptacles;

NOTE: *Information on marks that may be used for identifying threads for cylinders is given in ISO/TR 11364, Gas cylinders – Compilation of national and international valve stem/gas cylinder neck threads and their identification and marking system.*

(n) The manufacturer's mark registered by the competent authority. When the country of manufacture is not the same as the country of approval, then the manufacturer's mark shall be preceded by the character(s) identifying the country of manufacture as indicated by the distinguishing sign used on vehicles in international road traffic[2]. The country mark and the manufacturer's mark shall be separated by a space or slash;

NOTE: *For acetylene cylinders, if the manufacturer of the acetylene cylinder and the manufacturer of the cylinder shell are different, only the mark of the manufacturer of the completed acetylene cylinder is required.*

(o) The serial number assigned by the manufacturer;

(p) In the case of steel pressure receptacles and composite pressure receptacles with steel liner intended for the carriage of gases with a risk of hydrogen embrittlement, the letter "H" showing compatibility of the steel (see ISO 11114-1:2012 + A1:2017);

[2] *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*

(q) For composite cylinders and tubes having a limited design life, the letters "FINAL" followed by the design life shown as the year (four digits) followed by the month (two digits) separated by a slash (i.e. "/");

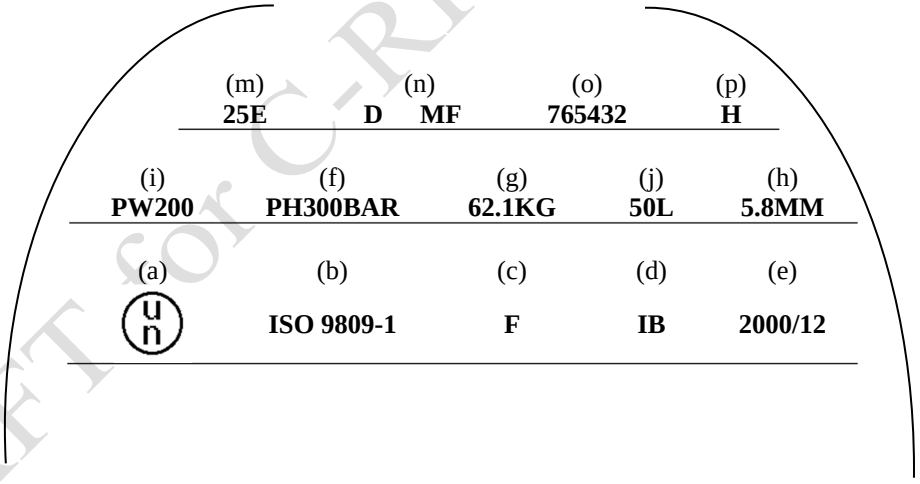
(r) For composite cylinders and tubes having a limited design life greater than 15 years and for composite cylinders and tubes having non-limited design life, the letters "SERVICE" followed by the date 15 years from the date of manufacture (initial inspection) shown as the year (four digits) followed by the month (two digits) separated by a slash (i.e. "/").

NOTE: *Once the initial design type has passed the service life test programme requirements in accordance with 6.2.2.1.1 NOTE 2 or 6.2.2.1.2 NOTE 2, future production no longer requires this initial service life mark. The initial service life mark shall be made unreadable on cylinders and tubes of a design type that has met the service life test programme requirements.*

6.2.2.7.5 The above marks shall be placed in three groups:

- Manufacturing marks shall be the top grouping and shall appear consecutively in the sequence given in 6.2.2.7.4 except for the marks described in 6.2.2.7.4 (q) and (r) which shall be adjacent to the periodic inspection and test marks of 6.2.2.7.7;
- The operational marks in 6.2.2.7.3 shall be the middle grouping and the test pressure (f) shall be immediately preceded by the working pressure (i) when the latter is required;
- Certification marks shall be the bottom grouping and shall appear in the sequence given in 6.2.2.7.2.

The following is an example of marking a cylinder.



6.2.2.7.6 Other marks are allowed in areas other than the side wall, provided they are made in low stress areas and are not of a size and depth that will create harmful stress concentrations. In the case of closed cryogenic receptacles, such marks may be on a separate plate attached to the outer jacket. Such marks shall not conflict with required marks.

6.2.2.7.7 In addition to the preceding marks, each refillable pressure receptacle that meets the periodic inspection and test requirements of 6.2.2.4 shall be marked indicating:

(a) The character(s) identifying the country authorizing the body performing the periodic inspection and test as indicated by the distinguishing sign used on vehicles in international road traffic[2]. This mark is not required if this body is approved by the competent authority of the country approving manufacture;

[2] *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*

(b) The registered mark of the body authorised by the competent authority for performing periodic inspection and test;

(c) The date of the periodic inspection and test, the year (two digits) followed by the month (two digits) separated by a slash (i.e. "/"). Four digits may be used to indicate the year.

The above marks shall appear consecutively in the sequence given.

6.2.2.7.8 The marks in accordance with 6.2.2.7.7 may be engraved on a metallic ring affixed to the cylinder or pressure drum when the valve is installed, and which is removable only by disconnecting the valve from the cylinder or pressure drum.

6.2.2.7.9 *(Deleted)*

6.2.2.8 Marking of non-refillable UN cylinders

6.2.2.8.1 Non-refillable UN cylinders shall be marked clearly and legibly with certification and gas or cylinder specific marks. These marks shall be permanently affixed (e.g. stencilled, stamped, engraved, or etched) on the cylinder. Except when stencilled, the marks shall be on the shoulder, top end or neck of the cylinder shell or on a permanently affixed component of the cylinder (e.g. welded collar). Except for the UN packaging symbol and the "DO NOT REFILL" mark, the minimum size of the marks shall be 5 mm for cylinders with a diameter greater than or equal to 140 mm and 2.5 mm for cylinders with a diameter less than 140 mm. The minimum size of the UN packaging symbol shall be 10 mm for cylinders with a diameter greater than or equal to 140 mm and 5 mm for cylinders with a diameter less than 140 mm. The minimum size of the "DO NOT REFILL" mark shall be 5 mm.

6.2.2.8.2 The marks listed in 6.2.2.7.2 to 6.2.2.7.4 shall be applied with the exception of (g), (h) and (m). The serial number (o) may be replaced by the batch number. In addition, the words "DO NOT REFILL" in letters of at least 5 mm in height are required.

6.2.2.8.3 The requirements of 6.2.2.7.5 shall apply.

NOTE: *Non-refillable cylinders may, on account of their size, substitute a label for these permanent marks.*

6.2.2.8.4 Other marks are allowed provided they are made in low stress areas other than the side wall and are not of a size and depth that will create harmful stress concentrations. Such marks shall not conflict with required marks.

6.2.2.9 Marking of UN metal hydride storage systems

6.2.2.9.1 UN metal hydride storage systems shall be marked clearly and legibly with the marks listed below. These marks shall be permanently affixed (e.g. stamped, engraved, or etched) on the metal hydride storage system. The marks shall be on the shoulder, top end or neck of the metal hydride storage system or on a permanently affixed component of the metal hydride storage system. Except for the United Nations packaging symbol, the minimum size of the marks shall be 5 mm for metal hydride storage systems with a smallest overall dimension greater than or equal to 140 mm and 2.5 mm for metal hydride storage systems with a smallest overall dimension less than 140 mm. The minimum size of the United Nations packaging symbol shall be 10 mm for metal hydride storage systems with a smallest overall dimension greater than or equal to 140 mm and 5 mm for metal hydride storage systems with a smallest overall dimension less than 140 mm.

6.2.2.9.2 The following marks shall be applied:

(a) The United Nations packaging symbol  .

This symbol shall not be used for any purpose other than certifying that a packaging, a flexible bulk container, a portable tank or a MEGC complies with the relevant requirements in Chapter 6.1, 6.2, 6.3, 6.5, 6.6, 6.7 or 6.11;

(b) "ISO 16111" (the technical standard used for design, manufacture and testing);

(c) The character(s) identifying the country of approval as indicated by the distinguishing sign used on vehicles in international road traffic[2];

NOTE: *For the purpose of this mark the country of approval means the country of the competent authority that authorized the initial inspection and test of the individual system at the time of manufacture..*

(d) The identity mark or stamp of the inspection body that is registered with the competent authority of the country authorizing the marking;

(e) The date of the initial inspection, the year (four digits) followed by the month (two digits) separated by a slash (i.e. "/");

(f) The test pressure of the receptacle in bar, preceded by the letters "PH" and followed by the letters "BAR";

(g) The rated charging pressure of the metal hydride storage system in bar, preceded by the letters "RCP" and followed by the letters "BAR";

(h) The manufacturer's mark registered by the competent authority. When the country of manufacture is not the same as the country of approval, then the manufacturer's mark shall be preceded by the character(s) identifying the country of manufacture as indicated by the distinguishing sign used on vehicles in international road traffic[2]. The country mark and the manufacturer's mark shall be separated by a space or slash;

(i) The serial number assigned by the manufacturer;

(j) In the case of steel receptacles and composite receptacles with steel liner, the letter "H" showing compatibility of the steel (see ISO 11114-1:2012 + A1:2017); and,

(k) In the case of metal hydride storage systems having limited life, the date of expiry, denoted by the letters "FINAL" followed by the year (four digits) followed by the month (two digits) separated by a slash (i.e. "/").

The certification marks specified in (a) to (e) above shall appear consecutively in the sequence given. The test pressure (f) shall be immediately preceded by the rated charging pressure (g). The manufacturing marks specified in (h) to (k) above shall appear consecutively in the sequence given.

6.2.2.9.3 Other marks are allowed in areas other than the side wall, provided they are made in low stress areas and are not of a size and depth that will create harmful stress concentrations. Such marks shall not conflict with required marks.

6.2.2.9.4 In addition to the preceding marks, each metal hydride storage system that meets the periodic inspection and test requirements of 6.2.2.4 shall be marked indicating:

(a) The character(s) identifying the country authorizing the body performing the periodic inspection and test, as indicated by the distinguishing sign used on vehicles in international road traffic[2]. This mark is not required if this body is approved by the competent authority of the country approving manufacture;

(b) The registered mark of the body authorised by the competent authority for performing periodic inspection and test;

(c) The date of the periodic inspection and test, the year (two digits) followed by the month (two digits) separated by a slash (i.e. "/"). Four digits may be used to indicate the year.

The above marks shall appear consecutively in the sequence given.

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[2] *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*

[2] *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*

6.2.2.10 ***Marking of UN bundles of cylinders***

6.2.2.10.1 Individual cylinder shells in a bundle of cylinders shall be marked in accordance with 6.2.2.7. Individual closures in a bundle of cylinders shall be marked in accordance with 6.2.2.11.

6.2.2.10.2 Refillable UN bundles of cylinders shall be marked clearly and legibly with certification, operational, and manufacturing marks. These marks shall be permanently affixed (e.g. stamped, engraved, or etched) on a plate permanently attached to the frame of the bundle of cylinders. Except for the UN packaging symbol, the minimum size of the marks shall be 5 mm. The minimum size of the UN packaging symbol shall be 10 mm.

6.2.2.10.3 The following marks shall be applied:

(a) The certification marks specified in 6.2.2.7.2 (a), (b), (c), (d) and (e);

(b) The operational marks specified in 6.2.2.7.3 (f), (i), (j) and the total of the mass of the frame of the bundle and all permanently attached parts (cylinder shells and service equipment). Bundles intended for the carriage of UN 1001 acetylene, dissolved and UN 3374 acetylene, solvent free shall bear the tare as specified in clause B.4.2 of ISO 10961:2010; and

(c) The manufacturing marks specified in 6.2.2.7.4 (n), (o) and, where applicable, (p).

6.2.2.10.4 The marks shall be placed in three groups:

(a) The manufacturing marks shall be the top grouping and shall appear consecutively in the sequence given in 6.2.2.10.3 (c);

(b) The operational marks in 6.2.2.10.3 (b) shall be the middle grouping and the operational mark specified in 6.2.2.7.3 (f) shall be immediately preceded by the operational mark specified in 6.2.2.7.3 (i) when the latter is required;

(c) Certification marks shall be the bottom grouping and shall appear in the sequence given in 6.2.2.10.3 (a).

6.2.2.11 Marking of closures for refillable UN pressure receptacles

For closures the following permanent marks shall be applied clearly and legibly, (e.g. stamped, engraved or etched):

(a) Manufacturer’s identification mark;

(b) Design standard or design standard designation;

(c) Date of manufacture (year and month or year and week) and

(d) The identity mark of the inspection body responsible for the initial inspection and test, if applicable.

The valve test pressure shall be marked when it is less than the test pressure which is indicated by the rating of the valve filling connection.

6.2.2.12 Equivalent procedures for conformity assessment and periodic inspection and test

For UN pressure receptacles the requirements of 6.2.2.5 and 6.2.2.6 are considered to have been complied with when the following procedures laid down in 1.8.7.1.6 are applied:

(a) Type approval in accordance with 1.8.7.1.6.1
(b) Design verification, initial inspection and test in accordance with 1.8.7.1.6.2
(c) In service inspection and test in accordance with 1.8.7.1.6.3

6.2.3 General requirements for non-UN pressure receptacles

6.2.3.1 Design and construction

6.2.3.1.1 Pressure receptacles and their closures not designed, constructed, inspected, tested and approved according to the requirements of 6.2.2 shall be designed, constructed, inspected, tested and approved in

accordance with the general requirements of 6.2.1 as supplemented or modified by the requirements of this section and those of 6.2.4 or 6.2.5.

6.2.3.1.2 Whenever possible the wall thickness shall be determined by calculation, accompanied, if needed, by experimental stress analysis. Otherwise the wall thickness may be determined by experimental means.

Appropriate design calculations for the pressure receptacles or pressure receptacle shells including all permanently attached parts (e.g. neck ring, foot ring, etc.) shall be used to ensure the safety of the pressure receptacles concerned.

The minimum wall thickness to withstand pressure shall be calculated in particular with regard to:

- The calculation pressures, which shall not be less than the test pressure;
- The calculation temperatures allowing for appropriate safety margins;
- The maximum stresses and peak stress concentrations where necessary;
- Factors inherent to the properties of the material.

6.2.3.1.3 For welded pressure receptacles, only metals of weldable quality whose adequate impact strength can be guaranteed shall be used.

6.2.3.1.4 For closed cryogenic receptacles, the impact strength to be established as required by 6.2.1.1.8.1

6.2.3.2 *(Reserved)*

6.2.3.3 Service equipment

6.2.3.3.1 Service equipment shall comply with 6.2.1.3.

6.2.3.3.2 Pressure drums may be provided with openings for filling and discharge and with other openings intended for level gauges, pressure gauges or relief devices. The number of openings shall be kept to a minimum consistent with safe operations. Pressure drums may also be provided with an inspection opening, which shall be closed by an effective closure.

6.2.3.3.3 If cylinders are fitted with a device to prevent rolling, this device shall not be integral with the valve cap.

6.2.3.3.4 Pressure drums which are capable of being rolled shall be equipped with rolling hoops or be otherwise protected against damage due to rolling (e.g. by corrosion resistant metal sprayed on to the pressure receptacle surface).

6.2.3.3.5 Bundles of cylinders shall be fitted with appropriate devices ensuring that they can be handled and carried safely.

6.2.3.3.6 If level gauges, pressure gauges or relief devices are installed, they shall be protected in the same way as is required for valves in 4.1.6.8.

6.2.3.4 Initial inspection and test

6.2.3.4.1 New pressure receptacles shall be subjected to testing and inspection during and after manufacture in accordance with the requirements of 6.2.1.5.

6.2.3.4.2 Specific provisions applying to aluminium alloy pressure receptacle shells

(a) In addition to the initial inspection required by 6.2.1.5.1, it is necessary to test for possible intercrystalline corrosion of the inside wall of the pressure receptacle shells where use is made of an aluminium alloy containing copper, or where use is made of an aluminium alloy containing magnesium and manganese and the magnesium content is greater than 3.5 % or the manganese content lower than 0.5 %;

(b) In the case of an aluminium/copper alloy the test shall be carried out by the manufacturer at the time of approval of a new alloy by the competent authority; it shall thereafter be repeated in the course of production, for each pour of the alloy;

(c) In the case of an aluminium/magnesium alloy the test shall be carried out by the manufacturer at the time of approval of a new alloy and of the manufacturing process by the competent authority. The test shall be repeated whenever a change is made in the composition of the alloy or in the manufacturing process.

6.2.3.5 Periodic inspection and test

6.2.3.5.1 Periodic inspection and test shall be in accordance with 6.2.1.6.

6.2.3.5.2 Closed cryogenic receptacles shall be subject to periodic inspections and tests in accordance with the periodicity defined in packing instruction P203 (8) (b) of 4.1.4.1, in accordance with the following:

(a) Check of the external condition of the pressure receptacle and verification of the service equipment and the external marks;

(b) The leakproofness test.

6.2.3.5.3 *General provisions for the substitution of dedicated check(s) for periodic inspection and test required in 6.2.3.5.1*

6.2.3.5.3.1 This paragraph only applies to types of pressure receptacles designed and manufactured in accordance with the standards referred to in 6.2.4.1 or a technical code in accordance with 6.2.5, and for which the inherent properties of the design prevent the checks (b) or (d) for periodic inspection and test required in 6.2.1.6.1 to be applied or the results to be interpreted.

For such pressure receptacles, these check(s) shall be replaced by alternative method(s) related to the characteristics of the specific design specified under 6.2.3.5.4, and detailed in a special provision of Chapter 3.3 or a standard referenced in 6.2.4.2.

The alternative methods shall specify which checks and tests according to 6.2.1.6.1 (b) and (d) are to be substituted.

The alternative method(s) in combination with the remaining checks according to 6.2.1.6.1 (a) to (e) shall ensure a level of safety at least equivalent to the safety level for pressure receptacles of a similar size and use which are periodically inspected and tested in compliance with 6.2.3.5.1.

The alternative method(s) shall moreover detail all the following elements:

- A description of the relevant types of pressure receptacles;
- The procedure for the test(s);
- The specifications of the acceptance criteria;
- A description of the measures to be taken in case of rejection of pressure receptacles.

6.2.3.5.3.2 Non-destructive testing as an alternative method

The check(s) identified in 6.2.3.5.3.1 shall be supplemented or replaced by one (or more) non-destructive test method(s) to be performed on each individual pressure receptacle.

6.2.3.5.3.3 Destructive testing as an alternative method

If no non-destructive test method leads to an equivalent level of safety, the check(s) identified in 6.2.3.5.3.1, with exception of the check of the internal conditions mentioned in 6.2.1.6.1 b, shall be supplemented or replaced by one (or more) destructive test method(s) in combination with its statistical evaluation.

In addition to the elements described above, the detailed method for destructive testing shall document the following elements:

- A description of the relevant basic population of pressure receptacles;
- A procedure for the random sampling of individual pressure receptacles to be tested;
- A procedure for the statistical evaluation of the test results including rejection criteria;

- A specification for the periodicity of destructive sample tests;

- A description of the measures to be taken if acceptance criteria are met but a safety relevant degradation of material properties is observed, which shall be used for the determination of the end of service life;

- A statistical assessment of the level of safety achieved by the alternative method.

6.2.3.5.4 Over-moulded cylinders subject to 6.2.3.5.3.1 shall be subject to periodic inspection and test in accordance with special provision 674 of Chapter 3.3.

6.2.3.6 Approval of pressure receptacles

Approval shall be in accordance with the requirements of 6.2.1.4

6.2.3.7 Requirements for manufacturers

6.2.3.7.1 The relevant requirements of 1.8.7 shall be met.

6.2.3.8 (Reserved)

6.2.3.9 Marking of refillable pressure receptacles

6.2.3.9.1 Marking shall be in accordance with sub-section 6.2.2.7 with the following variations.

6.2.3.9.2 The United Nations packaging symbol specified in 6.2.2.7.2 (a) and the provisions of 6.2.2.7.4 (q) and (r) shall not be applied.

6.2.3.9.3 The requirements of 6.2.2.7.3 (j) shall be replaced by the following:

(j) The water capacity of the pressure receptacle in litres followed by the letter "L". In the case of pressure receptacles for liquefied gases the water capacity in litres shall be expressed to three significant figures rounded down to the last digit. If the value of the minimum or nominal water capacity is an integer, the figures after the decimal point may be neglected.

The requirements of 6.2.2.7.4 (n) shall be replaced by the following:

(n) The manufacturer's mark. When the country of manufacture is not the same as the country of approval, then the manufacturer's mark shall be preceded by the character(s) identifying the country of manufacture as indicated by the distinguishing sign used on vehicles in international road traffic[2]. The country mark and the manufacturer's mark shall be separated by a space or slash.

6.2.3.9.4 The marks specified in 6.2.2.7.3 (g) and (h) and 6.2.2.7.4 (m) are not required for pressure receptacles for UN No. 1965 hydrocarbon gas mixture, liquefied, n.o.s.

6.2.3.9.5 When marking the date required by 6.2.2.7.7 (c), the month need not be indicated for gases for which the interval between periodic inspections is 10 years or more (see packing instructions P200 and P203 of 4.1.4.1).

6.2.3.9.6 The marks in accordance with 6.2.2.7.7 may be engraved on a ring of an appropriate material affixed to the cylinder or pressure drum when the valve is installed and which is removable only by disconnecting the valve from the cylinder or pressure drum.

6.2.3.9.7 Marking of bundles of cylinders

6.2.3.9.7.1 Individual cylinders in a bundle of cylinders shall be marked in accordance with 6.2.3.9.1 to 6.2.3.9.6.

[2] *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*

6.2.3.9.8 Marking of closures for refillable pressure receptacles

6.2.3.9.8.1 Marking shall be in accordance with 6.2.2.11.

6.2.3.10 Marking of non-refillable cylinders

6.2.3.10.1 Marking shall be in accordance with 6.2.2.8, except that the United Nations packaging symbol specified in 6.2.2.7.2 (a) shall not be applied.

6.2.3.11 Salvage pressure receptacles

6.2.3.11.1 To permit the safe handling and disposal of the pressure receptacles carried within the salvage pressure receptacle, the design may include equipment not otherwise used for cylinders or pressure drums such as flat heads, quick opening devices and openings in the cylindrical part.

6.2.3.11.2 Instructions on the safe handling and use of the salvage pressure receptacle shall be clearly shown in the documentation for the application to the competent authority of the country of approval and shall form part of the approval certificate. In the approval certificate, the pressure receptacles authorized to be carried in a salvage pressure receptacle shall be indicated. A list of the materials of construction of all parts likely to be in contact with the dangerous goods shall also be included.

6.2.3.11.3 A copy of the approval certificate shall be delivered by the manufacturer to the owner of a salvage pressure receptacle.

6.2.3.11.4 The marking of salvage pressure receptacles according to 6.2.3 shall be determined by the competent authority of the country of approval taking into account suitable marking provisions of 6.2.3.9 as appropriate. The marks shall include the water capacity and test pressure of the salvage pressure receptacle.

6.2.4 Requirements for non-UN pressure receptacles designed, constructed and tested according to referenced standards

NOTE: *Persons or bodies identified in standards as having responsibilities in accordance with this Code shall meet the requirements of this Code.*

6.2.4.1 Design, construction and initial inspection and test

The use of the referenced standards is mandatory. Exceptions are dealt with in 6.2.5.

Type approval certificates shall be issued in accordance with 1.8.7. For the issuance of a type approval certificate, one standard applicable according to the indication in column (4) shall be chosen from the table below. If more than one standard may be applied, only one of them shall be chosen.

Column (3) shows the paragraphs of Chapter 6.2 to which the standard conforms.

Column (5) gives the latest date when existing type approvals shall be withdrawn according to 1.8.7.2.2.2; if no date is shown the type approval remains valid until it expires.

Standards shall be applied in accordance with 1.1.5. They shall be applied in full unless otherwise specified in the table below.

The scope of application of each standard is defined in the scope clause of the standard unless otherwise specified in the table below.

NOTE: *The words "cylinder", "tube" and "pressure drum" when used in these standards shall be understood to exclude closures except in the case of non-refillable cylinders.*

Reference	Title of document	Requirements the standard complies with	Applicable for new type approvals or for renewals	Latest date for withdrawal of existing type approvals
(1)	**(2)**	**(3)**	**(4)**	**(5)**
for design and construction of pressure receptacles or pressure receptacle shells				

Reference	Title of document	Requirements the standard complies with	Applicable for new type approvals or for renewals	Latest date for withdrawal of existing type approvals
(1)	(2)	(3)	(4)	(5)
AS 1210:2010 Amd 2:2015	Pressure vessels	6.2.3.1 and 6.2.3.4	Until further notice	
AS 2030.1:2009	Gas cylinders. Part 1: General requirements	6.2.3.1 and 6.2.3.4	Until further notice	
AS 2030.2:2021	The verification, filling, inspection, testing and maintenance of cylinders for the storage and transport of compressed gases, Part 2: Cylinders for dissolved acetylene	6.2.1.1.9	Until further notice	
for design and construction of closures				
AS 2473.1:2006 + Amd 1:2020	Valves for compressed gas cylinders, Part 1: Specifications, type testing, and manufacturing tests and inspections		Until further notice	
AS 2473.2:2015 Amd 1:2020	Valves for compressed gas cylinders, Part 2: Outlet connections (threaded) and stem (inlet) threads		Until further notice	
AS 2473.3:2007	Valves for compressed gas cylinders, Part 3: Outlet connections for medical gases (including pin-indexed yoke connections)		Until further notice	
AS 2613:2005 + Amd 1:2005	Safety devices for gas cylinders		Until further notice	

6.2.4.2 Periodic inspection and test

The standards referenced in the table below shall be applied for the periodic inspection and test of pressure receptacles as indicated in column (3) to meet the requirements of 6.2.3.5. The standards shall be applied in accordance with 1.1.5.

The use of a referenced standard is mandatory.

When a pressure receptacle is constructed in accordance with the provisions of 6.2.5 the procedure for periodic inspection if specified in the type approval shall be followed.

Standards shall be applied in full, unless otherwise specified in the table below. If more than one standard is referenced for the application of the same requirements, only one of them shall be applied.

The scope of application of each standard is defined in the scope clause of the standard unless otherwise specified in the Table below.

Reference	Title of document	Applicable
(1)	(2)	(3)
AS 2030.2:2021	The verification, filling, inspection, testing and maintenance of cylinders for the storage and transport of compressed gases, Part 2: Cylinders for dissolved acetylene	Until further notice
AS 2030.5:2009 + Amd 1:2015	Gas cylinders, Part 5: Filling, inspection and testing of refillable cylinders	Until further notice
AS 2337.1:2004	Gas cylinder test stations, Part 1: General requirements, inspection and tests — Gas cylinders	Until further notice
AS 2337.3:2020	Gas cylinder test stations, Part 3: Transportable gas cylinders — Periodic inspection and testing of composite cylinders (ISO 11623:2015, MOD)	Until further notice

6.2.5 Requirements for non-UN pressure receptacles not designed, constructed and tested according to referenced standards

To reflect scientific and technical progress or where no standard is referenced in 6.2.2 or 6.2.4, or to deal with specific aspects not addressed in a standard referenced in 6.2.2 or 6.2.4, the competent authority may recognize the use of another standard or technical code providing the same level of safety.

In the type approval the issuing body shall specify the procedure for periodic inspections if the standards referenced in 6.2.2 or 6.2.4 are not applicable or shall not be applied.

As soon as a standard newly referenced in 6.2.2 or 6.2.4 can be applied, the competent authority shall withdraw its recognition of the relevant technical code. A transitional period ending no later than the date of entry into force of the next edition of this Code may be applied.

Where a competent authority has recognised the use of a standard or technical code, it shall transmit to the National Transport Commission information about the use of the Code. The information should include the following details: name and date of the code, purpose of the code and details of where it may be obtained.

NOTE 1: *The National Transport Commission will use this information to consult on including it in the list of accepted standards in 6.2.4 in future editions of this Code.*

A standard which has been adopted for reference in a future edition of the this Code may be approved by the competent authority for use without notifying the National Transport Commission.

The requirements of 6.2.1, 6.2.3 and the following requirements however shall be met.

NOTE 2: *For this section, the references to technical standards in 6.2.1 shall be considered as references to technical codes.*

6.2.6 General requirements for aerosol dispensers, small receptacles containing gas (gas cartridges) and fuel cell cartridges containing liquefied flammable gas

6.2.6.1 Design and construction

6.2.6.1.1 Aerosol dispensers (UN No.1950 aerosols) containing only a gas or a mixture of gases, and small receptacles containing gas (gas cartridges) (UN No. 2037), shall be made of metal. This requirement shall not apply to aerosols and small receptacles containing gas (gas cartridges) with a maximum capacity of 100 ml for UN No. 1011 butane. Other aerosol dispensers (UN No.1950 aerosols) shall be made of metal, synthetic material or glass. Receptacles made of metal and having an outside diameter of not less than 40 mm shall have a concave bottom.

6.2.6.1.2 The capacity of receptacles made of metal shall not exceed 1 000 ml; that of receptacles made of synthetic material or of glass shall not exceed 500 ml.

6.2.6.1.3 Each model of receptacles (aerosol dispensers or cartridges) shall, before being put into service, satisfy a hydraulic pressure test carried out in conformity with 6.2.6.2.

6.2.6.1.4 The release valves and dispersal devices of aerosol dispensers (UN No.1950 aerosols) and the valves of UN No. 2037 small receptacles containing gas (gas cartridges) shall ensure that the receptacles are so closed as to be leakproof and shall be protected against accidental opening. Valves and dispersal devices which close only by the action of the internal pressure are not to be accepted.

6.2.6.1.5 The internal pressure of aerosol dispensers at 50 °C shall not exceed 1.2 MPa (12 bar) when using flammable liquefied gases, 1.32 MPa (13.2 bar) when using non-flammable liquefied gases, and 1.5 MPa (15 bar) when using non-flammable compressed or dissolved gases. In case of a mixture of several gases, the stricter limit shall apply. They shall be so filled that at 50 °C the liquid phase does not exceed 95 % of their capacity. Small receptacles containing gas (gas cartridges) shall meet the test pressure and filling requirements of packing instruction P200 of 4.1.4.1. In addition, the product of test pressure and water capacity shall not exceed 30 bar.litres for liquefied gases or 54 bar.litres for compressed gases and the test pressure shall not exceed 250 bar for liquefied gases or 450 bar for compressed gases.

6.2.6.2 Hydraulic pressure test

6.2.6.2.1 The internal pressure to be applied (test pressure) shall be 1.5 times the internal pressure at 50 °C, with a minimum pressure of 1 MPa (10 bar).

6.2.6.2.2 The hydraulic pressure tests shall be carried out on at least five empty receptacles of each model:

(a) until the prescribed test pressure is reached, by which time no leakage or visible permanent deformation shall have occurred; and

(b) until leakage or bursting occurs; the dished end, if any, shall yield first and the receptacle shall not leak or burst until a pressure 1.2 times the test pressure has been reached or passed.

6.2.6.3 Tightness (leakproofness) test

Each filled aerosol dispenser or gas cartridge or fuel cell cartridge shall be subjected to a test in a hot water bath in accordance with 6.2.6.3.1 or an approved water bath alternative in accordance with 6.2.6.3.2.

6.2.6.3.1 Hot water bath test

6.2.6.3.1.1 The temperature of the water bath and the duration of the test shall be such that the internal pressure reaches that which would be reached at 55 °C (50 °C if the liquid phase does not exceed 95 % of the capacity of the aerosol dispenser, gas cartridge or the fuel cell cartridge at 50 °C). If the contents are sensitive to heat or if the aerosol dispensers, gas cartridges or the fuel cell cartridges are made of plastics material which softens at this test temperature, the temperature of the bath shall be set at between 20 °C and 30 °C but, in addition, one aerosol dispenser, gas cartridge or the fuel cell cartridge in 2 000 shall be tested at the higher temperature.

6.2.6.3.1.2 No leakage or permanent deformation of an aerosol dispenser, gas cartridge or the fuel cell cartridge may occur, except that a plastic aerosol dispenser, gas cartridge or the fuel cell cartridge may be deformed through softening provided that it does not leak.

6.2.6.3.2 Alternative methods

With the approval of the competent authority alternative methods that provide an equivalent level of safety may be used provided that the requirements of 6.2.6.3.2.1 and, as appropriate, 6.2.6.3.2.2 or 6.2.6.3.2.3 are met.

6.2.6.3.2.1 Quality system

Aerosol dispenser, gas cartridge or the fuel cell cartridge fillers and component manufacturers shall have a quality system. The quality system shall implement procedures to ensure that all aerosol dispensers, gas cartridges or the fuel cell cartridges that leak or that are deformed are rejected and not offered for transport.

The quality system shall include:

(a) A description of the organizational structure and responsibilities;

(b) The relevant inspection and test, quality control, quality assurance, and process operation instructions that will be used;

(c) Quality records, such as inspection reports, test data, calibration data and certificates;

(d) Management reviews to ensure the effective operation of the quality system;

(e) A process for control of documents and their revision;

(f) A means for control of non-conforming aerosol dispensers, gas cartridges or the fuel cell cartridges;

(g) Training programmes and qualification procedures for relevant personnel; and

(h) Procedures to ensure that there is no damage to the final product.

An initial audit and periodic audits shall be conducted to the satisfaction of the competent authority. These audits shall ensure the approved system is and remains adequate and efficient. Any proposed changes to the approved system shall be notified to the competent authority in advance.

6.2.6.3.2.2 Aerosol dispensers

6.2.6.3.2.2.1 Pressure and leak testing of aerosol dispensers before filling

Each empty aerosol dispenser shall be subjected to a pressure equal to or in excess of the maximum expected in the filled aerosol dispensers at 55 °C (50 °C if the liquid phase does not exceed 95 % of the capacity of the receptacle at 50 °C). This shall be at least two-thirds of the design pressure of the aerosol dispenser. If any aerosol dispenser shows evidence of leakage at a rate equal to or greater than 3.3×10^{-2} mbar.l.s^{-1} at the test pressure, distortion or other defect, it shall be rejected.

6.2.6.3.2.2.2 Testing of the aerosol dispensers after filling

Prior to filling the filler shall ensure that the crimping equipment is set appropriately and the specified propellant is used.

Each filled aerosol dispenser shall be weighed and leak tested. The leak detection equipment shall be sufficiently sensitive to detect at least a leak rate of 2.0×10^{-3} mbar.l.s^{-1} at 20 °C.

Any filled aerosol dispenser that shows evidence of leakage, deformation or excessive mass shall be rejected.

6.2.6.3.2.3 Gas cartridges and fuel cell cartridges

6.2.6.3.2.3.1 Pressure testing of gas cartridges and fuel cell cartridges

Each gas cartridge or fuel cell cartridge shall be subjected to a test pressure equal to or in excess of the maximum expected in the filled receptacle at 55 °C (50 °C if the liquid phase does not exceed 95 % of the capacity of the receptacle at 50 °C). This test pressure shall be that specified for the gas cartridge or fuel cell cartridge and shall not be less than two thirds the design pressure of the gas cartridge or fuel cell cartridge. If any gas cartridge or fuel cell cartridge shows evidence of leakage at a rate equal to or greater than 3.3×10^{-2} mbar.l.s^{-1} at the test pressure or distortion or any other defect, it shall be rejected.

6.2.6.3.2.3.2 Leak testing gas cartridges and fuel cell cartridges

Prior to filling and sealing, the filler shall ensure that the closures (if any), and the associated sealing equipment are closed appropriately and the specified gas is used.

Each filled gas cartridge or fuel cell cartridge shall be checked for the correct mass of gas and shall be leak tested. The leak detection equipment shall be sufficiently sensitive to detect at least a leak rate of 2.0×10^{-3} mbar.l.s^{-1} at 20 °C.

Any gas cartridge or fuel cell cartridge that has gas masses not in conformity with the declared mass limits or shows evidence of leakage or deformation, shall be rejected.

6.2.6.3.3 With the approval of the competent authority, aerosols and receptacles, small, are not subject to 6.2.6.3.1 and 6.2.6.3.2, if they are required to be sterile but may be adversely affected by water bath testing, provided:

(a) They contain a non-flammable gas and either

(i) contain other substances that are constituent parts of pharmaceutical products for medical, veterinary or similar purposes;

(ii) contain other substances used in the production process for pharmaceutical products; or

(iii) are used in medical, veterinary or similar applications;

(b) An equivalent level of safety is achieved by the manufacturer's use of alternative methods for leak detection and pressure resistance, such as helium detection and water bathing a statistical sample of at least 1 in 2000 from each production batch; and

(c) For pharmaceutical products according to (a) (i) and (iii) above, they are manufactured under the authority of a national health administration. If required by the competent authority, the principles of Good Manufacturing Practice (GMP) established by the World Health Organization (WHO)[3] shall be followed.

6.2.6.4 Reference to standards

The requirements of this section are deemed to be met if the following standards are complied with:

- for aerosol dispensers (UN No. 1950 aerosols): AS 2278 as applicable at the date of manufacture;

- for UN No. 2037, small receptacles containing gas (gas cartridges) containing UN No. 1965, hydrocarbon gas mixture n.o.s, liquefied: EN 417:2012 Non-refillable metallic gas cartridges for liquefied petroleum gases, with or without a valve, for use with portable appliances - Construction, inspection, testing and marking;

- for UN No. 2037 small receptacles containing gas (gas cartridges) containing non-toxic, non-flammable compressed or liquefied gases: EN 16509:2014 Transportable gas cylinders - Non-refillable, small transportable, steel cylinders of capacities up to and including 120 ml containing compressed or liquefied gases (compact cylinders) – Design, construction, filling and testing. In addition to the marks required by this standard the gas cartridge shall be marked "UN 2037/EN 16509".

[3] *WHO Publication: "Quality assurance of pharmaceuticals. A compendium of guidelines and related materials. Volume 2: Good manufacturing practices and inspection".*

CHAPTER 6.3

REQUIREMENTS FOR THE CONSTRUCTION AND TESTING OF PACKAGINGS FOR CLASS 6.2 INFECTIOUS SUBSTANCES OF CATEGORY A (UN Nos. 2814 AND 2900)

NOTE: *The requirements of this Chapter don't apply to packagings used for the carriage of Class 6.2 substances according to packing instruction P621 or P621a of 4.1.4.1.*

6.3.1 General

6.3.1.1 The requirements of this Chapter apply to packagings intended for the carriage of infectious substances of Category A, UN Nos. 2814 and 2900.

6.3.2 Requirements for packagings

6.3.2.1 The requirements for packagings in this section are based on packagings, as specified in 6.1.4, currently used. In order to take into account progress in science and technology, there is no objection to the use of packagings having specifications different from those in this Chapter provided that they are equally effective, acceptable to the competent authority and able to successfully fulfil the requirements described in 6.3.5. Methods of testing other than those described in this Code are acceptable provided they are equivalent, and are recognized by the competent authority.

6.3.2.2 Packagings shall be manufactured and tested under a quality assurance programme which satisfies the competent authority in order to ensure that each packaging meets the requirements of this Chapter.

NOTE: *ISO 16106:2020 "Transport packages for dangerous goods – Dangerous goods packagings, intermediate bulk containers (IBCs) and large packagings – Guidelines for the application of ISO 9001" provides acceptable guidance on procedures which may be followed.*

6.3.2.3 Manufacturers and subsequent distributors of packagings shall provide information regarding procedures to be followed and a description of the types and dimensions of closures (including required gaskets) and any other components needed to ensure that packages as presented for carriage are capable of passing the applicable performance tests of this Chapter.

6.3.3 Code for designating types of packagings

6.3.3.1 The codes for designating types of packagings are set out in 6.1.2.7.

6.3.3.2 The letters "U" or "W" may follow the packaging code. The letter "U" signifies a special packaging conforming to the requirements of 6.3.5.1.6. The letter "W" signifies that the packaging, although, of the same type indicated by the code is manufactured to a specification different from that in 6.1.4 and is considered equivalent under the requirements of 6.3.2.1.

6.3.4 Marking

NOTE 1: *The marks indicate that the packaging which bears them corresponds to a successfully tested design type and that it complies with the requirements of this Chapter which are related to the manufacture, but not to the use, of the packaging.*

NOTE 2: *The marks are intended to be of assistance to packaging manufacturers, reconditioners, packaging users, carriers and regulatory authorities.*

NOTE 3: *The marks do not always provide full details of the test levels, etc., and these may need to be taken further into account, e.g. by reference to a test certificate, to test reports or to a register of successfully tested packagings.*

6.3.4.1 Each packaging intended for use according to this Code shall bear marks which are durable, legible and placed in a location and of such a size relative to the packaging as to be readily visible. For packages with a gross mass of more than 30 kg, the marks or a duplicate thereof shall appear on the top or on a

side of the packaging. Letters, numerals and symbols shall be at least 12 mm high, except for packagings of 30 *l* capacity or less or of 30 kg maximum net mass, when they shall be at least 6 mm in height and except for packagings of 5 *l* capacity or less or of 5 kg maximum net mass when they shall be of an appropriate size.

6.3.4.2 A packaging that meets the requirements of this section and of 6.3.5 shall be marked with:

(a) The United Nations packaging symbol  .

This symbol shall not be used for any purpose other than certifying that a packaging, a flexible bulk container, a portable tank or a MEGC complies with the relevant requirements in Chapter 6.1, 6.2, 6.3, 6.5, 6.6, 6.7 or 6.11;

(b) The code designating the type of packaging according to the requirements of 6.1.2;

(c) The text "CLASS 6.2";

(d) The last two digits of the year of manufacture of the packaging;

(e) The state authorizing the allocation of the mark, indicated by the distinguishing sign used on vehicles in international road traffic[1];

(f) The name of the manufacturer or other identification of the packaging specified by the competent authority;

(g) For packagings meeting the requirements of 6.3.5.1.6, the letter "U", inserted immediately following the mark required in (b) above.

6.3.4.3 Marks shall be applied in the sequence shown in 6.3.4.2 (a) to (g); each mark required in these sub-paragraphs shall be clearly separated, e.g. by a slash or space, so as to be easily identifiable. For examples, see 6.3.4.4.

Any additional marks authorized by a competent authority shall still enable the marks required in 6.3.4.1 to be correctly identified.

6.3.4.4 Example of marking

4G/CLASS 6.2/06 as in 6.3.4.2 (a), (b), (c) and (d)

S/SP-9989-ERIKSSON as in 6.3.4.2 (e) and (f)

6.3.5 Test requirements for packagings

6.3.5.1 Performance and frequency of tests

6.3.5.1.1 The design type of each packaging shall be tested as provided in this section in accordance with procedures established by the competent authority allowing the allocation of the mark and shall be approved by this competent authority.

6.3.5.1.2 Each packaging design type shall successfully pass the tests prescribed in this Chapter before being used. A packaging design type is defined by the design, size, material and thickness, manner of construction and packing, but may include various surface treatments. It also includes packagings which differ from the design type only in their lesser design height.

6.3.5.1.3 Tests shall be repeated on production samples at intervals established by the competent authority.

6.3.5.1.4 Tests shall also be repeated after each modification which alters the design, material or manner of construction of a packaging.

[1] *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*

6.3.5.1.5 The competent authority may permit the selective testing of packagings that differ only in minor respects from a tested type, e.g. smaller sizes or lower net mass of primary receptacles; and packagings such as drums and boxes which are produced with small reductions in external dimension(s).

6.3.5.1.6 Primary receptacles of any type may be assembled within a secondary packaging and carried without testing in the rigid outer packaging under the following conditions:

(a) The rigid outer packaging shall have been successfully tested in accordance with 6.3.5.2.2 with fragile (e.g. glass) primary receptacles;

(b) The total combined gross mass of primary receptacles shall not exceed one half the gross mass of primary receptacles used for the drop test in (a) above;

(c) The thickness of cushioning between primary receptacles and between primary receptacles and the outside of the secondary packaging shall not be reduced below the corresponding thicknesses in the originally tested packaging; and if a single primary receptacle was used in the original test, the thickness of cushioning between primary receptacles shall not be less than the thickness of cushioning between the outside of the secondary packaging and the primary receptacle in the original test. When either fewer or smaller primary receptacles are used (as compared to the primary receptacles used in the drop test), sufficient additional cushioning material shall be used to take up the void spaces;

(d) The rigid outer packaging shall have successfully passed the stacking test in 6.1.5.6 while empty. The total mass of identical packages shall be based on the combined mass of packagings used in the drop test in (a) above;

(e) For primary receptacles containing liquids, an adequate quantity of absorbent material to absorb the entire liquid content of the primary receptacles shall be present;

(f) If the rigid outer packaging is intended to contain primary receptacles for liquids and is not leakproof, or is intended to contain primary receptacles for solids and is not siftproof, a means of containing any liquid or solid contents in the event of leakage shall be provided in the form of a leakproof liner, plastics bag or other equally effective means of containment;

(g) In addition to the marks prescribed in 6.3.4.2 (a) to (f), packagings shall be marked in accordance with 6.3.4.2 (g).

6.3.5.1.7 The competent authority may at any time require proof, by tests in accordance with this section, that serially-produced packagings meet the requirements of the design type tests.

6.3.5.1.8 Provided the validity of the test results is not affected and with the approval of the competent authority, several tests may be made on one sample.

6.3.5.2 Preparation of packagings for testing

6.3.5.2.1 Samples of each packaging shall be prepared as for carriage, except that a liquid or solid infectious substance shall be replaced by water or, where conditioning at –18 °C is specified, by water/antifreeze. Each primary receptacle shall be filled to not less than 98 % of its capacity.

NOTE: *The term water includes water/antifreeze solution with a minimum specific gravity of 0.95 for testing at – 18 °C.*

6.3.5.2.2 Tests and number of samples required

Tests required for packaging types

Type of packaging [a]			Tests required					
Rigid outer packaging	**Primary receptacle**		**Water spray 6.3.5.3.5.1**	**Cold conditioning 6.3.5.3.5.2**	**Drop 6.3.5.3**	**Additional drop 6.3.5.3.5.3**	**Puncture 6.3.5.4**	**Stack 6.1.5.6**
	Plastics	**Other**						
			No. of samples	**No. of samples**	**No. of samples**	**No. of samples**	**No. of samples**	**No. of samples**
Fibreboard box	x		5	5	10	Required on one sample when the packaging is intended to contain dry ice.	2	Required on three samples when testing a "U"-marked packaging as defined in 6.3.5.1.6 for specific provisions.
		x	5	0	5		2	
Fibreboard drum	x		3	3	6		2	
		x	3	0	3		2	
Plastics box	x		0	5	5		2	
		x	0	5	5		2	
Plastics drum/ jerrican	x		0	3	3		2	
		x	0	3	3		2	
Boxes of other material	x		0	5	5		2	
		x	0	0	5		2	
Drums/ jerricans of other material	x		0	3	3		2	
		x	0	0	3		2	

[a] *"Type of packaging" categorizes packagings for test purposes according to the kind of packaging and its material characteristics.*

NOTE 1: *In instances where a primary receptacle is made of two or more materials, the material most liable to damage determines the appropriate test.*

NOTE 2: *The material of the secondary packagings are not taken into consideration when selecting the test or conditioning for the test.*

Explanation for use of the table:

If the packaging to be tested consists of a fibreboard outer box with a plastics primary receptacle, five samples must undergo the water spray test (see 6.3.5.3.5.1) prior to dropping and another five must be conditioned to – 18 °C (see 6.3.5.3.5.2) prior to dropping. If the packaging is to contain dry ice then one further single sample shall be dropped in accordance with 6.3.5.3.5.3.

Packagings prepared as for carriage shall be subjected to the tests in 6.3.5.3 and 6.3.5.4. For outer packagings, the headings in the table relate to fibreboard or similar materials whose performance may be rapidly affected by moisture; plastics which may embrittle at low temperature; and other materials such as metal whose performance is not affected by moisture or temperature.

6.3.5.3 Drop test

6.3.5.3.1 Drop height and target

Samples shall be subjected to free-fall drops from a height of 9 m onto a non-resilient, horizontal, flat, massive and rigid surface in conformity with 6.1.5.3.4.

6.3.5.3.2 Number of test samples and drop orientation

6.3.5.3.2.1 Where the samples are in the shape of a box, five shall be dropped one in each of the following orientations:

(a) flat on the base;

(b) flat on the top;

(c) flat on the longest side;

(d) flat on the shortest side;

(e) on a corner.

6.3.5.3.2.2 Where the samples are in the shape of a drum or a jerrican, three shall be dropped one in each of the following orientations:

(a) diagonally on the top edge, with the centre of gravity directly above the point of impact;

(b) diagonally on the base edge;

(c) flat on the body or side.

6.3.5.3.3 While the sample shall be released in the required orientation, it is accepted that for aerodynamic reasons the impact may not take place in that orientation.

6.3.5.3.4 Following the appropriate drop sequence, there shall be no leakage from the primary receptacle(s) which shall remain protected by cushioning/absorbent material in the secondary packaging.

6.3.5.3.5 *Special preparation of test sample for the drop test*

6.3.5.3.5.1 Fibreboard - Water spray test

Fibreboard outer packagings: The sample shall be subjected to a water spray that simulates exposure to rainfall of approximately 5 cm per hour for at least one hour. It shall then be subjected to the test described in 6.3.5.3.1.

6.3.5.3.5.2 Plastics material – Cold conditioning

Plastics primary receptacles or outer packagings: The temperature of the test sample and its contents shall be reduced to – 18 °C or lower for a period of at least 24 hours and within 15 minutes of removal from that atmosphere the test sample shall be subjected to the test described in 6.3.5.3.1. Where the sample contains dry ice, the conditioning period shall be reduced to 4 hours.

6.3.5.3.5.3 Packagings intended to contain dry ice – Additional drop test

Where the packaging is intended to contain dry ice, a test additional to that specified in 6.3.5.3.1 and, when appropriate, in 6.3.5.3.5.1 or 6.3.5.3.5.2 shall be carried out. One sample shall be stored so that all the dry ice dissipates and then that sample shall be dropped in one of the orientations described in 6.3.5.3.2.1 or 6.3.5.3.2.2, as appropriate, which shall be that most likely to result in failure of the packaging.

6.3.5.4 Puncture test

6.3.5.4.1 *Packagings with a gross mass of 7 kg or less*

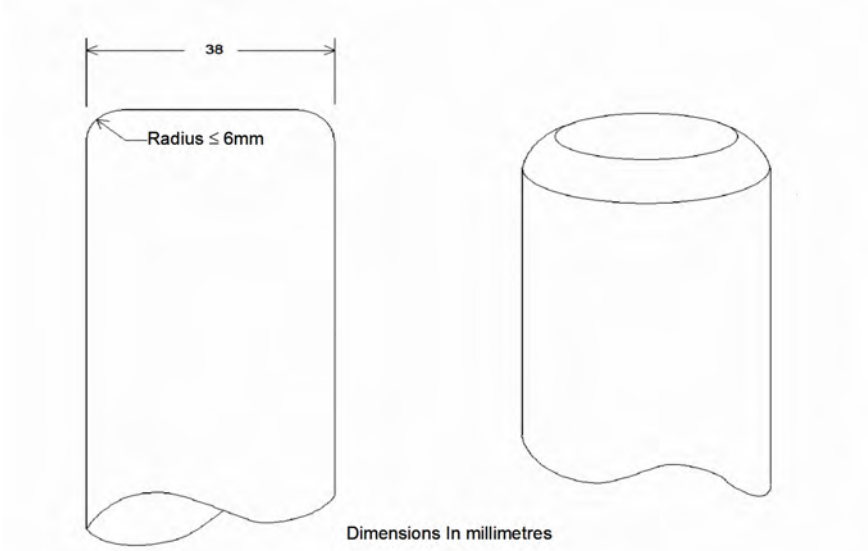
Samples shall be placed on a level hard surface. A cylindrical steel rod with a mass of at least 7 kg, a diameter of 38 mm and whose impact end edges have a radius not exceeding 6 mm (see Figure 6.3.5.4.2), shall be dropped in a vertical free fall from a height of 1 m, measured from the impact end to the impact surface of the sample. One sample shall be placed on its base. A second sample shall be placed in an orientation perpendicular to that used for the first. In each instance the steel rod shall be aimed to impact the primary receptacle. Following each impact, penetration of the secondary packaging is acceptable, provided that there is no leakage from the primary receptacle(s).

6.3.5.4.2 *Packagings with a gross mass exceeding 7 kg*

Samples shall be dropped on to the end of a cylindrical steel rod. The rod shall be set vertically in a level hard surface. It shall have a diameter of 38 mm and the edges of its upper end shall have a radius not exceeding 6 mm (see Figure 6.3.5.4.2). The rod shall protrude from the surface a distance at least equal to that between the centre of the primary receptacle(s) and the outer surface of the outer packaging with a minimum of 200 mm. One sample shall be dropped with its top face lowermost in a vertical free fall from a height of 1 m, measured from the top of the steel rod. A second sample shall be dropped from the same height in an orientation perpendicular to that used for the first. In each instance, the

packaging shall be so orientated that the steel rod would be capable of penetrating the primary receptacle(s). Following each impact, penetration of the secondary packaging is acceptable provided that there is no leakage from the primary receptacle(s).

Figure 6.3.5.4.2



6.3.5.5 Test report

6.3.5.5.1 A written test report containing at least the following particulars shall be drawn up and shall be available to the users of the packaging:

1. Name and address of the test facility;
2. Name and address of applicant (where appropriate);
3. A unique test report identification;
4. Date of the test and of the report;
5. Manufacturer of the packaging;
6. Description of the packaging design type (e.g. dimensions, materials, closures, thickness, etc.), including method of manufacture (e.g. blow moulding) and which may include drawing(s) and/or photograph(s);
7. Maximum capacity;
8. Test contents;
9. Test descriptions and results;
10. The test report shall be signed with the name and status of the signatory.

6.3.5.5.2 The test report shall contain statements that the packaging prepared as for carriage was tested in accordance with the appropriate requirements of this Chapter and that the use of other packaging methods or components may render it invalid. A copy of the test report shall be available to the competent authority.

CHAPTER 6.4

REQUIREMENTS FOR THE CONSTRUCTION, TESTING AND APPROVAL OF PACKAGES FOR RADIOACTIVE MATERIAL AND FOR THE APPROVAL OF SUCH MATERIAL

6.4.1 (Reserved)

6.4.2 General requirements

6.4.2.1 The package shall be so designed in relation to its mass, volume and shape that it can be easily and safely carried. In addition, the package shall be so designed that it can be properly secured in or on the vehicle during carriage.

6.4.2.2 The design shall be such that any lifting attachments on the package will not fail when used in the intended manner and that, if failure of the attachments should occur, the ability of the package to meet other requirements of this Annex would not be impaired. The design shall take account of appropriate safety factors to cover snatch lifting.

6.4.2.3 Attachments and any other features on the outer surface of the package which could be used to lift it shall be designed either to support its mass in accordance with the requirements of 6.4.2.2 or shall be removable or otherwise rendered incapable of being used during carriage.

6.4.2.4 As far as practicable, the packaging shall be so designed that the external surfaces are free from protruding features and can be easily decontaminated.

6.4.2.5 As far as practicable, the outer layer of the package shall be so designed as to prevent the collection and the retention of water.

6.4.2.6 Any features added to the package at the time of carriage which are not part of the package shall not reduce its safety.

6.4.2.7 The package shall be capable of withstanding the effects of any acceleration, vibration or vibration resonance which may arise under routine conditions of carriage without any deterioration in the effectiveness of the closing devices on the various receptacles or in the integrity of the package as a whole. In particular, nuts, bolts and other securing devices shall be so designed as to prevent them from becoming loose or being released unintentionally, even after repeated use.

6.4.2.8 The design of the package shall take into account ageing mechanisms.

6.4.2.9 The materials of the packaging and any components or structures shall be physically and chemically compatible with each other and with the radioactive contents. Account shall be taken of their behaviour under irradiation.

6.4.2.10 All valves through which the radioactive contents could escape shall be protected against unauthorized operation.

6.4.2.11 The design of the package shall take into account ambient temperatures and pressures that are likely to be encountered in routine conditions of carriage.

6.4.2.12 A package shall be so designed that it provides sufficient shielding to ensure that, under routine conditions of carriage and with the maximum radioactive contents that the package is designed to contain, the dose rate at any point on the external surface of the package would not exceed the values specified in 2.2.7.2.4.1.2, 4.1.9.1.11 and 4.1.9.1.12, as applicable, with account taken of 7.5.11 CV33 (3.3) (b) and (3.5).

6.4.2.13 For radioactive material having other dangerous properties the package design shall take into account those properties; see 2.1.3.5.3 and 4.1.9.1.5.

6.4.2.14 Manufacturers and subsequent distributors of packagings shall provide information regarding procedures to be followed and a description of the types and dimensions of closures (including required

gaskets) and any other components needed to ensure that packages as presented for carriage are capable of passing the applicable performance tests of this Chapter.

6.4.3 (Reserved)

6.4.4 Requirements for excepted packages

An excepted package shall be designed to meet the requirements specified in 6.4.2.1 to 6.4.2.13 and, in addition, the requirements of 6.4.7.2 if it contains fissile material allowed by one of the provisions of 2.2.7.2.3.5 (a) to (f).

6.4.5 Requirements for Industrial packages

6.4.5.1 Types IP-1, IP-2, and IP-3 packages shall meet the requirements specified in 6.4.2 and 6.4.7.2.

6.4.5.2 A Type IP-2 package shall, if it were subjected to the tests specified in 6.4.15.4 and 6.4.15.5, prevent:

(a) Loss or dispersal of the radioactive contents; and

(b) More than a 20 % increase in the maximum dose rate at any external surface of the package.

6.4.5.3 A Type IP-3 package shall meet all the requirements specified in 6.4.7.2 to 6.4.7.15.

6.4.5.4 Alternative requirements for Types IP-2 and IP-3 packages

6.4.5.4.1 Packages may be used as Type IP-2 package provided that:

(a) They satisfy the requirements of 6.4.5.1;

(b) They are designed to satisfy the requirements prescribed for packing group I or II in Chapter 6.1; and

(c) When subjected to the tests required for packing groups I or II in Chapter 6.1, they would prevent:

(i) Loss or dispersal of the radioactive contents; and

(ii) More than a 20 % increase in the maximum dose rate at any external surface of the package.

6.4.5.4.2 Portable tanks may also be used as Types IP-2 or IP-3 packages, provided that:

(a) They satisfy the requirements of 6.4.5.1;

(b) They are designed to satisfy the requirements prescribed in Chapter 6.7 and are capable of withstanding a test pressure of 265 kPa; and

(c) They are designed so that any additional shielding which is provided shall be capable of withstanding the static and dynamic stresses resulting from handling and routine conditions of carriage and of preventing more than a 20 % increase in the maximum dose rate at any external surface of the portable tanks.

6.4.5.4.3 Tanks, other than portable tanks, may also be used as Types IP-2 or IP-3 packages for carrying LSA-I and LSA-II as prescribed in Table 4.1.9.2.5, provided that:

(a) They satisfy the requirements of 6.4.5.1;

(b) They are designed to satisfy the requirements prescribed in Chapter 6.8; and

(c) They are designed so that any additional shielding which is provided shall be capable of withstanding the static and dynamic stresses resulting from handling and routine conditions of carriage and of preventing more than a 20 % increase in the maximum dose rate at any external surface of the tanks.

6.4.5.4.4 Containers with the characteristics of a permanent enclosure may also be used as Types IP-2 or IP-3 packages, provided that:

(a) The radioactive contents are restricted to solid materials;

(b) They satisfy the requirements of 6.4.5.1; and

(c) They are designed to conform to ISO 1496-1:1990: "Series 1 Containers - Specifications and Testing - Part 1: General Cargo Containers" and subsequent amendments 1:1993, 2:1998, 3:2005, 4:2006 and 5:2006, excluding dimensions and ratings. They shall be designed such that if subjected to the tests prescribed in that document and the accelerations occurring during routine conditions of carriage they would prevent:

(i) loss or dispersal of the radioactive contents; and

(ii) more than a 20 % increase in the maximum dose rate at any external surface of the containers.

6.4.5.4.5 Metal intermediate bulk containers may also be used as Types IP-2 or IP-3 packages provided that:

(a) They satisfy the requirements of 6.4.5.1; and

(b) They are designed to satisfy the requirements prescribed in Chapter 6.5 for packing group I or II, and if they were subjected to the tests prescribed in that Chapter, but with the drop test conducted in the most damaging orientation, they would prevent:

(i) loss or dispersal of the radioactive contents; and

(ii) more than a 20 % increase in the maximum dose rate at any external surface of the intermediate bulk container.

6.4.6 Requirements for packages containing uranium hexafluoride

6.4.6.1 Packages designed to contain uranium hexafluoride shall meet the requirements which pertain to the radioactive and fissile properties of the material prescribed elsewhere in this Code. Except as allowed in 6.4.6.4, uranium hexafluoride in quantities of 0.1 kg or more shall also be packaged and carried in accordance with the provisions of ISO 7195:2005 "Nuclear Energy – Packaging of uranium hexafluoride (UF_6) for transport", and the requirements of 6.4.6.2 and 6.4.6.3.

6.4.6.2 Each package designed to contain 0.1 kg or more of uranium hexafluoride shall be designed so that the package would meet the following requirements:

(a) Withstand without leakage and without unacceptable stress, as specified in ISO 7195:2005, the structural test as specified in 6.4.21.5 except as allowed in 6.4.6.4;

(b) Withstand without loss or dispersal of the uranium hexafluoride the free drop test specified in 6.4.15.4; and

(c) Withstand without rupture of the containment system the thermal test specified in 6.4.17.3 except as allowed in 6.4.6.4.

6.4.6.3 Packages designed to contain 0.1 kg or more of uranium hexafluoride shall not be provided with pressure relief devices.

6.4.6.4 Subject to multilateral approval, packages designed to contain 0.1 kg or more of uranium hexafluoride may be carried if the packages are designed:

(a) to international or national standards other than ISO 7195:2005 provided an equivalent level of safety is maintained; and/or

(b) to withstand without leakage and without unacceptable stress a test pressure of less than 2.76 MPa as specified in 6.4.21.5; and/or

(c) to contain 9 000 kg or more of uranium hexafluoride and the packages do not meet the requirement of 6.4.6.2 (c).

In all other respects the requirements specified in 6.4.6.1 to 6.4.6.3 shall be satisfied.

6.4.7 Requirements for Type A packages

6.4.7.1 Type A packages shall be designed to meet the general requirements of 6.4.2 and of 6.4.7.2 to 6.4.7.17.

6.4.7.2 The smallest overall external dimension of the package shall not be less than 10 cm.

6.4.7.3 The outside of the package shall incorporate a feature such as a seal, which is not readily breakable and which, while intact, will be evidence that it has not been opened.

6.4.7.4 Any tie-down attachments on the package shall be so designed that, under normal and accident conditions of carriage, the forces in those attachments shall not impair the ability of the package to meet the requirements of this Code.

6.4.7.5 The design of the package shall take into account temperatures ranging from -40°C to +70°C for the components of the packaging. Attention shall be given to freezing temperatures for liquids and to the potential degradation of packaging materials within the given temperature range.

6.4.7.6 The design and manufacturing techniques shall be in accordance with national or international standards, or other requirements, acceptable to the competent authority.

6.4.7.7 The design shall include a containment system securely closed by a positive fastening device which cannot be opened unintentionally or by a pressure which may arise within the package.

6.4.7.8 Special form radioactive material may be considered as a component of the containment system.

6.4.7.9 If the containment system forms a separate unit of the package, the continment system shall be capable of being securely closed by a positive fastening device which is independent of any other part of the packaging.

6.4.7.10 The design of any component of the containment system shall take into account, where applicable, the radiolytic decomposition of liquids and other vulnerable materials and the generation of gas by chemical reaction and radiolysis.

6.4.7.11 The containment system shall retain its radioactive contents under a reduction of ambient pressure to 60 kPa.

6.4.7.12 All valves, other than pressure relief valves, shall be provided with an enclosure to retain any leakage from the valve.

6.4.7.13 A radiation shield which encloses a component of the package specified as a part of the containment system shall be so designed as to prevent the unintentional release of that component from the shield. Where the radiation shield and such component within it form a separate unit, the radiation shield shall be capable of being securely closed by a positive fastening device which is independent of any other packaging structure.

6.4.7.14 A package shall be so designed that if it were subjected to the tests specified in 6.4.15, it would prevent:

(a) Loss or dispersal of the radioactive contents; and

(b) More than a 20 % increase in the maximum dose rate at any external surface of the package.

6.4.7.15 The design of a package intended for liquid radioactive material shall make provision for ullage to accommodate variations in the temperature of the contents, dynamic effects and filling dynamics.

Type A packages to contain liquids

6.4.7.16 A Type A package designed to contain liquid radioactive material shall, in addition:

(a) Be adequate to meet the conditions specified in 6.4.7.14 (a) above if the package is subjected to the tests specified in 6.4.16; and

(b) Either

(i) be provided with sufficient absorbent material to absorb twice the volume of the liquid contents. Such absorbent material shall be suitably positioned so as to contact the liquid in the event of leakage; or

(ii) be provided with a containment system composed of primary inner and secondary outer containment components designed to enclose the liquid contents completely and ensure their retention, within the secondary outer containment components, even if the primary inner components leak.

Type A packages to contain gas

6.4.7.17 A Type A package designed for gases shall prevent loss or dispersal of the radioactive contents if the package were subjected to the tests specified in 6.4.16, except for a Type A package designed for tritium gas or for noble gases.

6.4.8 Requirements for Type B(U) packages

6.4.8.1 Type B(U) packages shall be designed to meet the requirements specified in 6.4.2, and of 6.4.7.2 to 6.4.7.15, except as specified in 6.4.7.14 (a), and, in addition, the requirements specified in 6.4.8.2 to 6.4.8.15.

6.4.8.2 A package shall be so designed that, under the ambient conditions specified in 6.4.8.5 and 6.4.8.6, heat generated within the package by the radioactive contents shall not, under normal conditions of carriage, as demonstrated by the tests in 6.4.15, adversely affect the package in such a way that it would fail to meet the applicable requirements for containment and shielding if left unattended for a period of one week. Particular attention shall be paid to the effects of heat, which may cause one or more of the following:

(a) Alteration of the arrangement, the geometrical form or the physical state of the radioactive contents or, if the radioactive material is enclosed in a can or receptacle (for example, clad fuel elements), cause the can, receptacle or radioactive material to deform or melt;

(b) Lessening of the efficiency of the packaging through differential thermal expansion or cracking or melting of the radiation shielding material;

(c) Acceleration of corrosion when combined with moisture.

6.4.8.3 A package shall be so designed that, under the ambient condition specified in 6.4.8.5 and in the absence of insolation, the temperature of the accessible surfaces of a package shall not exceed 50 °C, unless the package is carried under exclusive use.

6.4.8.4 The maximum temperature of any surface readily accessible during carriage of a package under exclusive use shall not exceed 85 °C in the absence of insolation under the ambient conditions specified in 6.4.8.5. Account may be taken of barriers or screens intended to give protection to persons without the need for the barriers or screens being subject to any test.

6.4.8.5 The ambient temperature shall be assumed to be 38 °C.

6.4.8.6 The solar insolation conditions shall be assumed to be as specified in Table 6.4.8.6.

Table 6.4.8.6: Insolation data

Case	Form and location of surface	Insolation for 12 hours per day (W/m²)
1	Flat surfaces carried horizontally-downward facing	0
2	Flat surfaces carried horizontally-upward facing	800
3	Surfaces carried vertically	200[a]
4	Other downward facing (not horizontal) surfaces	200[a]
5	All other surfaces	400[a]

[a] *Alternatively, a sine function may be used, with an absorption coefficient adopted and the effects of possible reflection from neighbouring objects neglected.*

6.4.8.7 A package which includes thermal protection for the purpose of satisfying the requirements of the thermal test specified in 6.4.17.3 shall be so designed that such protection will remain effective if the package is subjected to the tests specified in 6.4.15 and 6.4.17.2 (a) and (b) or 6.4.17.2 (b) and (c), as appropriate. Any such protection on the exterior of the package shall not be rendered ineffective by ripping, cutting, skidding, abrasion or rough handling.

6.4.8.8 A package shall be so designed that, if it were subjected to:

(a) The tests specified in 6.4.15, it would restrict the loss of radioactive contents to not more than 10^{-6} A_2 per hour; and

(b) The tests specified in 6.4.17.1, 6.4.17.2 (b), 6.4.17.3, and 6.4.17.4 and either the test in

(i) 6.4.17.2 (c), when the package has a mass not greater than 500 kg, an overall density not greater than 1 000 kg/m³ based on the external dimensions, and radioactive contents greater than 1 000 A_2 not as special form radioactive material, or

(ii) 6.4.17.2 (a), for all other packages,

it would meet the following requirements:

- retain sufficient shielding to ensure that the dose rate at 1 m from the surface of the package would not exceed 10 mSv/h with the maximum radioactive contents which the package is designed to contain; and

- restrict the accumulated loss of radioactive contents in a period of one week to not more than 10 A_2 for krypton-85 and not more than A_2 for all other radionuclides.

Where mixtures of different radionuclides are present, the provisions of 2.2.7.2.2.4 to 2.2.7.2.2.6 shall apply except that for krypton-85 an effective A_2(i) value equal to 10 A_2 may be used. For case (a) above, the assessment shall take into account the external non-fixed contamination limits of 4.1.9.1.2.

6.4.8.9 A package for radioactive contents with activity greater than 10^5 A_2 shall be so designed that if it were subjected to the enhanced water immersion test specified in 6.4.18, there would be no rupture of the containment system.

6.4.8.10 Compliance with the permitted activity release limits shall depend neither upon filters nor upon a mechanical cooling system.

6.4.8.11 A package shall not include a pressure relief system from the containment system which would allow the release of radioactive material to the environment under the conditions of the tests specified in 6.4.15 and 6.4.17.

6.4.8.12 A package shall be so designed that if it were at the maximum normal operating pressure and it were subjected to the tests specified in 6.4.15 and 6.4.17, the level of strains in the containment system would not attain values which would adversely affect the package in such a way that it would fail to meet the applicable requirements.

6.4.8.13 A package shall not have a maximum normal operating pressure in excess of a gauge pressure of 700 kPa.

6.4.8.14 A package containing low dispersible radioactive material shall be so designed that any features added to the low dispersible radioactive material that are not part of it, or any internal components of the packaging shall not adversely affect the performance of the low dispersible radioactive material.

6.4.8.15 A package shall be designed for an ambient temperature range from -40 °C to +38 °C.

6.4.9 Requirements for Type B(M) packages

6.4.9.1 Type B(M) packages shall meet the requirements for Type B(U) packages specified in 6.4.8.1, except that for packages to be carried solely within a specified country or solely between specified countries, conditions other than those given in 6.4.7.5, 6.4.8.4 to 6.4.8.6, and 6.4.8.9 to 6.4.8.15 above may be assumed with the approval of the competent authorities of these countries. The requirements for Type B(U) packages specified in 6.4.8.4 and 6.4.8.9 to 6.4.8.15 shall be met as far as practicable.

6.4.9.2 Intermittent venting of Type B(M) packages may be permitted during carriage, provided that the operational controls for venting are acceptable to the relevant competent authorities.

6.4.10 Requirements for Type C packages

6.4.10.1 Type C packages shall be designed to meet the requirements specified in 6.4.2 and of 6.4.7.2 to 6.4.7.15, except as specified in 6.4.7.14 (a), and of the requirements specified in 6.4.8.2 to 6.4.8.6, 6.4.8.10 to 6.4.8.15, and, in addition, of 6.4.10.2 to 6.4.10.4.

6.4.10.2 A package shall be capable of meeting the assessment criteria prescribed for tests in 6.4.8.8 (b) and 6.4.8.12 after burial in an environment defined by a thermal conductivity of 0.33 $W.m^{-1}.K^{-1}$ and a temperature of 38 °C in the steady state. Initial conditions for the assessment shall assume that any thermal insulation of the package remains intact, the package is at the maximum normal operating pressure and the ambient temperature is 38 °C.

6.4.10.3 A package shall be so designed that, if it were at the maximum normal operating pressure and subjected to:

(a) The tests specified in 6.4.15, it would restrict the loss of radioactive contents to not more than 10^{-6} A_2 per hour; and

(b) The test sequences in 6.4.20.1,

(i) it would retain sufficient shielding to ensure that the dose rate at 1 m from the surface of the package would not exceed 10 mSv/h with the maximum radioactive contents which the package is designed to contain; and

(ii) it would restrict the accumulated loss of radioactive contents in a period of 1 week to not more than 10 A_2 for krypton-85 and not more than A_2 for all other radionuclides.

Where mixtures of different radionuclides are present, the provisions of 2.2.7.2.2.4 to 2.2.7.2.2.6 shall apply except that for krypton-85 an effective A_2(i) value equal to 10 A_2 may be used. For case (a) above, the assessment shall take into account the external contamination limits of 4.1.9.1.2.

6.4.10.4 A package shall be so designed that there will be no rupture of the containment system following performance of the enhanced water immersion test specified in 6.4.18.

6.4.11 Requirements for packages containing fissile material

6.4.11.1 Fissile material shall be carried so as to:

(a) Maintain sub-criticality during routine, normal and accident conditions of carriage; in particular, the following contingencies shall be considered:

(i) water leaking into or out of packages;

(ii) the loss of efficiency of built-in neutron absorbers or moderators;

(iii) rearrangement of the contents either within the package or as a result of loss from the package;

(iv) reduction of spaces within or between packages;

(v) packages becoming immersed in water or buried in snow; and

(vi) temperature changes; and

(b) Meet the requirements:

(i) of 6.4.7.2 except for unpackaged material when specifically allowed by 2.2.7.2.3.5 (e);

(ii) prescribed elsewhere in this Code which pertain to the radioactive properties of the material;

(iii) of 6.4.7.3 unless the material is excepted by 2.2.7.2.3.5;

(iv) of 6.4.11.4 to 6.4.11.14, unless the material is excepted by 2.2.7.2.3.5, 6.4.11.2 or 6.4.11.3.

6.4.11.2 Packages containing fissile material that meet the provisions of subparagraph (d) and one of the provisions of (a) to (c) below are excepted from the requirements of 6.4.11.4 to 6.4.11.14.

(a) Packages containing fissile material in any form provided that:

(i) The smallest external dimension of the package is not less than 10 cm;

(ii) The criticality safety index of the package is calculated using the following formula:

$$CSI = 50 \times 5 \times \left(\frac{Mass \text{ of U - 235 in package (g)}}{Z} + \frac{Mass \text{ of other fissile nuclides * in package (g)}}{280} \right)$$

* *Plutonium may be of any isotopic composition provided that the amount of Pu-241 is less than that of Pu-240 in the package*

where the values of Z are taken from Table 6.4.11.2;

(iii) The *CSI* of any package does not exceed 10;

(b) Packages containing fissile material in any form provided that:

(i) The smallest external dimension of the package is not less than 30 cm;

(ii) The package, after being subjected to the tests specified in 6.4.15.1 to 6.4.15.6:

- Retains its fissile material contents;
- Preserves the minimum overall outside dimensions of the package to at least 30 cm;
- Prevents the entry of a 10 cm cube;

(iii) The criticality safety index of the package is calculated using the following formula:

$$CSI = 50 \times 2 \times \left(\frac{Mass \text{ of U - 235 in package (g)}}{Z} + \frac{Mass \text{ of other fissile nuclides * in package (g)}}{280} \right)$$

* *Plutonium may be of any isotopic composition provided that the amount of Pu-241 is less than that of Pu-240 in the package*

where the values of Z are taken from Table 6.4.11.2;

(iv) The criticality safety index of any package does not exceed 10;

(c) Packages containing fissile material in any form provided that:

(i) The smallest external dimension of the package is not less than 10 cm;

(ii) The package, after being subjected to the tests specified in 6.4.15.1 to 6.4.15.6:

- Retains its fissile material contents;
- Preserves the minimum overall outside dimensions of the package to at least 10 cm;
- Prevents the entry of a 10 cm cube;

(iii) The CSI of the package is calculated using the following formula:

$$CSI = 50 \times 2 \times \left(\frac{Mass \text{ of U - 235 in package (g)}}{450} + \frac{Mass \text{ of other fissile nuclides * in package (g)}}{280} \right)$$

* *Plutonium may be of any isotopic composition provided that the amount of Pu-241 is less than that of Pu-240 in the package*

(iv) The total mass of fissile nuclides in any package does not exceed 15 g;

(d) The total mass of beryllium, hydrogenous material enriched in deuterium, graphite and other allotropic forms of carbon in an individual package shall not be greater than the mass of fissile nuclides in the package except where the total concentration of these materials does not exceed 1 g in any 1 000 g of material. Beryllium incorporated in copper alloys up to 4 % in weight of the alloy does not need to be considered.

Table 6.4.11.2 Values of Z for calculation of criticality safety index in accordance with 6.4.11.2

Enrichment[a]	*Z*
Uranium enriched up to 1.5 %	2200
Uranium enriched up to 5 %	850
Uranium enriched up to 10 %	660
Uranium enriched up to 20 %	580
Uranium enriched up to 100 %	450

[a] *If a package contains uranium with varying enrichments of U-235, then the value corresponding to the highest enrichment shall be used for Z.*

6.4.11.3 Packages containing not more than 1 000 g of plutonium are excepted from the application of 6.4.11.4 to 6.4.11.14 provided that:

(a) Not more than 20 % of the plutonium by mass is fissile nuclides;

(b) The criticality safety index of the package is calculated using the following formula:

$$CSI = 50 \times 2 \times \frac{\text{mass of plutonium (g)}}{1000}$$

(c) If uranium is present with the plutonium, the mass of uranium shall be no more than 1 % of the mass of the plutonium.

6.4.11.4 Where the chemical or physical form, isotopic composition, mass or concentration, moderation ratio or density, or geometric configuration is not known, the assessments of 6.4.11.8 to 6.4.11.13 shall be performed assuming that each parameter that is not known has the value which gives the maximum neutron multiplication consistent with the known conditions and parameters in these assessments.

6.4.11.5 For irradiated nuclear fuel the assessments of 6.4.11.8 to 6.4.11.13 shall be based on an isotopic composition demonstrated to provide either:

(a) The maximum neutron multiplication during the irradiation history; or

(b) A conservative estimate of the neutron multiplication for the package assessments. After irradiation but prior to shipment, a measurement shall be performed to confirm the conservatism of the isotopic composition.

6.4.11.6 The package, after being subjected to the tests specified in 6.4.15, shall:

(a) Preserve the minimum overall outside dimensions of the package to at least 10 cm; and

(b) Prevent the entry of a 10 cm cube.

6.4.11.7 The package shall be designed for an ambient temperature range of -40°C to + 38°C unless the competent authority specifies otherwise in the certificate of approval for the package design.

6.4.11.8 For a package in isolation, it shall be assumed that water can leak into or out of all void spaces of the package, including those within the containment system. However, if the design incorporates special features to prevent such leakage of water into or out of certain void spaces, even as a result of error, absence of leakage may be assumed in respect of those void spaces. Special features shall include either of the following:

(a) Multiple high standard water barriers, not less than two of which would remain watertight if the package were subject to the tests prescribed in 6.4.11.13 (b), a high degree of quality control in the manufacture, maintenance and repair of packagings and tests to demonstrate the closure of each package before each shipment; or

(b) For packages containing uranium hexafluoride only, with maximum enrichment of 5 mass percent uranium-235:

(i) packages where, following the tests prescribed in 6.4.11.13 (b), there is no physical contact between the valve or the plug and any other component of the packaging other than at its original point of attachment and where, in addition, following the test prescribed in 6.4.17.3 the valves and the plug remain leaktight; and

(ii) a high degree of quality control in the manufacture, maintenance and repair of packagings coupled with tests to demonstrate closure of each package before each shipment.

6.4.11.9 It shall be assumed that the confinement system is closely reflected by at least 20 cm of water or such greater reflection as may additionally be provided by the surrounding material of the packaging. However, when it can be demonstrated that the confinement system remains within the packaging following the tests prescribed in 6.4.11.13 (b), close reflection of the package by at least 20 cm of water may be assumed in 6.4.11.10 (c).

6.4.11.10 The package shall be subcritical under the conditions of 6.4.11.8 and 6.4.11.9 with the package conditions that result in the maximum neutron multiplication consistent with:

(a) Routine conditions of carriage (incident free);

(b) The tests specified in 6.4.11.12 (b);

(c) The tests specified in 6.4.11.13 (b).

6.4.11.11 *(Reserved)*

6.4.11.12 For normal conditions of carriage a number "N" shall be derived, such that five times "N" packages shall be subcritical for the arrangement and package conditions that provide the maximum neutron multiplication consistent with the following:

(a) There shall not be anything between the packages, and the package arrangement shall be reflected on all sides by at least 20 cm of water; and

(b) The state of the packages shall be their assessed or demonstrated condition if they had been subjected to the tests specified in 6.4.15.

6.4.11.13 For accident conditions of carriage a number "N" shall be derived, such that two times "N" packages shall be subcritical for the arrangement and package conditions that provide the maximum neutron multiplication consistent with the following:

(a) Hydrogenous moderation between packages, and the package arrangement reflected on all sides by at least 20 cm of water; and

(b) The tests specified in 6.4.15 followed by whichever of the following is the more limiting:

(i) the tests specified in 6.4.17.2 (b) and, either 6.4.17.2 (c) for packages having a mass not greater than 500 kg and an overall density not greater than 1 000 kg/m^3 based on the external dimensions, or 6.4.17.2 (a) for all other packages; followed by the test specified in 6.4.17.3 and completed by the tests specified in 6.4.19.1 to 6.4.19.3; or

(ii) the test specified in 6.4.17.4; and

(c) Where any part of the fissile material escapes from the containment system following the tests specified in 6.4.11.13 (b), it shall be assumed that fissile material escapes from each package in the array and all of the fissile material shall be arranged in the configuration and moderation that results in the maximum neutron multiplication with close reflection by at least 20 cm of water.

6.4.11.14 The criticality safety index (CSI) for packages containing fissile material shall be obtained by dividing the number 50 by the smaller of the two values of N derived in 6.4.11.12 and 6.4.11.13 (i.e. CSI = 50/N). The value of the criticality safety index may be zero, provided that an unlimited number of packages is subcritical (i.e. N is effectively equal to infinity in both cases).

6.4.12 Test procedures and demonstration of compliance

6.4.12.1 Demonstration of compliance with the performance standards required in 2.2.7.2.3.3.1, 2.2.7.2.3.3.2, 2.2.7.2.3.4.1, 2.2.7.2.3.4.2, 2.2.7.2.3.4.3, and 6.4.2 to 6.4.11 must be accomplished by any of the methods listed below or by a combination thereof:

(a) Performance of tests with specimens representing special form radioactive material, or low dispersible radioactive material or with prototypes or samples of the packaging, where the contents of the specimen or the packaging for the tests shall simulate as closely as practicable the expected range of radioactive contents and the specimen or packaging to be tested shall be prepared as presented for carriage;

(b) Reference to previous satisfactory demonstrations of a sufficiently similar nature;

(c) Performance of tests with models of appropriate scale incorporating those features which are significant with respect to the item under investigation when engineering experience has shown results of such tests to be suitable for design purposes. When a scale model is used, the need for adjusting certain test parameters, such as penetrator diameter or compressive load, shall be taken into account;

(d) Calculation, or reasoned argument, when the calculation procedures and parameters are generally agreed to be reliable or conservative.

6.4.12.2 After the specimen, prototype or sample has been subjected to the tests, appropriate methods of assessment shall be used to assure that the requirements for the test procedures have been fulfilled in compliance with the performance and acceptance standards prescribed in 2.2.7.2.3.3.1, 2.2.7.2.3.3.2, 2.2.7.2.3.4.1, 2.2.7.2.3.4.2, 2.2.7.2.3.4.3, and 6.4.2 to 6.4.11.

6.4.12.3 All specimens shall be inspected before testing in order to identify and record faults or damage including the following:

(a) Divergence from the design;

(b) Defects in manufacture;

(c) Corrosion or other deterioration; and

(d) Distortion of features.

The containment system of the package shall be clearly specified. The external features of the specimen shall be clearly identified so that reference may be made simply and clearly to any part of such specimen.

6.4.13 Testing the integrity of the containment system and shielding and evaluating criticality safety

After each test or group of tests or sequence of the applicable tests, as appropriate, specified in 6.4.15 to 6.4.21:

(a) Faults and damage shall be identified and recorded;

(b) It shall be determined whether the integrity of the containment system and shielding has been retained to the extent required in 6.4.2 to 6.4.11 for the package under test; and

(c) For packages containing fissile material, it shall be determined whether the assumptions and conditions used in the assessments required by 6.4.11.1 to 6.4.11.14 for one or more packages are valid.

6.4.14 Target for drop tests

The target for the drop tests specified in 2.2.7.2.3.3.5 (a), 6.4.15.4, 6.4.16 (a), 6.4.17.2 and 6.4.20.2 shall be a flat, horizontal surface of such a character that any increase in its resistance to displacement or deformation upon impact by the specimen would not significantly increase the damage to the specimen.

6.4.15 Tests for demonstrating ability to withstand normal conditions of carriage

6.4.15.1 The tests are: the water spray test, the free drop test, the stacking test and the penetration test. Specimens of the package shall be subjected to the free drop test, the stacking test and the penetration test, preceded in each case by the water spray test. One specimen may be used for all the tests, provided that the requirements of 6.4.15.2 are fulfilled.

6.4.15.2 The time interval between the conclusion of the water spray test and the succeeding test shall be such that the water has soaked in to the maximum extent, without appreciable drying of the exterior of the specimen. In the absence of any evidence to the contrary, this interval shall be taken to be two hours if the water spray is applied from four directions simultaneously. No time interval shall elapse, however, if the water spray is applied from each of the four directions consecutively.

6.4.15.3 Water spray test: The specimen shall be subjected to a water spray test that simulates exposure to rainfall of approximately 5 cm per hour for at least one hour.

6.4.15.4 Free drop test: The specimen shall drop onto the target so as to suffer maximum damage in respect of the safety features to be tested.

(a) The height of the drop, measured from the lowest point of the specimen to the upper surface of the target, shall be not less than the distance specified in Table 6.4.15.4 for the applicable mass. The target shall be as defined in 6.4.14;

(b) For rectangular fibreboard or wood packages not exceeding a mass of 50 kg, a separate specimen shall be subjected to a free drop onto each corner from a height of 0.3 m;

(c) For cylindrical fibreboard packages not exceeding a mass of 100 kg, a separate specimen shall be subjected to a free drop onto each of the quarters of each rim from a height of 0.3 m.

Table 6.4.15.4: Free drop distance for testing packages to normal conditions of carriage

Package mass (kg)	Free drop distance (m)
Package mass < 5 000	1.2
5 000 ≤ Package mass < 10 000	0.9
10 000 ≤ Package mass < 15 000	0.6
15 000 ≤ Package mass	0.3

6.4.15.5 Stacking test: Unless the shape of the packaging effectively prevents stacking, the specimen shall be subjected, for a period of 24 h, to a compressive load equal to the greater of the following:

(a) The equivalent of 5 times the maximum weight of the package; and

(b) The equivalent of 13 kPa multiplied by the vertically projected area of the package.

The load shall be applied uniformly to two opposite sides of the specimen, one of which shall be the base on which the package would typically rest.

6.4.15.6 Penetration test: The specimen shall be placed on a rigid, flat, horizontal surface which will not move significantly while the test is being carried out.

(a) A bar of 3.2 cm in diameter with a hemispherical end and a mass of 6 kg shall be dropped and directed to fall, with its longitudinal axis vertical, onto the centre of the weakest part of the specimen, so that, if it penetrates sufficiently far, it will hit the containment system. The bar shall not be significantly deformed by the test performance;

(b) The height of the drop of the bar, measured from its lower end to the intended point of impact on the upper surface of the specimen, shall be 1 m.

6.4.16 Additional tests for Type A packages designed for liquids and gases

A specimen or separate specimens shall be subjected to each of the following tests unless it can be demonstrated that one test is more severe for the specimen in question than the other, in which case one specimen shall be subjected to the more severe test.

(a) Free drop test: The specimen shall drop onto the target so as to suffer the maximum damage in respect of containment. The height of the drop measured from the lowest part of the specimen to the upper surface of the target shall be 9 m. The target shall be as defined in 6.4.14;

(b) Penetration test: The specimen shall be subjected to the test specified in 6.4.15.6 except that the height of drop shall be increased to 1.7 m from the 1 m specified in 6.4.15.6 (b).

6.4.17 Tests for demonstrating ability to withstand accident conditions in carriage

6.4.17.1 The specimen shall be subjected to the cumulative effects of the tests specified in 6.4.17.2 and 6.4.17.3, in that order. Following these tests, either this specimen or a separate specimen shall be subjected to the effect(s) of the water immersion test(s) as specified in 6.4.17.4 and, if applicable, 6.4.18.

6.4.17.2 Mechanical test: The mechanical test consists of three different drop tests. Each specimen shall be subjected to the applicable drops as specified in 6.4.8.8 or 6.4.11.13. The order in which the specimen is subjected to the drops shall be such that, on completion of the mechanical test, the specimen shall have suffered such damage as will lead to the maximum damage in the thermal test which follows.

(a) For drop I, the specimen shall drop onto the target so as to suffer the maximum damage, and the height of the drop measured from the lowest point of the specimen to the upper surface of the target shall be 9 m. The target shall be as defined in 6.4.14;

(b) For drop II, the specimen shall drop onto a bar rigidly mounted perpendicularly on the target so as to suffer the maximum damage. The height of the drop measured from the intended point of impact of the specimen to the upper surface of the bar shall be 1 m. The bar shall be of solid mild steel of circular cross-section, (15.0 cm ± 0.5 cm) in diameter and 20 cm long unless a longer bar would cause greater damage, in which case a bar of sufficient length to cause maximum damage shall be used. The upper end of the bar shall be flat and horizontal with its edge rounded off to a radius of not more than 6 mm. The target on which the bar is mounted shall be as described in 6.4.14;

(c) For drop III, the specimen shall be subjected to a dynamic crush test by positioning the specimen on the target so as to suffer maximum damage by the drop of a 500 kg mass from 9 m onto the specimen. The mass shall consist of a solid mild steel plate 1 m by 1 m and shall fall in a horizontal attitude. The lower face of the steel plate shall have its edges and corners rounded off to a radius of not more than 6 mm. The height of the drop shall be measured from the underside of the plate to the highest point of the specimen. The target on which the specimen rests shall be as defined in 6.4.14.

6.4.17.3 Thermal test: The specimen shall be in thermal equilibrium under conditions of an ambient temperature of 38 °C, subject to the solar insolation conditions specified in Table 6.4.8.6 and subject to the design maximum rate of internal heat generation within the package from the radioactive contents. Alternatively, any of these parameters are allowed to have different values prior to and during the test, providing due account is taken of them in the subsequent assessment of package response.

The thermal test shall then consist of:

(a) Exposure of a specimen for a period of 30 minutes to a thermal environment which provides a heat flux at least equivalent to that of a hydrocarbon fuel/air fire in sufficiently quiescent ambient

conditions to give a minimum average flame emissivity coefficient of 0.9 and an average temperature of at least 800 °C, fully engulfing the specimen, with a surface absorptivity coefficient of 0.8 or that value which the package may be demonstrated to possess if exposed to the fire specified, followed by;

(b) Exposure of the specimen to an ambient temperature of 38 °C, subject to the solar insolation conditions specified in Table 6.4.8.6 and subject to the design maximum rate of internal heat generation within the package by the radioactive contents for a sufficient period to ensure that temperatures in the specimen are decreasing in all parts of the specimen and/or are approaching initial steady state conditions. Alternatively, any of these parameters are allowed to have different values following cessation of heating, providing due account is taken of them in the subsequent assessment of package response.

During and following the test the specimen shall not be artificially cooled and any combustion of materials of the specimen shall be permitted to proceed naturally.

6.4.17.4 Water immersion test: The specimen shall be immersed under a head of water of at least 15 m for a period of not less than eight hours in the attitude which will lead to maximum damage. For demonstration purposes, an external gauge pressure of at least 150 kPa shall be considered to meet these conditions.

6.4.18 Enhanced water immersion test for Type B(U) and Type B(M) packages containing more than 10^5 A_2 and Type C packages

Enhanced water immersion test: The specimen shall be immersed under a head of water of at least 200 m for a period of not less than one hour. For demonstration purposes, an external gauge pressure of at least 2 MPa shall be considered to meet these conditions.

6.4.19 Water leakage test for packages containing fissile material

6.4.19.1 Packages for which water in-leakage or out-leakage to the extent which results in greatest reactivity has been assumed for purposes of assessment under 6.4.11.8 to 6.4.11.13 shall be excepted from the test.

6.4.19.2 Before the specimen is subjected to the water leakage test specified below, it shall be subjected to the tests in 6.4.17.2 (b), and either 6.4.17.2 (a) or (c) as required by 6.4.11.13, and the test specified in 6.4.17.3.

6.4.19.3 The specimen shall be immersed under a head of water of at least 0.9 m for a period of not less than 8 hours and in the attitude for which maximum leakage is expected.

6.4.20 Tests for Type C packages

6.4.20.1 Specimens shall be subjected to the effects of each of the following test sequences in the orders specified:

(a) The tests specified in 6.4.17.2 (a), 6.4.17.2 (c), 6.4.20.2 and 6.4.20.3; and

(b) The test specified in 6.4.20.4.

Separate specimens are allowed to be used for each of the sequences (a) and (b).

6.4.20.2 Puncture/tearing test: The specimen shall be subjected to the damaging effects of a vertical solid probe made of mild steel. The orientation of the package specimen and the impact point on the package surface shall be such as to cause maximum damage at the conclusion of the test sequence specified in 6.4.20.1 (a).

(a) The specimen, representing a package having a mass less than 250 kg, shall be placed on a target and subjected to a probe having a mass of 250 kg falling from a height of 3 m above the intended impact point. For this test the probe shall be a 20 cm diameter cylindrical bar with the striking end forming a frustum of a right circular cone with the following dimensions: 30 cm height and 2.5 cm in diameter at the top with its edge rounded off to a radius of not more than 6 mm. The target on which the specimen is placed shall be as specified in 6.4.14;

(b) For packages having a mass of 250 kg or more, the base of the probe shall be placed on a target and the specimen dropped onto the probe. The height of the drop, measured from the point of impact with the specimen to the upper surface of the probe shall be 3 m. For this test the probe shall have the same properties and dimensions as specified in (a) above, except that the length and mass of the probe shall be such as to incur maximum damage to the specimen. The target on which the base of the probe is placed shall be as specified in 6.4.14.

6.4.20.3 Enhanced thermal test: The conditions for this test shall be as specified in 6.4.17.3, except that the exposure to the thermal environment shall be for a period of 60 minutes.

6.4.20.4 Impact test: The specimen shall be subject to an impact on a target at a velocity of not less than 90 m/s, at such an orientation as to suffer maximum damage. The target shall be as defined in 6.4.14, except that the target surface may be at any orientation as long as the surface is normal to the specimen path.

6.4.21 Inspections for packagings designed to contain 0.1 kg or more of uranium hexafluoride

6.4.21.1 Every manufactured packaging and its service and structural equipment shall, either jointly or separately, undergo an inspection initially before being put into service and periodically thereafter. These inspections shall be performed and certified by agreement with the competent authority.

6.4.21.2 The initial inspection shall consist of a check of the design characteristics, a structural test, a leakproofness test, a water capacity test and a check of satisfactory operation of the service equipment.

6.4.21.3 The periodic inspections shall consist of a visual examination, a structural test, a leakproofness test and a check of satisfactory operation of the service equipment. The maximum intervals for periodic inspections shall be five years. Packagings which have not been inspected within this five-year period shall be examined before carriage in accordance with a programme approved by the competent authority. They shall not be refilled before completion of the full programme for periodic inspections.

6.4.21.4 The check of design characteristics shall demonstrate compliance with the design type specifications and the manufacturing programme.

6.4.21.5 For the initial structural test, packagings designed to contain 0.1 kg or more of uranium hexafluoride shall be tested hydraulically at an internal pressure of at least 1.38 MPa but, when the test pressure is less than 2.76 MPa, the design shall require multilateral approval. For retesting packagings, any other equivalent non-destructive testing may be applied subject to multilateral approval.

6.4.21.6 The leakproofness test shall be performed in accordance with a procedure which is capable of indicating leakages in the containment system with a sensitivity of 0.1 Pa.l/s (10^{-6} bar.l/s).

6.4.21.7 The water capacity of the packagings shall be established with an accuracy of ± 0.25 % at a reference temperature of 15 °C. The volume shall be stated on the plate described in 6.4.21.8.

6.4.21.8 A plate made of non-corroding metal shall be durably attached to every packaging in a readily accessible place. The method of attaching the plate must not impair the strength of the packaging. The following particulars, at least, shall be marked on the plate by stamping or by any other equivalent method:

- Approval number;
- Manufacturer's serial number;
- Maximum working pressure (gauge pressure);
- Test pressure (gauge pressure);
- Contents: uranium hexafluoride;
- Capacity in litres;
- Maximum permissible filling mass of uranium hexafluoride;
- Tare mass;
- Date (month, year) of the initial test and the most recent periodic test;
- Stamp of the expert who performed the tests.

6.4.22 Approvals of package designs and materials

6.4.22.1 The approval of designs for packages containing 0.1 kg or more of uranium hexafluoride requires that:

(a) Each design that meets the requirements of 6.4.6.4 shall require multilateral approval;

(b) Each design that meets the requirements of 6.4.6.1 to 6.4.6.3 shall require unilateral approval by the competent authority of the country of origin of the design, unless multilateral approval is otherwise required by this Code.

6.4.22.2 Each Type B(U) and Type C package design shall require unilateral approval, except that:

(a) A package design for fissile material, which is also subject to 6.4.22.4, 6.4.23.7, and 5.1.5.2.1 shall require multilateral approval; and

(b) A Type B(U) package design for low dispersible radioactive material shall require multilateral approval.

6.4.22.3 Each Type B(M) package design, including those for fissile material which are also subject to the requirements of 6.4.22.4, 6.4.23.7, and 5.1.5.2.1 and those for low dispersible radioactive material, shall require multilateral approval.

6.4.22.4 Each package design for fissile material which is not excepted by any of the paragraphs 2.2.7.2.3.5 (a) to (f), 6.4.11.2 and 6.4.11.3 shall require multilateral approval.

6.4.22.5 The design for special form radioactive material shall require unilateral approval. The design for low dispersible radioactive material shall require multilateral approval (see also 6.4.23.8).

6.4.22.6 The design for a fissile material excepted from "FISSILE" classification in accordance with 2.2.7.2.3.5 (f) shall require multilateral approval.

6.4.22.7 Alternative activity limits for an exempt consignment of instruments or articles in accordance with 2.2.7.2.2.2 (b) shall require multilateral approval.

6.4.22.8 Any design that requires unilateral approval originating in a country Contracting Party to ADR shall be approved by the competent authority of this country; if the country where the package design has been designed is not a Contracting Party to ADR, carriage is possible on condition that:

(a) A certificate has been supplied by this country, proving that the package design satisfies the technical requirements of ADR, and that this certificate is validated by a competent authority of an ADR Contracting Party;

(b) If no certificate and no existing package design approval by a country Contracting Party to ADR has been supplied, the package design is approved by the competent authority of an ADR Contracting Party.

6.4.22.9 For designs approved under the transitional measures see 1.6.6.

6.4.23 Applications and approvals for radioactive material carriage

6.4.23.1 *(Reserved)*

6.4.23.2 Applications for approval of shipment

6.4.23.2.1 An application for approval of shipment shall include:

(a) The period of time, related to the shipment, for which the approval is sought;

(b) The actual radioactive contents, the expected modes of carriage, the type of vehicle, and the probable or proposed route; and

(c) The details of how the precautions and administrative or operational controls, referred to in the certificate of approval for the package design, if applicable, issued under 5.1.5.2.1 (a) (v), (vi) or (vii), are to be put into effect.

6.4.23.2.2 An application for approval of SCO-III shipments shall include:

(a) A statement of the respects in which, and of the reasons why, the consignment is considered SCO-III;

(b) Justification for choosing SCO-III by demonstrating that:

(i) No suitable packaging currently exists;

(ii) Designing and/or constructing a packaging or segmenting the object is not practically, technically or economically feasible;

(iii) No other viable alternative exists;

(c) A detailed description of the proposed radioactive contents with reference to their physical and chemical states and the nature of the radiation emitted;

(d) A detailed statement of the design of the SCO-III, including complete engineering drawings and schedules of materials and methods of manufacture;

(e) All information necessary to satisfy the competent authority that the requirements of 4.1.9.2.4 (e) and the requirements of 7.5.11, CV33 (2), if applicable, are satisfied;

(f) A transport plan;

(g) A specification of the applicable management system as required in 1.7.3.

6.4.23.3 An application for approval of shipments under special arrangement shall include all the information necessary to satisfy the competent authority that the overall level of safety in carriage is at least equivalent to that which would be provided if all the applicable requirements of this Code had been met.

The application shall also include:

(a) A statement of the respects in which, and of the reasons why, the shipment cannot be made in full accordance with the applicable requirements of this Code; and

(b) A statement of any special precautions or special administrative or operational controls which are to be employed during carriage to compensate for the failure to meet the applicable requirements of this Code.

6.4.23.4 An application for approval of Type B(U) or Type C package design shall include:

(a) A detailed description of the proposed radioactive contents with reference to their physical and chemical states and the nature of the radiation emitted;

(b) A detailed statement of the design, including complete engineering drawings and schedules of materials and methods of manufacture;

(c) A statement of the tests which have been done and their results, or evidence based on calculative methods or other evidence that the design is adequate to meet the applicable requirements;

(d) The proposed operating and maintenance instructions for the use of the packaging;

(e) If the package is designed to have a maximum normal operating pressure in excess of 100 kPa gauge, a specification of the materials of manufacture of the containment system, the samples to be taken, and the tests to be made;

(f) If the package is to be used for shipment after storage, a justification of considerations to ageing mechanisms in the safety analysis and within the proposed operating and maintenance instructions;

(g) Where the proposed radioactive contents are irradiated nuclear fuel, a statement and a justification of any assumption in the safety analysis relating to the characteristics of the fuel and a description of any pre-shipment measurement as required by 6.4.11.5 (b);

(h) Any special stowage provisions necessary to ensure the safe dissipation of heat from the package considering the various modes of carriage to be used and type of vehicle or container;

(i) A reproducible illustration, not larger than 21 cm by 30 cm, showing the make-up of the package;

(j) A specification of the applicable management system as required in 1.7.3; and

(k) For packages which are to be used for shipment after storage, a gap analysis programme describing a systematic procedure for a periodic evaluation of changes of applicable regulations, changes in technical knowledge and changes of the state of the package design during storage.

6.4.23.5 An application for approval of a Type B(M) package design shall include, in addition to the general information required in 6.4.23.4 for Type B(U) packages:

(a) A list of the requirements specified in 6.4.7.5, 6.4.8.4 to 6.4.8.6 and 6.4.8.9 to 6.4.8.15 with which the package does not conform;

(b) Any proposed supplementary operational controls to be applied during carriage not regularly provided for in this Annex, but which are necessary to ensure the safety of the package or to compensate for the deficiencies listed in (a) above;

(c) A statement relative to any restrictions on the mode of carriage and to any special loading, carriage, unloading or handling procedures; and

(d) A statement of the range of ambient conditions (temperature, solar radiation) which are expected to be encountered during carriage and which have been taken into account in the design.

6.4.23.6 The application for approval of designs for packages containing 0.1 kg or more of uranium hexafluoride shall include all information necessary to satisfy the competent authority that the design meets the applicable requirements of 6.4.6.1, and a description of the applicable management system as required in 1.7.3.

6.4.23.7 An application for a fissile package approval shall include all information necessary to satisfy the competent authority that the design meets the applicable requirements of 6.4.11.1, and a specification of the applicable management system as required by 1.7.3.

6.4.23.8 An application for approval of design for special form radioactive material and design for low dispersible radioactive material shall include:

(a) A detailed description of the radioactive material or, if a capsule, the contents; particular reference shall be made to both physical and chemical states;

(b) A detailed statement of the design of any capsule to be used;

(c) A statement of the tests which have been done and their results, or evidence based on calculations to show that the radioactive material is capable of meeting the performance standards, or other evidence that the special form radioactive material or low dispersible radioactive material meets the applicable requirements of this Code;

(d) A specification of the applicable management system as required in 1.7.3; and

(e) Any proposed pre-shipment actions for use in the consignment of special form radioactive material or low dispersible radioactive material.

6.4.23.9 An application for approval of design for fissile material excepted from "FISSILE" classification in accordance with Table 2.2.7.2.1.1, under 2.2.7.2.3.5 (f) shall include:

(a) A detailed description of the material; particular reference shall be made to both physical and chemical states;

(b) A statement of the tests that have been carried out and their results, or evidence based on calculation methods to show that the material is capable of meeting the requirements specified in 2.2.7.2.3.6;

(c) A specification of the applicable management system as required in 1.7.3;

(d) A statement of specific actions to be taken prior to shipment.

6.4.23.10 An application for approval of alternative activity limits for an exempt consignment of instruments or articles shall include:

(a) An identification and detailed description of the instrument or article, its intended uses and the radionuclide(s) incorporated;

(b) The maximum activity of the radionuclide(s) in the instrument or article;

(c) Maximum external dose rates arising from the instrument or article;

(d) The chemical and physical forms of the radionuclide(s) contained in the instrument or article;

(e) Details of the construction and design of the instrument or article, particularly as related to the containment and shielding of the radionuclide in routine, normal and accident conditions of carriage;

(f) The applicable management system, including the quality testing and verification procedures to be applied to radioactive sources, components and finished products to ensure that the maximum specified activity of radioactive material or the maximum dose rates specified for the instrument or article are not exceeded, and that the instruments or articles are constructed according to the design specifications;

(g) The maximum number of instruments or articles expected to be shipped per consignment and annually;

(h) Dose assessments in accordance with the principles and methodologies set out in the Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, IAEA Safety Standards Series No. GSR Part 3, IAEA, Vienna (2014), including individual doses to transport workers and members of the public and, if appropriate, collective doses arising from routine, normal and accident conditions of carriage, based on representative carriage scenarios the consignments are subject to.

6.4.23.11 Each certificate of approval issued by a competent authority shall be assigned an identification mark. The identification mark shall be of the following generalized type:

VRI/Number/Type Code

(a) Except as provided in 6.4.23.12 (b), VRI represents the distinguishing sign used on vehicles in international road traffic[1];

(b) The number shall be assigned by the competent authority, and shall be unique and specific with regard to the particular design or shipment or alternative activity limit for exempt consignment. The identification mark of the approval of shipment shall be clearly related to the identification mark of the approval of design;

[1] *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*

(c) The following type codes shall be used in the order listed to indicate the types of certificate of approval issued:

AF	Type A package design for fissile material
B(U)	Type B(U) package design [B(U) F if for fissile material]
B(M)	Type B(M) package design [B(M) F if for fissile material]
C	Type C package design (CF if for fissile material)
IF	Industrial package design for fissile material
S	Special form radioactive material
LD	Low dispersible radioactive material
FE	Fissile material complying with the requirements of 2.2.7.2.3.6
T	Shipment
X	Special arrangement
AL	Alternative activity limits for an exempt consignment of instruments or articles

In the case of package designs for non-fissile or fissile excepted uranium hexafluoride, where none of the above codes apply, then the following type codes shall be used:

H(U)	Unilateral approval
H(M)	Multilateral approval.

6.4.23.12 These identification marks shall be applied as follows:

(a) Each certificate and each package shall bear the appropriate identification mark, comprising the symbols prescribed in 6.4.23.11 (a), (b) and (c) above, except that, for packages, only the applicable design type codes shall appear following the second stroke, that is, the "T" or "X" shall not appear in the identification mark on the package. Where the approval of design and the approval of shipment are combined, the applicable type codes do not need to be repeated. For example:

A/132/B(M)F:	A Type B(M) package design approved for fissile material, requiring multilateral approval, for which the competent authority of Austria has assigned the design number 132 (to be marked on both the package and on the certificate of approval for the package design);
A/132/B(M)FT:	The approval of shipment issued for a package bearing the identification mark elaborated above (to be marked on the certificate only);
A/137/X:	An approval of special arrangement issued by the competent authority of Austria, to which the number 137 has been assigned (to be marked on the certificate only);
A/139/IF:	An industrial package design for fissile material approved by the competent authority of Austria, to which package design number 139 has been assigned (to be marked on both the package and on the certificate of approval for the package design); and
A/145/H(U):	A package design for fissile excepted uranium hexafluoride approved by the competent authority of Austria, to which package design number 145 has been assigned (to be marked on both the package and on the certificate of approval for the package design);

(b) Where multilateral approval is effected by validation in accordance with 6.4.23.20, only the identification mark issued by the country of origin of the design or shipment shall be used. Where multilateral approval is effected by issue of certificates by successive countries, each certificate shall bear the appropriate identification mark and the package whose design was so approved shall bear all appropriate identification marks. For example:

A/132/B(M)F
CH/28/B(M)F

would be the identification mark of a package which was originally approved by Austria and was subsequently approved, by separate certificate, by Switzerland. Additional identification marks would be tabulated in a similar manner on the package;

(c) The revision of a certificate shall be indicated by a parenthetical expression following the identification mark on the certificate. For example, A/132/B(M)F (Rev.2) would indicate revision 2 of the Austrian certificate of approval for the package design; or A/132/B(M)F (Rev.0) would indicate the original issuance of the Austrian certificate of approval for the package design. For original issuances, the parenthetical entry is optional and other words such as "original issuance" may also be used in place of "Rev.0". Certificate revision numbers may only be issued by the country issuing the original certificate of approval;

(d) Additional symbols (as may be necessitated by national regulations) may be added in brackets to the end of the identification mark; for example, A/132/B(M)F (SP503);

(e) It is not necessary to alter the identification mark on the packaging each time that a revision to the design certificate is made. Such re-marking shall be required only in those cases where the revision to the package design certificate involves a change in the letter type codes for the package design following the second stroke.

6.4.23.13 Each certificate of approval issued by a competent authority for special form radioactive material or low dispersible radioactive material shall include the following information:

(a) Type of certificate;

(b) The competent authority identification mark;

(c) The issue date and an expiry date;

(d) List of applicable national and international regulations, including the edition of the IAEA Regulations for the Safe Transport of Radioactive Material under which the special form radioactive material or low dispersible radioactive material is approved;

(e) The identification of the special form radioactive material or low dispersible radioactive material;

(f) A description of the special form radioactive material or low dispersible radioactive material;

(g) Design specifications for the special form radioactive material or low dispersible radioactive material which may include references to drawings;

(h) A specification of the radioactive contents which includes the activities involved and which may include the physical and chemical form;

(i) A specification of the applicable management system as required in 1.7.3;

(j) Reference to information provided by the applicant relating to specific actions to be taken prior to shipment;

(k) If deemed appropriate by the competent authority, reference to the identity of the applicant;

(l) Signature and identification of the certifying official.

6.4.23.14 Each certificate of approval issued by a competent authority for material excepted from classification as "FISSILE" shall include the following information:

(a) Type of certificate;

(b) The competent authority identification mark;

(c) The issue date and an expiry date;

(d) List of applicable national and international regulations, including the edition of the IAEA Regulations for the Safe Transport of Radioactive Material under which the exception is approved;

(e) A description of the excepted material;

(f) Limiting specifications for the excepted material;

(g) A specification of the applicable management system as required in 1.7.3;

(h) Reference to information provided by the applicant relating to specific actions to be taken prior to shipment;

(i) If deemed appropriate by the competent authority, reference to the identity of the applicant;

(j) Signature and identification of the certifying official;

(k) Reference to documentation that demonstrates compliance with 2.2.7.2.3.6.

6.4.23.15 Each certificate of approval issued by a competent authority for a special arrangement shall include the following information:

(a) Type of certificate;

(b) The competent authority identification mark;

(c) The issue date and an expiry date;

(d) Mode(s) of carriage;

(e) Any restrictions on the modes of carriage, type of vehicle, container, and any necessary routeing instructions;

(f) List of applicable national and international regulations, including the edition of the IAEA Regulations for the Safe Transport of Radioactive Material under which the special arrangement is approved;

(g) The following statement:

"This certificate does not relieve the consignor from compliance with any requirement of the government of any country through or into which the package will be carried.";

(h) References to certificates for alternative radioactive contents, other competent authority validation, or additional technical data or information, as deemed appropriate by the competent authority;

(i) Description of the packaging by a reference to the drawings or a specification of the design. If deemed appropriate by the competent authority, a reproducible illustration, not larger than 21 cm by 30 cm, showing the make-up of the package shall also be provided, accompanied by a brief description of the packaging, including materials of manufacture, gross mass, general outside dimensions and appearance;

(j) A specification of the authorized radioactive contents, including any restrictions on the radioactive contents which might not be obvious from the nature of the packaging. This shall include the physical and chemical forms, the activities involved (including those of the various isotopes, if appropriate), mass in grams (for fissile material or for each fissile nuclide when appropriate), and whether special form radioactive material, low dispersible radioactive material or fissile material excepted under 2.2.7.2.3.5 (f) if applicable;

(k) Additionally, for packages containing fissile material:

(i) a detailed description of the authorized radioactive contents;

(ii) the value of the criticality safety index;

(iii) reference to the documentation that demonstrates the criticality safety of the package;

(iv) any special features, on the basis of which the absence of water from certain void spaces has been assumed in the criticality assessment;

(v) any allowance (based on 6.4.11.5 (b)) for a change in neutron multiplication assumed in the criticality assessment as a result of actual irradiation experience; and

(vi) the ambient temperature range for which the special arrangement has been approved;

(l) A detailed listing of any supplementary operational controls required for preparation, loading, carriage, unloading and handling of the consignment, including any special stowage provisions for the safe dissipation of heat;

(m) If deemed appropriate by the competent authority, reasons for the special arrangement;

(n) Description of the compensatory measures to be applied as a result of the shipment being under special arrangement;

(o) Reference to information provided by the applicant relating to the use of the packaging or specific actions to be taken prior to the shipment;

(p) A statement regarding the ambient conditions assumed for purposes of design if these are not in accordance with those specified in 6.4.8.5, 6.4.8.6, and 6.4.8.15, as applicable;

(q) Any emergency arrangements deemed necessary by the competent authority;

(r) A specification of the applicable management system as required in 1.7.3;

(s) If deemed appropriate by the competent authority, reference to the identity of the applicant and to the identity of the carrier;

(t) Signature and identification of the certifying official.

6.4.23.16 Each certificate of approval for a shipment issued by a competent authority shall include the following information:

(a) Type of certificate;

(b) The competent authority identification mark(s);

(c) The issue date and an expiry date;

(d) List of applicable national and international regulations, including the edition of the IAEA Regulations for the Safe Transport of Radioactive Material under which the shipment is approved;

(e) Any restrictions on the modes of carriage, type of vehicle, container, and any necessary routeing instructions;

(f) The following statement:

"This certificate does not relieve the consignor from compliance with any requirement of the government of any country through or into which the package will be carried.";

(g) A detailed listing of any supplementary operational controls required for preparation, loading, carriage, unloading and handling of the consignment, including any special stowage provisions for the safe dissipation of heat or maintenance of criticality safety;

(h) Reference to information provided by the applicant relating to specific actions to be taken prior to shipment;

(i) Reference to the applicable certificate(s) of approval of design;

(j) A specification of the actual radioactive contents, including any restrictions on the radioactive contents which might not be obvious from the nature of the packaging. This shall include the physical and chemical forms, the total activities involved (including those of the various isotopes, if appropriate), mass in grams (for fissile material or for each fissile nuclide when appropriate), and whether special form radioactive material, low dispersible radioactive material or fissile material excepted under 2.2.7.2.3.5 (f) if applicable;;

(k) Any emergency arrangements deemed necessary by the competent authority;

(l) A specification of the applicable management system as required in 1.7.3;

(m) If deemed appropriate by the competent authority, reference to the identity of the applicant;

(n) Signature and identification of the certifying official.

6.4.23.17 Each certificate of approval of the design of a package issued by a competent authority shall include the following information:

(a) Type of certificate;

(b) The competent authority identification mark;

(c) The issue date and an expiry date;

(d) Any restriction on the modes of carriage, if appropriate;

(e) List of applicable national and international regulations, including the edition of the IAEA Regulations for the Safe Transport of Radioactive Material under which the design is approved;

(f) The following statement;

"This certificate does not relieve the consignor from compliance with any requirement of the government of any country through or into which the package will be carried.";

(g) References to certificates for alternative radioactive contents, other competent authority validation, or additional technical data or information, as deemed appropriate by the competent authority;

(h) A statement authorizing shipment where approval of shipment is required under 5.1.5.1.2, if deemed appropriate;

(i) Identification of the packaging;

(j) Description of the packaging by a reference to the drawings or specification of the design. If deemed appropriate by the competent authority, a reproducible illustration, not larger than 21 cm by 30 cm, showing the make-up of the package shall also be provided, accompanied by a brief description of the packaging, including materials of manufacture, gross mass, general outside dimensions and appearance;

(k) Specification of the design by reference to the drawings;

(l) A specification of the authorized radioactive content, including any restrictions on the radioactive contents which might not be obvious from the nature of the packaging. This shall include the physical and chemical forms, the activities involved (including those of the various isotopes, if appropriate), mass in grams (for fissile material the total mass of fissile nuclides or the mass for each fissile nuclide, when appropriate) and whether special form radioactive material, low dispersible radioactive material or fissile material excepted under 2.2.7.2.3.5 (f), if applicable;

(m) A description of the containment system;

(n) For package designs containing fissile material which require multilateral approval of the package design in accordance with 6.4.22.4:

(i) a detailed description of the authorized radioactive contents;

(ii) a description of the confinement system;

(iii) the value of the criticality safety index;

(iv) reference to the documentation that demonstrates the criticality safety of the package;

(v) any special features, on the basis of which the absence of water from certain void spaces has been assumed in the criticality assessment;

(vi) any allowance (based on 6.4.11.5 (b)) for a change in neutron multiplication assumed in the criticality assessment as a result of actual irradiation experience; and

(vii) the ambient temperature range for which the package design has been approved;

(o) For Type B(M) packages, a statement specifying those requirements of 6.4.7.5, 6.4.8.4, 6.4.8.5, 6.4.8.6 and 6.4.8.9 to 6.4.8.15 with which the package does not conform and any amplifying information which may be useful to other competent authorities;

(p) For package designs subject to the transitional provisions in 1.6.6.2.1, a statement specifying those requirements of this Code applicable as from 1 January 2021 with which the package does not conform;

(q) For packages containing more than 0.1 kg of uranium hexafluoride, a statement specifying those prescriptions of 6.4.6.4 which apply if any and any amplifying information which may be useful to other competent authorities;

(r) A detailed listing of any supplementary operational controls required for preparation, loading, carriage, unloading and handling of the consignment, including any special stowage provisions for the safe dissipation of heat;

(s) Reference to information provided by the applicant relating to the use of the packaging or specific actions to be taken prior to shipment;

(t) A statement regarding the ambient conditions assumed for purposes of design if these are not in accordance with those specified in 6.4.8.5, 6.4.8.6 and 6.4.8.15, as applicable;

(u) A specification of the applicable management system as required in 1.7.3;

(v) Any emergency arrangements deemed necessary by the competent authority;

(w) If deemed appropriate by the competent authority, reference to the identity of the applicant;

(x) Signature and identification of the certifying official.

6.4.23.18 Each certificate issued by a competent authority for alternative activity limits for an exempt consignment of instruments or articles according to 5.1.5.2.1 (d) shall include the following information:

(a) Type of certificate;

(b) The competent authority identification mark;

(c) The issue date and an expiry date;

(d) List of applicable national and international regulations, including the edition of the IAEA Regulations for the Safe Transport of Radioactive Material under which the exemption is approved;

(e) The identification of the instrument or article;

(f) A description of the instrument or article;

(g) Design specifications for the instrument or article;

(h) A specification of the radionuclide(s), the approved alternative activity limit(s) for the exempt consignment(s) of the instrument(s) or article(s);

(i) Reference to documentation that demonstrates compliance with 2.2.7.2.2.2 (b);

(j) If deemed appropriate by the competent authority, reference to the identity of the applicant;

(k) Signature and identification of the certifying official.

6.4.23.19 The competent authority shall be informed of the serial number of each packaging manufactured to a design approved by them under 1.6.6.2.1, 1.6.6.2.2, 6.4.22.2, 6.4.22.3 and 6.4.22.4.

6.4.23.20 Multilateral approval may be by validation of the original certificate issued by the competent authority of the country of origin of the design or shipment. Such validation may take the form of an endorsement on the original certificate or the issuance of a separate endorsement, annex, supplement, etc., by the competent authority of the country through or into which the shipment is made.

CHAPTER 6.5

REQUIREMENTS FOR THE CONSTRUCTION AND TESTING OF INTERMEDIATE BULK CONTAINERS (IBCs)

6.5.1 General requirements

6.5.1.1 *Scope*

6.5.1.1.1 The requirements of this Chapter apply to intermediate bulk containers (IBCs) the use of which is expressly authorized for the carriage of certain dangerous goods according to the packing instructions indicated in Column (8) of Table A in Chapter 3.2. Portable tanks and tank-containers which meet the requirements of Chapter 6.7 or 6.8 respectively are not considered to be IBCs. IBCs which meet the requirements of this Chapter are not considered to be containers for the purposes of this Code. The letters IBC only will be used in the rest of the text to refer to intermediate bulk containers.

6.5.1.1.2 The requirements for IBCs in 6.5.3 are based on IBCs currently in use. In order to take into account progress in science and technology, there is no objection to the use of IBCs having specifications different from those in 6.5.3 and 6.5.5, provided that they are equally effective, acceptable to the competent authority and able to successfully fulfil the requirements described in 6.5.4 and 6.5.6. Methods of inspection and testing other than those described in this Code are acceptable, provided they are equivalent, and are recognized by the competent authority.

6.5.1.1.3 The construction, equipment, testing, marking and operation of IBCs shall be subject to acceptance by the competent authority of the country in which the IBCs are approved.

NOTE: *Parties performing inspections and tests in other countries, after the IBC has been put into service, need not be accepted by the competent authority of the country in which the IBC has been approved, but the inspections and tests have to be performed according to the rules specified in the IBC's approval.*

6.5.1.1.4 Manufacturers and subsequent distributors of IBCs shall provide information regarding procedures to be followed and a description of the types and dimensions of closures (including required gaskets) and any other components needed to ensure that IBCs as presented for carriage are capable of passing the applicable performance tests of this Chapter.

6.5.1.2 *(Reserved)*

6.5.1.3 *(Reserved)*

6.5.1.4 Designatory code system for IBCs

6.5.1.4.1 The code shall consist of two Arabic numerals as specified in (a), followed by a capital letter(s) specified in (b), followed, when specified in an individual section, by an Arabic numeral indicating the category of IBC.

(a)

Type	For solids, filled or discharged		For liquids
	by gravity	under pressure of more than 10 kPa (0.1 bar)	
Rigid	11	21	31
Flexible	13	-	-

(b) Materials

A. Steel (all types and surface treatments)
B. Aluminium
C. Natural wood
D. Plywood
F. Reconstituted wood
G. Fibreboard
H. Plastics material
L. Textile
M. Paper, multiwall
N. Metal (other than steel or aluminium).

6.5.1.4.2 For composite IBCs, two capital letters in Latin characters shall be used in sequence in the second position of the code. The first shall indicate the material of the inner receptacle of the IBC and the second that of the outer packaging of the IBC.

6.5.1.4.3 The following types and codes of IBC are assigned:

Material	Category	Code	Sub-section
Metal			
A. Steel	for solids, filled or discharged by gravity	11A	6.5.5.1
	for solids, filled or discharged under pressure	21A	
	for liquids	31A	
B. Aluminium	for solids, filled or discharged by gravity	11B	
	for solids, filled or discharged under pressure	21B	
	for liquids	31B	
N. Other than steel or aluminium	for solids, filled or discharged by gravity	11N	
	for solids, filled or discharged under pressure	21N	
	for liquids	31N	
Flexible			
H. Plastics	woven plastics without coating or liner	13H1	6.5.5.2
	woven plastics, coated	13H2	
	woven plastics with liner	13H3	
	woven plastics, coated and with liner	13H4	
	plastics film	13H5	
L. Textile	without coating or liner	13L1	
	coated	13L2	
	with liner	13L3	
	coated and with liner	13L4	
M. Paper	multiwall	13M1	
	multiwall, water resistant	13M2	
H. Rigid plastics	for solids, filled or discharged by gravity, fitted with structural equipment	11H1	6.5.5.3
	for solids, filled or discharged by gravity, freestanding	11H2	
	for solids, filled or discharged under pressure, fitted with structural equipment	21H1	
	for solids, filled or discharged under pressure, freestanding	21H2	
	for liquids, fitted with structural equipment	31H1	
	for liquids, freestanding	31H2	

Material	Category	Code	Sub-section
HZ. Composite with plastics inner receptacle [a]	for solids, filled or discharged by gravity, with rigid plastics inner receptacle	11HZ1	6.5.5.4
	for solids, filled or discharged by gravity, with flexible plastics inner receptacle	11HZ2	
	for solids, filled or discharged under pressure, with rigid plastics inner receptacle	21HZ1	
	for solids, filled or discharged under pressure, with flexible plastics inner receptacle	21HZ2	
	for liquids, with rigid plastics inner receptacle	31HZ1	
	for liquids, with flexible plastics inner receptacle	31HZ2	
G. Fibreboard	for solids, filled or discharged by gravity	11G	6.5.5.5
Wooden			
C. Natural wood	for solids, filled or discharged by gravity with inner liner	11C	6.5.5.6
D. Plywood	for solids, filled or discharged by gravity, with inner liner	11D	
F. Reconstituted wood	for solids, filled or discharged by gravity, with inner liner	11F	

[a] *The code shall be completed by replacing the letter Z by a capital letter in accordance with 6.5.1.4.1 (b) to indicate the nature of the material used for the outer casing.*

6.5.1.4.4 The letter "W" may follow the IBC code. The letter "W" signifies that the IBC, although of the same type indicated by the code, is manufactured to a specification different from those in 6.5.5 and is considered equivalent in accordance with the requirements in 6.5.1.1.2.

6.5.2 Marking

6.5.2.1 Primary marking

6.5.2.1.1 Each IBC manufactured and intended for use according to this Code shall bear marks which are durable, legible and placed in a location so as to be readily visible. Letters, numerals and symbols shall be at least 12 mm high and shall show:

(a) The United Nations packaging symbol  .

This symbol shall not be used for any purpose other than certifying that a packaging, a flexible bulk container, a portable tank or a MEGC complies with the relevant requirements in Chapter 6.1, 6.2, 6.3, 6.5, 6.6, 6.7 or 6.11. For metal IBCs on which the marks are stamped or embossed, the capital letters "UN" may be applied instead of the symbol;

(b) The code designating the type of IBC according to 6.5.1.4;

(c) A capital letter designating the packing group(s) for which the design type has been approved:

(i) X for packing groups I, II and III (IBCs for solids only);

(ii) Y for packing groups II and III;

(iii) Z for packing group III only;

(d) The month and year (last two digits) of manufacture;

(e) The State authorizing the allocation of the mark; indicated by the distinguishing sign used on vehicles in international road traffic[1];

(f) The name or symbol of the manufacturer and other identification of the IBC as specified by the

[1] *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*

competent authority;

(g) The stacking test load in kg. For IBCs not designed for stacking, the figure "0" shall be shown;

(h) The maximum permissible gross mass in kg.

The primary marks required above shall be applied in the sequence of the subparagraphs above. The marks required by 6.5.2.2 and any further mark authorized by a competent authority shall still enable the primary marks to be correctly identified.

Each mark applied in accordance with (a) to (h) and with 6.5.2.2 shall be clearly separated, e.g. by a slash or space, so as to be easily identifiable.

6.5.2.1.2 IBCs manufactured from recycled plastics material as defined in 1.2.1 shall be marked “REC”. For rigid IBCs this mark shall be placed near the marks prescribed in 6.5.2.1.1. For the inner receptacle of composite IBCs, this mark shall be placed near the marks prescribed in 6.5.2.2.4.

6.5.2.1.3 *Examples of marking for various types of IBC in accordance with 6.5.2.1.1 (a) to (h) above:*

 11A/Y/02 99 NL/Mulder 007 5500/1500	For a metal IBC for solids discharged by gravity and made from steel/for packing groups II and III/ manufactured in February 1999/authorized by the Netherlands/manufactured by Mulder and of a design type to which the competent authority has allocated serial number 007/the stacking test load in kg/the maximum permissible gross mass in kg.
 13H3/Z/03 01 F/Meunier 1713 0/1500	For a flexible IBC for solids discharged for instance by gravity and made from woven plastics with a liner/not designed to be stacked.
 31H1/Y/04 99 GB/9099 10800/1200	For a rigid plastics IBC for liquids made from plastics with structural equipment withstanding the stack load.
 31HA1/Y/05 01 D/Muller 1683 10800/1200	For a composite IBC for liquids with a rigid plastics inner receptacle and a steel outer casing.
 11C/X/01 02 S/Aurigny 9876 3000/910	For a wooden IBC for solids with an inner liner authorized for packing groups I, II and III solids.

6.5.2.1.4 Where an IBC conforms to one or more than one tested IBC design type, including one or more than one tested packaging or large packaging design type, the IBC may bear more than one mark to indicate the relevant performance test requirements that have been met. Where more than one mark appears on an IBC, the marks shall appear in close proximity to one another and each mark shall appear in its entirety.

6.5.2.2 Additional marking

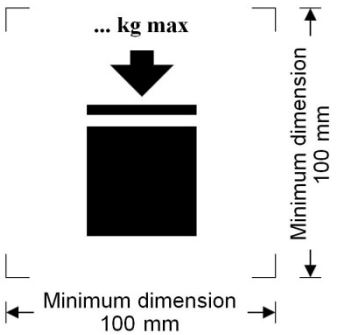
6.5.2.2.1 Each IBC shall bear the marks required in 6.5.2.1 and, in addition, the following information which may appear on a corrosion-resistant plate permanently attached in a place readily accessible for inspection:

Additional marks	Category of IBC				
	Metal	**Rigid plastics**	**Composite**	**Fibreboard**	**Wooden**
Capacity in litres [a] at 20 °C	X	X	X		
Tare mass in kg [a]	X	X	X	X	X
Test (gauge) pressure, in kPa or bar [a], if applicable		X	X		
Maximum filling / discharge pressure in kPa or bar [a] , if applicable	X	X	X		
Body material and its minimum thickness in mm	X				
Date of last leakproofness test, if applicable (month and year)	X	X	X		
Date of last inspection (month and year)	X	X	X		
Serial number of the manufacturer	X				

[a] *The unit used shall be indicated.*

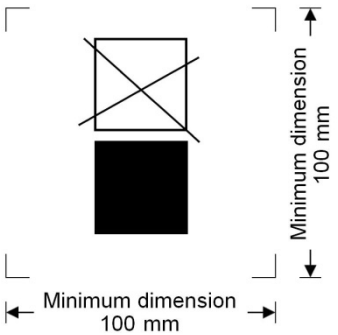
6.5.2.2.2 The maximum permitted stacking load applicable shall be displayed on a symbol as shown in Figure 6.5.2.2.2.1 or Figure 6.5.2.2.2.2. The symbol shall be durable and clearly visible.

Figure 6.5.2.2.2.1



IBCs capable of being stacked

Figure 6.5.2.2.2.2



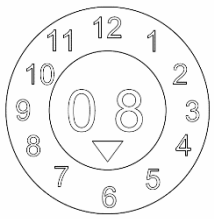
IBCs NOT capable of being stacked

The minimum dimensions shall be 100 mm × 100 mm. The letters and numbers indicating the mass shall be at least 12 mm high. The area within the printer's marks indicated by the dimensional arrows shall be square. Where dimensions are not specified, all features shall be in approximate proportion to those shown. The mass marked above the symbol shall not exceed the load imposed during the design type test (see 6.5.6.6.4) divided by 1.8.

6.5.2.2.3 In addition to the marks required in 6.5.2.1, flexible IBCs may bear a pictogram indicating recommended lifting methods.

6.5.2.2.4 Inner receptacles that are of composite IBC design type shall be identified by the application of the marks indicated in 6.5.2.1.1 (b), (c), (d) where this date is that of the manufacture of the plastics inner receptacle, (e) and (f). The UN packaging symbol shall not be applied. The marks shall be applied in the sequence shown in 6.5.2.1.1. They shall be durable, legible and placed in a location so as to be readily accessible for inspection after assembling the inner receptacle in the outer casing. When the marks on the inner receptacle are not readily accessible for inspection due to the design of the outer casing, a duplicate of the required marks on the inner receptacle shall be placed on the outer casing preceded by the wording "Inner receptacle". This duplicate shall be durable, legible and placed in a location so as to be readily accessible for inspection.

The date of the manufacture of the plastics inner receptacle may alternatively be marked on the inner receptacle adjacent to the remainder of the marks. In such a case, the date may be waived from the remainder of the marks. An example of an appropriate marking method is:



NOTE 1: *Other methods that provide the minimum required information in a durable, visible and legible form are also acceptable.*

NOTE 2: *The date of manufacture of the inner receptacle may be different from the marked date of manufacture (see 6.5.2.1), repair (see 6.5.4.5.3) or remanufacture (see 6.5.2.4) of the composite IBC.*

6.5.2.2.5 Where a composite IBCs is designed in such a manner that the outer casing is intended to be dismantled for carriage when empty (such as for return of the IBC for reuse to the original consignor), each of the parts intended to be detached when so dismantled shall be marked with the month and year of manufacture and the name or symbol of the manufacturer and other identification of the IBC as specified by the competent authority (see 6.5.2.1.1 (f)).

6.5.2.3 Conformity to design type

The marks indicate that IBCs correspond to a successfully tested design type and that the requirements referred to in the certificate have been met.

6.5.2.4 Marking of remanufactured composite IBCs (31HZ1)

The marks specified in 6.5.2.1.1 and 6.5.2.2 shall be removed from the original IBC or made permanently illegible and new marks shall be applied to an IBC remanufactured in accordance with this Code.

6.5.3 Construction requirements

6.5.3.1 General requirements

6.5.3.1.1 IBCs shall be resistant to or adequately protected from deterioration due to the external environment.

6.5.3.1.2 IBCs shall be so constructed and closed that none of the contents can escape under normal conditions of carriage including the effect of vibration, or by changes in temperature, humidity or pressure.

6.5.3.1.3 IBCs and their closures shall be constructed of materials compatible with their contents, or be protected internally, so that they are not liable:

(a) To be attacked by the contents so as to make their use dangerous;

(b) To cause the contents to react or decompose, or form harmful or dangerous compounds with the IBCs.

6.5.3.1.4 Gaskets, where used, shall be made of materials not subject to attack by the contents of the IBCs.

6.5.3.1.5 All service equipment shall be so positioned or protected as to minimize the risk of escape of the contents owing to damage during handling and carriage.

6.5.3.1.6 IBCs, their attachments and their service and structural equipment shall be designed to withstand, without loss of contents, the internal pressure of the contents and the stresses of normal handling and carriage. IBCs intended for stacking shall be designed for stacking. Any lifting or securing features of IBCs shall be of sufficient strength to withstand the normal conditions of handling and carriage without gross distortion or failure and shall be so positioned that no undue stress is caused in any part of the IBC.

6.5.3.1.7 Where an IBC consists of a body within a framework it shall be so constructed that:

(a) The body does not chafe or rub against the framework so as to cause material damage to the body;

(b) The body is retained within the framework at all times;

(c) The items of equipment are fixed in such a way that they cannot be damaged if the connections between body and frame allow relative expansion or movement.

6.5.3.1.8 Where a bottom discharge valve is fitted, it shall be capable of being made secure in the closed position and the whole discharge system shall be suitably protected from damage. Valves having lever closures shall be able to be secured against accidental opening and the open or closed position shall be readily apparent. For IBCs containing liquids, a secondary means of sealing the discharge aperture shall also be provided, e.g. a blank flange or equivalent device.

6.5.4 Testing, certification and inspection

6.5.4.1 *Quality assurance*: the IBCs shall be manufactured, remanufactured, repaired and tested under a quality assurance programme which satisfies the competent authority, in order to ensure that each manufactured, remanufactured or repaired IBC meets the requirements of this Chapter.

NOTE: *ISO 16106:2020 "Transport packages for dangerous goods – Dangerous goods packagings, intermediate bulk containers (IBCs) and large packagings – Guidelines for the application of ISO 9001" provides acceptable guidance on procedures which may be followed.*

6.5.4.2 *Test requirements:* IBCs shall be subject to design type tests and, if applicable, to initial and periodic inspections and tests in accordance with 6.5.4.4.

6.5.4.3 *Certification*: in respect of each design type of IBC a certificate and mark (as in 6.5.2) shall be issued attesting that the design type, including its equipment, meets the test requirements.

6.5.4.4 Inspection and testing

NOTE: *See also 6.5.4.5 for tests and inspections on repaired IBCs.*

6.5.4.4.1 Every metal, rigid plastics and composite IBC shall be inspected to the satisfaction of the competent authority:

(a) Before it is put into service (including after remanufactured), and thereafter at intervals not exceeding five years, with regard to:

(i) conformity to design type including marks;

(ii) internal and external condition;

(iii) proper functioning of service equipment.

Thermal insulation, if any, need be removed only to the extent necessary for a proper examination of the body of the IBC.

(b) At intervals of not more than two and a half years, with regard to:

(i) external condition;

(ii) proper functioning of service equipment.

Thermal insulation, if any, need be removed only to the extent necessary for a proper examination of the body of the IBC.

Each IBC shall correspond in all respects to its design type.

6.5.4.4.2 Every metal, rigid plastics and composite IBC for liquids, or for solids which are filled or discharged under pressure, shall undergo a suitable leakproofness test. This test is part of a quality assurance programme as stipulated in 6.5.4.1 which shows the capability of meeting the appropriate test level indicated in 6.5.6.7.3:

(a) Before it is first used for carriage;

(b) At intervals of not more than two and a half years.

For this test the IBC shall be fitted with the primary bottom closure. The inner receptacle of a composite IBC may be tested without the outer casing, provided that the test results are not affected.

6.5.4.4.3 A report of each inspection and test shall be kept by the owner of the IBC at least until the next inspection or test. The report shall include the results of the inspection and test and shall identify the party performing the inspection and test (see also the marking requirements in 6.5.2.2.1).

6.5.4.4.4 The competent authority may at any time require proof, by tests in accordance with this Chapter, that IBCs meet the requirements of the design type tests.

6.5.4.5 Repaired IBCs

6.5.4.5.1 When an IBC is impaired as a result of impact (e.g. accident) or any other cause, it shall be repaired or otherwise maintained (see definition of *"Routine maintenance of IBCs"* in 1.2.1), so as to conform to the design type. The bodies of rigid plastics IBCs and the inner receptacles of composite IBCs that are impaired shall be replaced.

6.5.4.5.2 In addition to any other testing and inspection requirements in this Code, an IBC shall be subjected to the full testing and inspection requirements set out in 6.5.4.4, and the required reports shall be prepared, whenever it is repaired.

6.5.4.5.3 The Party performing the tests and inspections after the repair shall durably mark the IBC near the manufacturer's UN design type marks to show:

(a) The State in which the tests and inspections were carried out;

(b) The name or authorized symbol of the party performing the tests and inspections; and

(c) The date (month, year) of the tests and inspections.

6.5.4.5.4 Test and inspections performed in accordance with 6.5.4.5.2 may be considered to satisfy the requirements for the two and a half and five year periodic tests and inspections.

6.5.5 Specific requirements for IBCs

6.5.5.1 Specific requirements for metal IBCs

6.5.5.1.1 These requirements apply to metal IBCs intended for the carriage of solids and liquids. There are three categories of metal IBCs:

(a) Those for solids which are filled or discharged by gravity (11A, 11B, 11N);

(b) Those for solids which are filled or discharged at a gauge pressure greater than 10 kPa (0.1 bar) (21A, 21B, 21N); and

(c) Those for liquids (31A, 31B, 31N).

6.5.5.1.2 Bodies shall be made of suitable ductile metal in which the weldability has been fully demonstrated. Welds shall be skilfully made and afford complete safety. Low-temperature performance of the material shall be taken into account when appropriate.

6.5.5.1.3 Care shall be taken to avoid damage by galvanic action due to the juxtaposition of dissimilar metals.

6.5.5.1.4 Aluminium IBCs intended for the carriage of flammable liquids shall have no movable parts, such as covers, closures, etc., made of unprotected steel liable to rust, which might cause a dangerous reaction by coming into frictional or percussive contact with the aluminium.

6.5.5.1.5 Metal IBCs shall be made of metals which meet the following requirements:

(a) for steel the elongation at fracture, in %, shall not be less than $\frac{10000}{Rm}$ with an absolute minimum of 20 %;

where Rm = guaranteed minimum tensile strength of the steel to be used, in N/mm²;

(b) for aluminium and its alloy the elongation at fracture, in %, shall not be less than $\frac{10000}{6Rm}$ with an absolute minimum of 8 %.

Specimens used to determine the elongation at fracture shall be taken transversely to the direction of rolling and be so secured that:

$L_o = 5d$ or

$L_o = 5.65\sqrt{A}$

where: L_o = gauge length of the specimen before the test

d = diameter

A = cross-sectional area of test specimen.

6.5.5.1.6 *Minimum wall thickness:*

Metal IBCs with a capacity of more than 1500 *l* shall comply with the following minimum wall thickness requirement:

(a) for a reference steel having a product of $Rm \times A_o = 10\,000$, the wall thickness shall not be less than:

Wall thickness (T) in mm			
Types 11A, 11B, 11N		**Types 21A, 21B, 21N, 31A, 31B, 31N**	
Unprotected	**Protected**	**Unprotected**	**Protected**
T = C/2000 + 1.5	T = C/2000 + 1.0	T = C/1000 + 1.0	T = C/2000 + 1.5

where: A_o = minimum elongation (as a percentage) of the reference steel to be used on fracture under tensile stress (see 6.5.5.1.5);

C = capacity in litres;

(b) for metals other than the reference steel described in (a), the minimum wall thickness is given by the following equivalence formula:

$$e_1 = \frac{21.4 \times e_0}{\sqrt[3]{Rm_1 \times A_1}}$$

where: e_1 = required equivalent wall thickness of the metal to be used (in mm);

e_0 = required minimum wall thickness for the reference steel (in mm);

Rm_1 = guaranteed minimum tensile strength of the metal to be used (in N/mm²) (see (c));

A_1 = minimum elongation (as a percentage) of the metal to be used on fracture under tensile stress (see 6.5.5.1.5).

However, in no case shall the wall thickness be less than 1.5 mm.

(c) For purposes of the calculation described in (b), the guaranteed minimum tensile strength of the metal to be used (Rm_1) shall be the minimum value according to national or international material standards. However, for austenitic steels, the specified value for Rm according to the material standards may be increased by up to 15 % when a greater value is attested in the material inspection certificate. When no material standard exists for the material in question, the value of Rm shall be the minimum value attested in the material inspection certificate.

6.5.5.1.7 Pressure-relief requirements: IBCs for liquids shall be capable of releasing a sufficient amount of vapour in the event of fire engulfment to ensure that no rupture of the body will occur. This can be achieved by conventional pressure relief devices or by other constructional means. The start-to-discharge pressure shall not be higher than 65 kPa (0.65 bar) and no lower than the total gauge pressure experienced in the IBC (i.e. the vapour pressure of the filling substance plus the partial pressure of the air or other inert gases, minus 100 kPa (1 bar)) at 55 °C, determined on the basis of a maximum degree of filling as defined in 4.1.1.4. The required relief devices shall be fitted in the vapour space.

6.5.5.2 Specific requirements for flexible IBCs

6.5.5.2.1 These requirements apply to flexible IBCs of the following types:

13H1	woven plastics without coating or liner
13H2	woven plastics, coated
13H3	woven plastics with liner
13H4	woven plastics, coated and with liner
13H5	plastics film
13L1	textile without coating or liner
13L2	textile, coated
13L3	textile with liner
13L4	textile, coated and with liner
13M1	paper, multiwall
13M2	paper, multiwall, water resistant

Flexible IBCs are intended for the carriage of solids only.

6.5.5.2.2 Bodies shall be manufactured from suitable materials. The strength of the material and the construction of the flexible IBC shall be appropriate to its capacity and its intended use.

6.5.5.2.3 All materials used in the construction of flexible IBCs of types 13M1 and 13M2 shall, after complete immersion in water for not less than 24 hours, retain at least 85 % of the tensile strength as measured originally on the material conditioned to equilibrium at 67 % relative humidity or less.

6.5.5.2.4 Seams shall be formed by stitching, heat sealing, gluing or any equivalent method. All stitched seam-ends shall be secured.

6.5.5.2.5 Flexible IBCs shall provide adequate resistance to ageing and to degradation caused by ultraviolet radiation or the climatic conditions, or by the substance contained, thereby rendering them appropriate to their intended use.

6.5.5.2.6 For flexible plastics IBCs where protection against ultraviolet radiation is required, it shall be provided by the addition of carbon black or other suitable pigments or inhibitors. These additives shall be compatible with the contents and remain effective throughout the life of the body. Where use is made of carbon black, pigments or inhibitors other than those used in the manufacture of the tested design type, re-testing may be waived if changes in the carbon black content, the pigment content or the inhibitor content do not adversely affect the physical properties of the material of construction.

6.5.5.2.7 Additives may be incorporated into the material of the body to improve the resistance to ageing or to serve other purposes, provided that these do not adversely affect the physical or chemical properties of the material.

6.5.5.2.8 No material recovered from used receptacles shall be used in the manufacture of IBC bodies. Production residues or scrap from the same manufacturing process may, however, be used. Component parts such as fittings and pallet bases may also be used provided such components have not in any way been damaged in previous use.

6.5.5.2.9 When filled, the ratio of height to width shall be not more than 2:1.

6.5.5.2.10 The liner shall be made of a suitable material. The strength of the material used and the construction of the liner shall be appropriate to the capacity of the IBC and the intended use. Joins and closures shall be siftproof and capable of withstanding pressures and impacts liable to occur under normal conditions of handling and carriage.

6.5.5.3 Specific requirements for rigid plastics IBCs

6.5.5.3.1 These requirements apply to rigid plastics IBCs for the carriage of solids or liquids. Rigid plastics IBCs are of the following types:

11H1	fitted with structural equipment designed to withstand the whole load when IBCs are stacked, for solids which are filled or discharged by gravity
11H2	freestanding, for solids which are filled or discharged by gravity
21H1	fitted with structural equipment designed to withstand the whole load when IBCs are stacked, for solids which are filled or discharged under pressure
21H2	freestanding, for solids which are filled or discharged under pressure
31H1	fitted with structural equipment designed to withstand the whole load when IBCs are stacked, for liquids
31H2	freestanding, for liquids.

6.5.5.3.2 The body shall be manufactured from suitable plastics material of known specifications and be of adequate strength in relation to its capacity and its intended use. Except for recycled plastics material as defined in 1.2.1, no used material other than production residues or regrind from the same manufacturing process may be used. The material shall be adequately resistant to ageing and to degradation caused by the substance contained or, where relevant, by ultraviolet radiation. Low temperature performance shall be taken into account when appropriate. Any permeation of the substance contained shall not constitute a danger under normal conditions of carriage.

6.5.5.3.3 Where protection against ultraviolet radiation is required, it shall be provided by the addition of carbon black or other suitable pigments or inhibitors. These additives shall be compatible with the contents and remain effective throughout the life of the body. Where use is made of carbon black, pigments or inhibitors other than those used in the manufacture of the tested design type, re-testing may be waived if changes in the carbon black content, the pigment content or the inhibitor content do not adversely affect the physical properties of the material of construction.

6.5.5.3.4 Additives may be incorporated in the material of the body to improve the resistance to ageing or to serve other purposes, provided that these do not adversely affect the physical or chemical properties of the material.

6.5.5.4 Specific requirements for composite IBCs with plastics inner receptacles

6.5.5.4.1 These requirements apply to composite IBCs for the carriage of solids and liquids of the following types:

11HZ1	Composite IBCs with a rigid plastics inner receptacle, for solids filled or discharged by gravity
11HZ2	Composite IBCs with a flexible plastics inner receptacle, for solids filled or discharged by gravity
21HZ1	Composite IBCs with a rigid plastics inner receptacle, for solids filled or discharged under pressure
21HZ2	Composite IBCs with a flexible plastics inner receptacle, for solids filled or discharged under pressure
31HZ1	Composite IBCs with a rigid plastics inner receptacle, for liquids
31HZ2	Composite IBCs with a flexible plastics inner receptacle, for liquids.

This code shall be completed by replacing the letter Z by a capital letter in accordance with 6.5.1.4.1 (b) to indicate the nature of the material used for the outer casing.

6.5.5.4.2 The inner receptacle is not intended to perform a containment function without its outer casing. A "rigid" inner receptacle is a receptacle which retains its general shape when empty without closures in place and without benefit of the outer casing. Any inner receptacle that is not "rigid" is considered to be "flexible".

6.5.5.4.3 The outer casing normally consists of rigid material formed so as to protect the inner receptacle from physical damage during handling and carriage but is not intended to perform the containment function. It includes the base pallet where appropriate.

6.5.5.4.4 A composite IBC with a fully enclosing outer casing shall be so designed that the integrity of the inner receptacle may be readily assessed following the leakproofness and hydraulic pressure tests.

6.5.5.4.5 IBCs of type 31HZ2 shall be limited to a capacity of not more than 1 250 litres.

6.5.5.4.6 The inner receptacle shall be manufactured from suitable plastics material of known specifications and be of adequate strength in relation to its capacity and its intended use. Except for recycled plastics material as defined in 1.2.1, no used material other than production residues or regrind from the same manufacturing process may be used. The material shall be adequately resistant to ageing and to degradation caused by the substance contained or, where relevant, by ultraviolet radiation. Low temperature performance shall be taken into account when appropriate. Any permeation of the substance contained shall not constitute a danger under normal conditions of carriage.

6.5.5.4.7 Where protection against ultraviolet radiation is required, it shall be provided by the addition of carbon black or other suitable pigments or inhibitors. These additives shall be compatible with the contents and remain effective throughout the life of the inner receptacle. Where use is made of carbon black, pigments or inhibitors, other than those used in the manufacture of the tested design type, retesting may be waived if changes in carbon black content, the pigment content or the inhibitor content do not adversely affect the physical properties of the material of construction.

6.5.5.4.8 Additives may be incorporated in the material of the inner receptacle to improve the resistance to ageing or to serve other purposes, provided that these do not adversely affect the physical or chemical properties of the material.

6.5.5.4.9 The inner receptacle of IBCs type 31HZ2 shall consist of at least three plies of film.

6.5.5.4.10 The strength of the material and the construction of the outer casing shall be appropriate to the capacity of the composite IBC and its intended use.

6.5.5.4.11 The outer casing shall be free of any projection that might damage the inner receptacle.

6.5.5.4.12 Metal outer casings shall be constructed of a suitable metal of adequate thickness.

6.5.5.4.13 Outer casings of natural wood shall be of well seasoned wood, commercially dry and free from defects that would materially lessen the strength of any part of the casing. The tops and bottoms may be made of water resistant reconstituted wood such as hardboard, particle board or other suitable type.

6.5.5.4.14 Outer casings of plywood shall be made of well seasoned rotary cut, sliced or sawn veneer, commercially dry and free from defects that would materially lessen the strength of the casing. All adjacent plies shall be glued with water resistant adhesive. Other suitable materials may be used with plywood for the construction of casings. Casings shall be firmly nailed or secured to corner posts or ends or be assembled by equally suitable devices.

6.5.5.4.15 The walls of outer casings of reconstituted wood shall be made of water resistant reconstituted wood such as hardboard, particle board or other suitable type. Other parts of the casings may be made of other suitable material.

6.5.5.4.16 For fibreboard outer casings, strong and good quality solid or double-faced corrugated fibreboard (single or multiwall) shall be used appropriate to the capacity of the casing and to its intended use. The water resistance of the outer surface shall be such that the increase in mass, as determined in a test carried out over 30 minutes by the Cobb method of determining water absorption, is not greater than 155 g/m² (see ISO 535:2014). It shall have proper bending qualities. Fibreboard shall be cut, creased without scoring, and slotted so as to permit assembly without cracking, surface breaks or undue bending. The fluting of corrugated fibreboard shall be firmly glued to the facings.

6.5.5.4.17 The ends of fibreboard outer casings may have a wooden frame or be entirely of wood. Reinforcements of wooden battens may be used.

6.5.5.4.18 Manufacturing joins in the fibreboard outer casing shall be taped, lapped and glued, or lapped and stitched with metal staples. Lapped joins shall have an appropriate overlap. Where closing is effected by gluing or taping, a water resistant adhesive shall be used.

6.5.5.4.19 Where the outer casing is of plastics material, the relevant requirements of 6.5.5.4.6 to 6.5.5.4.8 apply, on the understanding that, in this case, the requirements applicable to the inner receptacle are applicable to the outer casing of composite IBCs.

6.5.5.4.20 The outer casing of an IBC type 31HZ2 shall enclose the inner receptacle on all sides.

6.5.5.4.21 Any integral pallet base forming part of an IBC or any detachable pallet shall be suitable for mechanical handling with the IBC filled to its maximum permissible gross mass.

6.5.5.4.22 The pallet or integral base shall be designed so as to avoid any protrusion of the base of the IBC that might be liable to damage in handling.

6.5.5.4.23 The outer casing shall be secured to any detachable pallet to ensure stability in handling and carriage. Where a detachable pallet is used, its top surface shall be free from sharp protrusions that might damage the IBC.

6.5.5.4.24 Strengthening devices such as timber supports to increase stacking performance may be used but shall be external to the inner receptacle.

6.5.5.4.25 Where IBCs are intended for stacking, the bearing surface shall be such as to distribute the load in a safe manner. Such IBCs shall be designed so that the load is not supported by the inner receptacle.

6.5.5.5 Specific requirements for fibreboard IBCs

6.5.5.5.1 These requirements apply to fibreboard IBCs for the carriage of solids which are filled or discharged by gravity. Fibreboard IBCs are of the following type: 11G.

6.5.5.5.2 Fibreboard IBCs shall not incorporate top lifting devices.

6.5.5.5.3 The body shall be made of strong and good quality solid or double-faced corrugated fibreboard (single or multiwall), appropriate to the capacity of the IBC and to its intended use. The water resistance of the outer surface shall be such that the increase in mass, as determined in a test carried out over a period of 30 minutes by the Cobb method of determining water absorption, is not greater than 155 g/m² (see ISO 535:2014). It shall have proper bending qualities. Fibreboard shall be cut, creased without scoring, and slotted so as to permit assembly without cracking, surface breaks or undue bending. The fluting or corrugated fibreboard shall be firmly glued to the facings.

6.5.5.5.4 The walls, including top and bottom, shall have a minimum puncture resistance of 15 J measured according to ISO 3036:1975.

6.5.5.5.5 Manufacturing joins in the body of IBCs shall be made with an appropriate overlap and shall be taped, glued, stitched with metal staples or fastened by other means at least equally effective. Where joins are effected by gluing or taping, a water resistant adhesive shall be used. Metal staples shall pass completely through all pieces to be fastened and be formed or protected so that any inner liner cannot be abraded or punctured by them.

6.5.5.5.6 The liner shall be made of a suitable material. The strength of the material used and the construction of the liner shall be appropriate to the capacity of the IBC and the intended use. Joins and closures shall be siftproof and capable of withstanding pressures and impacts liable to occur under normal conditions of handling and carriage.

6.5.5.5.7 Any integral pallet base forming part of an IBC or any detachable pallet shall be suitable for mechanical handling with the IBC filled to its maximum permissible gross mass.

6.5.5.5.8 The pallet or integral base shall be designed so as to avoid any protrusion of the base of the IBC that might be liable to damage in handling.

6.5.5.5.9 The body shall be secured to any detachable pallet to ensure stability in handling and carriage. Where a detachable pallet is used, its top surface shall be free from sharp protrusions that might damage the IBC.

6.5.5.5.10 Strengthening devices such as timber supports to increase stacking performance may be used but shall be external to the liner.

6.5.5.5.11 Where IBCs are intended for stacking, the bearing surface shall be such as to distribute the load in a safe manner.

6.5.5.6 Specific requirements for wooden IBCs

6.5.5.6.1 These requirements apply to wooden IBCs for the carriage of solids which are filled or discharged by gravity. Wooden IBCs are of the following types:

11C Natural wood with inner liner
11D Plywood with inner liner
11F Reconstituted wood with inner liner.

6.5.5.6.2 Wooden IBCs shall not incorporate top lifting devices.

6.5.5.6.3 The strength of the materials used and the method of construction of the body shall be appropriate to the capacity and intended use of the IBC.

6.5.5.6.4 Natural wood shall be well seasoned, commercially dry and free from defects that would materially lessen the strength of any part of the IBC. Each part of the IBC shall consist of one piece or be equivalent thereto. Parts are considered equivalent to one piece when a suitable method of glued assembly is used (as for instance Lindermann joint, tongue and groove joint, ship lap or rabbet joint); or butt joint with at least two corrugated metal fasteners at each joint, or when other methods at least equally effective are used.

6.5.5.6.5 Bodies of plywood shall be at least 3-ply. They shall be made of well seasoned rotary cut, sliced or sawn veneer, commercially dry and free from defects that would materially lessen the strength of the body. All adjacent plies shall be glued with water resistant adhesive. Other suitable materials may be used with plywood for the construction of the body.

6.5.5.6.6 Bodies of reconstituted wood shall be made of water resistant reconstituted wood such as hardboard, particle board or other suitable type.

6.5.5.6.7 IBCs shall be firmly nailed or secured to corner posts or ends or be assembled by equally suitable devices.

6.5.5.6.8 The liner shall be made of a suitable material. The strength of the material used and the construction of the liner shall be appropriate to the capacity of the IBC and the intended use. Joins and closures shall be siftproof and capable of withstanding pressures and impacts liable to occur under normal conditions of handling and carriage.

6.5.5.6.9 Any integral pallet base forming part of an IBC or any detachable pallet shall be suitable for mechanical handling with the IBC filled to its maximum permissible gross mass.

6.5.5.6.10 The pallet or integral base shall be designed so as to avoid any protrusion of the base of the IBC that might be liable to damage in handling.

6.5.5.6.11 The body shall be secured to any detachable pallet to ensure stability in handling and carriage. Where a detachable pallet is used, its top surface shall be free from sharp protrusions that might damage the IBC.

6.5.5.6.12 Strengthening devices such as timber supports to increase stacking performance may be used but shall be external to the liner.

6.5.5.6.13 Where IBCs are intended for stacking, the bearing surface shall be such as to distribute the load in a safe manner.

6.5.6 Test requirements for IBCs

6.5.6.1 Performance and frequency of tests

6.5.6.1.1 Each IBC design type shall successfully pass the tests prescribed in this Chapter before being used and being approved by the competent authority allowing the allocation of the mark. An IBC design type is defined by the design, size, material and thickness, manner of construction and means of filling and discharging but may include various surface treatments. It also includes IBCs which differ from the design type only in their lesser external dimensions.

6.5.6.1.2 Tests shall be carried out on IBCs prepared for carriage. IBCs shall be filled as indicated in the relevant sections. The substances to be carried in the IBCs may be replaced by other substances except where this would invalidate the results of the tests. For solids, when another substance is used it shall have the same physical characteristics (mass, grain size, etc.) as the substance to be carried. It is permissible to use additives, such as bags of lead shot, to achieve the requisite total package mass, so long as they are placed so that the test results are not affected.

6.5.6.2 Design type tests

6.5.6.2.1 One IBC of each design type, size, wall thickness and manner of construction shall be submitted to the tests listed in the order shown in 6.5.6.3.7 and as set out in 6.5.6.4 to 6.5.6.13. These design type tests shall be carried out as required by the competent authority.

6.5.6.2.2 To prove sufficient chemical compatibility with the contained goods or standard liquids in accordance with 6.5.6.3.3 or 6.5.6.3.5 for rigid plastics IBCs of type 31H2 and for composite IBCs of types 31HH1 and 31HH2, a second IBC can be used when the IBCs are designed to be stacked. In such case both IBCs shall be subjected to a preliminary storage.

6.5.6.2.3 The competent authority may permit the selective testing of IBCs which differ only in minor respects from a tested type, e.g. with small reductions in external dimensions.

6.5.6.2.4 If detachable pallets are used in the tests, the test report issued in accordance with 6.5.6.14 shall include a technical description of the pallets used.

6.5.6.3 Preparation of IBCs for testing

6.5.6.3.1 Paper and fibreboard IBCs and composite IBCs with fibreboard outer casings shall be conditioned for at least 24 hours in an atmosphere having a controlled temperature and relative humidity (r.h.). There are three options, one of which shall be chosen. The preferred atmosphere is 23 ± 2 °C and 50 % ± 2 % r.h. The two other options are 20 ± 2 °C and 65 % ± 2 % r.h.; or 27 ± 2 °C and 65 % ± 2 % r.h.

NOTE: *Average values shall fall within these limits. Short-term fluctuations and measurement limitations may cause individual measurements to vary by up to ± 5 % relative humidity without significant impairment of test reproducibility.*

6.5.6.3.2 Additional steps shall be taken to ascertain that the plastics material used in the manufacture of rigid plastics IBCs (types 31H1 and 31H2) and composite IBCs (types 31HZ1 and 31HZ2) complies respectively with the requirements in 6.5.5.3.2 to 6.5.5.3.4 and 6.5.5.4.6 to 6.5.5.4.8.

6.5.6.3.3 To prove there is sufficient chemical compatibility with the contained goods, the sample IBC shall be subjected to a preliminary storage for six months, during which the samples shall remain filled with the substances they are intended to contain or with substances which are known to have at least as severe a stress-cracking, weakening or molecular degradation influence on the plastics materials in question, and after which the samples shall be submitted to the applicable tests listed in the table in 6.5.6.3.7.

6.5.6.3.4 Where the satisfactory behaviour of the plastics material has been established by other means, the above compatibility test may be dispensed with. Such procedures shall be at least equivalent to the above compatibility test and recognized by the competent authority.

6.5.6.3.5 For polyethylene rigid plastics IBCs (types 31H1 and 31H2) in accordance with 6.5.5.3 and composite IBCs with polyethylene inner receptacle (types 31HZ1 and 31HZ2) in accordance with 6.5.5.4, chemical compatibility with filling liquids assimilated in accordance with 4.1.1.21 may be verified as follows with standard liquids (see 6.1.6).

The standard liquids are representative for the processes of deterioration on polyethylene, as there are softening through swelling, cracking under stress, molecular degradation and combinations thereof.

The sufficient chemical compatibility of the IBCs may be verified by storage of the required test samples for three weeks at 40 °C with the appropriate standard liquid(s); where this standard liquid is water, storage in accordance with this procedure is not required. Storage is not required either for test samples which are used for the stacking test in case of the standard liquids wetting solution and acetic acid. After this storage, the test samples shall undergo the tests prescribed in 6.5.6.4 to 6.5.6.9.

The compatibility test for tert-Butyl hydroperoxide with more than 40 % peroxide content and peroxyacetic acids of Class 5.2 shall not be carried out using standard liquids. For these substances, sufficient chemical compatibility of the test samples shall be verified during a storage period of six months at ambient temperature with the substances they are intended to carry.

Results of the procedure in accordance with this paragraph from polyethylene IBCs can be approved for an equal design type, the internal surface of which is fluorinated.

6.5.6.3.6 For IBC design types, made of polyethylene, as specified in 6.5.6.3.5, which have passed the test in 6.5.6.3.5, the chemical compatibility with filling substances may also be verified by laboratory tests proving that the effect of such filling substances on the test specimens is less than that of the appropriate standard liquid(s) taking into account the relevant processes of deterioration. The same conditions as those set out in 4.1.1.21.2 shall apply with respect to relative density and vapour pressure.

6.5.6.3.7 *Design type tests required and sequential order*

Type of IBC	Vibration [f]	Bottom lift	Top lift [a]	Stacking [b]	Leak-proofness	Hydraulic pressure	Drop	Tear	Topple	Righting [c]
Metal:										
11A, 11B, 11N	-	1st [a]	2nd	3rd	-	-	4th [e]	-	-	-
21A, 21B, 21N	-	1st [a]	2nd	3rd	4th	5th	6th [e]	-	-	-
31A, 31B, 31N	1st	2nd [a]	3rd	4th	5th	6th	7th [e]	-	-	-
Flexible [d]	-	-	x [c]	x	-	-	x	x	x	x
Rigid plastics:										
11H1, 11H2	-	1st [a]	2nd	3rd	-	-	4th	-	-	-
21H1, 21H2	-	1st [a]	2nd	3rd	4th	5th	6th	-	-	-
31H1, 31H2	1st	2nd [a]	3rd	4th [g]	5th	6th	7th	-	-	-
Composite:										
11HZ1, 11HZ2	-	1st [a]	2nd	3rd	-	-	4th [e]	-	-	-
21HZ1, 21HZ2	-	1st [a]	2nd	3rd	4th	5th	6th [e]	-	-	-
31HZ1, 31HZ2	1st	2nd [a]	3rd	4th [g]	5th	6th	7th [e]	-	-	-
Fibreboard	-	1st	-	2nd	-	-	3rd	-	-	-
Wooden	-	1st	-	2nd	-	-	3rd	-	-	-

[a] *When IBCs are designed for this method of handling.*

[b] *When IBCs are designed to be stacked.*

[c] *When IBCs are designed to be lifted from the top or the side.*

[d] *Required test indicated by x; an IBC which has passed one test may be used for other tests, in any order.*

[e] *Another IBC of the same design may be used for the drop test.*

[f] *Another IBC of the same design may be used for the vibration test.*

[g] *The second IBC in accordance with 6.5.6.2.2 can be used out of the sequential order direct after the preliminary storage.*

6.5.6.4 Bottom lift test

6.5.6.4.1 *Applicability*

For all fibreboard and wooden IBCs, and for all types of IBC which are fitted with means of lifting from the base, as a design type test.

6.5.6.4.2 *Preparation of the IBC for test*

The IBC shall be filled. A load shall be added and evenly distributed. The mass of the filled IBC and the load shall be 1.25 times the maximum permissible gross mass.

6.5.6.4.3 *Method of testing*

The IBC shall be raised and lowered twice by a lift truck with the forks centrally positioned and spaced at three quarters of the dimension of the side of entry (unless the points of entry are fixed). The forks shall penetrate to three quarters of the direction of entry. The test shall be repeated from each possible direction of entry.

6.5.6.4.4 *Criteria for passing the test*

No permanent deformation which renders the IBC, including the base pallet, if any, unsafe for carriage and no loss of contents.

6.5.6.5 Top lift test

6.5.6.5.1 *Applicability*

For all types of IBC which are designed to be lifted from the top and for flexible IBCs designed to be lifted from the top or the side, as a design type test.

6.5.6.5.2 *Preparation of the IBC for test*

Metal, rigid plastics and composite IBCs shall be filled. A load shall be added and evenly distributed. The mass of the filled IBC and the load shall be twice the maximum permissible gross mass. Flexible IBCs shall be filled with a representative material and then shall be loaded to six times their maximum permissible gross mass, the load being evenly distributed.

6.5.6.5.3 *Methods of testing*

Metal and flexible IBCs shall be lifted in the manner for which they are designed until clear of the floor and maintained in that position for a period of five minutes.

Rigid plastics and composite IBCs shall be lifted:

(a) by each pair of diagonally opposite lifting devices, so that the hoisting forces are applied vertically, for a period of five minutes; and

(b) by each pair of diagonally opposite lifting devices, so that the hoisting forces are applied toward the centre at 45º to the vertical, for a period of five minutes.

6.5.6.5.4 Other methods of top lift testing and preparation at least equally effective may be used for flexible IBCs.

6.5.6.5.5 *Criteria for passing the test*

(a) Metal, rigid plastics and composite IBCs: the IBC remains safe for normal conditions of carriage, there is no observable permanent deformation of the IBC, including the base pallet, if any, and no loss of contents;

(b) Flexible IBCs: no damage to the IBC or its lifting devices which renders the IBC unsafe for carriage or handling and no loss of contents.

6.5.6.6 Stacking test

6.5.6.6.1 *Applicability*

For all types of IBC which are designed to be stacked on each other, as a design type test.

6.5.6.6.2 *Preparation of the IBC for test*

The IBC shall be filled to its maximum permissible gross mass. If the specific gravity of the product being used for testing makes this impracticable, the IBC shall additionally be loaded so that it is tested at its maximum permissible gross mass the load being evenly distributed.

6.5.6.6.3 *Method of testing*

(a) The IBC shall be placed on its base on level hard ground and subjected to a uniformly distributed superimposed test load (see 6.5.6.6.4). For rigid plastics IBCs of type 31H2 and composite IBCs of types 31HH1 and 31HH2, a stacking test shall be carried out with the original filling substance or a standard liquid (see 6.1.6) in accordance with 6.5.6.3.3 or 6.5.6.3.5 using the second IBC in accordance with 6.5.6.2.2 after the preliminary storage. IBCs shall be subjected to the test load for a period of at least:

(i) 5 minutes, for metal IBCs;

(ii) 28 days at 40 °C, for rigid plastics IBCs of types 11H2, 21H2 and 31H2 and for composite IBCs with outer casings of plastics material which bear the stacking load (i.e., types 11HH1, 11HH2, 21HH1, 21HH2, 31HH1 and 31HH2);

(iii) 24 hours, for all other types of IBCs;

(b) The load shall be applied by one of the following methods:

(i) one or more IBCs of the same type filled to the maximum permissible gross mass stacked on the test IBC;

(ii) appropriate weights loaded on to either a flat plate or a reproduction of the base of the IBC, which is stacked on the test IBC.

6.5.6.6.4 *Calculation of superimposed test load*

The load to be placed on the IBC shall be 1.8 times the combined maximum permissible gross mass of the number of similar IBCs that may be stacked on top of the IBC during carriage.

6.5.6.6.5 *Criteria for passing the test*

(a) All types of IBCs other than flexible IBCs: no permanent deformation which renders the IBC including the base pallet, if any, unsafe for carriage and no loss of contents;

(b) Flexible IBCs: no deterioration of the body which renders the IBC unsafe for carriage and no loss of contents.

6.5.6.7 Leakproofness test

6.5.6.7.1 *Applicability*

For those types of IBC used for liquids or for solids filled or discharged under pressure, as a design type test and periodic test.

6.5.6.7.2 *Preparation of the IBC for test*

The test shall be carried out before the fitting of any thermal insulation equipment. Vented closures shall either be replaced by similar non-vented closures or the vent shall be sealed.

6.5.6.7.3 *Method of testing and pressure to be applied*

The test shall be carried out for a period of at least 10 minutes using air at a gauge pressure of not less than 20 kPa (0.2 bar). The air tightness of the IBC shall be determined by a suitable method such as by air-pressure differential test or by immersing the IBC in water or, for metal IBCs, by coating the seams and joints with a soap solution. In the case of immersing a correction factor shall be applied for the hydrostatic pressure.

6.5.6.7.4 *Criterion for passing the test*

No leakage of air.

6.5.6.8 Internal pressure (hydraulic) test

6.5.6.8.1 *Applicability*

For those types of IBCs used for liquids or for solids filled or discharged under pressure, as a design type test.

6.5.6.8.2 *Preparation of the IBC for test*

The test shall be carried out before the fitting of any thermal insulation equipment. Pressure-relief devices shall be removed and their apertures plugged, or shall be rendered inoperative.

6.5.6.8.3 *Method of testing*

The test shall be carried out for a period of at least 10 minutes applying a hydraulic pressure not less than that indicated in 6.5.6.8.4. The IBCs shall not be mechanically restrained during the test.

6.5.6.8.4 *Pressures to be applied*

6.5.6.8.4.1 Metal IBCs:

(a) For IBCs of types 21A, 21B and 21N, for packing group I solids, a 250 kPa (2.5 bar) gauge pressure;

(b) For IBCs of types 21A, 21B, 21N, 31A, 31B and 31N, for packing groups II or III substances, a 200 kPa (2 bar) gauge pressure;

(c) In addition, for IBCs of types 31A, 31B and 31N, a 65kPa (0.65 bar) gauge pressure. This test shall be performed before the 200 kPa (2 bar) test.

6.5.6.8.4.2 Rigid plastics and composite IBCs:

(a) For IBCs of types 21H1, 2lH2, 21HZ1 and 21HZ2: 75 kPa (0.75 bar) (gauge);

(b) For IBCs of types 31H1, 31H2, 31HZ1 and 31HZ2: whichever is the greater of two values, the first as determined by one of the following methods:

(i) the total gauge pressure measured in the IBC (i.e. the vapour pressure of the filling substance and the partial pressure of the air or other inert gases, minus 100 kPa) at 55 °C multiplied by a safety factor of 1.5; this total gauge pressure shall be determined on the basis of a maximum degree of filling in accordance with 4.1.1.4 and a filling temperature of 15 °C;

(ii) 1.75 times the vapour pressure at 50 °C of the substance to be carried minus 100 kPa, but with a minimum test pressure of 100 kPa;

(iii) 1.5 times the vapour pressure at 55 °C of the substance to be carried minus 100 kPa, but with a minimum test pressure of 100 kPa;

and the second as determined by the following method:

(iv) twice the static pressure of the substance to be carried, with a minimum of twice the static pressure of water;

6.5.6.8.5 *Criteria for passing the test(s):*

(a) For IBCs of types 21A, 21B, 21N, 31A, 31B and 31N, when subjected to the test pressure specified in 6.5.6.8.4.1 (a) or (b): no leakage;

(b) For IBCs of types 31A, 31B and 31N, when subjected to the test pressure specified in 6.5.6.8.4.1 (c): no permanent deformation which renders the IBC unsafe for carriage and no leakage;

(c) For rigid plastics and composite IBCs: no permanent deformation which would render the IBC unsafe for carriage and no leakage.

6.5.6.9 Drop test

6.5.6.9.1 *Applicability*

For all types of IBCs, as a design type test.

6.5.6.9.2 *Preparation of the IBC for test*

(a) Metal IBCs: the IBC shall be filled to not less than 95 % of its maximum capacity for solids or 98 % of its maximum capacity for liquids. Pressure-relief devices shall be removed and their apertures plugged, or shall be rendered inoperative;

(b) Flexible IBCs: the IBC shall be filled to the maximum permissible gross mass, the contents being evenly distributed;

(c) Rigid plastics and composite IBCs: the IBC shall be filled to not less than 95 % of its maximum capacity for solids or 98 % of its maximum capacity for liquids. Arrangements provided for pressure relief may be removed and plugged or rendered inoperative. Testing of IBCs shall be carried out when the temperature of the test sample and its contents has been reduced to minus 18 °C or lower. Where test samples of composite IBCs are prepared in this way the conditioning specified in 6.5.6.3.1 may be waived. Test liquids shall be kept in the liquid state, if necessary by the addition of anti-freeze. This conditioning may be disregarded if the materials in question are of sufficient ductility and tensile strength at low temperatures;

(d) Fibreboard and wooden IBCs: The IBC shall be filled to not less than 95 % of its maximum capacity.

6.5.6.9.3 *Method of testing*

The IBC shall be dropped on its base onto a non-resilient, horizontal, flat, massive and rigid surface in conformity with the requirements of 6.1.5.3.4, in such a manner as to ensure that the point of impact is that part of the base of the IBC considered to be the most vulnerable. IBCs of 0.45 m³ or less capacity shall also be dropped:

(a) Metal IBCs: on the most vulnerable part other than the part of the base tested in the first drop;

(b) Flexible IBCs: on the most vulnerable side;

(c) Rigid plastics, composite, fibreboard and wooden IBCs: flat on a side, flat on the top and on a corner.

The same IBC or a different IBC of the same design may be used for each drop.

6.5.6.9.4 *Drop height*

For solids and liquids, if the test is performed with the solid or liquid to be carried or with another substance having essentially the same physical characteristics:

Packing group I	Packing group II	Packing group III
1.8 m	1.2 m	0.8 m

For liquids if the test is performed with water:

(a) Where the substances to be carried have a relative density not exceeding 1.2:

Packing group II	Packing group III
1.2 m	0.8 m

(b) Where the substances to be carried have a relative density exceeding 1.2, the drop heights shall be calculated on the basis of the relative density (d) of the substance to be carried rounded up to the first decimal as follows:

Packing group II	Packing group III
d × 1.0 m	d × 0.67 m

6.5.6.9.5 *Criteria for passing the test(s):*

(a) Metal IBCs: no loss of contents;

(b) Flexible IBCs: no loss of contents. A slight discharge, e.g. from closures or stitch holes, upon impact shall not be considered to be a failure of the IBC provided that no further leakage occurs after the IBC has been raised clear of the ground;

(c) Rigid plastics, composite, fibreboard and wooden IBCs: no loss of contents. A slight discharge from a closure upon impact shall not be considered to be a failure of the IBC provided that no further leakage occurs;

(d) All IBCs: no damage which renders the IBC unsafe to be carried for salvage or for disposal, and no loss of contents. In addition, the IBC shall be capable of being lifted by an appropriate means until clear of the floor for five minutes.

NOTE: *The criteria in (d) apply to design types for IBCs manufactured as from 1 January 2011.*

6.5.6.10 ***Tear test***

6.5.6.10.1 *Applicability*

For all types of flexible IBCs, as a design type test.

6.5.6.10.2 *Preparation of the IBC for test*

The IBC shall be filled to not less than 95 % of its capacity and to its maximum permissible gross mass, the contents being evenly distributed.

6.5.6.10.3 *Method of testing*

Once the IBC is placed on the ground, a 100 mm knife score, completely penetrating the wall of a wide face, is made at a 45° angle to the principal axis of the IBC, halfway between the bottom surface and the top level of the contents. The IBC shall then be subjected to a uniformly distributed superimposed load equivalent to twice the maximum permissible gross mass. The load shall be applied for at least five minutes. An IBC which is designed to be lifted from the top or the side shall then, after removal of the superimposed load, be lifted clear of the floor and maintained in that position for a period of five minutes.

6.5.6.10.4 *Criteria for passing the test*

The cut shall not propagate more than 25 % of its original length.

6.5.6.11 Topple test

6.5.6.11.1 *Applicability*

For all types of flexible IBC, as a design type test.

6.5.6.11.2 *Preparation of the IBC for test*

The IBC shall be filled to not less than 95 % of its capacity and to its maximum permissible gross mass, the contents being evenly distributed.

6.5.6.11.3 *Method of testing*

The IBC shall be caused to topple on to any part of its top on to a rigid, non-resilient, smooth, flat and horizontal surface.

6.5.6.11.4 *Topple height*

Packing group I	Packing group II	Packing group III
1.8 m	1.2 m	0.8 m

6.5.6.11.5 *Criteria for passing the test*

No loss of contents. A slight discharge, e.g. from closures or stitch holes, upon impact shall not be considered to be a failure of the IBC provided that no further leakage occurs.

6.5.6.12 Righting test

6.5.6.12.1 *Applicability*

For all flexible IBCs designed to be lifted from the top or side, as a design type test.

6.5.6.12.2 *Preparation of the IBC for test*

The IBC shall be filled to not less than 95 % of its capacity and to its maximum permissible gross mass, the contents being evenly distributed.

6.5.6.12.3 *Method of testing*

The IBC, lying on its side, shall be lifted at a speed of at least 0.1 m/s to upright position, clear of the floor, by one lifting device or by two lifting devices when four are provided.

6.5.6.12.4 *Criteria for passing the test*

No damage to the IBC or its lifting devices which renders the IBC unsafe for carriage or handling.

6.5.6.13 Vibration test

6.5.6.13.1 *Applicability*

For all IBCs used for liquids, as a design type test.

NOTE: *This test applies to design types for IBCs manufactured after 31 December 2010 (see also 1.6.1.14).*

6.5.6.13.2 *Preparation of the IBC for test*

A sample IBC shall be selected at random and shall be fitted and closed as for carriage. The IBC shall be filled with water to not less than 98 % of its maximum capacity.

6.5.6.13.3 *Test method and duration*

6.5.6.13.3.1 The IBC shall be placed in the centre of the test machine platform with a vertical sinusoidal, double amplitude (peak-to peak displacement) of 25 mm ± 5 %. If necessary, restraining devices shall be attached to the platform to prevent the specimen from moving horizontally off the platform without restricting vertical movement.

6.5.6.13.3.2 The test shall be conducted for one hour at a frequency that causes part of the base of the IBC to be momentarily raised from the vibrating platform for part of each cycle to such a degree that a metal shim can be completely inserted intermittently at, at least, one point between the base of the IBC and the test platform. The frequency may need to be adjusted after the initial set point to prevent the packaging from going into resonance. Nevertheless, the test frequency shall continue to allow placement of the metal shim under the IBC as described in this paragraph. The continuing ability to insert the metal shim is essential to passing the test. The metal shim used for this test shall be at least 1.6 mm thick, 50 mm wide, and be of sufficient length to be inserted between the IBC and the test platform a minimum of 100 mm to perform the test.

6.5.6.13.4 *Criteria for passing the test*

No leakage or rupture shall be observed. In addition, no breakage or failure of structural components, such as broken welds or failed fastenings, shall be observed.

6.5.6.14 Test report

6.5.6.14.1 A test report containing at least the following particulars shall be drawn up and shall be made available to the users of the IBC:

1. Name and address of the test facility;
2. Name and address of applicant (where appropriate);
3. A unique test report identification;
4. Date of the test report;
5. Manufacturer of the IBC;
6. Description of the IBC design type (e.g. dimensions, materials, closures, thickness, etc.) including method of manufacture (e.g. blow moulding) and which may include drawing(s) and/or photograph(s);
7. Maximum capacity;
8. Characteristics of test contents, e.g. viscosity and relative density for liquids and particle size for solids. For rigid plastics and composite IBCs subject to the hydraulic pressure test in 6.5.6.8, the temperature of the water used;
9. Test descriptions and results;
10. The test report shall be signed with the name and status of the signatory.

6.5.6.14.2 The test report shall contain statements that the IBC prepared as for carriage was tested in accordance with the appropriate requirements of this Chapter and that the use of other packaging methods or components may render it invalid. A copy of the test report shall be available to the competent authority.

CHAPTER 6.6

REQUIREMENTS FOR THE CONSTRUCTION AND TESTING OF LARGE PACKAGINGS

6.6.1 General

6.6.1.1 The requirements of this Chapter do not apply to:

(a) packagings for Class 2, except large packagings for articles, including aerosols;

(b) packagings for Class 6.2, except large packagings for clinical waste of UN No. 3291;

(c) Class 7 packages containing radioactive material.

6.6.1.2 Large packagings shall be manufactured, tested and remanufactured under a quality assurance programme which satisfies the competent authority in order to ensure that each manufactured or remanufactured large packaging meets the requirements of this Chapter.

NOTE: *ISO 16106:2020 "Transport packages for dangerous goods – Dangerous goods packagings, intermediate bulk containers (IBCs) and large packagings – Guidelines for the application of ISO 9001" provides acceptable guidance on procedures which may be followed.*

6.6.1.3 The specific requirements for large packagings in 6.6.4 are based on large packagings currently used. In order to take into account progress in science and technology, there is no objection to the use of large packagings having specifications different from those in 6.6.4 provided they are equally effective, acceptable to the competent authority and able to successfully fulfil the requirements described in 6.6.5. Methods of testing other than those described in this Code are acceptable provided they are equivalent and are recognized by the competent authority.

6.6.1.4 Manufacturers and subsequent distributors of packagings shall provide information regarding procedures to be followed and a description of the types and dimensions of closures (including required gaskets) and any other components needed to ensure that packages as presented for carriage are capable of passing the applicable performance tests of this Chapter.

6.6.2 Code for designating types of large packagings

6.6.2.1 The code used for large packagings consist of:

(a) Two Arabic numerals:

50 for rigid large packagings; or
51 for flexible large packagings; and

(b) A capital letter in Latin character indicating the nature of the material, e.g. wood, steel etc. The capital letters used shall be those shown in 6.1.2.6.

6.6.2.2 The letters "T" or "W" may follow the Large Packaging code. The letter "T" signifies a large salvage packaging conforming to the requirements of 6.6.5.1.9. The letter "W" signifies that the large packaging, although of the same type indicated by the code, is manufactured to a specification different from those in 6.6.4 and is considered equivalent in accordance with the requirements in 6.6.1.3.

6.6.3 Marking

6.6.3.1 Primary marking

Each large packaging manufactured and intended for use in accordance with the provisions of this Code shall bear marks which are durable, legible and placed in a location so as to be readily visible. Letters, numerals and symbols shall be at least 12 mm high and shall show:

(a) The United Nations packaging symbol  .

This symbol shall not be used for any purpose other than certifying that a packaging, a flexible bulk container, a portable tank or a MEGC complies with the relevant requirements in Chapter 6.1, 6.2, 6.3, 6.5, 6.6, 6.7 or 6.11. For metal large packagings on which the marks are stamped or embossed, the capital letters "UN" may be applied instead of the symbol;

(b) The number "50" designating a large rigid packaging or "51" for flexible large packagings, followed by the material type in accordance with 6.5.1.4.1 (b);

(c) A capital letter designating the packing group(s) for which the design type has been approved:

X for packing groups I, II and III
Y for packing groups II and III
Z for packing group III only;

(d) The month and year (last two digits) of manufacture;

(e) The State authorizing the allocation of the mark; indicated by the distinguishing sign used on vehicles in international road traffic[1];

(f) The name or symbol of the manufacturer and other identification of the large packagings as specified by the competent authority;

(g) The stacking test load in kg. For large packagings not designed for stacking the figure "0" shall be shown;

(h) The maximum permissible gross mass in kilograms.

The primary mark required above shall be applied in the sequence of the sub-paragraphs.

Each mark applied in accordance with (a) to (h) shall be clearly separated, e.g. by a slash or space, so as to be easily identifiable.

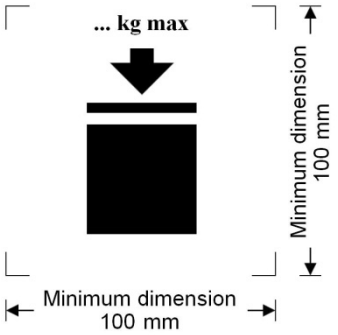
[1] *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*

6.6.3.2 ***Examples of marking***

	50A/X/05 01/N/PQRS 2500/1000	For a large steel packaging suitable for stacking; stacking load: 2 500 kg; maximum gross mass: 1 000 kg.
	50H/Y/04 02/D/ABCD 987 0/800	For a large plastics packaging not suitable for stacking; maximum gross mass: 800 kg.
	51H/Z/06 01/S/1999 0/500	For a large flexible packaging not suitable for stacking; maximum gross mass: 500 kg.
	50AT/Y/05/01/B/PQRS 2500/1000	For a large steel salvage packaging suitable for stacking; stacking load: 2 500 kg; maximum gross mass: 1 000 kg.

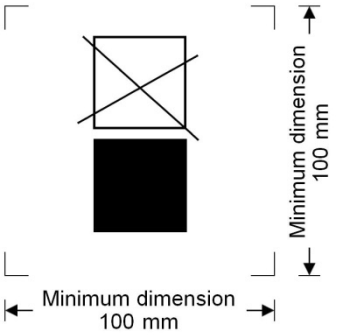
6.6.3.3 The maximum permitted stacking load applicable shall be displayed on a symbol as shown in Figure 6.6.3.3.1 or Figure 6.6.3.3.2. The symbol shall be durable and clearly visible.

Figure 6.6.3.3.1



Large packagings capable of being stacked

Figure 6.6.3.3.2



Large packagings NOT capable of being stacked

The minimum dimensions shall be 100 mm × 100 mm. The letters and numbers indicating the mass shall be at least 12 mm high. The area within the printer's marks indicated by the dimensional arrows shall be square. Where dimensions are not specified, all features shall be in approximate proportion to those shown. The mass marked above the symbol shall not exceed the load imposed during the design type test (see 6.6.5.3.3.4) divided by 1.8.

6.6.3.4 Where a large packaging conforms to one or more than one tested large packaging design type, including one or more than one tested packaging or IBC design type, the large packaging may bear more than one mark to indicate the relevant performance test requirements that have been met. Where more than one mark appears on a large packaging, the marks shall appear in close proximity to one another and each mark shall appear in its entirety.

6.6.4 Specific requirements for large packagings

6.6.4.1 Specific requirements for metal large packagings

50A steel
50B aluminium
50N metal (other than steel or aluminium)

6.6.4.1.1 The large packaging shall be made of suitable ductile metal in which the weldability has been fully demonstrated. Welds shall be skilfully made and afford complete safety. Low-temperature performance shall be taken into account when appropriate.

6.6.4.1.2 Care shall be taken to avoid damage by galvanic action due to the juxtaposition of dissimilar metals.

6.6.4.2 Specific requirements for flexible material large packagings

51H flexible plastics
51M flexible paper

6.6.4.2.1 The large packaging shall be manufactured from suitable materials. The strength of the material and the construction of the flexible large packagings shall be appropriate to its capacity and its intended use.

6.6.4.2.2 All materials used in the construction of flexible large packagings of types 51M shall, after complete immersion in water for not less than 24 hours, retain at least 85 % of the tensile strength as measured originally on the material conditioned to equilibrium at 67 % relative humidity or less.

6.6.4.2.3 Seams shall be formed by stitching, heat sealing, glueing or any equivalent method. All stitched seam-ends shall be secured.

6.6.4.2.4 Flexible large packagings shall provide adequate resistance to ageing and to degradation caused by ultraviolet radiation or the climatic conditions, or by the substance contained, thereby rendering them appropriate to their intended use.

6.6.4.2.5 For plastics flexible large packagings where protection against ultraviolet radiation is required, it shall be provided by the addition of carbon black or other suitable pigments or inhibitors. These additives shall be compatible with the contents and remain effective throughout the life of the large packaging. Where use is made of carbon black, pigments or inhibitors other than those used in the manufacture of the tested design type, re-testing may be waived if changes in the carbon black content, the pigment content or the inhibitor content do not adversely affect the physical properties of the material of construction.

6.6.4.2.6 Additives may be incorporated into the material of the large packaging to improve the resistance to ageing or to serve other purposes, provided that these do not adversely affect the physical or chemical properties of the material.

6.6.4.2.7 When filled, the ratio of height to width shall be not more than 2:1.

6.6.4.3 Specific requirements for plastics large packagings

50H rigid plastics

6.6.4.3.1 The large packaging shall be manufactured from suitable plastics material of known specifications and be of adequate strength in relation to its capacity and its intended use. The material shall be adequately resistant to ageing and to degradation caused by the substance contained or, where relevant, by ultraviolet radiation. Low temperature performance shall be taken into account when appropriate. Any permeation of the substance contained shall not constitute a danger under normal conditions of carriage.

6.6.4.3.2 Where protection against ultraviolet radiation is required, it shall be provided by the addition of carbon black or other suitable pigments or inhibitors. These additives shall be compatible with the contents and remain effective throughout the life of the outer packaging. Where use is made of carbon black, pigments or inhibitors other than those used in the manufacture of the tested design type, re-testing may be waived if changes in the carbon black content, the pigment content or the inhibitor content do not adversely affect the physical properties of the material of construction.

6.6.4.3.3 Additives may be incorporated in the material of the large packaging to improve the resistance to ageing or to serve other purposes, provided that these do not adversely affect the physical or chemical properties of the material.

6.6.4.4 Specific requirements for fibreboard large packagings

50G rigid fibreboard

6.6.4 4.1 Strong and good quality solid or double-faced corrugated fibreboard (single or multiwall) shall be used, appropriate to the capacity of the large packagings and to their intended use. The water resistance of the outer surface shall be such that the increase in mass, as determined in a test carried out over a period of 30 minutes by the Cobb method of determining water absorption, is not greater than 155 g/m² - see ISO 535:1991. It shall have proper bending qualities. Fibreboard shall be cut, creased without scoring, and slotted so as to permit assembly without cracking, surface breaks or undue bending. The fluting or corrugated fibreboard shall be firmly glued to the facings.

6.6.4.4.2 The walls, including top and bottom, shall have a minimum puncture resistance of 15 J measured according to ISO 3036:1975.

6.6.4.4.3 Manufacturing joins in the outer packaging of large packagings shall be made with an appropriate overlap and shall be taped, glued, stitched with metal staples or fastened by other means at least equally effective. Where joins are effected by gluing or taping, a water resistant adhesive shall be used. Metal staples shall pass completely through all pieces to be fastened and be formed or protected so that any inner liner cannot be abraded or punctured by them.

6.6.4.4.4 Any integral pallet base forming part of a large packaging or any detachable pallet shall be suitable for mechanical handling with the large packaging filled to its maximum permissible gross mass.

6.6.4.4.5 The pallet or integral base shall be designed so as to avoid any protrusion of the base of the large packaging that might be liable to damage in handling.

6.6.4.4.6 The body shall be secured to any detachable pallet to ensure stability in handling and carriage. Where a detachable pallet is used, its top surface shall be free from sharp protrusions that might damage the large packaging.

6.6.4.4.7 Strengthening devices such as timber supports to increase stacking performance may be used but shall be external to the liner.

6.6.4.4.8 Where large packagings are intended for stacking, the bearing surface shall be such as to distribute the load in a safe manner.

6.6.4.5 Specific requirements for wooden large packagings

50C natural wood
50D plywood
50F reconstituted wood

6.6.4.5.1 The strength of the materials used and the method of construction shall be appropriate to the capacity and intended use of the large packagings.

6.6.4.5.2 Natural wood shall be well seasoned, commercially dry and free from defects that would materially lessen the strength of any part of the large packagings. Each part of the large packagings shall consist of one piece or be equivalent thereto. Parts are considered equivalent to one piece when a suitable method of glued assembly is used as for instance Lindermann joint, tongue and groove joint, ship lap or rabbet joint; or butt joint with at least two corrugated metal fasteners at each joint, or when other methods at least equally effective are used.

6.6.4.5.3 Large packagings of plywood shall be at least 3-ply. They shall be made of well seasoned rotary cut, sliced or sawn veneer, commercially dry and free from defects that would materially lessen the strength of the large packaging. All adjacent plies shall be glued with water resistant adhesive. Other suitable materials may be used with plywood for the construction of the large packaging.

6.6.4.5.4 Large packagings of reconstituted wood shall be made of water resistant reconstituted wood such as hardboard, particle board or other suitable type.

6.6.4.5.5 Large packagings shall be firmly nailed or secured to corner posts or ends or be assembled by equally suitable devices.

6.6.4.5.6 Any integral pallet base forming part of a large packaging or any detachable pallet shall be suitable for mechanical handling with the large packaging filled to its maximum permissible gross mass.

6.6.4.5.7 The pallet or integral base shall be designed so as to avoid any protrusion of the base of the large packaging that might be liable to damage in handling.

6.6.4.5.8 The body shall be secured to any detachable pallet to ensure stability in handling and carriage. Where a detachable pallet is used, its top surface shall be free from sharp protrusions that might damage the large packaging.

6.6.4.5.9 Strengthening devices such as timber supports to increase stacking performance may be used but shall be external to the liner.

6.6.4.5.10 Where large packagings are intended for stacking, the bearing surface shall be such as to distribute the load in a safe manner.

6.6.5 Test requirements for large packagings

6.6.5.1 Performance and frequency of test

6.6.5.1.1 The design type of each large packaging shall be tested as provided in 6.6.5.3 in accordance with procedures established by the competent authority allowing the allocation of the mark and shall be approved by this competent authority.

6.6.5.1.2 Each large packaging design type shall successfully pass the tests prescribed in this Chapter before being used. A large packaging design type is defined by the design, size, material and thickness, manner of construction and packing, but may include various surface treatments. It also includes large packagings which differ from the design type only in their lesser design height.

6.6.5.1.3 Tests shall be repeated on production samples at intervals established by the competent authority. For such tests on fibreboard large packagings, preparation at ambient conditions is considered equivalent to the provisions of 6.6.5.2.4.

6.6.5.1.4 Tests shall also be repeated after each modification which alters the design, material or manner of construction of large packagings.

6.6.5.1.5 The competent authority may permit the selective testing of large packagings that differ only in minor respects from a tested type, e.g. smaller sizes of inner packagings or inner packagings of lower net mass; and large packagings which are produced with small reductions in external dimension(s).

6.6.5.1.6 *(Reserved)*

NOTE: *For the conditions for assembling different inner packagings in a large packaging and permissible variations in inner packagings, see 4.1.1.5.1.*

6.6.5.1.7 The competent authority may at any time require proof, by tests in accordance with this section, that serially-produced large packagings meet the requirements of the design type tests.

6.6.5.1.8 Provided the validity of the test results is not affected and with the approval of the competent authority, several tests may be made on one sample.

6.6.5.1.9 *Large salvage packagings*

Large salvage packagings shall be tested and marked in accordance with the provisions applicable to packing group II large packagings intended for the carriage of solids or inner packagings, except as follows:

(a) The test substance used in performing the tests shall be water, and the large salvage packagings shall be filled to not less than 98 % of their maximum capacity. It is permissible to use additives, such as bags of lead shot, to achieve the requisite total package mass so long as they are placed so that the test results are not affected. Alternatively, in performing the drop test, the drop height may be varied in accordance with 6.6.5.3.4.4.2 (b);

(b) Large salvage packagings shall, in addition, have been successfully subjected to the leakproofness test at 30 kPa, with the results of this test reflected in the test report required by 6.6.5.4; and

(c) Large salvage packagings shall be marked with the letter "T" as described in 6.6.2.2.

6.6.5.2 Preparation for testing

6.6.5.2.1 Tests shall be carried out on large packagings prepared as for carriage including the inner packagings or articles used. Inner packagings shall be filled to not less than 98 % of their maximum capacity for liquids or 95 % for solids. For large packagings where the inner packagings are designed to carry liquids and solids, separate testing is required for both liquid and solid contents. The substances in the inner packagings or the articles to be carried in the large packagings may be replaced by other material or articles except where this would invalidate the results of the tests. When other inner packagings or articles are used they shall have the same physical characteristics (mass, etc) as the inner packagings or

articles to be carried. It is permissible to use additives, such as bags of lead shot, to achieve the requisite total package mass, so long as they are placed so that the test results are not affected.

6.6.5.2.2 In the drop tests for liquids, when another substance is used, it shall be of similar relative density and viscosity to those of the substance being carried. Water may also be used for the liquid drop test under the conditions in 6.6.5.3.4.4.

6.6.5.2.3 Large packagings made of plastics materials and large packagings containing inner packagings of plastic materials - other than bags intended to contain solids or articles - shall be drop tested when the temperature of the test sample and its contents has been reduced to -18 °C or lower. This conditioning may be disregarded if the materials in question are of sufficient ductility and tensile strength at low temperatures. Where test sample are prepared in this way, the conditioning in 6.6.5.2.4 may be waived. Test liquids shall be kept in the liquid state by the addition of anti-freeze if necessary.

6.6.5.2.4 Large packagings of fibreboard shall be conditioned for at least 24 hours in an atmosphere having a controlled temperature and relative humidity (r.h.). There are three options, one of which shall be chosen.

The preferred atmosphere is 23 °C ± 2 °C and 50 % ± 2 % r.h. The two other options are: 20 °C ± 2 °C and 65 % ± 2 % r.h.; or 27 °C ± 2 °C and 65 % ± 2 % r.h.

NOTE: *Average values shall fall within these limits. Short term fluctuations and measurement limitations may cause individual measurements to vary by up to ± 5 % relative humidity without significant impairment of test reproducibility.*

6.6.5.3 Test requirements

6.6.5.3.1 *Bottom lift test*

6.6.5.3.1.1 Applicability

For all types of large packagings which are fitted with means of lifting from the base, as a design type test.

6.6.5.3.1.2 Preparation of large packaging for test

The large packaging shall be loaded to 1.25 times its maximum permissible gross mass, the load being evenly distributed.

6.6.5.3.1.3 Method of testing

The large packaging shall be raised and lowered twice by a lift truck with the forks centrally positioned and spaced at three quarters of the dimension of the side of entry (unless the points of entry are fixed). The forks shall penetrate to three quarters of the direction of entry. The test shall be repeated from each possible direction of entry.

6.6.5.3.1.4 Criteria for passing the test

No permanent deformation which renders the large packaging unsafe for carriage and no loss of contents.

6.6.5.3.2 *Top lift test*

6.6.5.3.2.1 Applicability

For types of large packagings which are intended to be lifted from the top and fitted with means of lifting, as a design type test.

6.6.5.3.2.2 Preparation of large packaging for test

The large packaging shall be loaded to twice its maximum permissible gross mass. A flexible large packaging shall be loaded to six times its maximum permissible gross mass, the load being evenly distributed.

6.6.5.3.2.3 Method of testing

The large packaging shall be lifted in the manner for which it is designed until clear of the floor and maintained in that position for a period of five minutes.

6.6.5.3.2.4 *Criteria for passing the test*

(a) All types of large packagings other than flexible and composite large packagings: no permanent deformation which renders the large packaging, including the base pallet, if any, unsafe for carriage and no loss of contents;

(b) Flexible large packagings: no damage to the large packaging or its lifting devices which renders the large packaging unsafe for carriage or handling and no loss of contents.

6.6.5.3.3 *Stacking test*

6.6.5.3.3.1 Applicability

For all types of large packagings which are designed to be stacked on each other, as a design type test.

6.6.5.3.3.2 Preparation of large packaging for test

The large packaging shall be filled to its maximum permissible gross mass.

6.6.5.3.3.3 Method of testing

The large packaging shall be placed on its base on level hard ground and subjected to a uniformly distributed superimposed test load (see 6.6.5.3.3.4) for a period of at least five minutes, large packagings of wood, fibreboard and plastics materials for a period of 24 h.

6.6.5.3.3.4 Calculation of superimposed test load

The load to be placed on the large packagings shall be 1.8 times the combined maximum permissible gross mass of the number of similar large packagings that may be stacked on top of the large packagings during carriage.

6.6.5.3.3.5 Criteria for passing the test

(a) All types of large packagings other than flexible large packagings: no permanent deformation which renders the large packaging including the base pallet, if any, unsafe for carriage and no loss of contents;

(b) Flexible large packagings: no deterioration of the body which renders the large packaging unsafe for carriage and no loss of contents.

6.6.5.3.4 *Drop test*

6.6.5.3.4.1 Applicability

For all types of large packagings as a design type test.

6.6.5.3.4.2 Preparation of large packaging for testing

The large packaging shall be filled in accordance with 6.6.5.2.1

6.6.5.3.4.3 Method of testing

The large packaging shall be dropped onto a non resilient, horizontal, flat, massive and rigid surface in conformity with the requirements of 6.1.5.3.4, in such a manner as to ensure that the point of impact is that part of the base of the large packaging considered to be the most vulnerable.

6.6.5.3.4.4 Drop height

NOTE: *Large packagings for substances and articles of Class 1 shall be tested at the packing group II performance level.*

6.6.5.3.4.4.1 For inner packagings containing solid or liquid substances or articles, if the test is performed with the solid, liquid or articles to be carried, or with another substance or article having essentially the same characteristics:

Packing group I	Packing group II	Packing group III
1.8 m	1.2 m	0.8 m

6.6.5.3.4.4.2 For inner packagings containing liquids if the test is performed with water:

(a) Where the substances to be carried have a relative density not exceeding 1.2:

Packing group I	Packing group II	Packing group III
1.8 m	1.2 m	0.8 m

(b) Where the substances to be carried have a relative density exceeding 1.2, the drop height shall be calculated on the basis of the relative density (d) of the substance to be carried, rounded up to the first decimal, as follows:

Packing group I	Packing group II	Packing group III
d ×1.5 (m)	d × 1.0 (m)	d × 0.67 (m)

6.6.5.3.4.5 Criteria for passing the test

6.6.5.3.4.5.1 The large packaging shall not exhibit any damage liable to affect safety during carriage. There shall be no leakage of the filling substance from inner packaging(s) or article(s).

6.6.5.3.4.5.2 No rupture is permitted in large packagings for articles of Class 1 which would permit the spillage of loose explosive substances or articles from the large packaging.

6.6.5.3.4.5.3 Where a large packaging undergoes a drop test, the sample passes the test if the entire contents are retained even if the closure is no longer sift-proof.

6.6.5.4 Certification and test report

6.6.5.4.1 In respect of each design type of large packaging a certificate and mark (as in 6.6.3) shall be issued attesting that the design type including its equipment meets the test requirements.

6.6.5.4.2 A test report containing at least the following particulars shall be drawn up and shall be made available to the users of the large packaging:

1. Name and address of the test facility;
2. Name and address of applicant (where appropriate);
3. A unique test report identification;
4. Date of the test report;
5. Manufacturer of the large packaging;
6. Description of the large packaging design type (e.g. dimensions, materials, closures, thickness, etc) and/or photograph(s);
7. Maximum capacity/maximum permissible gross mass;
8. Characteristics of test contents, e.g. types and descriptions of inner packagings or articles used;
9. Test descriptions and results;
10. The test report shall be signed with the name and status of the signatory.

6.6.5.4.3 The test report shall contain statements that the large packaging prepared as for carriage was tested in accordance with the appropriate provisions of this Chapter and that the use of other packaging methods

or components may render it invalid. A copy of the test report shall be available to the competent authority.

CHAPTER 6.7

REQUIREMENTS FOR THE DESIGN, CONSTRUCTION, INSPECTION AND TESTING OF PORTABLE TANKS AND UN MULTIPLE-ELEMENT GAS CONTAINERS (MEGCs)

NOTE 1: *For fixed tanks (tank-vehicles), demountable tanks and tank-containers and tank swap bodies, with shells made of metallic materials, and battery-vehicles and multiple element gas containers (MEGCs) other than UN MEGCs, see Chapter 6.8; for vacuum operated waste tanks, see Chapter 6.10; for fixed tanks (tank-vehicles) and demountable tanks with shells made of fibre-reinforced plastics, see Chapter 6.13.*

NOTE 2: *The requirements of this Chapter also apply to portable tanks with shells made of fibre-reinforced plastics (FRP) to the extent indicated in Chapter 6.9.*

6.7.1 Application and general requirements

6.7.1.1 The requirements of this Chapter apply to portable tanks intended for the carriage of dangerous goods, and to MEGCs intended for the carriage of non-refrigerated gases of Class 2, by all modes of carriage. In addition to the requirements of this Chapter, unless otherwise specified, the applicable requirements of the International Convention for Safe Containers (CSC) 1972, as amended, shall be fulfilled by any multimodal portable tank or MEGC which meets the definition of a "container" within the terms of that Convention. Additional requirements may apply to offshore portable tanks or MEGCs that are handled in open seas.

6.7.1.2 In recognition of scientific and technological advances, the technical requirements of this Chapter may be varied by alternative arrangements. These alternative arrangements shall offer a level of safety not less than that given by the requirements of this Chapter with respect to the compatibility with substances carried and the ability of the portable tank or MEGC to withstand impact, loading and fire conditions. For international carriage, alternative arrangement portable tanks or MEGCs shall be approved by the applicable competent authorities.

6.7.1.3 When a substance is not assigned a portable tank instruction (T1 to T23, T50 or T75) in Column (10) of Table A of in Chapter 3.2, interim approval for carriage may be issued by the competent authority of the country of origin. The approval shall be included in the documentation of the consignment and contain as a minimum the information normally provided in the portable tank instructions and the conditions under which the substance shall be carried.

6.7.2 Requirements for the design, construction, inspection and testing of portable tanks intended for the carriage of substances of Class 1 and Classes 3 to 9

6.7.2.1 Definitions

For the purposes of this section:

Alternative arrangement means an approval granted by the competent authority for a portable tank or MEGC that has been designed, constructed or tested to technical requirements or testing methods other than those specified in this Chapter:

Portable tank means a multimodal tank used for the carriage of substances of Class 1 and Classes 3 to 9. The portable tank includes a shell fitted with service equipment and structural equipment necessary for the carriage of dangerous substances. The portable tank shall be capable of being filled and discharged without the removal of its structural equipment. It shall possess stabilizing members external to the shell, and shall be capable of being lifted when full. It shall be designed primarily to be loaded onto a vehicle, wagon or sea-going or inland navigation vessel and shall be equipped with skids, mountings or accessories to facilitate mechanical handling. Tank-vehicles, tank-wagons, non-metallic tanks and intermediate bulk containers (IBCs) are not considered to fall within the definition for portable tanks;

Shell means the part of the portable tank which retains the substance intended for carriage (tank proper), including openings and their closures, but does not include service equipment or external structural equipment;

Service equipment means measuring instruments and filling, discharge, venting, safety, heating, cooling and insulating devices;

Structural equipment means the reinforcing, fastening, protective and stabilizing members external to the shell;

Maximum allowable working pressure (MAWP) means a pressure that shall be not less than the highest of the following pressures measured at the top of the shell while in operating position:

(a) The maximum effective gauge pressure allowed in the shell during filling or discharge; or

(b) The maximum effective gauge pressure to which the shell is designed which shall be not less than the sum of:

(i) the absolute vapour pressure (in bar) of the substance at 65 °C, minus 1 bar; and

(ii) the partial pressure (in bar) of air or other gases in the ullage space being determined by a maximum ullage temperature of 65 °C and a liquid expansion due to an increase in mean bulk temperature of $t_r - t_f$ (t_f = filling temperature, usually 15 °C; t_r = maximum mean bulk temperature, 50 °C);

Design pressure means the pressure to be used in calculations required by a recognized pressure vessel code. The design pressure shall be not less than the highest of the following pressures:

(a) The maximum effective gauge pressure allowed in the shell during filling or discharge; or

(b) The sum of:

(i) the absolute vapour pressure (in bar) of the substance at 65 °C, minus 1 bar;

(ii) the partial pressure (in bar) of air or other gases in the ullage space being determined by a maximum ullage temperature of 65 °C and a liquid expansion due to an increase in mean bulk temperature of $t_r - t_f$ (t_f = filling temperature usually 15 °C; t_r = maximum mean bulk temperature, 50 °C); and

(iii) a head pressure determined on the basis of the static forces specified in 6.7.2.2.12, but not less than 0.35 bar; or

(c) Two thirds of the minimum test pressure specified in the applicable portable tank instruction in 4.2.5.2.6;

Test pressure means the maximum gauge pressure at the top of the shell during the hydraulic pressure test equal to not less than 1.5 times the design pressure. The minimum test pressure for portable tanks intended for specific substances is specified in the applicable portable tank instruction in 4.2.5.2.6;

Leakproofness test means a test using gas subjecting the shell and its service equipment to an effective internal pressure of not less than 25 % of the MAWP;

Maximum permissible gross mass (MPGM) means the sum of the tare mass of the portable tank and the heaviest load authorized for carriage;

Reference steel means a steel with a tensile strength of 370 N/mm² and an elongation at fracture of 27 %;

Mild steel means a steel with a guaranteed minimum tensile strength of 360 N/mm² to 440 N/mm² and a guaranteed minimum elongation at fracture conforming to 6.7.2.3.3.3;

Design temperature range for the shell shall be -40 °C to 50 °C for substances carried under ambient conditions. For the other substances handled under elevated temperature conditions the design temperature shall be not less than the maximum temperature of the substance during filling, discharge or carriage. More severe design temperatures shall be considered for portable tanks subjected to severe climatic conditions;

Fine grain steel means steel which has a ferritic grain size of 6 or finer when determined in accordance with ASTM E 112-96 or as defined in EN 10028-3, Part 3;

Fusible element means a non-reclosable pressure relief device that is thermally actuated;

Offshore portable tank means a portable tank specially designed for repeated use for carriage to, from and between offshore facilities. An offshore portable tank is designed and constructed in accordance with the guidelines for the approval of containers handled in open seas specified by the International Maritime Organization in document MSC/Circ.860.

6.7.2.2 General design and construction requirements

6.7.2.2.1 Shells shall be designed and constructed in accordance with the requirements of a pressure vessel code recognized by the competent authority. Shells shall be made of metallic materials suitable for forming. The materials shall in principle conform to national or international material standards. For welded shells only a material whose weldability has been fully demonstrated shall be used. Welds shall be skilfully made and afford complete safety. When the manufacturing process or the materials make it necessary, the shells shall be suitably heat-treated to guarantee adequate toughness in the weld and in the heat affected zones. In choosing the material, the design temperature range shall be taken into account with respect to risk of brittle fracture, to stress corrosion cracking and to resistance to impact. When fine grain steel is used, the guaranteed value of the yield strength shall be not more than 460 N/mm² and the guaranteed value of the upper limit of the tensile strength shall be not more than 725 N/mm² according to the material specification. Aluminium may only be used as a construction material when indicated in a portable tank special provision assigned to a specific substance in Column (11) of Table A of Chapter 3.2 or when approved by the competent authority. When aluminium is authorized, it shall be insulated to prevent significant loss of physical properties when subjected to a heat load of 110 kW/m² for a period of not less than 30 minutes. The insulation shall remain effective at all temperatures less than 649 °C and shall be jacketed with a material with a melting point of not less than 700 °C. Portable tank materials shall be suitable for the external environment in which they may be carried.

6.7.2.2.2 Portable tank shells, fittings, and pipework shall be constructed from materials which are:

(a) Substantially immune to attack by the substance(s) intended to be carried; or

(b) Properly passivated or neutralized by chemical reaction; or

(c) Lined with corrosion-resistant material directly bonded to the shell or attached by equivalent means.

6.7.2.2.3 Gaskets shall be made of materials not subject to attack by the substance(s) intended to be carried.

6.7.2.2.4 When shells are lined, the lining shall be substantially immune to attack by the substance(s) intended to be carried, homogeneous, non porous, free from perforations, sufficiently elastic and compatible with the thermal expansion characteristics of the shell. The lining of every shell, shell fittings and piping shall be continuous, and shall extend around the face of any flange. Where external fittings are welded to the tank, the lining shall be continuous through the fitting and around the face of external flanges.

6.7.2.2.5 Joints and seams in the lining shall be made by fusing the material together or by other equally effective means.

6.7.2.2.6 Contact between dissimilar metals which could result in damage by galvanic action shall be avoided.

6.7.2.2.7 The materials of the portable tank, including any devices, gaskets, linings and accessories, shall not adversely affect the substance(s) intended to be carried in the portable tank.

6.7.2.2.8 Portable tanks shall be designed and constructed with supports to provide a secure base during carriage and with suitable lifting and tie-down attachments.

6.7.2.2.9 Portable tanks shall be designed to withstand, without loss of contents, at least the internal pressure due to the contents, and the static, dynamic and thermal loads during normal conditions of handling and carriage. The design shall demonstrate that the effects of fatigue, caused by repeated application of these loads through the expected life of the portable tank, have been taken into account.

6.7.2.2.9.1 For portable tanks that are intended for use offshore, the dynamic stresses imposed by handling in open seas shall be taken into account.

6.7.2.2.10 A shell which is to be equipped with a vacuum-relief device shall be designed to withstand, without permanent deformation, an external pressure of not less than 0.21 bar above the internal pressure. The vacuum-relief device shall be set to relieve at a vacuum setting not greater than minus (-) 0.21 bar unless

the shell is designed for a higher external over pressure, in which case the vacuum-relief pressure of the device to be fitted shall be not greater than the tank design vacuum pressure. A shell used for the carriage of solid substances (powdery or granular) of packing groups II or III only, which do not liquefy during carriage, may be designed for a lower external pressure, subject to the approval of the competent authority. In this case, the vacuum valve shall be set to relieve at this lower pressure. A shell that is not to be fitted with a vacuum-relief device shall be designed to withstand, without permanent deformation an external pressure of not less than 0.4 bar above the internal pressure.

6.7.2.2.11 Vacuum-relief devices used on portable tanks intended for the carriage of substances meeting the flash-point criteria of Class 3, including elevated temperature substances carried at or above their flash-point, shall prevent the immediate passage of flame into the shell, or the portable tank shall have a shell capable of withstanding, without leakage an internal explosion resulting from the passage of flame into the shell.

6.7.2.2.12 Portable tanks and their fastenings shall, under the maximum permissible load, be capable of absorbing the following separately applied static forces:

(a) In the direction of travel: twice the MPGM multiplied by the acceleration due to gravity (g)[1];

(b) Horizontally at right angles to the direction of travel: the MPGM (when the direction of travel is not clearly determined, the forces shall be equal to twice the MPGM) multiplied by the acceleration due to gravity (g)[1];

(c) Vertically upwards: the MPGM multiplied by the acceleration due to gravity (g)[1]; and

(d) Vertically downwards: twice the MPGM (total loading including the effect of gravity) multiplied by the acceleration due to gravity (g)[1].

6.7.2.2.13 Under each of the forces in 6.7.2.2.12, the safety factor to be observed shall be as follows:

(a) For metals having a clearly defined yield point, a safety factor of 1.5 in relation to the guaranteed yield strength; or

(b) For metals with no clearly defined yield point, a safety factor of 1.5 in relation to the guaranteed 0.2 % proof strength and, for austenitic steels, the 1 % proof strength.

6.7.2.2.14 The values of yield strength or proof strength shall be the values according to national or international material standards. When austenitic steels are used, the specified minimum values of yield strength or proof strength according to the material standards may be increased by up to 15 % when these greater values are attested in the material inspection certificate. When no material standard exists for the metal in question, the value of yield strength or proof strength used shall be approved by the competent authority.

6.7.2.2.15 Portable tanks shall be capable of being electrically earthed when intended for the carriage of substances meeting the flash-point criteria of Class 3 including elevated temperature substances carried at or above their flash-point. Measures shall be taken to prevent dangerous electrostatic discharge.

6.7.2.2.16 When required for certain substances by the applicable portable tank instruction indicated in Column (10) of Table A of Chapter 3.2 and described in 4.2.5.2.6 or by a portable tank special provision indicated in Column (11) of Table A of Chapter 3.2 and described in 4.2.5.3, portable tanks shall be provided with additional protection, which may take the form of additional shell thickness or a higher test pressure, the additional shell thickness or higher test pressure being determined in the light of the inherent risks associated with the carriage of the substances concerned.

6.7.2.2.17 Thermal insulation directly in contact with the shell intended for substances carried at elevated temperature shall have an ignition temperature at least 50 °C higher than the maximum design temperature of the tank.

6.7.2.3 Design criteria

6.7.2.3.1 Shells shall be of a design capable of being stress-analysed mathematically or experimentally by resistance strain gauges, or by other methods approved by the competent authority.

[1] *For calculation purposes g = 9.81 m/s^2.*

6.7.2.3.2 Shells shall be designed and constructed to withstand a hydraulic test pressure not less than 1.5 times the design pressure. Specific requirements are laid down for certain substances in the applicable portable tank instruction indicated in Column (10) of Table A of Chapter 3.2 and described in 4.2.5.2.6 or by a portable tank special provision indicated in Column (11) of Table A of Chapter 3.2 and described in 4.2.5.3. Attention is drawn to the minimum shell thickness requirements specified in 6.7.2.4.1 to 6.7.2.4.10.

6.7.2.3.3 For metals exhibiting a clearly defined yield point or characterized by a guaranteed proof strength (0.2 % proof strength, generally, or 1 % proof strength for austenitic steels) the primary membrane stress σ (sigma) in the shell shall not exceed 0.75 Re or 0.50 Rm, whichever is lower, at the test pressure, where:

Re = yield strength in N/mm², or 0.2 % proof strength or, for austenitic steels, 1 % proof strength;

Rm = minimum tensile strength in N/mm².

6.7.2.3.3.1 The values of Re and Rm to be used shall be the specified minimum values according to national or international material standards. When austenitic steels are used, the specified minimum values for Re and Rm according to the material standards may be increased by up to 15 % when greater values are attested in the material inspection certificate. When no material standard exists for the metal in question, the values of Re and Rm used shall be approved by the competent authority or its authorized body.

6.7.2.3.3.2 Steels which have a Re/Rm ratio of more than 0.85 are not allowed for the construction of welded shells. The values of Re and Rm to be used in determining this ratio shall be the values specified in the material inspection certificate.

6.7.2.3.3.3 Steels used in the construction of shells shall have an elongation at fracture, in %, of not less than 10 000/Rm with an absolute minimum of 16 % for fine grain steels and 20 % for other steels. Aluminium and aluminium alloys used in the construction of shells shall have an elongation at fracture, in %, of not less than 10 000/6Rm with an absolute minimum of 12 %.

6.7.2.3.3.4 For the purpose of determining actual values for materials, it shall be noted that for sheet metal, the axis of the tensile test specimen shall be at right angles (transversely) to the direction of rolling. The permanent elongation at fracture shall be measured on test specimens of rectangular cross sections in accordance with ISO 6892:1998 using a 50 mm gauge length.

6.7.2.4 Minimum shell thickness

6.7.2.4.1 The minimum shell thickness shall be the greater thickness based on:

(a) The minimum thickness determined in accordance with the requirements of 6.7.2.4.2 to 6.7.2.4.10;

(b) The minimum thickness determined in accordance with the recognized pressure vessel code including the requirements in 6.7.2.3; and

(c) The minimum thickness specified in the applicable portable tank instruction indicated in Column (10) of Table A of Chapter 3.2 and described in 4.2.5.2.6 or by a portable tank special provision indicated in Column (11) of Table A of Chapter 3.2 and described in 4.2.5.3.

6.7.2.4.2 The cylindrical portions, ends (heads) and manhole covers of shells not more than 1.80 m in diameter shall be not less than 5 mm thick in the reference steel or of equivalent thickness in the metal to be used. Shells more than 1.80 m in diameter shall be not less than 6 mm thick in the reference steel or of equivalent thickness in the metal to be used, except that for powdered or granular solid substances of packing group II or III the minimum thickness requirement may be reduced to not less than 5 mm thick in the reference steel or of equivalent thickness in the metal to be used.

6.7.2.4.3 When additional protection against shell damage is provided, portable tanks with test pressures less than 2.65 bar may have the minimum shell thickness reduced, in proportion to the protection provided, as approved by the competent authority. However, shells not more than 1.80 m in diameter shall be not less than 3 mm thick in the reference steel or of equivalent thickness in the metal to be used. Shells more than 1.80 m in diameter shall be not less than 4 mm thick in the reference steel or of equivalent thickness in the metal to be used.

6.7.2.4.4 The cylindrical portions, ends (heads) and manhole covers of all shells shall be not less than 3 mm thick regardless of the material of construction.

6.7.2.4.5 The additional protection referred to in 6.7.2.4.3 may be provided by overall external structural protection, such as suitable "sandwich" construction with the outer sheathing (jacket) secured to the shell, double wall construction or by enclosing the shell in a complete framework with longitudinal and transverse structural members.

6.7.2.4.6 The equivalent thickness of a metal other than the thickness prescribed for the reference steel in 6.7.2.4.2 shall be determined using the following formula:

$$e_1 = \frac{21.4 e_o}{\sqrt[3]{Rm_1 \times A_1}}$$

where:

e_1 = required equivalent thickness (in mm) of the metal to be used;

e_0 = minimum thickness (in mm) of the reference steel specified in the applicable portable tank instruction indicated in Column (10) of Table A of Chapter 3.2 and described in 4.2.5.2.6 or by a portable tank special provision indicated in Column (11) of Table A of Chapter 3.2 and described in 4.2.5.3;

Rm_1 = guaranteed minimum tensile strength (in N/mm²) of the metal to be used (see 6.7.2.3.3);

A_1 = guaranteed minimum elongation at fracture (in %) of the metal to be used according to national or international standards.

6.7.2.4.7 When in the applicable portable tank instruction in 4.2.5.2.6, a minimum thickness of 8 mm or 10 mm is specified, it shall be noted that these thicknesses are based on the properties of the reference steel and a shell diameter of 1.80 m. When a metal other than mild steel (see 6.7.2.1) is used or the shell has a diameter of more than 1.80 m, the thickness shall be determined using the following formula:

$$e_1 = \frac{21.4 e_o \, d_1}{1{,}8 \sqrt[3]{Rm_1 \times A_1}}$$

where:

e_1 = required equivalent thickness (in mm) of the metal to be used;

e_0 = minimum thickness (in mm) of the reference steel specified in the applicable portable tank instruction indicated in Column (10) of Table A of Chapter 3.2 and described in 4.2.5.2.6 or by a portable tank special provision indicated in Column (11) of Table A of Chapter 3.2 and described in 4.2.5.3;

d_1 = diameter of the shell (in m), but not less than 1.80 m;

Rm_1 = guaranteed minimum tensile strength (in N/mm²) of the metal to be used (see 6.7.2.3.3);

A_1 = guaranteed minimum elongation at fracture (in %) of the metal to be used according to national or international standards.

6.7.2.4.8 In no case shall the wall thickness be less than that prescribed in 6.7.2.4.2, 6.7.2.4.3 and 6.7.2.4.4. All parts of the shell shall have a minimum thickness as determined by 6.7.2.4.2 to 6.7.2.4.4. This thickness shall be exclusive of any corrosion allowance.

6.7.2.4.9 When mild steel is used (see 6.7.2.1), calculation using the formula in 6.7.2.4.6 is not required.

6.7.2.4.10 There shall be no sudden change of plate thickness at the attachment of the ends (heads) to the cylindrical portion of the shell.

6.7.2.5 Service equipment

6.7.2.5.1 Service equipment shall be so arranged as to be protected against the risk of being wrenched off or damaged during handling and carriage. When the connection between the frame and the shell allows relative movement between the sub-assemblies, the equipment shall be so fastened as to permit such movement without risk of damage to working parts. The external discharge fittings (pipe sockets, shut-off devices), the internal stop-valve and its seating shall be protected against the danger of being wrenched off by external forces (for example using shear sections). The filling and discharge devices (including flanges or threaded plugs) and any protective caps shall be capable of being secured against unintended opening.

6.7.2.5.2 All openings in the shell, intended for filling or discharging the portable tank shall be fitted with a manually operated stop-valve located as close to the shell as reasonably practicable. Other openings, except for openings leading to venting or pressure-relief devices, shall be equipped with either a stop-valve or another suitable means of closure located as close to the shell as reasonably practicable.

6.7.2.5.3 All portable tanks shall be fitted with a manhole or other inspection openings of a suitable size to allow for internal inspection and adequate access for maintenance and repair of the interior. Compartmented portable tanks shall have a manhole or other inspection openings for each compartment.

6.7.2.5.4 As far as reasonably practicable, external fittings shall be grouped together. For insulated portable tanks, top fittings shall be surrounded by a spill collection reservoir with suitable drains.

6.7.2.5.5 Each connection to a portable tank shall be clearly marked to indicate its function.

6.7.2.5.6 Each stop-valve or other means of closure shall be designed and constructed to a rated pressure not less than the MAWP of the shell taking into account the temperatures expected during carriage. All stop-valves with screwed spindles shall close by a clockwise motion of the handwheel. For other stop-valves the position (open and closed) and direction of closure shall be clearly indicated. All stop-valves shall be designed to prevent unintentional opening.

6.7.2.5.7 No moving parts, such as covers, components of closures, etc., shall be made of unprotected corrodible steel when they are liable to come into frictional or percussive contact with aluminium portable tanks intended for the carriage of substances meeting the flash-point criteria of Class 3 including elevated temperature substances carried at or above their flash-point.

6.7.2.5.8 Piping shall be designed, constructed and installed so as to avoid the risk of damage due to thermal expansion and contraction, mechanical shock and vibration. All piping shall be of a suitable metallic material. Welded pipe joints shall be used wherever possible.

6.7.2.5.9 Joints in copper tubing shall be brazed or have an equally strong metal union. The melting point of brazing materials shall be no lower than 525 °C. The joints shall not decrease the strength of the tubing as may happen when cutting threads.

6.7.2.5.10 The burst pressure of all piping and pipe fittings shall be not less than the highest of four times the MAWP of the shell or four times the pressure to which it may be subjected in service by the action of a pump or other device (except pressure-relief devices).

6.7.2.5.11 Ductile metals shall be used in the construction of valves and accessories.

6.7.2.5.12 The heating system shall be designed or controlled so that a substance cannot reach a temperature at which the pressure in the tank exceeds its MAWP or causes other hazards (e.g. dangerous thermal decomposition).

6.7.2.5.13 The heating system shall be designed or controlled so that power for internal heating elements shall not be available unless the heating elements are completely submerged. The temperature at the surface of the heating elements for internal heating equipment, or the temperature at the shell for external heating equipment shall, in no case, exceed 80 % of the autoignition temperature (in °C) of the substance carried.

6.7.2.5.14 If an electrical heating system is installed inside the tank, it shall be equipped with an earth leakage circuit breaker with a releasing current of less than 100 mA.

6.7.2.5.15 Electrical switch cabinets mounted to tanks shall not have a direct connection to the tank interior and shall provide protection of at least the equivalent of type IP56 according to IEC 144 or IEC 529.

6.7.2.6 Bottom openings

6.7.2.6.1 Certain substances shall not be carried in portable tanks with bottom openings. When the applicable portable tank instruction identified in Column (10) of Table A of Chapter 3.2 and described in 4.2.5.2.6 indicates that bottom openings are prohibited there shall be no openings below the liquid level of the shell when it is filled to its maximum permissible filling limit. When an existing opening is closed it shall be accomplished by internally and externally welding one plate to the shell.

6.7.2.6.2 Bottom discharge outlets for portable tanks carrying certain solid, crystallizable or highly viscous substances shall be equipped with not less than two serially fitted and mutually independent shut-off devices. The design of the equipment shall be to the satisfaction of the competent authority or its authorized body and shall include:

(a) An external stop-valve, fitted as close to the shell as reasonably practicable, and so designed as to prevent any unintended opening through impact or other inadvertent act; and

(b) A liquid tight closure at the end of the discharge pipe, which may be a bolted blank flange or a screw cap.

6.7.2.6.3 Every bottom discharge outlet, except as provided in 6.7.2.6.2, shall be equipped with three serially fitted and mutually independent shut-off devices. The design of the equipment shall be to the satisfaction of the competent authority or its authorized body and include:

(a) A self-closing internal stop-valve, that is a stop-valve within the shell or within a welded flange or its companion flange, such that:

(i) The control devices for the operation of the valve are designed so as to prevent any unintended opening through impact or other inadvertent act;

(ii) The valve may be operable from above or below;

(iii) If possible, the setting of the valve (open or closed) shall be capable of being verified from the ground;

(iv) Except for portable tanks having a capacity of not more than 1 000 litres, it shall be possible to close the valve from an accessible position of the portable tank that is remote from the valve itself; and

(v) The valve shall continue to be effective in the event of damage to the external device for controlling the operation of the valve;

(b) An external stop-valve fitted as close to the shell as reasonably practicable; and

(c) A liquid tight closure at the end of the discharge pipe, which may be a bolted blank flange or a screw cap.

6.7.2.6.4 For a lined shell, the internal stop-valve required by 6.7.2.6.3 (a) may be replaced by an additional external stop-valve. The manufacturer shall satisfy the requirements of the competent authority or its authorized body.

6.7.2.7 Safety-relief devices

6.7.2.7.1 All portable tanks shall be fitted with at least one pressure-relief device. All relief devices shall be designed, constructed and marked to the satisfaction of the competent authority or its authorized body.

6.7.2.8 Pressure-relief devices

6.7.2.8.1 Every portable tank with a capacity not less than 1 900 litres and every independent compartment of a portable tank with a similar capacity, shall be provided with one or more pressure-relief devices of the spring-loaded type and may in addition have a frangible disc or fusible element in parallel with the spring-loaded devices except when prohibited by reference to 6.7.2.8.3 in the applicable portable tank instruction in 4.2.5.2.6. The pressure-relief devices shall have sufficient capacity to prevent rupture of the shell due to over pressurization or vacuum resulting from filling, discharging, or from heating of the contents.

6.7.2.8.2 Pressure-relief devices shall be designed to prevent the entry of foreign matter, the leakage of liquid and the development of any dangerous excess pressure.

6.7.2.8.3 When required for certain substances by the applicable portable tank instruction indicated in Column (10) of Table A of Chapter 3.2 and described in 4.2.5.2.6, portable tanks shall have a pressure-relief device approved by the competent authority. Unless a portable tank in dedicated service is fitted with an approved relief device constructed of materials compatible with the substance carried, the relief device shall comprise a frangible disc preceding a spring-loaded pressure-relief device. When a frangible disc is inserted in series with the required pressure-relief device, the space between the frangible disc and the pressure-relief device shall be provided with a pressure gauge or suitable tell-tale indicator for the detection of disc rupture, pinholing, or leakage which could cause a malfunction of the pressure-relief system. The frangible disc shall rupture at a nominal pressure 10 % above the start to discharge pressure of the relief device.

6.7.2.8.4 Every portable tank with a capacity less than 1 900 litres shall be fitted with a pressure-relief device which may be a frangible disc when this disc complies with the requirements of 6.7.2.11.1. When no spring-loaded pressure-relief device is used, the frangible disc shall be set to rupture at a nominal pressure equal to the test pressure. In addition, fusible elements conforming to 6.7.2.10.1 may also be used.

6.7.2.8.5 When the shell is fitted for pressure discharge, the inlet line shall be provided with a suitable pressure-relief device set to operate at a pressure not higher than the MAWP of the shell, and a stop-valve shall be fitted as close to the shell as reasonably practicable.

6.7.2.9 Setting of pressure-relief devices

6.7.2.9.1 It shall be noted that the pressure-relief devices shall operate only in conditions of excessive rise in temperature, since the shell shall not be subject to undue fluctuations of pressure during normal conditions of carriage (see 6.7.2.12.2).

6.7.2.9.2 The required pressure-relief device shall be set to start-to-discharge at a nominal pressure of five-sixths of the test pressure for shells having a test pressure of not more than 4.5 bar and 110 % of two-thirds of the test pressure for shells having a test pressure of more than 4.5 bar. After discharge the device shall close at a pressure not more than 10 % below the pressure at which the discharge starts. The device shall remain closed at all lower pressures. This requirement does not prevent the use of vacuum-relief or combination pressure-relief and vacuum-relief devices.

6.7.2.10 Fusible elements

6.7.2.10.1 Fusible elements shall operate at a temperature between 100 °C and 149 °C on condition that the pressure in the shell at the fusing temperature will be not more than the test pressure. They shall be placed at the top of the shell with their inlets in the vapour space and when used for transport safety purposes, they shall not be shielded from external heat. Fusible elements shall not be used on portable tanks with a test pressure which exceeds 2.65 bar unless specified by special provision TP36 in Column (11) of Table A of Chapter 3.2. Fusible elements used on portable tanks intended for the carriage of elevated temperature substances shall be designed to operate at a temperature higher than the maximum temperature that will be experienced during carriage and shall be to the satisfaction of the competent authority or its authorized body.

6.7.2.11 Frangible discs

6.7.2.11.1 Except as specified in 6.7.2.8.3, frangible discs shall be set to rupture at a nominal pressure equal to the test pressure throughout the design temperature range. Particular attention shall be given to the requirements of 6.7.2.5.1 and 6.7.2.8.3 if frangible discs are used.

6.7.2.11.2 Frangible discs shall be appropriate for the vacuum pressures which may be produced in the portable tank.

6.7.2.12 Capacity of pressure-relief devices

6.7.2.12.1 The spring-loaded pressure-relief device required by 6.7.2.8.1 shall have a minimum cross sectional flow area equivalent to an orifice of 31.75 mm diameter. Vacuum-relief devices, when used, shall have a cross sectional flow area not less than 284 mm².

6.7.2.12.2 The combined delivery capacity of the pressure relief system (taking into account the reduction of the flow when the portable tank is fitted with frangible-discs preceding spring-loaded pressure-relief devices or when the spring-loaded pressure-relief devices are provided with a device to prevent the passage of the flame), in condition of complete fire engulfment of the portable tank shall be sufficient to limit the pressure in the shell to 20 % above the start-to-discharge pressure of the pressure limiting device. Emergency pressure-relief devices may be used to achieve the full relief capacity prescribed. These devices may be fusible, spring loaded or frangible disc components, or a combination of spring-loaded and frangible disc devices. The total required capacity of the relief devices may be determined using the formula in 6.7.2.12.2.1 or the table in 6.7.2.12.2.3.

6.7.2.12.2.1 To determine the total required capacity of the relief devices, which shall be regarded as being the sum of the individual capacities of all the contributing devices, the following formula shall be used:

$$Q = 12.4 \frac{FA^{0.82}}{LC} \sqrt{\frac{ZT}{M}}$$

where:

Q = minimum required rate of discharge in cubic metres of air per second (m³/s) at standard conditions: 1 bar and 0 °C (273 K);

F = is a coefficient with the following value:

for uninsulated shells: F = 1;

for insulated shells: F = U(649 - t)/13.6 but in no case is less than 0.25

where:

U = heat transfer coefficient of the insulation, in $kW.m^{-2}.K^{-1}$, at 38 °C;

t = actual temperature of the substance during filling (in °C); when this temperature is unknown, let t = 15 °C;

The value of F given above for insulated shells may be taken provided that the insulation is in accordance with 6.7.2.12.2.4;

A = total external surface area of shell in m²;

Z = the gas compressibility factor in the accumulating condition (when this factor is unknown, let Z =1.0);

T = absolute temperature in Kelvin (°C + 273) above the pressure-relief devices in the accumulating condition;

L = the latent heat of vaporization of the liquid, in kJ/kg, in the accumulating condition;

M = molecular mass of the discharged gas;

C = a constant which is derived from one of the following formulae as a function of the ratio k of specific heats:

$$k = \frac{c_p}{c_v}$$

where:

c_p is the specific heat at constant pressure; and

c_v is the specific heat at constant volume.

When k > 1:

$$C = \sqrt{k\left(\frac{2}{k+1}\right)^{\frac{k+1}{k-1}}}$$

When k = 1 or k is unknown:

$$C = \frac{1}{\sqrt{e}} = 0.607$$

where e is the mathematical constant 2.7183

C may also be taken from the following table:

k	C	k	C	k	C
1.00	0.607	1.26	0.660	1.52	0.704
1.02	0.611	1.28	0.664	1.54	0.707
1.04	0.615	1.30	0.667	1.56	0.710
1.06	0.620	1.32	0.671	1.58	0.713
1.08	0.624	1.34	0.674	1.60	0.716
1.10	0.628	1.36	0.678	1.62	0.719
1.12	0.633	1.38	0.681	1.64	0.722
1.14	0.637	1.40	0.685	1.66	0.725
1.16	0.641	1.42	0.688	1.68	0.728
1.18	0.645	1.44	0.691	1.70	0.731
1.20	0.649	1.46	0.695	2.00	0.770
1.22	0.652	1.48	0.698	2.20	0.793
1.24	0.656	1.50	0.701		

6.7.2.12.2.2 As an alternative to the formula above, shells designed for the carriage of liquids may have their relief devices sized in accordance with the table in 6.7.2.12.2.3. This table assumes an insulation value of *F* = 1 and shall be adjusted accordingly when the shell is insulated. Other values used in determining this table are:

M	=	86.7	T	=	394 K
L	=	334.94 kJ/kg	C	=	0.607
Z	=	1			

6.7.2.12.2.3 Minimum required rate of discharge, Q, in cubic metres per air per second at 1 bar and 0 °C (273 K)

A Exposed area (square metres)	Q (cubic metres of air per second)	A Exposed area (square metres)	Q (cubic metres of air per second)
2	0.230	37.5	2.539
3	0.320	40	2.677
4	0.405	42.5	2.814
5	0.487	45	2.949
6	0.565	47.5	3.082
7	0.641	50	3.215
8	0.715	52.5	3.346
9	0.788	55	3.476

A Exposed area (square metres)	Q (cubic metres of air per second)	A Exposed area (square metres)	Q (cubic metres of air per second)
10	0.859	57.5	3.605
12	0.998	60	3.733
14	1.132	62.5	3.860
16	1.263	65	3.987
18	1.391	67.5	4.112
20	1.517	70	4.236
22.5	1.670	75	4.483
25	1.821	80	4.726
27.5	1.969	85	4.967
30	2.115	90	5.206
32.5	2.258	95	5.442
35	2.400	100	5.676

6.7.2.12.2.4 Insulation systems, used for the purpose of reducing venting capacity, shall be approved by the competent authority or its authorized body. In all cases, insulation systems approved for this purpose shall:

(a) Remain effective at all temperatures up to 649 °C; and

(b) Be jacketed with a material having a melting point of 700 °C or greater.

6.7.2.13 Marking of pressure-relief devices

6.7.2.13.1 Every pressure-relief device shall be clearly and permanently marked with the following particulars:

(a) The pressure (in bar or kPa) or temperature (in °C) at which it is set to discharge;

(b) The allowable tolerance at the discharge pressure for spring-loaded devices;

(c) The reference temperature corresponding to the rated pressure for frangible discs;

(d) The allowable temperature tolerance for fusible elements; and

(e) The rated flow capacity of the spring-loaded pressure relief devices, frangible discs or fusible elements in standard cubic metres of air per second (m^3/s);

(f) The cross sectional flow areas of the spring loaded pressure-relief devices, frangible discs and fusible elements in mm^2.

When practicable, the following information shall also be shown:

(g) The manufacturer's name and relevant catalogue number of the device.

6.7.2.13.2 The rated flow capacity marked on the spring-loaded pressure-relief devices shall be determined according to ISO 4126-1:2004 and ISO 4126-7:2004.

6.7.2.14 Connections to pressure-relief devices

6.7.2.14.1 Connections to pressure-relief devices shall be of sufficient size to enable the required discharge to pass unrestricted to the safety device. No stop-valve shall be installed between the shell and the pressure-relief devices except where duplicate devices are provided for maintenance or other reasons and the stop-valves serving the devices actually in use are locked open or the stop-valves are interlocked so that at least one of the duplicate devices is always in use. There shall be no obstruction in an opening leading to a vent or pressure-relief device which might restrict or cut-off the flow from the shell to that device. Vents or pipes from the pressure-relief device outlets, when used, shall deliver the relieved vapour or liquid to the atmosphere in conditions of minimum back-pressure on the relieving devices.

6.7.2.15 Siting of pressure-relief devices

6.7.2.15.1 Each pressure-relief device inlet shall be situated on top of the shell in a position as near the longitudinal and transverse centre of the shell as reasonably practicable. All pressure-relief device inlets shall under maximum filling conditions be situated in the vapour space of the shell and the devices shall be so arranged as to ensure the escaping vapour is discharged unrestrictedly. For flammable substances, the escaping vapour shall be directed away from the shell in such a manner that it cannot impinge upon the shell. Protective devices which deflect the flow of vapour are permissible provided the required relief-device capacity is not reduced.

6.7.2.15.2 Arrangements shall be made to prevent access to the pressure-relief devices by unauthorized persons and to protect the devices from damage caused by the portable tank overturning.

6.7.2.16 Gauging devices

6.7.2.16.1 Glass level-gauges and gauges made of other fragile material, which are in direct communication with the contents of the tank shall not be used.

6.7.2.17 Portable tank supports, frameworks, lifting and tie-down attachments

6.7.2.17.1 Portable tanks shall be designed and constructed with a support structure to provide a secure base during carriage. The forces specified in 6.7.2.2.12 and the safety factor specified in 6.7.2.2.13 shall be considered in this aspect of the design. Skids, frameworks, cradles or other similar structures are acceptable.

6.7.2.17.2 The combined stresses caused by portable tank mountings (e.g. cradles, framework, etc.) and portable tank lifting and tie-down attachments shall not cause excessive stress in any portion of the shell. Permanent lifting and tie-down attachments shall be fitted to all portable tanks. Preferably they shall be fitted to the portable tank supports but may be secured to reinforcing plates located on the shell at the points of support.

6.7.2.17.3 In the design of supports and frameworks the effects of environmental corrosion shall be taken into account.

6.7.2.17.4 Forklift pockets shall be capable of being closed off. The means of closing forklift pockets shall be a permanent part of the framework or permanently attached to the framework. Single compartment portable tanks with a length less than 3.65 m need not have closed off forklift pockets provided that:

(a) The shell including all the fittings are well protected from being hit by the forklift blades; and

(b) The distance between the centres of the forklift pockets is at least half of the maximum length of the portable tank.

6.7.2.17.5 When portable tanks are not protected during carriage, according to 4.2.1.2, the shells and service equipment shall be protected against damage to the shell and service equipment resulting from lateral or longitudinal impact or overturning. External fittings shall be protected so as to preclude the release of the shell contents upon impact or overturning of the portable tank on its fittings. Examples of protection include:

(a) Protection against lateral impact which may consist of longitudinal bars protecting the shell on both sides at the level of the median line;

(b) Protection of the portable tank against overturning which may consist of reinforcement rings or bars fixed across the frame;

(c) Protection against rear impact which may consist of a bumper or frame;

(d) Protection of the shell against damage from impact or overturning by use of an ISO frame in accordance with ISO 1496-3:1995.

6.7.2.18 Design approval

6.7.2.18.1 The competent authority or its authorized body shall issue a design approval certificate for any new design of a portable tank. This certificate shall attest that a portable tank has been surveyed by that authority, is suitable for its intended purpose and meets the requirements of this Chapter and where

appropriate, the provisions for substances provided in Chapter 4.2 and in Table A of Chapter 3.2. When a series of portable tanks are manufactured without change in the design, the certificate shall be valid for the entire series. The certificate shall refer to the prototype test report, the substances or group of substances allowed to be carried, the materials of construction of the shell and lining (when applicable) and an approval number. The approval number shall consist of the distinguishing sign or mark of the State in whose territory the approval was granted, indicated by the distinguishing sign used on vehicles in international road traffic[2], and a registration number. Any alternative arrangements according to 6.7.1.2 shall be indicated on the certificate. A design approval may serve for the approval of smaller portable tanks made of materials of the same kind and thickness, by the same fabrication techniques and with identical supports, equivalent closures and other appurtenances.

6.7.2.18.2 The prototype test report for the design approval shall include at least the following:

(a) The results of the applicable framework test specified in ISO 1496-3:1995;

(b) The results of the initial inspection and test according to 6.7.2.19.3; and

(c) The results of the impact test in 6.7.2.19.1, when applicable.

6.7.2.19 Inspection and testing

6.7.2.19.1 Portable tanks meeting the definition of container in the International Convention for Safe Containers (CSC), 1972, as amended, shall not be used unless they are successfully qualified by subjecting a representative prototype of each design to the Dynamic, Longitudinal Impact Test prescribed in the Manual of Tests and Criteria, Part IV, Section 41.

6.7.2.19.2 The shell and items of equipment of each portable tank shall be inspected and tested before being put into service for the first time (initial inspection and test) and thereafter at not more than five-year intervals (5 year periodic inspection and test) with an intermediate periodic inspection and test (2.5 year periodic inspection and test) midway between the 5 year periodic inspections and tests. The 2.5 year inspection and test may be performed within 3 months of the specified date. An exceptional inspection and test shall be performed regardless of the date of the last periodic inspection and test when necessary according to 6.7.2.19.7.

6.7.2.19.3 The initial inspection and test of a portable tank shall include a check of the design characteristics, an internal and external examination of the portable tank and its fittings with due regard to the substances to be carried, and a pressure test. Before the portable tank is placed into service, a leakproofness test and a check of the satisfactory operation of all service equipment shall also be performed. When the shell and its fittings have been pressure-tested separately, they shall be subjected together after assembly to a leakproofness test.

6.7.2.19.4 The 5-year periodic inspection and test shall include an internal and external examination and, as a general rule, a hydraulic pressure test. For tanks only used for the carriage of solid substances, other than toxic or corrosive substances that do not liquefy during carriage, the hydraulic pressure test may be replaced by a suitable pressure test at 1.5 times the MAWP, subject to competent authority approval. Sheathing, thermal insulation and the like shall be removed only to the extent required for reliable appraisal of the condition of the portable tank. When the shell and equipment have been pressure-tested separately, they shall be subjected together after assembly to a leakproofness test.

6.7.2.19.5 The intermediate 2.5 year periodic inspection and test shall at least include an internal and external examination of the portable tank and its fittings with due regard to the substances intended to be carried, a leakproofness test and a check of the satisfactory operation of all service equipment. Sheathing, thermal insulation and the like shall be removed only to the extent required for reliable appraisal of the condition of the portable tank. For portable tanks intended for the carriage of a single substance, the 2.5 year internal examination may be waived or substituted by other test methods or inspection procedures specified by the competent authority or its authorized body.

[2] *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*

6.7.2.19.6 Inspection and test of portable tanks and filling after the date of expiry of the last periodic inspection and test

6.7.2.19.6.1 A portable tank may not be filled and offered for carriage after the date of expiry of the last 5 year or 2.5 year periodic inspection and test as required by 6.7.2.19.2. However, a portable tank filled prior to the date of expiry of the last periodic inspection and test may be carried for a period not to exceed three months beyond the date of expiry of the last periodic test or inspection. In addition, a portable tank may be carried after the date of expiry of the last periodic test and inspection:

(a) After emptying but before cleaning, for purposes of performing the next required test or inspection prior to refilling; and

(b) Unless otherwise approved by the competent authority, for a period not to exceed six months beyond the date of expiry of the last periodic test or inspection, in order to allow the return of dangerous goods for proper disposal or recycling. Reference to this exemption shall be mentioned in the transport document.

6.7.2.19.6.2 Except as provided for in 6.7.2.19.6.1, portable tanks which have missed the timeframe for their scheduled 5 year or 2.5-year periodic inspection and test may only be filled and offered for carriage if a new 5-year periodic inspection and test is performed according to 6.7.2.19.4.

6.7.2.19.7 The exceptional inspection and test is necessary when the portable tank shows evidence of damaged or corroded areas, or leakage, or other conditions that indicate a deficiency that could affect the integrity of the portable tank. The extent of the exceptional inspection and test shall depend on the amount of damage or deterioration of the portable tank. It shall include at least the 2.5 year inspection and test according to 6.7.2.19.5.

6.7.2.19.8 The internal and external examinations shall ensure that:

(a) The shell is inspected for pitting, corrosion, or abrasions, dents, distortions, defects in welds or any other conditions, including leakage, that might render the portable tank unsafe for carriage. The wall thickness shall be verified by appropriate measurement if this inspection indicates a reduction of wall thickness;

(b) The piping, valves, heating/cooling system, and gaskets are inspected for corroded areas, defects, or any other conditions, including leakage, that might render the portable tank unsafe for filling, discharge or carriage;

(c) Devices for tightening manhole covers are operative and there is no leakage at manhole covers or gaskets;

(d) Missing or loose bolts or nuts on any flanged connection or blank flange are replaced or tightened;

(e) All emergency devices and valves are free from corrosion, distortion and any damage or defect that could prevent their normal operation. Remote closure devices and self-closing stop-valves shall be operated to demonstrate proper operation;

(f) Linings, if any, are inspected in accordance with criteria outlined by the lining manufacturer;

(g) Required marks on the portable tank are legible and in accordance with the applicable requirements; and

(h) The framework, supports and arrangements for lifting the portable tank are in a satisfactory condition.

6.7.2.19.9 The inspections and tests in 6.7.2.19.1, 6.7.2.19.3, 6.7.2.19.4, 6.7.2.19.5 and 6.7.2.19.7 shall be performed or witnessed by an expert approved by the competent authority or its authorized body. When the pressure test is a part of the inspection and test, the test pressure shall be the one indicated on the data plate of the portable tank. While under pressure, the portable tank shall be inspected for any leaks in the shell, piping or equipment.

6.7.2.19.10 In all cases when cutting, burning or welding operations on the shell have been effected, that work shall be to the approval of the competent authority or its authorized body taking into account the pressure

vessel code used for the construction of the shell. A pressure test to the original test pressure shall be performed after the work is completed.

6.7.2.19.11 When evidence of any unsafe condition is discovered, the portable tank shall not be returned to service until it has been corrected and the test is repeated and passed. .

6.7.2.20 ***Marking***

6.7.2.20.1 Every portable tank shall be fitted with a corrosion resistant metal plate permanently attached to the portable tank in a conspicuous place readily accessible for inspection. When for reasons of portable tank arrangements the plate cannot be permanently attached to the shell, the shell shall be marked with at least the information required by the pressure vessel code. As a minimum, at least the following information shall be marked on the plate by stamping or by any other similar method:

(a) Owner information

(i) Owner's registration number;

(b) Manufacturing information

(i) Country of manufacture;

(ii) Year of manufacture;

(iii) Manufacturer's name or mark;

(iv) Manufacturer's serial number;

(c) Approval information

(i) The United Nations packaging symbol  .

This symbol shall not be used for any purpose other than certifying that a packaging, a flexible bulk container, a portable tank or a MEGC complies with the relevant requirements in Chapter 6.1, 6.2, 6.3, 6.5, 6.6, 6.7 or 6.11;

(ii) Approval country;

(iii) Authorized body for the design approval;

(iv) Design approval number;

(v) Letters 'AA', if the design was approved under alternative arrangements (see 6.7.1.2);

(vi) Pressure vessel code to which the shell is designed;

(d) Pressures

(i) MAWP (in bar gauge or kPa gauge)[3];

(ii) Test pressure (in bar gauge or kPa gauge)[3];

(iii) Initial pressure test date (month and year);

(iv) Identification mark of the initial pressure test witness;

(v) External design pressure[4] (in bar gauge or kPa gauge)[3];

(vi) MAWP for heating/cooling system (in bar gauge or kPa gauge)[3] (when applicable);

[3] *The unit used shall be indicated.*

[4] *See 6.7.2.2.10.*

(e) Temperatures

(i) Design temperature range (in °C)[3];

(f) Materials

(i) Shell material(s) and material standard reference(s);

(ii) Equivalent thickness in reference steel (in mm)[3];

(iii) Lining material (when applicable);

(g) Capacity

(i) Tank water capacity at 20 °C (in litres)[3];

This indication is to be followed by the symbol "S" when the shell is divided by surge plates into sections of not more than 7 500 litres capacity;

(ii) Water capacity of each compartment at 20 °C (in litres)[3] (when applicable, for multi-compartment tanks).

This indication is to be followed by the symbol "S" when the compartment is divided by surge plates into sections of not more than 7 500 litres capacity;

(h) Periodic inspections and tests

(i) Type of the most recent periodic test (2.5-year, 5-year or exceptional);

(ii) Date of the most recent periodic test (month and year);

(iii) Test pressure (in bar gauge or kPa gauge)[3] of the most recent periodic test (if applicable);

(iv) Identification mark of the authorized body who performed or witnessed the most recent test.

[3] *The unit used shall be indicated.*

Figure 6.7.2.20.1: Example of a plate for marking

Owner's registration number					
MANUFACTURING INFORMATION					
Country of manufacture					
Year of manufacture					
Manufacturer					
Manufacturer's serial number					
APPROVAL INFORMATION					
(UN)	Approval country				
	Authorized body for design approval				
	Design approval number				'AA' *(if applicable)*
Shell design code (pressure vessel code)					
PRESSURES					
MAWP					bar *or* kPa
Test pressure					bar *or* kPa
Initial pressure test date:	*(mm/yyyy)*		Witness stamp:		
External design pressure					bar *or* kPa
MAWP for heating/cooling system (*when applicable)*					bar *or* kPa
TEMPERATURES					
Design temperature range			°C to		°C
MATERIALS					
Shell material(s) and material standard reference(s)					
Equivalent thickness in reference steel					mm
Lining material *(when applicable)*					
CAPACITY					
Tank water capacity at 20 °C			litres		'S' *(if applicable)*
Water capacity of compartment___at 20 °C *(when applicable, for multi-compartment tanks)*			litres		'S' *(if applicable)*

PERIODIC INSPECTIONS / TESTS							
Test type	Test date	Witness stamp and test pressure[a]		Test type	Test date	Witness stamp and test pressure[a]	
	(mm/yyyy)		bar *or* kPa		*(mm/yyyy)*		bar *or* kPa

[a] *Test pressure if applicable.*

6.7.2.20.2 The following particulars shall be durably marked either on the portable tank itself or on a metal plate firmly secured to the portable tank:

Name of the operator
Maximum permissible gross mass (MPGM) _____ kg
Unladen (tare) mass _____ kg
Portable tank instruction in accordance with 4.2.5.2.6

NOTE: *For the identification of the substances being carried, see also Part 5.*

6.7.2.20.3 If a portable tank is designed and approved for handling in open seas, the words "OFFSHORE PORTABLE TANK" shall be marked on the identification plate.

6.7.3 Requirements for the design, construction, inspection and testing of portable tanks intended for the carriage of non-refrigerated liquefied gases

NOTE: *These requirements also apply to portable tanks intended for the carriage of chemicals under pressure (UN Nos. 3500, 3501, 3502, 3503, 3504 and 3505).*

6.7.3.1 Definitions

For the purposes of this section:

Alternative arrangement means an approval granted by the competent authority for a portable tank or MEGC that has been designed, constructed or tested to technical requirements or testing methods other than those specified in this Chapter;

Portable tank means a multimodal tank having a capacity of more than 450 litres used for the carriage of non-refrigerated liquefied gases of Class 2. The portable tank includes a shell fitted with service equipment and structural equipment necessary for the carriage of gases. The portable tank shall be capable of being filled and discharged without the removal of its structural equipment. It shall possess stabilizing members external to the shell, and shall be capable of being lifted when full. It shall be designed primarily to be loaded onto a vehicle, wagon or sea-going or inland navigation vessel and shall be equipped with skids, mountings or accessories to facilitate mechanical handling. Tank-vehicles, tank-wagons, non-metallic tanks, intermediate bulk containers (IBCs), gas cylinders and large receptacles are not considered to fall within the definition for portable tanks;

Shell means the part of the portable tank which retains the non-refrigerated liquefied gas intended for carriage (tank proper), including openings and their closures, but does not include service equipment or external structural equipment;

Service equipment means measuring instruments and filling, discharge, venting, safety and insulating devices;

Structural equipment means the reinforcing, fastening, protective and stabilizing members external to the shell;

Maximum allowable working pressure (MAWP) means a pressure that shall be not less than the highest of the following pressures measured at the top of the shell while in operating position, but in no case less than 7 bar:

(a) The maximum effective gauge pressure allowed in the shell during filling or discharge; or

(b) The maximum effective gauge pressure to which the shell is designed, which shall be:

(i) for a non-refrigerated liquefied gas listed in the portable tank instruction T50 in 4.2.5.2.6, the MAWP (in bar) given in T50 portable tank instruction for that gas;

(ii) for other non-refrigerated liquefied gases, not less than the sum of:

- the absolute vapour pressure (in bar) of the non-refrigerated liquefied gas at the design reference temperature minus 1 bar; and
- the partial pressure (in bar) of air or other gases in the ullage space being determined by the design reference temperature and the liquid phase expansion due to an increase of the mean bulk temperature of $t_r - t_f$ (t_f = filling temperature, usually 15 °C, t_r = maximum mean bulk temperature, 50 °C);

(iii) for chemicals under pressure, the MAWP (in bar) given in T50 portable tank instruction for the liquefied gas portion of the propellants listed in T50 in 4.2.5.2.6;

Design pressure means the pressure to be used in calculations required by a recognized pressure vessel code. The design pressure shall be not less than the highest of the following pressures:

(a) The maximum effective gauge pressure allowed in the shell during filling or discharge; or

(b) The sum of:

(i) the maximum effective gauge pressure to which the shell is designed as defined in (b) of the MAWP definition (see above); and

(ii) a head pressure determined on the basis of the static forces specified in 6.7.3.2.9, but not less than 0.35 bar;

Test pressure means the maximum gauge pressure at the top of the shell during the pressure test;

Leakproofness test means a test using gas subjecting the shell and its service equipment to an effective internal pressure of not less than 25 % of the MAWP;

Maximum permissible gross mass (MPGM) means the sum of the tare mass of the portable tank and the heaviest load authorized for carriage;

Reference steel means a steel with a tensile strength of 370 N/mm² and an elongation at fracture of 27 %;

Mild steel means a steel with a guaranteed minimum tensile strength of 360 N/mm² to 440 N/mm² and a guaranteed minimum elongation at fracture conforming to 6.7.3.3.3.3;

Design temperature range for the shell shall be -40 °C to 50 °C for non-refrigerated liquefied gases carried under ambient conditions. More severe design temperatures shall be considered for portable tanks subjected to severe climatic conditions;

Design reference temperature means the temperature at which the vapour pressure of the contents is determined for the purpose of calculating the MAWP. The design reference temperature shall be less than the critical temperature of the non-refrigerated liquefied gas or liquefied gas propellants of chemicals under pressure intended to be carried to ensure that the gas at all times is liquefied. This value for each portable tank type is as follows:

(a) Shell with a diameter of 1.5 metres or less: 65 °C;

(b) Shell with a diameter of more than 1.5 metres:

(i) without insulation or sun shield: 60 °C;

(ii) with sun shield (see 6.7.3.2.12): 55 °C; and

(iii) with insulation (see 6.7.3.2.12) : 50 °C;

Filling density means the average mass of non-refrigerated liquefied gas per litre of shell capacity (kg/*l*). The filling density is given in portable tank instruction T50 in 4.2.5.2.6.

6.7.3.2 General design and construction requirements

6.7.3.2.1 Shells shall be designed and constructed in accordance with the requirements of a pressure vessel code recognized by the competent authority. Shells shall be made of steel suitable for forming. The materials shall in principle conform to national or international material standards. For welded shells, only a material whose weldability has been fully demonstrated shall be used. Welds shall be skilfully made and afford complete safety. When the manufacturing process or the materials make it necessary, the shells shall be suitability heat-treated to guarantee adequate toughness in the weld and in the heat affected zones. In choosing the material the design temperature range shall be taken into account with respect to risk of brittle fracture, to stress corrosion cracking and to resistance to impact. When fine grain steel is used, the guaranteed value of the yield strength shall be not more than 460 N/mm² and the guaranteed value of the upper limit of the tensile strength shall be not more than 725 N/mm² according to the material specification. Portable tank materials shall be suitable for the external environment in which they may be carried.

6.7.3.2.2 Portable tank shells, fittings and pipework shall be constructed of materials which are:

(a) Substantially immune to attack by the non-refrigerated liquefied gas(es) intended to be carried; or

(b) Properly passivated or neutralized by chemical reaction.

6.7.3.2.3 Gaskets shall be made of materials compatible with the non-refrigerated liquefied gas(es) intended to be carried.

6.7.3.2.4 Contact between dissimilar metals which could result in damage by galvanic action shall be avoided.

6.7.3.2.5 The materials of the portable tank, including any devices, gaskets, and accessories, shall not adversely affect the non-refrigerated liquefied gas(es) intended for carriage in the portable tank.

6.7.3.2.6 Portable tanks shall be designed and constructed with supports to provide a secure base during carriage and with suitable lifting and tie-down attachments.

6.7.3.2.7 Portable tanks shall be designed to withstand, without loss of contents, at least the internal pressure due to the contents, and the static, dynamic and thermal loads during normal conditions of handling and carriage. The design shall demonstrate that the effects of fatigue, caused by repeated application of these loads through the expected life of the portable tank, have been taken into account.

6.7.3.2.8 Shells shall be designed to withstand an external pressure of at least 0.4 bar (gauge pressure) above the internal pressure without permanent deformation. When the shell is to be subjected to a significant vacuum before filling or during discharge it shall be designed to withstand an external pressure of at least 0.9 bar (gauge pressure) above the internal pressure and shall be proven at that pressure.

6.7.3.2.9 Portable tanks and their fastenings shall, under the maximum permissible load, be capable of absorbing the following separately applied static forces:

(a) In the direction of travel: twice the MPGM multiplied by the acceleration due to gravity (g)[1];

(b) Horizontally at right angles to the direction of travel: the MPGM (when the direction of travel is not clearly determined, the forces shall be equal to twice the MPGM) multiplied by the acceleration due to gravity (g)[1];

(c) Vertically upwards: the MPGM multiplied by the acceleration due to gravity (g)[1]; and

(d) Vertically downwards: twice the MPGM (total loading including the effect of gravity) multiplied by the acceleration due to gravity (g)[1].

6.7.3.2.10 Under each of the forces in 6.7.3.2.9, the safety factor to be observed shall be as follows:

(a) For steels having a clearly defined yield point, a safety factor of 1.5 in relation to the guaranteed yield strength; or

(b) For steels with no clearly defined yield point, a safety factor of 1.5 in relation to the guaranteed 0.2 % proof strength and, for austenitic steels, the 1 % proof strength.

6.7.3.2.11 The values of yield strength or proof strength shall be the values according to national or international material standards. When austenitic steels are used, the specified minimum values of yield strength and proof strength according to the material standards may be increased by up to 15 % when these greater values are attested in the material inspection certificate. When no material standard exists for the steel in question, the value of yield strength or proof strength used shall be approved by the competent authority.

6.7.3.2.12 When the shells intended for the carriage of non-refrigerated liquefied gases are equipped with thermal insulation, the thermal insulation systems shall satisfy the following requirements:

(a) It shall consist of a shield covering not less than the upper third but not more than the upper half of the surface of the shell and separated from the shell by an air space about 40 mm across;

(b) It shall consist of a complete cladding of adequate thickness of insulating materials protected so as to prevent the ingress of moisture and damage under normal conditions of carriage and so as to provide a heat transfer coefficient of not more than 0.67 ($W.m^{-2}.K^{-1}$);

(c) When the protective covering is so closed as to be gas-tight, a device shall be provided to prevent any dangerous pressure from developing in the insulating layer in the event of inadequate gas tightness of the shell or of its items of equipment; and

(d) The thermal insulation shall not inhibit access to the fittings and discharge devices.

6.7.3.2.13 Portable tanks intended for the carriage of flammable non-refrigerated liquefied gases shall be capable of being electrically earthed.

[1] *For calculation purposes g = 9.81 m/s².*

6.7.3.3 Design criteria

6.7.3.3.1 Shells shall be of a circular cross-section.

6.7.3.3.2 Shells shall be designed and constructed to withstand a test pressure not less than 1.3 times the design pressure. The shell design shall take into account the minimum MAWP values provided in portable tank instruction T50 in 4.2.5.2.6 for each non-refrigerated liquefied gas intended for carriage. Attention is drawn to the minimum shell thickness requirements for these shells specified in 6.7.3.4.

6.7.3.3.3 For steels exhibiting a clearly defined yield point or characterized by a guaranteed proof strength (0.2 % proof strength, generally, or 1 % proof strength for austenitic steels) the primary membrane stress σ (sigma) in the shell shall not exceed 0.75 Re or 0.50 Rm, whichever is lower, at the test pressure, where:

Re = yield strength in N/mm², or 0.2 % proof strength or, for austenitic steels, 1 % proof stress;

Rm = minimum tensile strength in N/mm².

6.7.3.3.3.1 The values of Re and Rm to be used shall be the specified minimum values according to national or international material standards. When austenitic steels are used, the specified minimum values for Re and Rm according to the material standards may be increased by up to 15 % when these greater values are attested in the material inspection certificate. When no material standard exists for the steel in question, the values of Re and Rm used shall be approved by the competent authority or its authorized body.

6.7.3.3.3.2 Steels which have a Re/Rm ratio of more than 0.85 are not allowed for the construction of welded shells. The values of Re and Rm to be used in determining this ratio shall be the values specified in the material inspection certificate.

6.7.3.3.3.3 Steels used in the construction of shells shall have an elongation at fracture, in %, of not less than 10 000/Rm with an absolute minimum of 16 % for fine grain steels and 20 % for other steels.

6.7.3.3.3.4 For the purpose of determining actual values for materials, it shall be noted that for sheet metal, the axis of the tensile test specimen shall be at right angles (transversely) to the direction of rolling. The permanent elongation at fracture shall be measured on test specimens of rectangular cross sections in accordance with ISO 6892:1998 using a 50 mm gauge length.

6.7.3.4 Minimum shell thickness

6.7.3.4.1 The minimum shell thickness shall be the greater thickness based on:

(a) The minimum thickness determined in accordance with the requirements in 6.7.3.4; and

(b) The minimum thickness determined in accordance with the recognized pressure vessel code including the requirements in 6.7.3.3.

In addition, any relevant portable tank special provision indicated in Column (11) of Table A of Chapter 3.2 and described in 4.2.5.3 shall be taken into account.

6.7.3.4.2 The cylindrical portions, ends (heads) and manhole covers of shells of not more than 1.80 m in diameter shall be not less than 5 mm thick in the reference steel or of equivalent thickness in the steel to be used. Shells of more than 1.80 m in diameter shall be not less than 6 mm thick in the reference steel or of equivalent thickness in the steel to be used.

6.7.3.4.3 The cylindrical portions, ends (heads) and manhole covers of all shells shall be not less than 4 mm thick regardless of the material of construction.

6.7.3.4.4 The equivalent thickness of a steel other than the thickness prescribed for the reference steel in 6.7.3.4.2 shall be determined using the following formula:

$$e_1 = \frac{21{,}4 e_o}{\sqrt[3]{Rm_1 \times A_1}}$$

where:

e_1 = required equivalent thickness (in mm) of the steel to be used;

e_0 = minimum thickness (in mm) for the reference steel specified in 6.7.3.4.2;

Rm_1 = guaranteed minimum tensile strength (in N/mm²) of the steel to be used (see 6.7.3.3.3);

A_1 = guaranteed minimum elongation at fracture (in %) of the steel to be used according to national or international standards.

6.7.3.4.5 In no case shall the wall thickness be less than that prescribed in 6.7.3.4.1 to 6.7.3.4.3. All parts of the shell shall have a minimum thickness as determined by 6.7.3.4.1 to 6.7.3.4.3. This thickness shall be exclusive of any corrosion allowance.

6.7.3.4.6 When mild steel is used (see 6.7.3.1), calculation using the formula in 6.7.3.4.4 is not required.

6.7.3.4.7 There shall be no sudden change of plate thickness at the attachment of the ends (heads) to the cylindrical portion of the shell.

6.7.3.5 Service equipment

6.7.3.5.1 Service equipment shall be so arranged as to be protected against the risk of being wrenched off or damaged during handling and carriage. When the connection between the frame and the shell allows relative movement between the sub-assemblies, the equipment shall be so fastened as to permit such movement without risk of damage to working parts. The external discharge fittings (pipe sockets, shut-off devices), the internal stop-valve and its seating shall be protected against the danger of being wrenched off by external forces (for example using shear sections). The filling and discharge devices (including flanges or threaded plugs) and any protective caps shall be capable of being secured against unintended opening.

6.7.3.5.2 All openings with a diameter of more than 1.5 mm in shells of portable tanks, except openings for pressure-relief devices, inspection openings and closed bleed holes, shall be fitted with at least three mutually independent shut-off devices in series, the first being an internal stop-valve, excess flow valve or equivalent device, the second being an external stop-valve and the third being a blank flange or equivalent device.

6.7.3.5.2.1 When a portable tank is fitted with an excess flow valve, the excess flow valve shall be so fitted that its seating is inside the shell or inside a welded flange or, when fitted externally, its mountings shall be designed so that in the event of impact its effectiveness shall be maintained. The excess flow valves shall be selected and fitted so as to close automatically when the rated flow specified by the manufacturer is reached. Connections and accessories leading to or from such a valve shall have a capacity for a flow more than the rated flow of the excess flow valve.

6.7.3.5.3 For filling and discharge openings, the first shut-off device shall be an internal stop-valve and the second shall be a stop-valve placed in an accessible position on each discharge and filling pipe.

6.7.3.5.4 For filling and discharge bottom openings of portable tanks intended for the carriage of flammable and/or toxic non-refrigerated liquefied gases or chemicals under pressure the internal stop-valve shall be a quick closing safety device which closes automatically in the event of unintended movement of the portable tank during filling or discharge or fire engulfment. Except for portable tanks having a capacity of not more than 1 000 litres, it shall be possible to operate this device by remote control.

6.7.3.5.5 In addition to filling, discharge and gas pressure equalizing orifices, shells may have openings in which gauges, thermometers and manometers can be fitted. Connections for such instruments shall be made by suitable welded nozzles or pockets and not be screwed connections through the shell.

6.7.3.5.6 All portable tanks shall be fitted with manholes or other inspection openings of suitable size to allow for internal inspection and adequate access for maintenance and repair of the interior.

6.7.3.5.7 External fittings shall be grouped together so far as reasonably practicable.

6.7.3.5.8 Each connection on a portable tank shall be clearly marked to indicate its function.

6.7.3.5.9 Each stop-valve or other means of closure shall be designed and constructed to a rated pressure not less than the MAWP of the shell taking into account the temperatures expected during carriage. All stop-valves with a screwed spindle shall close by a clockwise motion of the handwheel. For other stop-valves the position (open and closed) and direction of closure shall be clearly indicated. All stop-valves shall be designed to prevent unintentional opening.

6.7.3.5.10 Piping shall be designed, constructed and installed so as to avoid the risk of damage due to thermal expansion and contraction, mechanical shock and vibration. All piping shall be of suitable metallic material. Welded pipe joints shall be used wherever possible.

6.7.3.5.11 Joints in copper tubing shall be brazed or have an equally strong metal union. The melting point of brazing materials shall be no lower than 525 °C. The joints shall not decrease the strength of tubing as may happen when cutting threads.

6.7.3.5.12 The burst pressure of all piping and pipe fittings shall be not less than the highest of four times the MAWP of the shell or four times the pressure to which it may be subjected in service by the action of a pump or other device (except pressure-relief devices).

6.7.3.5.13 Ductile metals shall be used in the construction of valves and accessories.

6.7.3.6 Bottom openings

6.7.3.6.1 Certain non-refrigerated liquefied gases shall not be carried in portable tanks with bottom openings when portable tank instruction T50 in 4.2.5.2.6 indicates that bottom openings are not allowed. There shall be no openings below the liquid level of the shell when it is filled to its maximum permissible filling limit.

6.7.3.7 Pressure-relief devices

6.7.3.7.1 Portable tanks shall be provided with one or more spring-loaded pressure-relief devices. The pressure-relief devices shall open automatically at a pressure not less than the MAWP and be fully open at a pressure equal to 110 % of the MAWP. These devices shall, after discharge, close at a pressure not lower than 10 % below the pressure at which discharge starts and shall remain closed at all lower pressures. The pressure-relief devices shall be of a type that will resist dynamic forces including liquid surge. Frangible discs not in series with a spring-loaded pressure-relief device are not permitted.

6.7.3.7.2 Pressure-relief devices shall be designed to prevent the entry of foreign matter, the leakage of gas and the development of any dangerous excess pressure.

6.7.3.7.3 Portable tanks intended for the carriage of certain non-refrigerated liquefied gases identified in portable tank instruction T50 in 4.2.5.2.6 shall have a pressure-relief device approved by the competent authority. Unless a portable tank in dedicated service is fitted with an approved relief device constructed of materials compatible with the load, such device shall comprise a frangible disc preceding a spring-loaded device. The space between the frangible disc and the device shall be provided with a pressure gauge or a suitable tell-tale indicator. This arrangement permits the detection of disc rupture, pinholing or leakage which could cause a malfunction of the pressure-relief device. The frangible discs shall rupture at a nominal pressure 10 % above the start-to-discharge pressure of the relief device.

6.7.3.7.4 In the case of multi-purpose portable tanks, the pressure-relief devices shall open at a pressure indicated in 6.7.3.7.1 for the gas having the highest maximum allowable pressure of the gases allowed to be carried in the portable tank.

6.7.3.8 Capacity of relief devices

6.7.3.8.1 The combined delivery capacity of the relief devices shall be sufficient that, in the event of total fire engulfment, the pressure (including accumulation) inside the shell does not exceed 120 % of the MAWP. Spring-loaded relief devices shall be used to achieve the full relief capacity prescribed. In the case of multi-purpose tanks, the combined delivery capacity of the pressure-relief devices shall be taken for the gas which requires the highest delivery capacity of the gases allowed to be carried in portable tanks.

6.7.3.8.1.1 To determine the total required capacity of the relief devices, which shall be regarded as being the sum of the individual capacities of the several devices, the following formula shall be used:

$$Q = 12.4 \frac{FA^{0.82}}{LC} \sqrt{\frac{ZT}{M}}$$

where:

Q = minimum required rate of discharge in cubic metres of air per second (m^3/s) at standard conditions: 1 bar and 0 °C (273 K);

F = is a coefficient with the following value:

for uninsulated shells: F = 1;

for insulated shells: F = U(649-t)/13.6 but in no case is less than 0.25

where:

U = heat transfer coefficient of the insulation, in $kW.m^{-2}.K^{-1}$, at 38 °C;

t = actual temperature of the non-refrigerated liquefied gas during filling (°C); when this temperature is unknown, let *t*=15 °C;

The value of F given above for insulated shells may be taken provided that the insulation is in accordance with 6.7.3.8.1.2;

where:

A = total external surface area of shell in square metres;

Z = the gas compressibility factor in the accumulating condition (when this factor is unknown, let Z =1.0);

T = absolute temperature in Kelvin (°C + 273) above the pressure relief devices in the accumulating condition;

L = the latent heat of vaporization of the liquid, in kJ/kg, in the accumulating condition;

M = molecular mass of the discharged gas;

C = a constant which is derived from one of the following formulae as a function of the ratio k of specific heats

$$k = \frac{c_p}{c_v}$$

where

c_p is the specific heat at constant pressure; and

c_v is the specific heat at constant volume.

<u>when k > 1</u>:

$$C = \sqrt{k\left(\frac{2}{k+1}\right)^{\frac{k+1}{k-1}}}$$

when k = 1 or k is unknown:

$$C = \frac{1}{\sqrt{e}} = 0.607$$

where e is the mathematical constant 2.7183

C may also be taken from the following table:

k	C	k	C	k	C
1.00	0.607	1.26	0.660	1.52	0.704
1.02	0.611	1.28	0.664	1.54	0.707
1.04	0.615	1.30	0.667	1.56	0.710
1.06	0.620	1.32	0.671	1.58	0.713
1.08	0.624	1.34	0.674	1.60	0.716
1.10	0.628	1.36	0.678	1.62	0.719
1.12	0.633	1.38	0.681	1.64	0.722
1.14	0.637	1.40	0.685	1.66	0.725
1.16	0.641	1.42	0.688	1.68	0.728
1.18	0.645	1.44	0.691	1.70	0.731
1.20	0.649	1.46	0.695	2.00	0.770
1.22	0.652	1.48	0.698	2.20	0.793
1.24	0.656	1.50	0.701		

NOTE: *This formula applies only to non-refrigerated liquefied gases which have critical temperatures well above the temperature at the accumulating condition. For gases which have critical temperatures near or below the temperature at the accumulating condition, the calculation of the pressure-relief device delivery capacity shall consider further thermodynamic properties of the gas (see, e.g. CGA S-1.2-2003 Pressure Relief Device Standards – Part 2 – Cargo and Portable Tanks for Compressed Gases).*

6.7.3.8.1.2 Insulation systems, used for the purpose of reducing the venting capacity, shall be approved by the competent authority or its authorized body. In all cases, insulation systems approved for this purpose shall:

(a) Remain effective at all temperatures up to 649 °C; and

(b) Be jacketed with a material having a melting point of 700 °C or greater.

6.7.3.9 Marking of pressure-relief devices

6.7.3.9.1 Every pressure-relief device shall be plainly and permanently marked with the following particulars:

(a) The pressure (in bar or kPa) at which it is set to discharge;

(b) The allowable tolerance at the discharge pressure for spring-loaded devices;

(c) The reference temperature corresponding to the rated pressure for frangible discs;

(d) The rated flow capacity of the device in standard cubic metres of air per second (m^3/s); and

(e) The cross sectional flow areas of the spring loaded pressure-relief devices and frangible discs in mm^2.

When practicable, the following information shall also be shown:

(f) The manufacturer's name and relevant catalogue number of the device.

6.7.3.9.2 The rated flow capacity marked on the pressure-relief devices shall be determined according to ISO 4126-1:2004 and ISO 4126-7:2004.

6.7.3.10 Connections to pressure-relief devices

6.7.3.10.1 Connections to pressure-relief devices shall be of sufficient size to enable the required discharge to pass unrestricted to the safety device. No stop-valve shall be installed between the shell and the pressure-relief devices except when duplicate devices are provided for maintenance or other reasons and the stop-valves serving the devices actually in use are locked open or the stop-valves are interlocked so that at least one of the duplicate devices is always operable and capable of meeting the requirements of 6.7.3.8. There shall be no obstruction in an opening leading to a vent or pressure-relief device which might restrict or cut-off the flow from the shell to that device. Vents from the pressure-relief devices, when used, shall deliver the relieved vapour or liquid to the atmosphere in conditions of minimum back-pressure on the relieving device.

6.7.3.11 Siting of pressure-relief devices

6.7.3.11.1 Each pressure-relief device inlet shall be situated on top of the shell in a position as near the longitudinal and transverse centre of the shell as reasonably practicable. All pressure relief device inlets shall under maximum filling conditions be situated in the vapour space of the shell and the devices shall be so arranged as to ensure that the escaping vapour is discharged unrestrictedly. For flammable non-refrigerated liquefied gases, the escaping vapour shall be directed away from the shell in such a manner that it cannot impinge upon the shell. Protective devices which deflect the flow of vapour are permissible provided the required relief-device capacity is not reduced.

6.7.3.11.2 Arrangements shall be made to prevent access to the pressure-relief devices by unauthorized persons and to protect the devices from damage caused by the portable tank overturning.

6.7.3.12 Gauging devices

6.7.3.12.1 Unless a portable tank is intended to be filled by weight it shall be equipped with one or more gauging devices. Glass level-gauges and gauges made of other fragile material, which are in direct communication with the contents of the shell shall not be used.

6.7.3.13 Portable tank supports, frameworks, lifting and tie-down attachments

6.7.3.13.1 Portable tanks shall be designed and constructed with a support structure to provide a secure base during carriage. The forces specified in 6.7.3.2.9 and the safety factor specified in 6.7.3.2.10 shall be considered in this aspect of the design. Skids, frameworks, cradles or other similar structures are acceptable.

6.7.3.13.2 The combined stresses caused by portable tank mountings (e.g. cradles, frameworks, etc.) and portable tank lifting and tie-down attachments shall not cause excessive stress in any portion of the shell. Permanent lifting and tie-down attachments shall be fitted to all portable tanks. Preferably they shall be fitted to the portable tank supports but may be secured to reinforcing plates located on the shell at the points of support.

6.7.3.13.3 In the design of supports and frameworks the effects of environmental corrosion shall be taken into account.

6.7.3.13.4 Forklift pockets shall be capable of being closed off. The means of closing forklift pockets shall be a permanent part of the framework or permanently attached to the framework. Single compartment portable tanks with a length less than 3.65 m need not have closed off forklift pockets provided that:

(a) The shell and all the fittings are well protected from being hit by the forklift blades; and

(b) The distance between the centres of the forklift pockets is at least half of the maximum length of the portable tank.

6.7.3.13.5 When portable tanks are not protected during carriage, according to 4.2.2.3, the shells and service equipment shall be protected against damage to the shell and service equipment resulting from lateral or longitudinal impact or overturning. External fittings shall be protected so as to preclude the release of the shell contents upon impact or overturning of the portable tank on its fittings. Examples of protection include:

(a) Protection against lateral impact which may consist of longitudinal bars protecting the shell on both sides at the level of the median line;

(b) Protection of the portable tank against overturning which may consist of reinforcement rings or bars fixed across the frame;

(c) Protection against rear impact which may consist of a bumper or frame;

(d) Protection of the shell against damage from impact or overturning by use of an ISO frame in accordance with ISO 1496-3:1995.

6.7.3.14 Design approval

6.7.3.14.1 The competent authority or its authorized body shall issue a design approval certificate for any new design of a portable tank. This certificate shall attest that a portable tank has been surveyed by that authority, is suitable for its intended purpose and meets the requirements of this Chapter and where appropriate the provisions for gases provided in portable tank instruction T50 in 4.2.5.2.6. When a series of portable tanks are manufactured without change in the design, the certificate shall be valid for the entire series. The certificate shall refer to the prototype test report, the gases allowed to be carried, the materials of construction of the shell and an approval number. The approval number shall consist of the distinguishing sign or mark of the State in whose territory the approval was granted, indicated by the distinguishing sign used on vehicles in international road traffic[2], and a registration number. Any alternative arrangements according to 6.7.1.2 shall be indicated on the certificate. A design approval may serve for the approval of smaller portable tanks made of materials of the same kind and thickness, by the same fabrication techniques and with identical supports, equivalent closures and other appurtenances.

6.7.3.14.2 The prototype test report for the design approval shall include at least the following:

(a) The results of the applicable framework test specified in ISO 1496-3:1995;

(b) The results of the initial inspection and test in 6.7.3.15.3; and

(c) The results of the impact test in 6.7.3.15.1, when applicable.

6.7.3.15 Inspection and testing

6.7.3.15.1 Portable tanks meeting the definition of container in the International Convention for Safe Containers (CSC), 1972, as amended, shall not be used unless they are successfully qualified by subjecting a representative prototype of each design to the Dynamic, Longitudinal Impact Test prescribed in the Manual of Tests and Criteria, Part IV, Section 41.

6.7.3.15.2 The shell and items of equipment of each portable tank shall be inspected and tested before being put into service for the first time (initial inspection and test) and thereafter at not more than five-year intervals (5 year periodic inspection and test) with an intermediate periodic inspection and test (2.5 year periodic inspection and test) midway between the 5 year periodic inspections and tests. The 2.5 year inspection and test may be performed within 3 months of the specified date. An exceptional inspection and test shall be performed regardless of the last periodic inspection and test when necessary according to 6.7.3.15.7.

6.7.3.15.3 The initial inspection and test of a portable tank shall include a check of the design characteristics, an internal and external examination of the portable tank and its fittings with due regard to the non-refrigerated liquefied gases to be carried, and a pressure test referring to the test pressures according to 6.7.3.3.2. The pressure test may be performed as a hydraulic test or by using another liquid or gas with the agreement of the competent authority or its authorized body. Before the portable tank is placed into service, a leakproofness test and a test of the satisfactory operation of all service equipment shall also be performed. When the shell and its fittings have been pressure-tested separately, they shall be subjected together after assembly to a leakproofness test. All welds subject to full stress level in the shell shall be inspected during the initial test by radiographic, ultrasonic, or another suitable non-destructive test method. This does not apply to the jacket.

6.7.3.15.4 The 5 year periodic inspection and test shall include an internal and external examination and, as a general rule, a hydraulic pressure test. Sheathing, thermal insulation and the like shall be removed only

[2] *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*

to the extent required for reliable appraisal of the condition of the portable tank. When the shell and equipment have been pressure-tested separately, they shall be subjected together after assembly to a leakproofness test.

6.7.3.15.5 The intermediate 2.5 year periodic inspection and test shall at least include an internal and external examination of the portable tank and its fittings with due regard to the non-refrigerated liquefied gases intended to be carried, a leakproofness test and a check of the satisfactory operation of all service equipment. Sheathing thermal insulation and the like shall be removed only to the extent required for reliable appraisal of the condition of the portable tank. For portable tanks intended for the carriage of a single non-refrigerated liquefied gas, the 2.5 year internal examination may be waived or substituted by other test methods or inspection procedures specified by the competent authority or its authorized body.

6.7.3.15.6 Inspection and test of portable tanks and filling after the date of expiry of the last periodic inspection and test

6.7.3.15.6.1 A portable tank may not be filled and offered for carriage after the date of expiry of the last 5 year or 2.5 year periodic inspection and test as required by 6.7.3.15.2. However a portable tank filled prior to the date of expiry of the last periodic inspection and test may be carried for a period not to exceed three months beyond the date of expiry of the last periodic test or inspection. In addition, a portable tank may be carried after the date of expiry of the last periodic test and inspection:

(a) After emptying but before cleaning, for purposes of performing the next required test or inspection prior to refilling; and

(b) Unless otherwise approved by the competent authority, for a period not to exceed six months beyond the date of expiry of the last periodic test or inspection, in order to allow the return of dangerous goods for proper disposal or recycling. Reference to this exemption shall be mentioned in the transport document.

6.7.3.15.6.2 Except as provided for in 6.7.3.15.6.1, portable tanks which have missed the timeframe for their scheduled 5 year or 2.5-year periodic inspection and test may only be filled and offered for carriage if a new 5-year periodic inspection and test is performed according to 6.7.3.15.4.

6.7.3.15.7 The exceptional inspection and test is necessary when the portable tank shows evidence of damaged or corroded areas, or leakage, or other conditions that indicate a deficiency that could affect the integrity of the portable tank. The extent of the exceptional inspection and test shall depend on the amount of damage or deterioration of the portable tank. It shall include at least the 2.5 year inspection and test according to 6.7.3.15.5.

6.7.3.15.8 The internal and external examinations shall ensure that:

(a) The shell is inspected for pitting, corrosion, or abrasions, dents, distortions, defects in welds or any other conditions, including leakage, that might render the portable tank unsafe for carriage. The wall thickness shall be verified by appropriate measurement if this inspection indicates a reduction of wall thickness;

(b) The piping, valves, and gaskets are inspected for corroded areas, defects, or any other conditions, including leakage, that might render the portable tank unsafe for filling, discharge or carriage;

(c) Devices for tightening manhole covers are operative and there is no leakage at manhole covers or gaskets;

(d) Missing or loose bolts or nuts on any flanged connection or blank flange are replaced or tightened;

(e) All emergency devices and valves are free from corrosion, distortion and any damage or defect that could prevent their normal operation. Remote closure devices and self-closing stop-valves shall be operated to demonstrate proper operation;

(f) Required marks on the portable tank are legible and in accordance with the applicable requirements; and

(g) The framework, the supports and the arrangements for lifting the portable tank are in satisfactory condition.

6.7.3.15.9 The inspections and tests in 6.7.3.15.1, 6.7.3.15.3, 6.7.3.15.4, 6.7.3.15.5 and 6.7.3.15.7 shall be performed or witnessed by an expert approved by the competent authority or its authorized body. When the pressure test is a part of the inspection and test, the test pressure shall be the one indicated on the data plate of the portable tank. While under pressure, the portable tank shall be inspected for any leaks in the shell, piping or equipment.

6.7.3.15.10 In all cases when cutting, burning or welding operations on the shell have been effected, that work shall be to the approval of the competent authority or its authorized body taking into account the pressure vessel code used for the construction of the shell. A pressure test to the original test pressure shall be performed after the work is completed.

6.7.3.15.11 When evidence of any unsafe condition is discovered, the portable tank shall not be returned to service until it has been corrected and the pressure test is repeated and passed.

6.7.3.16 ***Marking***

6.7.3.16.1 Every portable tank shall be fitted with a corrosion resistant metal plate permanently attached to the portable tank in a conspicuous place readily accessible for inspection. When for reasons of portable tank arrangements the plate cannot be permanently attached to the shell, the shell shall be marked with at least the information required by the pressure vessel code. As a minimum, at least the following information shall be marked on the plate by stamping or by any other similar method:

(a) Owner information

(i) Owner's registration number;

(b) Manufacturing information

(i) Country of manufacture;

(ii) Year of manufacture;

(iii) Manufacturer's name or mark;

(iv) Manufacturer's serial number;

(c) Approval information

(i) The United Nations packaging symbol  .

This symbol shall not be used for any purpose other than certifying that a packaging, a flexible bulk container, a portable tank or a MEGC complies with the relevant requirements in Chapter 6.1, 6.2, 6.3, 6.5, 6.6, 6.7 or 6.11;

(ii) Approval country;

(iii) Authorized body for the design approval;

(iv) Design approval number;

(v) Letters 'AA', if the design was approved under alternative arrangements (see 6.7.1.2);

(vi) Pressure vessel code to which the shell is designed;

(d) Pressures

(i) MAWP (in bar gauge or kPa gauge)[3];

(ii) Test pressure (in bar gauge or kPa gauge)[3];

(iii) Initial pressure test date (month and year);

[3] *The unit used shall be indicated.*

(iv) Identification mark of the initial pressure test witness;

(v) External design pressure[5] (in bar gauge or kPa gauge)[3];

(e) Temperatures

(i) Design temperature range (in °C)[3];

(ii) Design reference temperature (in °C)[3];

(f) Materials

(i) Shell material(s) and material standard reference(s);

(ii) Equivalent thickness in reference steel (in mm)[3];

(g) Capacity

(i) Tank water capacity at 20 °C (in litres)[3];

(h) Periodic inspections and tests

(i) Type of the most recent periodic test (2.5-year, 5-year or exceptional);

(ii) Date of the most recent periodic test (month and year);

(iii) Test pressure (in bar gauge or kPa gauge)[3] of the most recent periodic test (if applicable);

(iv) Identification mark of the authorized body who performed or witnessed the most recent test.

[5] *See 6.7.3.2.8.*

[3] *The unit used shall be indicated.*

Figure 6.7.3.16.1: Example of a plate for marking

Owner's registration number					
MANUFACTURING INFORMATION					
Country of manufacture					
Year of manufacture					
Manufacturer					
Manufacturer's serial number					
APPROVAL INFORMATION					
UN	Approval country				
	Authorized body for design approval				
	Design approval number				'AA' *(if applicable)*
Shell design code (pressure vessel code)					
PRESSURES					
MAWP					bar *or* kPa
Test pressure					bar *or* kPa
Initial pressure test date:	*(mm/yyyy)*		Witness stamp:		
External design pressure					bar *or* kPa
TEMPERATURES					
Design temperature range			°C to		°C
Design reference temperature					°C
MATERIALS					
Shell material(s) and material standard reference(s)					
Equivalent thickness in reference steel					mm
CAPACITY					
Tank water capacity at 20 °C					litres

PERIODIC INSPECTIONS / TESTS							
Test type	Test date	Witness stamp and test pressure[a]		Test type	Test date	Witness stamp and test pressure[a]	
	(mm/yyyy)		bar *or* kPa		*(mm/yyyy)*		bar *or* kPa

[a] *Test pressure if applicable.*

6.7.3.16.2 The following information shall be durably marked either on the portable tank itself or on a metal plate firmly secured to the portable tank:

Name of the operator
Name of non-refrigerated liquefied gas(es) permitted for carriage
Maximum permissible load mass for each non-refrigerated liquefied gas permitted _____kg
Maximum permissible gross mass (MPGM)_____kg
Unladen (tare) mass_____kg
Portable tank instruction in accordance with 4.2.5.2.6

NOTE: *For the identification of the non-refrigerated liquefied gases being carried, see also Part 5.*

6.7.3.16.3 If a portable tank is designed and approved for handling in open seas, the words "OFFSHORE PORTABLE TANK" shall be marked on the identification plate.

6.7.4 Requirements for the design, construction, inspection and testing of portable tanks intended for the carriage of refrigerated liquefied gases

6.7.4.1 Definitions

For the purposes of this section:

Alternative arrangement means an approval granted by the competent authority for a portable tank or MEGC that has been designed, constructed or tested to technical requirements or testing methods other than those specified in this Chapter;

Portable tank means a thermally insulated multimodal tank having a capacity of more than 450 litres fitted with service equipment and structural equipment necessary for the carriage of refrigerated liquefied gases. The portable tank shall be capable of being filled and discharged without the removal of its structural equipment. It shall possess stabilizing members external to the tank, and shall be capable of being lifted when full. It shall be designed primarily to be loaded onto a vehicle, wagon or sea-going or inland navigation vessel and shall be equipped with skids, mountings or accessories to facilitate mechanical handling. Tank-vehicles, tank-wagons, non-metallic tanks, intermediate bulk containers (IBCs), gas cylinders and large receptacles are not considered to fall within the definition for portable tanks;

Tank means a construction which normally consists of either :

(a) A jacket and one or more inner shells where the space between the shell(s) and the jacket is exhausted of air (vacuum insulation) and may incorporate a thermal insulation system; or

(b) A jacket and an inner shell with an intermediate layer of solid thermally insulating material (e.g. solid foam);

Shell means the part of the portable tank which retains the refrigerated liquefied gas intended for carriage, including openings and their closures, but does not include service equipment or external structural equipment;

Jacket means the outer insulation cover or cladding which may be part of the insulation system;

Service equipment means measuring instruments and filling, discharge, venting, safety, pressurizing, cooling and thermal insulation devices;

Structural equipment means the reinforcing, fastening, protective and stabilizing members external to the shell;

Maximum allowable working pressure (MAWP) means the maximum effective gauge pressure permissible at the top of the shell of a loaded portable tank in its operating position including the highest effective pressure during filling and discharge;

Test pressure means the maximum gauge pressure at the top of the shell during the pressure test;

Leakproofness test means a test using gas subjecting the shell and its service equipment, to an effective internal pressure not less than 90 % of the MAWP;

Maximum permissible gross mass (MPGM) means the sum of the tare mass of the portable tank and the heaviest load authorized for carriage;

Holding time means the time that will elapse from the establishment of the initial filling condition until the pressure has risen due to heat influx to the lowest set pressure of the pressure limiting device(s);

Reference steel means a steel with a tensile strength of 370 N/mm² and an elongation at fracture of 27 %;

*Minimum design temperature m*eans the temperature which is used for the design and construction of the shell not higher than the lowest (coldest) temperature (service temperature) of the contents during normal conditions of filling, discharge and carriage.

6.7.4.2 General design and construction requirements

6.7.4.2.1 Shells shall be designed and constructed in accordance with the requirements of a pressure vessel code recognized by the competent authority. Shells and jackets shall be made of metallic materials suitable for forming. Jackets shall be made of steel. Non-metallic materials may be used for the attachments and supports between the shell and jacket, provided their material properties at the minimum design temperature are proven to be sufficient. The materials shall in principle conform to national or international material standards. For welded shells and jackets only materials whose weldability has been fully demonstrated shall be used. Welds shall be skilfully made and afford complete safety. When the manufacturing process or the materials make it necessary, the shell shall be suitably heat treated to

guarantee adequate toughness in the weld and in the heat affected zones. In choosing the material, the minimum design temperature shall be taken into account with respect to risk of brittle fracture, to hydrogen embrittlement, to stress corrosion cracking and to resistance to impact. When fine grain steel is used, the guaranteed value of the yield strength shall be not more than 460 N/mm² and the guaranteed value of the upper limit of the tensile strength shall be not more than 725 N/mm² in accordance with the material specifications. Portable tank materials shall be suitable for the external environment in which they may be carried.

6.7.4.2.2 Any part of a portable tank, including fittings, gaskets and pipe-work, which can be expected normally to come into contact with the refrigerated liquefied gas carried shall be compatible with that refrigerated liquefied gas.

6.7.4.2.3 Contact between dissimilar metals which could result in damage by galvanic action shall be avoided.

6.7.4.2.4 The thermal insulation system shall include a complete covering of the shell(s) with effective insulating materials. External insulation shall be protected by a jacket so as to prevent the ingress of moisture and other damage under normal carriage conditions.

6.7.4.2.5 When a jacket is so closed as to be gas-tight, a device shall be provided to prevent any dangerous pressure from developing in the insulation space.

6.7.4.2.6 Portable tanks intended for the carriage of refrigerated liquefied gases having a boiling point below minus (-) 182 °C at atmospheric pressure shall not include materials which may react with oxygen or oxygen enriched atmospheres in a dangerous manner, when located in parts of the thermal insulation when there is a risk of contact with oxygen or with oxygen enriched fluid.

6.7.4.2.7 Insulating materials shall not deteriorate unduly in service.

6.7.4.2.8 A reference holding time shall be determined for each refrigerated liquefied gas intended for carriage in a portable tank.

6.7.4.2.8.1 The reference holding time shall be determined by a method recognized by the competent authority on the basis of the following:

(a) The effectiveness of the insulation system, determined in accordance with 6.7.4.2.8.2;

(b) The lowest set pressure of the pressure limiting device(s);

(c) The initial filling conditions;

(d) An assumed ambient temperature of 30 °C;

(e) The physical properties of the individual refrigerated liquefied gas intended to be carried.

6.7.4.2.8.2 The effectiveness of the insulation system (heat influx in watts) shall be determined by type testing the portable tank in accordance with a procedure recognized by the competent authority. This test shall consist of either:

(a) A constant pressure test (for example at atmospheric pressure) when the loss of refrigerated liquefied gas is measured over a period of time; or

(b) A closed system test when the rise in pressure in the shell is measured over a period of time.

When performing the constant pressure test, variations in atmospheric pressure shall be taken into account. When performing either tests corrections shall be made for any variation of the ambient temperature from the assumed ambient temperature reference value of 30 °C.

NOTE: *For the determination of the actual holding time before each journey, refer to 4.2.3.7.*

6.7.4.2.9 The jacket of a vacuum-insulated double-wall tank shall have either an external design pressure not less than 100 kPa (1 bar) (gauge pressure) calculated in accordance with a recognized technical code or a calculated critical collapsing pressure of not less than 200 kPa (2 bar) (gauge pressure). Internal and external reinforcements may be included in calculating the ability of the jacket to resist the external pressure.

6.7.4.2.10 Portable tanks shall be designed and constructed with supports to provide a secure base during carriage and with suitable lifting and tie-down attachments.

6.7.4.2.11 Portable tanks shall be designed to withstand, without loss of contents, at least the internal pressure due to the contents, and the static, dynamic and thermal loads during normal conditions of handling and carriage. The design shall demonstrate that the effects of fatigue, caused by repeated application of these loads through the expected life of the portable tank, have been taken into account.

6.7.4.2.12 Portable tanks and their fastenings under the maximum permissible load shall be capable of absorbing the following separately applied static forces:

(a) In the direction of travel: twice the MPGM multiplied by the acceleration due to gravity (g)[1];

(b) Horizontally at right angles to the direction of travel: the MPGM (when the direction of travel is not clearly determined, the forces shall be equal to twice the MPGM) multiplied by the acceleration due to gravity (g)[1];

(c) Vertically upwards: the MPGM multiplied by the acceleration due to gravity (g)[1]; and

(d) Vertically downwards: twice the MPGM (total loading including the effect of gravity) multiplied by the acceleration due to gravity (g)[1].

6.7.4.2.13 Under each of the forces in 6.7.4.2.12, the safety factor to be observed shall be as follows:

(a) For materials having a clearly defined yield point, a safety factor of 1.5 in relation to the guaranteed yield strength; and

(b) For materials with no clearly defined yield point, a safety factor of 1.5 in relation to the guaranteed 0.2 % proof strength or, in case of austenitic steels, the 1 % proof strength.

6.7.4.2.14 The values of yield strength or proof strength shall be the values according to national or international material standards. When austenitic steels are used, the specified minimum values according to the material standards may be increased by up to 15 % when greater values are attested in the material inspection certificate. When no material standard exists for the metal in question, or when non-metallic materials are used the values of yield strength or proof strength shall be approved by the competent authority.

6.7.4.2.15 Portable tanks intended for the carriage of flammable refrigerated liquefied gases shall be capable of being electrically earthed.

6.7.4.3 Design criteria

6.7.4.3.1 Shells shall be of a circular cross section.

6.7.4.3.2 Shells shall be designed and constructed to withstand a test pressure not less than 1.3 times the MAWP. For shells with vacuum insulation the test pressure shall not be less than 1.3 times the sum of the MAWP and 100 kPa (1 bar). In no case shall the test pressure be less than 300 kPa (3 bar) (gauge pressure). Attention is drawn to the minimum shell thickness requirements, specified in 6.7.4.4.2 to 6.7.4.4.7.

6.7.4.3.3 For metals exhibiting a clearly defined yield point or characterized by a guaranteed proof strength (0.2 % proof strength, generally, or 1 % proof strength for austenitic steels) the primary membrane stress σ (sigma) in the shell shall not exceed 0.75 Re or 0.50 Rm, whichever is lower, at the test pressure, where:

Re = yield strength in N/mm², or 0.2 % proof strength or, for austenitic steels, 1 % proof strength;

Rm = minimum tensile strength in N/mm².

6.7.4.3.3.1 The values of Re and Rm to be used shall be the specified minimum values according to national or international material standards. When austenitic steels are used, the specified minimum values for Re and Rm according to the material standards may be increased by up to 15 % when greater values are

[1] *For calculation purposes g = 9.81 m/s².*

attested in the material inspection certificate. When no material standard exists for the metal in question, the values of Re and Rm used shall be approved by the competent authority or its authorized body.

6.7.4.3.3.2 Steels which have a Re/Rm ratio of more than 0.85 are not allowed for the construction of welded shells. The values of Re and Rm to be used in determining this ratio shall be the values specified in the material inspection certificate.

6.7.4.3.3.3 Steels used in the construction of shells shall have an elongation at fracture, in %, of not less than 10 000/Rm with an absolute minimum of 16 % for fine grain steels and 20 % for other steels. Aluminium and aluminium alloys used in the construction of shells shall have an elongation at fracture, in %, of not less than 10 000/6Rm with an absolute minimum of 12 %.

6.7.4.3.3.4 For the purpose of determining actual values for materials, it shall be noted that for sheet metal, the axis of the tensile test specimen shall be at right angles (transversely) to the direction of rolling. The permanent elongation at fracture shall be measured on test specimens of rectangular cross sections in accordance with ISO 6892:1988 using a 50 mm gauge length.

6.7.4.4 Minimum shell thickness

6.7.4.4.1 The minimum shell thickness shall be the greater thickness based on:

(a) The minimum thickness determined in accordance with the requirements in 6.7.4.4.2 to 6.7.4.4.7; or

(b) The minimum thickness determined in accordance with the recognized pressure vessel code including the requirements in 6.7.4.3.

6.7.4.4.2 Shells of not more than 1.80 m in diameter shall be not less than 5 mm thick in the reference steel or of equivalent thickness in the metal to be used. Shells of more than 1.80 m in diameter shall be not less than 6 mm thick in the reference steel or of equivalent thickness in the metal to be used.

6.7.4.4.3 Shells of vacuum-insulated tanks of not more than 1.80 m in diameter shall be not less than 3 mm thick in the reference steel or of equivalent thickness in the metal to be used. Such shells of more than 1.80 m in diameter shall be not less than 4 mm thick in the reference steel or of equivalent thickness in the metal to be used.

6.7.4.4.4 For vacuum-insulated tanks, the aggregate thickness of the jacket and the shell shall correspond to the minimum thickness prescribed in 6.7.4.4.2, the thickness of the shell itself being not less than the minimum thickness prescribed in 6.7.4.4.3.

6.7.4.4.5 Shells shall be not less than 3 mm thick regardless of the material of construction.

6.7.4.4.6 The equivalent thickness of a metal other than the thickness prescribed for the reference steel in 6.7.4.4.2 and 6.7.4.4.3 shall be determined using the following formula:

$$e_1 = \frac{21.4 e_o}{\sqrt[3]{Rm_1 \times A_1}}$$

where:

e_1 = required equivalent thickness (in mm) of the metal to be used;

e_0 = minimum thickness (in mm) of the reference steel specified in 6.7.4.4.2 and 6.7.4.4.3;

Rm_1 = guaranteed minimum tensile strength (in N/mm²) of the metal to be used (see 6.7.4.3.3);

A_1 = guaranteed minimum elongation at fracture (in %) of the metal to be used according to national or international standards.

6.7.4.4.7 In no case shall the wall thickness be less than that prescribed in 6.7.4.4.1 to 6.7.4.4.5. All parts of the shell shall have a minimum thickness as determined by 6.7.4.4.1 to 6.7.4.4.6. This thickness shall be exclusive of any corrosion allowance.

6.7.4.4.8 There shall be no sudden change of plate thickness at the attachment of the ends (heads) to the cylindrical portion of the shell.

6.7.4.5 Service equipment

6.7.4.5.1 Service equipment shall be so arranged as to be protected against the risk of being wrenched off or damaged during handling and carriage. When the connection between the frame and the tank or the jacket and the shell allows relative movement, the equipment shall be so fastened as to permit such movement without risk of damage to working parts. The external discharge fittings (pipe sockets, shut-off devices), the stop-valve and its seating shall be protected against the danger of being wrenched off by external forces (for example using shear sections). The filling and discharge devices (including flanges or threaded plugs) and any protective caps shall be capable of being secured against unintended opening.

6.7.4.5.2 Each filling and discharge opening in portable tanks used for the carriage of flammable refrigerated liquefied gases shall be fitted with at least three mutually independent shut-off devices in series, the first being a stop-valve situated as close as reasonably practicable to the jacket, the second being a stop-valve and the third being a blank flange or equivalent device. The shut-off device closest to the jacket shall be a quick closing device, which closes automatically in the event of unintended movement of the portable tank during filling or discharge or fire engulfment. This device shall also be possible to operate by remote control.

6.7.4.5.3 Each filling and discharge opening in portable tanks used for the carriage of non-flammable refrigerated liquefied gases shall be fitted with at least two mutually independent shut-off devices in series, the first being a stop-valve situated as close as reasonably practicable to the jacket, the second a blank flange or equivalent device.

6.7.4.5.4 For sections of piping which can be closed at both ends and where liquid product can be trapped, a method of automatic pressure relief shall be provided to prevent excess pressure build-up within the piping.

6.7.4.5.5 Vacuum insulated tanks need not have an opening for inspection.

6.7.4.5.6 External fittings shall be grouped together so far as reasonably practicable.

6.7.4.5.7 Each connection on a portable tank shall be clearly marked to indicate its function.

6.7.4.5.8 Each stop-valve or other means of closure shall be designed and constructed to a rated pressure not less than the MAWP of the shell taking into account the temperature expected during carriage. All stop-valves with a screwed spindle shall be closed by a clockwise motion of the handwheel. In the case of other stop-valves the position (open and closed) and direction of closure shall be clearly indicated. All stop-valves shall be designed to prevent unintentional opening.

6.7.4.5.9 When pressure-building units are used, the liquid and vapour connections to that unit shall be provided with a valve as close to the jacket as reasonably practicable to prevent the loss of contents in case of damage to the pressure-building unit.

6.7.4.5.10 Piping shall be designed, constructed and installed so as to avoid the risk of damage due to thermal expansion and contraction, mechanical shock and vibration. All piping shall be of a suitable material. To prevent leakage due to fire, only steel piping and welded joints shall be used between the jacket and the connection to the first closure of any outlet. The method of attaching the closure to this connection shall be to the satisfaction of the competent authority or its authorized body. Elsewhere pipe joints shall be welded when necessary.

6.7.4.5.11 Joints in copper tubing shall be brazed or have an equally strong metal union. The melting point of brazing materials shall be no lower than 525 °C. The joints shall not decrease the strength of the tubing as may happen when cutting threads.

6.7.4.5.12 The materials of construction of valves and accessories shall have satisfactory properties at the lowest operating temperature of the portable tank.

6.7.4.5.13 The burst pressure of all piping and pipe fittings shall be not less than the highest of four times the MAWP of the shell or four times the pressure to which it may be subjected in service by the action of a pump or other device (except pressure-relief devices).

6.7.4.6 Pressure-relief devices

6.7.4.6.1 Every shell shall be provided with not less than two independent spring-loaded pressure-relief devices. The pressure-relief devices shall open automatically at a pressure not less than the MAWP and be fully open at a pressure equal to 110 % of the MAWP. These devices shall, after discharge, close at a pressure not lower than 10 % below the pressure at which discharge starts and shall remain closed at all lower pressures. The pressure-relief devices shall be of the type that will resist dynamic forces including surge.

6.7.4.6.2 Shells for non-flammable refrigerated liquefied gases and hydrogen may in addition have frangible discs in parallel with the spring-loaded devices as specified in 6.7.4.7.2 and 6.7.4.7.3.

6.7.4.6.3 Pressure-relief devices shall be designed to prevent the entry of foreign matter, the leakage of gas and the development of any dangerous excess pressure.

6.7.4.6.4 Pressure-relief devices shall be approved by the competent authority or its authorized body.

6.7.4.7 Capacity and setting of pressure-relief devices

6.7.4.7.1 In the case of the loss of vacuum in a vacuum-insulated tank or of loss of 20 % of the insulation of a tank insulated with solid materials, the combined capacity of all pressure-relief devices installed shall be sufficient so that the pressure (including accumulation) inside the shell does not exceed 120 % of the MAWP.

6.7.4.7.2 For non-flammable refrigerated liquefied gases (except oxygen) and hydrogen, this capacity may be achieved by the use of frangible discs in parallel with the required safety-relief devices. Frangible discs shall rupture at nominal pressure equal to the test pressure of the shell.

6.7.4.7.3 Under the circumstances described in 6.7.4.7.1 and 6.7.4.7.2 together with complete fire engulfment the combined capacity of all pressure-relief devices installed shall be sufficient to limit the pressure in the shell to the test pressure.

6.7.4.7.4 The required capacity of the relief devices shall be calculated in accordance with a well-established technical code recognized by the competent authority[6].

6.7.4.8 Marking of pressure-relief devices

6.7.4.8.1 Every pressure-relief device shall be plainly and permanently marked with the following particulars:

(a) The pressure (in bar or kPa) at which it is set to discharge;

(b) The allowable tolerance at the discharge pressure for spring-loaded devices;

(c) The reference temperature corresponding to the rated pressure for frangible discs;

(d) The rated flow capacity of the device in standard cubic meters of air per second (m^3/s); and

(e) The cross sectional flow areas of the spring loaded pressure-relief devices and frangible discs in mm^2.

When practicable, the following information shall also be shown:

(f) The manufacturer's name and relevant catalogue number of the device.

6.7.4.8.2 The rated flow capacity marked on the pressure-relief devices shall be determined according to ISO 4126-1:2004 and ISO 4126-7:2004.

6.7.4.9 Connections to pressure-relief devices

6.7.4.9.1 Connections to pressure-relief devices shall be of sufficient size to enable the required discharge to pass unrestricted to the safety device. No stop-valve shall be installed between the shell and the pressure-relief devices except when duplicate devices are provided for maintenance or other reasons and the stop-valves serving the devices actually in use are locked open or the stop-valves are interlocked so that the

[6] *See for example CGA S-1.2-2003 "Pressure Relief Device Standards - Part 2 - Cargo and Portable Tanks for Compressed Gases".*

requirements of 6.7.4.7 are always fulfilled. There shall be no obstruction in an opening leading to a vent or pressure-relief device which might restrict or cut-off the flow from the shell to that device. Pipework to vent the vapour or liquid from the outlet of the pressure-relief devices, when used, shall deliver the relieved vapour or liquid to the atmosphere in conditions of minimum back-pressure on the relieving device.

6.7.4.10 Siting of pressure-relief devices

6.7.4.10.1 Each pressure-relief device inlet shall be situated on top of the shell in a position as near the longitudinal and transverse centre of the shell as reasonably practicable. All pressure-relief device inlets shall under maximum filling conditions be situated in the vapour space of the shell and the devices shall be so arranged as to ensure that the escaping vapour is discharged unrestrictedly. For refrigerated liquefied gases, the escaping vapour shall be directed away from the tank and in such a manner that it cannot impinge upon the tank. Protective devices which deflect the flow of vapour are permissible provided the required relief-device capacity is not reduced.

6.7.4.10.2 Arrangements shall be made to prevent access to the devices by unauthorized persons and to protect the devices from damage caused by the portable tank overturning.

6.7.4.11 Gauging devices

6.7.4.11.1 Unless a portable tank is intended to be filled by weight, it shall be equipped with one or more gauging devices. Glass level-gauges and gauges made of other fragile material, which are in direct communication with the contents of the shell shall not be used.

6.7.4.11.2 A connection for a vacuum gauge shall be provided in the jacket of a vacuum-insulated portable tank.

6.7.4.12 Portable tank supports, frameworks, lifting and tie-down attachments

6.7.4.12.1 Portable tanks shall be designed and constructed with a support structure to provide a secure base during carriage. The forces specified in 6.7.4.2.12 and the safety factor specified in 6.7.4.2.13 shall be considered in this aspect of the design. Skids, frameworks, cradles or other similar structures are acceptable.

6.7.4.12.2 The combined stresses caused by portable tank mountings (e.g. cradles, frameworks, etc.) and portable tank lifting and tie-down attachments shall not cause excessive stress in any portion of the tank. Permanent lifting and tie-down attachments shall be fitted to all portable tanks. Preferably they shall be fitted to the portable tank supports but may be secured to reinforcing plates located on the tank at the points of support.

6.7.4.12.3 In the design of supports and frameworks the effects of environmental corrosion shall be taken into account.

6.7.4.12.4 Forklift pockets shall be capable of being closed off. The means of closing forklift pockets shall be a permanent part of the framework or permanently attached to the framework. Single compartment portable tanks with a length less than 3.65 m need not have closed off forklift pockets provided that:

(a) The tank and all the fittings are well protected from being hit by the forklift blades; and

(b) The distance between the centres of the forklift pockets is at least half of the maximum length of the portable tank.

6.7.4.12.5 When portable tanks are not protected during carriage, according to 4.2.3.3, the shells and service equipment shall be protected against damage to the shell and service equipment resulting from lateral or longitudinal impact or overturning. External fittings shall be protected so as to preclude the release of the shell contents upon impact or overturning of the portable tank on its fittings. Examples of protection include:

(a) Protection against lateral impact which may consist of longitudinal bars protecting the shell on both sides at the level of the median line;

(b) Protection of the portable tank against overturning which may consist of reinforcement rings or bars fixed across the frame;

(c) Protection against rear impact which may consist of a bumper or frame;

(d) Protection of the shell against damage from impact or overturning by use of an ISO frame in accordance with ISO 1496-3:1995;

(e) Protection of the portable tank from impact or overturning by a vacuum insulation jacket.

6.7.4.13 Design approval

6.7.4.13.1 The competent authority or its authorized body shall issue a design approval certificate for any new design of a portable tank. This certificate shall attest that a portable tank has been surveyed by that authority, is suitable for its intended purpose and meets the requirements of this Chapter. When a series of portable tanks are manufactured without change in the design, the certificate shall be valid for the entire series. The certificate shall refer to the prototype test report, the refrigerated liquefied gases allowed to be carried, the materials of construction of the shell and jacket and an approval number. The approval number shall consist of the distinguishing sign or mark of the State in whose territory the approval was granted, indicated by the distinguishing sign for use in international road traffic[2], and a registration number. Any alternative arrangements according to 6.7.1.2 shall be indicated on the certificate. A design approval may serve for the approval of smaller portable tanks made of materials of the same kind and thickness, by the same fabrication techniques and with identical supports, equivalent closures and other appurtenances.

6.7.4.13.2 The prototype test report for the design approval shall include at least the following:

(a) The results of the applicable frame-work test specified in ISO 1496-3:1995;

(b) The results of the initial inspection and test in 6.7.4.14.3; and

(c) The results of the impact test in 6.7.4.14.1, when applicable.

6.7.4.14 Inspection and testing

6.7.4.14.1 Portable tanks meeting the definition of container in the International Convention for Safe Containers (CSC), 1972, as amended, shall not be used unless they are successfully qualified by subjecting a representative prototype of each design to the Dynamic, Longitudinal Impact Test prescribed in the Manual of Tests and Criteria, Part IV, Section 41.

6.7.4.14.2 The tank and items of equipment of each portable tank shall be inspected and tested before being put into service for the first time (initial inspection and test) and thereafter at not more than five-year intervals (5 year periodic inspection and test) with an intermediate periodic inspection and test (2.5 year periodic inspection and test) midway between the 5 year periodic inspections and tests. The 2.5 year inspection and test may be performed within 3 months of the specified date. An exceptional inspection and test shall be performed regardless of the last periodic inspection and test when necessary according to 6.7.4.14.7.

6.7.4.14.3 The initial inspection and test of a portable tank shall include a check of the design characteristics, an internal and external examination of the portable tank shell and its fittings with due regard to the refrigerated liquefied gases to be carried, and a pressure test referring to the test pressures according to 6.7.4.3.2. The pressure test may be performed as a hydraulic test or by using another liquid or gas with the agreement of the competent authority or its authorized body. Before the portable tank is placed into service, a leakproofness test and a check of the satisfactory operation of all service equipment shall also be performed. When the shell and its fittings have been pressure-tested separately, they shall be subjected together after assembly to a leakproofness test. All welds subject to full stress level shall be inspected during the initial test by radiographic, ultrasonic, or another suitable non-destructive test method. This does not apply to the jacket.

6.7.4.14.4 The 5 and 2.5 year periodic inspections and tests shall include an external examination of the portable tank and its fittings with due regard to the refrigerated liquefied gases carried, a leakproofness test, a check of the satisfactory operation of all service equipment and a vacuum reading, when applicable. In the case of non-vacuum insulated tanks, the jacket and insulation shall be removed during the 2.5 year and the 5 year periodic inspections and tests but only to the extent necessary for a reliable appraisal.

[2] *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*

6.7.4.14.5 *(Deleted)*

6.7.4.14.6 Inspection and test of portable tanks and filling after the date of expiry of the last periodic inspection and test

6.7.4.14.6.1 A portable tank may not be filled and offered for carriage after the date of expiry of the last 5 year or 2.5 year periodic inspection and test as required by 6.7.4.14.2. However a portable tank filled prior to the date of expiry of the last periodic inspection and test may be carried for a period not to exceed three months beyond the date of expiry of the last periodic test or inspection. In addition, a portable tank may be carried after the date of expiry of the last periodic test and inspection:

(a) After emptying but before cleaning, for purposes of performing the next required test or inspection prior to refilling; and

(b) Unless otherwise approved by the competent authority, for a period not to exceed six months beyond the date of expiry of the last periodic test or inspection, in order to allow the return of dangerous goods for proper disposal or recycling. Reference to this exemption shall be mentioned in the transport document.

6.7.4.14.6.2 Except as provided for in 6.7.4.14.6.1, portable tanks which have missed the timeframe for their scheduled 5 year or 2.5-year periodic inspection and test may only be filled and offered for carriage if a new 5-year periodic inspection and test is performed according to 6.7.4.14.4.

6.7.4.14.7 The exceptional inspection and test is necessary when the portable tank shows evidence of damaged or corroded areas, leakage, or any other conditions that indicate a deficiency that could affect the integrity of the portable tank. The extent of the exceptional inspection and test shall depend on the amount of damage or deterioration of the portable tank. It shall include at least the 2.5 year inspection and test according to 6.7.4.14.4.

6.7.4.14.8 The internal examination during the initial inspection and test shall ensure that the shell is inspected for pitting, corrosion, or abrasions, dents, distortions, defects in welds or any other conditions, that might render the portable tank unsafe for carriage.

6.7.4.14.9 The external examination shall ensure that:

(a) The external piping, valves, pressurizing/cooling systems when applicable and gaskets are inspected for corroded areas, defects, or any other conditions, including leakage, that might render the portable tank unsafe for filling, discharge or carriage;

(b) There is no leakage at any manhole covers or gaskets;

(c) Missing or loose bolts or nuts on any flanged connection or blank flange are replaced or tightened;

(d) All emergency devices and valves are free from corrosion, distortion and any damage or defect that could prevent their normal operation. Remote closure devices and self-closing stop-valves shall be operated to demonstrate proper operation;

(e) Required marks on the portable tank are legible and in accordance with the applicable requirements; and

(f) The framework, the supports and the arrangements for lifting the portable tank are in satisfactory condition.

6.7.4.14.10 The inspections and tests in 6.7.4.14.1, 6.7.4.14.3, 6.7.4.14.4 and 6.7.4.14.7 shall be performed or witnessed by an expert approved by the competent authority or its authorized body. When the pressure test is a part of the inspection and test, the test pressure shall be the one indicated on the data plate of the portable tank. While under pressure, the portable tank shall be inspected for any leaks in the shell, piping or equipment.

6.7.4.14.11 In all cases when cutting, burning or welding operations on the shell of a portable tank have been effected, that work shall be to the approval of the competent authority or its authorized body taking into account the pressure vessel code used for the construction of the shell. A pressure test to the original test pressure shall be performed after the work is completed.

6.7.4.14.12 When evidence of any unsafe condition is discovered, the portable tank shall not be returned to service until it has been corrected and the test is repeated and passed.

6.7.4.15 ***Marking***

6.7.4.15.1 Every portable tank shall be fitted with a corrosion resistant metal plate permanently attached to the portable tank in a conspicuous place readily accessible for inspection. When for reasons of portable tank arrangements the plate cannot be permanently attached to the shell, the shell shall be marked with at least the information required by the pressure vessel code. As a minimum, at least the following information shall be marked on the plate by stamping or by any other similar method:

(a) Owner information

(i) Owner's registration number;

(b) Manufacturing information

(i) Country of manufacture;

(ii) Year of manufacture;

(iii) Manufacturer's name or mark;

(iv) Manufacturer's serial number;

(c) Approval information

(i) The United Nations packaging symbol  .

This symbol shall not be used for any purpose other than certifying that a packaging, a flexible bulk container, a portable tank or a MEGC complies with the relevant requirements in Chapter 6.1, 6.2, 6.3, 6.5, 6.6, 6.7 or 6.11;

(ii) Approval country;

(iii) Authorized body for the design approval;

(iv) Design approval number;

(v) Letters 'AA', if the design was approved under alternative arrangements (see 6.7.1.2);

(vi) Pressure vessel code to which the shell is designed;

(d) Pressures

(i) MAWP (in bar gauge or kPa gauge)[3];

(ii) Test pressure (in bar gauge or kPa gauge)[3];

(iii) Initial pressure test date (month and year);

(iv) Identification mark of the initial pressure test witness;

(e) Temperatures

(i) Minimum design temperature (in °C)[3];

(f) Materials

(i) Shell material(s) and material standard reference(s);

(ii) Equivalent thickness in reference steel (in mm)[3];

[3] *The unit used shall be indicated.*

[3] *The unit used shall be indicated.*

(g) Capacity

(i) Tank water capacity at 20 °C (in litres)[3];

(h) Insulation

(i) Either "Thermally insulated" or "Vacuum insulated" (as applicable);

(ii) Effectiveness of the insulation system (heat influx) (in Watts)[3];

(i) Holding times – for each refrigerated liquefied gas permitted to be carried in the portable tank

(i) Name, in full, of the refrigerated liquefied gas;

(ii) Reference holding time (in days or hours)[3];

(iii) Initial pressure (in bar gauge or kPa gauge)[3];

(iv) Degree of filling (in kg)[3];

(j) Periodic inspections and tests

(i) Type of the most recent periodic test (2.5-year, 5-year or exceptional);

(ii) Date of the most recent periodic test (month and year);

(iii) Identification mark of the authorized body who performed or witnessed the most recent test.

Figure 6.7.4.15.1: Example of a plate for marking

Owner's registration number					
MANUFACTURING INFORMATION					
Country of manufacture					
Year of manufacture					
Manufacturer					
Manufacturer's serial number					
APPROVAL INFORMATION					
UN	Approval country				
	Authorized body for design approval				
	Design approval number				'AA' *(if applicable)*
Shell design code (pressure vessel code)					
PRESSURES					
MAWP					bar *or* kPa
Test pressure					bar *or* kPa
Initial pressure test date:	*(mm/yyyy)*	Witness stamp:			
TEMPERATURES					
Minimum design temperature					°C
MATERIALS					
Shell material(s) and material standard reference(s)					
Equivalent thickness in reference steel					mm
CAPACITY					
Tank water capacity at 20 °C					litres
INSULATION					
'Thermally insulated' or 'Vacuum insulated' *(as applicable)*					
Heat influx					Watts

HOLDING TIMES			
Refrigerated liquefied gas(es) permitted	Reference holding time	Initial pressure	Degree of filling
	days *or* hours	bar *or* kPa	kg

PERIODIC INSPECTIONS / TESTS					
Test type	Test date	Witness stamp	Test type	Test date	Witness stamp
	(mm/yyyy)			*(mm/yyyy)*	

6.7.4.15.2 The following particulars shall be durably marked either on the portable tank itself or on a metal plate firmly secured to the portable tank.

Name of the owner and the operator
Name of the refrigerated liquefied gas being carried (and minimum mean bulk temperature)
Maximum permissible gross mass (MPGM)_____kg
Unladen (tare) mass_____kg
Actual holding time for gas being carried _____days (or hours)
Portable tank instruction in accordance with 4.2.5.2.6

NOTE: *For the identification of the refrigerated liquefied gas(es) being carried, see also Part 5.*

6.7.4.15.3 If a portable tank is designed and approved for handling in open seas, the words "OFFSHORE PORTABLE TANK" shall be marked on the identification plate.

6.7.5 Requirements for the design, construction, inspection and testing of UN multiple-element gas containers (MEGCs) intended for the carriage of non-refrigerated gases

6.7.5.1 Definitions

For the purposes of this section:

Alternative arrangement means an approval granted by the competent authority for a portable tank or MEGC that has been designed, constructed or tested to technical requirements or testing methods other than those specified in this Chapter;

*Element*s are cylinders, tubes or bundles of cylinders;

Leakproofness test means a test using gas subjecting the elements and the service equipment of the MEGC to an effective internal pressure of not less than 20 % of the test pressure;

Manifold means an assembly of piping and valves connecting the filling and/or discharge openings of the elements;

Maximum permissible gross mass (MPGM) means the sum of the tare mass of the MEGC and the heaviest load authorized for carriage;

UN Multiple-element gas containers (MEGCs) are multimodal assemblies of cylinders, tubes and bundles of cylinders which are interconnected by a manifold and which are assembled within a framework. The MEGC includes service equipment and structural equipment necessary for the carriage of gases;

Service equipment means measuring instruments and filling, discharge, venting and safety devices;

Structural equipment means the reinforcing, fastening, protective and stabilizing members external to the elements.

6.7.5.2 General design and construction requirements

6.7.5.2.1 The MEGC shall be capable of being filled and discharged without the removal of its structural equipment. It shall possess stabilizing members external to the elements to provide structural integrity for handling and carriage. MEGCs shall be designed and constructed with supports to provide a secure base during carriage and with lifting and tie-down attachments which are adequate for lifting the MEGC including when filled to its maximum permissible gross mass. The MEGC shall be designed to be loaded onto a vehicle, wagon or sea-going or inland navigation vessel and shall be equipped with skids, mountings or accessories to facilitate mechanical handling.

6.7.5.2.2 MEGCs shall be designed, manufactured and equipped in such a way as to withstand all conditions to which they will be subjected during normal conditions of handling and carriage. The design shall take into account the effects of dynamic loading and fatigue.

6.7.5.2.3 Elements of an MEGC shall be made of seamless steel or composite construction and be constructed and tested according to 6.2.1 and 6.2.2. All of the elements in an MEGC shall be of the same design type.

6.7.5.2.4 Elements of MEGCs, fittings and pipework shall be:

(a) Compatible with the substances intended to be carried (see ISO 11114-1:2020 and ISO 11114-2:2021); or

(b) Properly passivated or neutralized by chemical reaction.

6.7.5.2.5 Contact between dissimilar metals which could result in damage by galvanic action shall be avoided.

6.7.5.2.6 The materials of the MEGC, including any devices, gaskets, and accessories, shall not adversely affect the gas(es) intended for carriage in the MEGC.

6.7.5.2.7 MEGCs shall be designed to withstand, without loss of contents, at least the internal pressure due to the contents, and the static, dynamic and thermal loads during normal conditions of handling and carriage.

The design shall demonstrate that the effects of fatigue, caused by repeated application of these loads through the expected life of the multiple-element gas container, have been taken into account.

6.7.5.2.8 MEGCs and their fastenings shall, under the maximum permissible load, be capable of withstanding the following separately applied static forces:

(a) In the direction of travel: twice the MPGM multiplied by the acceleration due to gravity (g)[1];

(b) Horizontally at right angles to the direction of travel: the MPGM (when the direction of travel is not clearly determined, the forces shall be equal to twice the MPGM) multiplied by the acceleration due to gravity (g)[1];

(c) Vertically upwards: the MPGM multiplied by the acceleration due to gravity (g)[1]; and

(d) Vertically downwards: twice the MPGM (total loading including the effect of gravity) multiplied by the acceleration due to gravity (g)[1].

6.7.5.2.9 Under the forces defined in 6.7.5.2.8, the stress at the most severely stressed point of the elements shall not exceed the values given in either the relevant standards of 6.2.2.1 or, if the elements are not designed, constructed and tested according to those standards, in the technical code or standard recognised or approved by the competent authority of the country of use (see 6.2.5).

6.7.5.2.10 Under each of the forces in 6.7.5.2.8, the safety factor for the framework and fastenings to be observed shall be as follows:

(a) for steels having a clearly defined yield point, a safety factor of 1.5 in relation to the guaranteed yield strength; or

(b) for steels with no clearly defined yield point, a safety factor of 1.5 in relation to the guaranteed 0.2 % proof strength and, for austenitic steels, the 1 % proof strength.

6.7.5.2.11 MEGCs intended for the carriage of flammable gases shall be capable of being electrically earthed.

6.7.5.2.12 The elements shall be secured in a manner that prevents undesired movement in relation to the structure and the concentration of harmful localized stresses.

6.7.5.3 Service equipment

6.7.5.3.1 Service equipment shall be configured or designed to prevent damage that could result in the release of the pressure receptacle contents during normal conditions of handling and carriage. When the connection between the frame and the elements allows relative movement between the sub-assemblies, the equipment shall be so fastened as to permit such movement without damage to working parts. The manifolds, the discharge fittings (pipe sockets, shut-off devices), and the stop-valves shall be protected from being wrenched off by external forces. Manifold piping leading to shut-off valves shall be sufficiently flexible to protect the valves and the piping from shearing, or releasing the pressure receptacle contents. The filling and discharge devices (including flanges or threaded plugs) and any protective caps shall be capable of being secured against unintended opening.

6.7.5.3.2 Each element intended for the carriage of toxic gases (gases of groups T, TF, TC, TO, TFC and TOC) shall be fitted with a valve. The manifold for liquefied toxic gases (gases of classification codes 2T, 2TF, 2TC, 2TO, 2TFC and 2TOC) shall be so designed that the elements can be filled separately and be kept isolated by a valve capable of being sealed. For the carriage of flammable gases (gases of group F), the elements shall be divided into groups of not more than 3 000 litres each isolated by a valve.

6.7.5.3.3 For filling and discharge openings of the MEGC, two valves in series shall be placed in an accessible position on each discharge and filling pipe. One of the valves may be a non-return valve. The filling and discharge devices may be fitted to a manifold. For sections of piping which can be closed at both ends and where a liquid product can be trapped, a pressure-relief valve shall be provided to prevent excessive pressure build-up. The main isolation valves on an MEGC shall be clearly marked to indicate their directions of closure. Each stop-valve or other means of closure shall be designed and constructed to withstand a pressure equal to or greater than 1.5 times the test pressure of the MEGC. All stop-valves with screwed spindles shall close by a clockwise motion of the handwheel. For other stop-valves, the

[1] *For calculation purposes g = 9.81 m/s^2.*

position (open and closed) and direction of closure shall be clearly indicated. All stop-valves shall be designed and positioned to prevent unintentional opening. Ductile metals shall be used in the construction of valves or accessories.

6.7.5.3.4 Piping shall be designed, constructed and installed so as to avoid damage due to expansion and contraction, mechanical shock and vibration. Joints in tubing shall be brazed or have an equally strong metal union. The melting point of brazing materials shall be no lower than 525 °C. The rated pressure of the service equipment and of the manifold shall be not less than two thirds of the test pressure of the elements.

6.7.5.4 Pressure-relief devices

6.7.5.4.1 The elements of MEGCs used for the carriage of UN No. 1013 carbon dioxide and UN No. 1070 nitrous oxide shall be divided into groups of not more than 3 000 litres each isolated by a valve. Each group shall be fitted with one or more pressure relief devices. If so required by the competent authority of the country of use, MEGCs for other gases shall be fitted with pressure relief devices as specified by that competent authority.

6.7.5.4.2 When pressure relief devices are fitted, every element or group of elements of an MEGC that can be isolated shall then be fitted with one or more pressure relief devices. Pressure relief devices shall be of a type that will resist dynamic forces including liquid surge and shall be designed to prevent the entry of foreign matter, the leakage of gas and the development of any dangerous excess pressure.

6.7.5.4.3 MEGCs used for the carriage of certain non-refrigerated gases identified in portable tank instruction T50 in 4.2.5.2.6 may have a pressure-relief device as required by the competent authority of the country of use. Unless an MEGC in dedicated service is fitted with an approved pressure relief device constructed of materials compatible with the gas carried, such a device shall comprise a frangible disc preceding a spring-loaded device. The space between the frangible disc and the spring-loaded device may be equipped with a pressure gauge or a suitable telltale indicator. This arrangement permits the detection of disc rupture, pinholing or leakage which could cause a malfunction of the pressure relief device. The frangible disc shall rupture at a nominal pressure 10 % above the start-to-discharge pressure of the spring-loaded device.

6.7.5.4.4 In the case of multi-purpose MEGCs used for the carriage of low-pressure liquefied gases, the pressure-relief devices shall open at a pressure as specified in 6.7.3.7.1 for the gas having the highest maximum allowable working pressure of the gases allowed to be carried in the MEGC.

6.7.5.5 Capacity of pressure relief devices

6.7.5.5.1 The combined delivery capacity of the pressure relief devices when fitted shall be sufficient that, in the event of total fire engulfment of the MEGC, the pressure (including accumulation) inside the elements does not exceed 120 % of the set pressure of the pressure relief device. The formula provided in CGA S-1.2-2003 "Pressure Relief Device Standards - Part 2 - Cargo and Portable Tanks for Compressed Gases" shall be used to determine the minimum total flow capacity for the system of pressure relief devices. CGA S-1.1-2003 "Pressure Relief Device Standards - Part 1 - Cylinders for Compressed Gases" may be used to determine the relief capacity of individual elements. Spring-loaded pressure relief devices may be used to achieve the full relief capacity prescribed in the case of low pressure liquefied gases. In the case of multi-purpose MEGCs, the combined delivery capacity of the pressure-relief devices shall be taken for the gas which requires the highest delivery capacity of the gases allowed to be carried in the MEGC.

6.7.5.5.2 To determine the total required capacity of the pressure relief devices installed on the elements for the carriage of liquefied gases, the thermodynamic properties of the gas shall be considered (see, for example, CGA S-1.2-2003 "Pressure Relief Device Standards - Part 2 - Cargo and Portable Tanks for Compressed Gases" for low pressure liquefied gases and CGA S-1.1-2003 "Pressure Relief Device Standards - Part 1 - Cylinders for Compressed Gases" for high pressure liquefied gases).

6.7.5.6 Marking of pressure-relief devices

6.7.5.6.1 Pressure relief devices shall be clearly and permanently marked with the following:

(a) The manufacturer's name and relevant catalogue number;

(b) The set pressure and/or the set temperature;

(c) The date of the last test.

(d) The cross sectional flow areas of the spring loaded pressure-relief devices and frangible discs in mm^2.

6.7.5.6.2 The rated flow capacity marked on spring loaded pressure relief devices for low pressure liquefied gases shall be determined according to ISO 4126-1:2004 and ISO 4126-7:2004.

6.7.5.7 Connections to pressure-relief devices

6.7.5.7.1 Connections to pressure-relief devices shall be of sufficient size to enable the required discharge to pass unrestricted to the pressure relief device. No stop-valve shall be installed between the element and the pressure-relief devices, except when duplicate devices are provided for maintenance or other reasons, and the stop-valves serving the devices actually in use are locked open, or the stop-valves are interlocked so that at least one of the duplicate devices is always operable and capable of meeting the requirements of 6.7.5.5. There shall be no obstruction in an opening leading to or leaving from a vent or pressure-relief device which might restrict or cut-off the flow from the element to that device. The opening through all piping and fittings shall have at least the same flow area as the inlet of the pressure relief device to which it is connected. The nominal size of the discharge piping shall be at least as large as that of the pressure relief device outlet. Vents from the pressure-relief devices, when used, shall deliver the relieved vapour or liquid to the atmosphere in conditions of minimum back-pressure on the relieving device.

6.7.5.8 Siting of pressure-relief devices

6.7.5.8.1 Each pressure relief device shall, under maximum filling conditions, be in communication with the vapour space of the elements for the carriage of liquefied gases. The devices, when fitted, shall be so arranged as to ensure that the escaping vapour is discharged upwards and unrestrictedly as to prevent any impingement of escaping gas or liquid upon the MEGC, its elements or personnel. For flammable, pyrophoric and oxidizing gases, the escaping gas shall be directed away from the element in such a manner that it cannot impinge upon the other elements. Heat resistant protective devices which deflect the flow of gas are permissible provided the required pressure relief device capacity is not reduced.

6.7.5.8.2 Arrangements shall be made to prevent access to the pressure-relief devices by unauthorized persons and to protect the devices from damage caused by the MEGC overturning.

6.7.5.9 Gauging devices

6.7.5.9.1 When an MEGC is intended to be filled by mass, it shall be equipped with one or more gauging devices. Level-gauges made of glass or other fragile material shall not be used.

6.7.5.10 MEGC supports, frameworks, lifting and tie-down attachments

6.7.5.10.1 MEGCs shall be designed and constructed with a support structure to provide a secure base during carriage. The forces specified in 6.7.5.2.8 and the safety factor specified in 6.7.5.2.10 shall be considered in this aspect of the design. Skids, frameworks, cradles or other similar structures are acceptable.

6.7.5.10.2 The combined stresses caused by element mountings (e.g. cradles, frameworks, etc.) and MEGC lifting and tie-down attachments shall not cause excessive stress in any element. Permanent lifting and tie-down attachments shall be fitted to all MEGCs. In no case shall mountings or attachments be welded onto the elements.

6.7.5.10.3 In the design of supports and frameworks, the effects of environmental corrosion shall be taken into account.

6.7.5.10.4 When MEGCs are not protected during carriage, according to 4.2.4.3, the elements and service equipment shall be protected against damage resulting from lateral or longitudinal impact or overturning. External fittings shall be protected so as to preclude the release of the elements' contents upon impact or overturning of the MEGC on its fittings. Particular attention shall be paid to the protection of the manifold. Examples of protection include:

(a) Protection against lateral impact which may consist of longitudinal bars;

(b) Protection against overturning which may consist of reinforcement rings or bars fixed across the frame;

(c) Protection against rear impact which may consist of a bumper or frame;

(d) Protection of the elements and service equipment against damage from impact or overturning by use of an ISO frame in accordance with the relevant provisions of ISO 1496-3:1995.

6.7.5.11 Design approval

6.7.5.11.1 The competent authority or its authorized body shall issue a design approval certificate for any new design of an MEGC. This certificate shall attest that the MEGC has been surveyed by that authority, is suitable for its intended purpose and meets the requirements of this Chapter, the applicable provisions for gases of Chapter 4.1 and of packing instruction P200. When a series of MEGCs are manufactured without change in the design, the certificate shall be valid for the entire series. The certificate shall refer to the prototype test report, the materials of construction of the manifold, the standards to which the elements are made and an approval number. The approval number shall consist of the distinguishing sign or mark of the country granting the approval, indicated by the distinguishing sign used on vehicles in international road traffic[2], and a registration number. Any alternative arrangements according to 6.7.1.2 shall be indicated on the certificate. A design approval may serve for the approval of smaller MEGCs made of materials of the same type and thickness, by the same fabrication techniques and with identical supports, equivalent closures and other appurtenances.

6.7.5.11.2 The prototype test report for the design approval shall include at least the following:

(a) The results of the applicable framework test specified in ISO 1496-3:1995;

(b) The results of the initial inspection and test specified in 6.7.5.12.3;

(c) The results of the impact test specified in 6.7.5.12.1; and

(d) Certification documents verifying that the cylinders and tubes comply with the applicable standards.

6.7.5.12 Inspection and testing

6.7.5.12.1 MEGCs meeting the definition of container in the International Convention for Safe Containers (CSC), 1972, as amended, shall not be used unless they are successfully qualified by subjecting a representative prototype of each design to the Dynamic, Longitudinal Impact Test prescribed in the Manual of Tests and Criteria, Part IV, Section 41.

6.7.5.12.2 The elements and items of equipment of each MEGC shall be inspected and tested before being put into service for the first time (initial inspection and test). Thereafter, MEGCs shall be inspected at no more than five-year intervals (5 year periodic inspection). An exceptional inspection and test shall be performed, regardless of the last periodic inspection and test, when necessary according to 6.7.5.12.5.

6.7.5.12.3 The initial inspection and test of an MEGC shall include a check of the design characteristics, an external examination of the MEGC and its fittings with due regard to the gases to be carried, and a pressure test performed at the test pressures according to packing instruction P200 of 4.1.4.1. The pressure test of the manifold may be performed as a hydraulic test or by using another liquid or gas with the agreement of the competent authority or its authorized body. Before the MEGC is placed into service, a leakproofness test and a test of the satisfactory operation of all service equipment shall also be performed. When the elements and their fittings have been pressure-tested separately, they shall be subjected together after assembly to a leakproofness test.

6.7.5.12.4 The 5-year periodic inspection and test shall include an external examination of the structure, the elements and the service equipment in accordance with 6.7.5.12.6. The elements and the piping shall be tested at the periodicity specified in packing instruction P200 and in accordance with the provisions described in 6.2.1.6. When the elements and equipment have been pressure-tested separately, they shall be subjected together after assembly to a leakproofness test.

6.7.5.12.5 An exceptional inspection and test is necessary when the MEGC shows evidence of damaged or corroded areas, leakage, or other conditions that indicate a deficiency that could affect the integrity of

[2] *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*

the MEGC. The extent of the exceptional inspection and test shall depend on the amount of damage or deterioration of the MEGC. It shall include at least the examinations required under 6.7.5.12.6.

6.7.5.12.6 The examinations shall ensure that:

(a) The elements are inspected externally for pitting, corrosion, abrasions, dents, distortions, defects in welds or any other conditions, including leakage, that might render the MEGC unsafe for carriage;

(b) The piping, valves, and gaskets are inspected for corroded areas, defects, and other conditions, including leakage, that might render the MEGC unsafe for filling, discharge or carriage;

(c) Missing or loose bolts or nuts on any flanged connection or blank flange are replaced or tightened;

(d) All emergency devices and valves are free from corrosion, distortion and any damage or defect that could prevent their normal operation. Remote closure devices and self-closing stop-valves shall be operated to demonstrate proper operation;

(e) Required marks on the MEGC are legible and in accordance with the applicable requirements; and

(f) The framework, the supports and the arrangements for lifting the MEGC are in satisfactory condition.

6.7.5.12.7 The inspections and tests in 6.7.5.12.1, 6.7.5.12.3, 6.7.5.12.4 and 6.7.5.12.5 shall be performed or witnessed by a body authorized by the competent authority. When the pressure test is a part of the inspection and test, the test pressure shall be the one indicated on the data plate of the MEGC. While under pressure, the MEGC shall be inspected for any leaks in the elements, piping or equipment.

6.7.5.12.8 When evidence of any unsafe condition is discovered, the MEGC shall not be returned to service until it has been corrected and the applicable tests and verifications are passed.

6.7.5.13 ***Marking***

6.7.5.13.1 Every MEGC shall be fitted with a corrosion resistant metal plate permanently attached to the MEGC in a conspicuous place readily accessible for inspection. The metal plate shall not be affixed to the elements. The elements shall be marked in accordance with Chapter 6.2. As a minimum, at least the following information shall be marked on the plate by stamping or by any other similar method:

(a) Owner information

(i) Owner's registration number;

(b) Manufacturing information

(i) Country of manufacture;

(ii) Year of manufacture;

(iii) Manufacturer's name or mark;

(iv) Manufacturer's serial number;

(c) Approval information

(i) The United Nations packaging symbol  .

This symbol shall not be used for any purpose other than certifying that a packaging, a flexible bulk container, a portable tank or a MEGC complies with the relevant requirements in Chapter 6.1, 6.2, 6.3, 6.5, 6.6, 6.7 or 6.11;

(ii) Approval country;

(iii) Authorized body for the design approval;

(iv) Design approval number;

(v) Letters ‘AA’, if the design was approved under alternative arrangements (see 6.7.1.2);

(d) Pressures

(i) Test pressure (in bar gauge)[3];

(ii) Initial pressure test date (month and year);

(iii) Identification mark of the initial pressure test witness;

(e) Temperatures

(i) Design temperature range (in °C)[3];

(f) Elements / Capacity

(i) Number of elements;

(ii) Total water capacity (in litres)[3];

(g) Periodic inspections and tests

(i) Type of the most recent periodic test (5-year or exceptional);

(ii) Date of the most recent periodic test (month and year);

(iii) Identification mark of the authorized body who performed or witnessed the most recent test.

[3] *The unit used shall be indicated.*

Figure 6.7.5.13.1: Example of a plate for marking

Owner's registration number					
MANUFACTURING INFORMATION					
Country of manufacture					
Year of manufacture					
Manufacturer					
Manufacturer's serial number					
APPROVAL INFORMATION					
(UN)	Approval country				
	Authorized body for design approval				
	Design approval number			'AA' *(if applicable)*	
PRESSURES					
Test pressure			bar		
Initial pressure test date:	*(mm/yyyy)*	Witness stamp:			
TEMPERATURES					
Design temperature range		°C to °C			
ELEMENTS / CAPACITY					
Number of elements					
Total water capacity		litres			
PERIODIC INSPECTIONS / TESTS					
Test type	Test date	Witness stamp	Test type	Test date	Witness stamp
	(mm/yyyy)			*(mm/yyyy)*	

6.7.5.13.2 The following information shall be durably marked on a metal plate firmly secured to the MEGC:

Name of the operator
Maximum permissible load mass _____ kg
Working pressure at 15°C: _____ bar gauge
Maximum permissible gross mass (MPGM) _____ kg
Unladen (tare) mass _____ kg

6.8 Chapter 6.8

NOTE 1: *The requirements for tanks in this edition of the code have been significantly updated from ADG 7. This chapter provides for the use of AS 2809-style tanks, and also permits the use of tanks designed according to the provisions of ADR.*

NOTE 2: *Tank designers and users should consider the use of ADR-style tanks for transport scenarios that were not considered in the development of AS 2809 parts 2 to 6.*

6.8.1 Scope and general provisions

6.8.1.1 The requirements across the whole width of the page apply both to fixed tanks (tank vehicles), to demountable tanks and tube-vehicles, and to tank-containers, tank swap bodies and MEGCs. Those contained in a single column apply only:

- to fixed tanks (tank-vehicles), to demountable tanks and tube-vehicles (left hand column);
- to tank-containers, tank swap bodies and MEGCs (right hand column).

6.8.1.2 These requirements shall apply to

fixed tanks (tank-vehicles), demountable tanks and tube-vehicles	tank-containers, tank swap bodies and MEGCs

used for the carriage of gaseous, liquid, powdery or granular substances.

6.8.1.3 Section 6.8.2 to 6.8.6 set out the requirements for the construction, equipment, inspection, tests and marking of fixed tanks (tank vehicles), demountable tanks and tube-vehicles, and tank-containers, tank swap bodies and MEGCs.

Only one of 6.8.1.3.1 or 6.8.1.3.2 shall apply, according to the design and approval:

NOTE: *Tanks are intended to be designed to a single design style (AS 2809 or ADR), except where permitted by a competent authority under alternative approval arrangements.*

6.8.1.3.1 Conformance to requirements in ADR

Section 6.8.2 sets out the requirements applicable to fixed tanks (tank-vehicles), to demountable tanks, tank-containers, tank swap bodies intended for the carriage of substances of all classes and tube-vehicles and MEGCs for gases of Class 2. Sections 6.8.3 to 6.8.5 contain special requirements supplementing or modifying the requirements of section 6.8.2.

Tanks that have been designed according to the requirements of 6.8.2 to 6.8.6 must conform to these requirements at the time of design and approval.

Note that Sections 6.8.2 to 6.8.6 have not been replicated in full in this Code.

6.8.1.3.2 Conformance to Australian Standards

Section 6.8.6 sets out the requirements applicable to fixed tanks (tank-vehicles), to demountable tanks, tank-containers, tank swap bodies intended for the carriage of substances of all classes and tube-vehicles and MEGCs for gases of Class 2. Section 6.8.7 contains special requirements supplementing or modifying the requirements of section 6.8.6.

6.8.1.4 For provisions concerning use of these tanks, see Chapter 4.3.

6.8.1.5 ***Conformity assessment, type approval and inspections procedures***

The following provisions describe how to apply the procedures in 1.8.7.

The conformity assessment of the tank shall verify that all its components conform to the requirements of the Code, irrespective of where they have been manufactured.

NOTE 1: *these assessment, type approval and inspection processes are derived from, but are substantially different to those found in ADR. A tank undergoing these processes will not conform to the strict requirements of ADR.*

NOTE 2: *For pressure receptacles, this section provides for equivalence between the approval, inspection and test requirements of this code and pressure receptacle legislation, by reference to the requirements in 1.8.7.1.6. Tank shells, service and structural equipment that do not form a part of the design covered by pressure receptacle legislation remain subject to the requirements of this chapter.*

NOTE 3: *There may also be other assessments, inspections and tests required under other legislation (as for pressure equipment). The requirements in this section do not override those obligations, but where those obligations meet the requirements below, a separate system is not required to be instituted.*

6.8.1.5.1 *Type examination according to 1.8.7.2.1*

The manufacturer of the tank shall engage a suitably qualified professional engineer to take responsibility for the type examination. The professional engineer shall be eligible for admission to Engineers Australia as a professional engineer. The professional engineer shall not have been involved in the original design process.

NOTE: *The competent authority may require evidence of the professional engineer's eligibility be provided for verification.*

6.8.1.5.2 *Type approval certificate issue according to 1.8.7.2.2*

The competent authority of the state or territory where the tank is manufactured, or imported into if it is an imported tank, shall issue the type approval certificate.

Where a tank is a pressure receptacle, the type approval is considered to be complied with when the requirements of 1.8.7.1.6.1 are followed.

NOTE: *A competent authority may direct applicants for type approval to submit the approval to another competent authority, with the consent of that other authority.*

6.8.1.5.3 *Supervision of manufacture according to 1.8.7.3*

For the supervision of manufacture, the manufacturer of the tank shall engage a suitably trained and qualified person. If the manufacturer uses an in-house supervisor, the manufacturer shall implement a quality assurance system to ensure the supervision remains satisfactory and efficient, and correctly supervises the manufacture process.

6.8.1.5.4 *Initial inspection and tests according to 1.8.7.4*

The manufacturer of the tank shall engage a suitably trained and qualified person to take responsibility for the initial inspection and tests. If the manufacturer uses an in-house inspection service, the manufacturer shall implement a a quality assurance system to ensure the inspection service remains satisfactory and efficient, and correctly undertakes the tank inspection and tests.

Where a tank is a pressure receptacle, the initial inspection and tests are considered to be complied with when the requirements of 1.8.7.1.6.2 are followed.

6.8.1.5.5 *Verification according to 1.8.7.5*

The competent authority where the tank is used may require, on an occasional basis, a verification of the tank to verify conformity with the applicable requirements.

The competent authority may require this verification prior to the tank or the vehicle it is mounted on being licensed, or its licence renewed.

The competent authority may undertake the verification itself or direct the verification to be undertaken by a person nominated by the competent authority.

6.8.1.5.6 *Intermediate, periodic or exceptional inspection according to 1.8.7.6*

The intermediate or periodic or exceptional inspection shall be performed by a suitably trained and qualified person. If the tank owner or operator uses an in-house inspection service, the owner or operator shall implement a quality assurance system to ensure the inspection remains satisfactory and efficient, and correctly undertakes the tank inspection and tests.

Where a tank is a pressure receptacle, the intermediate, periodic or exceptional inspections are considered to be complied with when the requirements of 1.8.7.1.6.3 are followed.

6.8.1.5.7 *Conformity assessment, type approval and inspections procedures for pressure receptacles*

NOTE: *Sections 6.8.2 to 6.8.6 have not been replicated in full in ADG 2025. Tanks that are designed to ADR using section 6.8.1.3.1 shall conform to the relevant requirements set out in ADR at the time of design. A copy of ADR is available from the UNECE website.*

6.8.2 Requirements applicable to all classes (ADR designs)

The full text of section 6.8.2 of ADR in force at the time of approval applies to tanks designed according to ADR, to which 6.8.2 applies.

6.8.3 Special requirements applicable to Class 2 (ADR designs)

The full text of section 6.8.3 of ADR in force at the time of approval applies to tanks designed according to ADR, to which 6.8.3 applies.

6.8.4 **Special provisions (ADR designs)**

The full text of section 6.8.4 of ADR in force at the time of approval applies to tanks designed according to ADR, to which 6.8.4 applies.

6.8.5 **Requirements concerning the materials and construction of fixed welded tanks, demountable welded tanks, and welded shells of tank-containers for which a test pressure of not less than 1 MPa (10 bar) is required, and of fixed welded tanks, demountable welded tanks and welded shells of tank-containers intended for the carriage of refrigerated liquefied gases of Class 2 (ADR designs)**

The full text of section 6.8.5 of ADR in force at the time of approval applies to tanks designed according to ADR, to which 6.8.5 applies.

6.8.6 **Requirements applicable to all classes (Australian Standards designs)**

NOTE: *These general requirements are derived from sections 6.8.2 to 6.8.5 of ADR and the AS 2809 series of standards.*

6.8.6.1 ***Construction***

Basic Principles

6.8.6.1.1 Shells, their attachments and their service and structural equipment shall be designed to withstand without loss of contents (other than quantities of gas escaping through any degassing vents) the static and dynamic stresses encountered in normal conditions of carriage detailed in 6.8.6.1.2.

6.8.6.1.2

The tanks and their fastenings shall be capable of absorbing, under the maximum permissible load, the forces exerted by:	Tank-containers and their fastenings shall, under the maximum permissible load be capable of absorbing the forces equal to those exerted by:
- in the direction of travel: twice the total mass; - at right angles to the direction of travel: the total mass; - vertically upwards: the total mass; - vertically downwards: twice the total mass.	- in the direction of travel: twice the total mass; - horizontally at right angles to the direction of travel: the total mass; (where the direction of travel is not clearly determined, twice the total mass in each direction); - vertically upwards: the total mass; - vertically downwards: twice the total mass.

6.8.6.1.3 The walls of the shells shall have at least the thickness specified in the relevant part of AS 2809.

6.8.6.1.4 Shells shall be designed and constructed in accordance with the requirements of standards listed in 6.8.6.6 or as recognized by the competent authority, in accordance with 6.8.6.7, in which the material is chosen and the shell thickness determined taking into account maximum and minimum filling and working temperatures, but the following minimum requirements of 6.8.6.1.6 to 6.8.6.1.26 shall be met.

6.8.6.1.5 Tanks intended to contain certain dangerous substances shall be provided with additional protection. This may take the form of additional thickness of the shell (increased calculation pressure) determined in the light of the dangers inherent in the substances concerned or of a protective device.

6.8.6.1.6 Welds shall be skilfully made and shall afford the fullest safety. The execution and checking of welds shall comply with the requirements of 6.8.6.1.23 and the standards referenced in 6.8.6.6.

6.8.6.1.7 Measures shall be taken to protect shells against the risk of deformation as a result of a negative internal pressure.

Materials for shells

6.8.6.1.8 Shells shall be made of suitable metallic materials which, unless other temperature ranges are prescribed in the various classes, shall be resistant to brittle fracture and to stress corrosion cracking between -20 °C and +50 °C.

6.8.6.1.9 The materials of shells or of their protective linings which are in contact with the contents shall not contain substances liable to react dangerously (see "Dangerous reaction" in 1.2.1) with the contents, to form dangerous compounds, or appreciably to weaken the material.

If contact between the substance carried and the material used for the construction of the shell entails a progressive decrease in the shell thickness, this thickness shall be increased at manufacture by an appropriate amount. This additional thickness to allow for corrosion shall not be taken into consideration in calculating the shell thickness.

6.8.6.1.10 For welded shells only materials of faultless weldability whose adequate impact strength at an ambient temperature of –20 °C can be guaranteed, particularly in the weld seams and the zones adjacent thereto, shall be used.

Where the standards referenced in 6.8.6.6 specify a minimum material grade, the mechanical properties of the chosen construction materials shall be no less than those properties specified.

6.8.6.1.11-21 (Reserved to preserve alignment to ADR numbering)

6.8.6.1.22 Surge-plates and partitions shall be dished, with a depth of dish of not less than 10 cm, or shall be corrugated, profiled or otherwise reinforced to give equivalent strength. The area of the surge plate shall be at least 70 % of the cross-sectional area of the tank in which the surge-plate is fitted.

Welding and inspection of welds

6.8.6.1.23 Welding shall be performed by qualified welders using a qualified welding process whose effectiveness (including any heat treatments required) has been demonstrated by tests.

Welds made during repairs or alterations shall be assessed as above and in accordance with the requirements of the relevant standard(s) referenced in 6.8.6.6

Where there are doubts regarding the quality of welds, including the welds made to repair any defects revealed by the non-destructive checks, additional checks of the welds may be required.

Other construction requirements

6.8.6.1.24 The protective lining shall be so designed that its leakproofness remains intact, whatever the deformation liable to occur in normal conditions of carriage (see 6.8.6.1.2).

6.8.6.1.25 The thermal insulation shall be so designed as not to hinder access to, or the operation of, filling and discharge devices and safety valves.

6.8.6.1.26 If shells intended for the carriage of flammable liquids having a flash-point of not more than 60 °C are fitted with non-metallic protective linings (inner layers), the shells and the protective linings shall be so designed that no danger of ignition from electrostatic charges can occur.

6.8.6.1.27 Shells intended for the carriage of liquids having a flash-point of not more than 60 °C or for the carriage of flammable gases, or of UN No.1361 carbon or UN No.1361 carbon black, packing group II, shall be linked to the chassis by means of at least one good electrical connection. Any metal contact capable of causing electrochemical corrosion shall be avoided. Shells shall be provided with at least one clearly marked earth fitting, capable of being electrically connected.

All parts of a tank-container intended for the carriage of liquids having a flash-point of not more than 60 °C, flammable gases, or UN No.1361 carbon or UN No.1361 carbon black, packing group II, shall be capable of being electrically earthed. Any metal contact capable of causing electrochemical corrosion shall be avoided.

6.8.6.1.28 *Protection of fittings mounted on the upper part of the tank*

The fittings and accessories mounted on the upper part of the tank shall be protected against damage caused by overturning.

6.8.6.2 ***Items of equipment***

6.8.6.2.1 Suitable non-metallic materials may be used to manufacture service and structural equipment. Welded elements shall be attached to the shell in such a way that tearing of the shell is prevented.

The items of equipment shall be so arranged as to be protected against the risk of being wrenched off or damaged during carriage or handling. They shall exhibit a suitable degree of safety comparable to that of the shells themselves, and shall in particular:

- be compatible with the substances carried; and
- meet the requirements of 6.8.6.1.1.

Piping shall be designed, constructed and installed so as to avoid the risk of damage due to thermal expansion and contraction, mechanical shock and vibration.

	As many operating parts as possible shall be served by the smallest possible number of openings in the shell. The leakproofness of the service equipment including the closure (cover) of the inspection openings shall be ensured even in the event of overturning of the tank, taking into account the forces generated by an impact (such as acceleration and dynamic pressure).	The leakproofness of the service equipment shall be ensured even in the event of the overturning of the tank-container.

The gaskets shall be made of a material compatible with the substance carried and shall be replaced as soon as their effectiveness is impaired, for example as a result of ageing.

Gaskets ensuring the leakproofness of fittings requiring manipulation during normal use of tanks shall be so designed and arranged that manipulation of the fittings incorporating them does not damage them.

6.8.6.2.2 Each bottom-filling or bottom-discharge opening in tanks shall be fitted with internal and external stop valves in accordance with the design standard.

However, in the case of tanks intended for the carriage of certain crystallizable or highly viscous substances and shells fitted with a protective lining, the internal stop-valve may be replaced by an external stop-valve provided with additional protection.

The internal stop-valve shall be operable either from above or from below. Its setting - open or closed - shall so far as possible in each case be capable of being verified from the ground. Internal stop-valve control devices shall be so designed as to prevent any unintended opening through impact or an inadvertent act.

The internal shut-off device shall continue to be effective in the event of damage to the external control device.

In order to avoid any loss of contents in the event of damage to the external fittings (pipes, lateral shut-off devices), the internal stop-valve and its seating shall be protected against the danger of being wrenched off by external stresses or shall be so designed as to resist them. The filling and discharge devices (including flanges or threaded plugs) and protective caps (if any) shall be capable of being secured against any unintended opening.

The position and/or direction of closure of shut-off devices shall be clearly apparent.

NOTE: *The mode of operation of dry break couplings is self-closing. Consequently, an open/closed indicator is not necessary. This type of closure shall only be used as a second or third closure.*

6.8.6.2.3 Tanks that are not hermetically closed may be fitted with vacuum valves to avoid an unacceptable negative internal pressure; these vacuum-relief valves shall be set to relieve at a vacuum setting not greater than the vacuum pressure for which the tank has been designed.

Vacuum valves and breather devices (see 6.8.2.2.6) used on tanks intended for the carriage of substances meeting the flash-point criteria of Class 3, shall prevent the immediate passage of flame into the shell by means of a suitable protective device.

If the protective device consists of a suitable flame trap or flame arrester, it shall be positioned as close as possible to the shell or the shell compartment. For multi-compartment tanks, each compartment shall be protected separately.

Flame arresters for breather devices shall be suitable for the vapour emitted by the substances carried (maximum experimental safety gap – MESG), temperature range and application.

6.8.6.2.4 The shell or each of its compartments shall be provided with an opening large enough to permit inspection.

6.8.6.2.5 (Reserved in ADR)

6.8.6.2.6 Tanks shall be fitted with pressure relief and safety devices specified in the applicable parts of the standards referenced in 6.8.6.6

6.8.6.2.7-8 (Reserved – not required for tanks designed to Australian Standards)

6.8.6.2.9 Movable parts such as covers, closures, etc., which are liable to come into frictional or percussive contact with aluminium shells intended for the carriage of flammable liquids having a flash-point of not more than 60 °C or for the carriage of flammable gases shall not be made of unprotected corrodible steel.

6.8.6.2.10 (Reserved – not required for tanks designed to Australian Standards)

6.8.6.2.11 Glass level-gauges and level-gauges made of other fragile material, which are in direct communication with the contents of the shell, shall not be used.

6.8.6.3 Type examination and type approval

6.8.6.3.1 *Type examination*

The provisions in 1.8.7.2.1 shall be applied.

A manufacturer of service equipment for which a standard is listed in the table in 6.8.6.6.1 or 6.8.7.6 may request a separate type examination. This separate type examination shall be taken into account during the type examination of the tank.

6.8.6.3.2 *Type approval*

The competent authority shall issue in respect of each new type of tank-vehicle, demountable tank, tank-container, tank swap body, tube-vehicle or MEGC a certificate attesting that the type, including fastenings, which has been examined, is suitable for the purpose for which it is intended and meets the construction requirements of 6.8.2.1, the equipment requirements of 6.8.2.2 and the special conditions for the classes of substances carried.

The certificate shall show in addition to the items listed in 1.8.7.2.2.1:

- an approval number for the type
- the substances (or group of substances) for the carriage of which the tank has been approved.
- the maximum density of the substances to be transported.

The substances referred to in the certificate or the groups of substances approved shall, in general, be compatible with the characteristics of the tank. A reservation shall be included in the certificate if it was not possible to investigate this compatibility exhaustively when the type approval was issued.

A copy of the certificate shall be attached to the tank record of each tank, tube-vehicle or MEGC constructed (see 4.3.2.1.7).

6.8.6.3.3 If the tanks, tube-vehicles or MECGs are manufactured in series without modification this approval shall be valid for the tanks, tube-vehicles or MECGs manufactured in series or according to the prototype.

A type approval may however serve for the approval of tanks with limited variations of the design that either reduce the loads and stresses on the tanks (e.g. reduced pressure, reduced mass, reduced volume) or increase the safety of the structure (e.g. increased shell thickness, more surge-plates, decreased diameter of openings). The limited variations shall be clearly described in the type approval certificate.

NOTE: *The permissible variations is at the discretion of the competent authority. A limited variation means that a tank is comparable to the approved design and is not intended to provide an umbrella approval for a wide variety of tanks.*

6.8.6.3.4 In accordance with 1.8.7.2.2.3, the competent authority shall issue a supplementary approval certificate for the modification in the case of a modification of a tank, tube-vehicle or MEGC with a valid, expired or withdrawn type approval.

6.8.6.4 ***Inspections and tests***

NOTE: *Tank-vehicles (including demountable tanks) are subject to additional inspection and testing requirements set out in Part 9 and AS 2809.1*

6.8.6.4.1 Shells and their equipment shall either together or separately undergo an initial inspection before being put into service. This inspection shall include:

- a check of conformity to the approved type;
- a check of the design characteristics
- an examination of the internal and external conditions;
- a hydrostatic pressure test in accordance with the design standard; and
- a check of satisfactory operation of the equipment.

If the shells and their equipment are tested separately, they shall be jointly subjected to a hydrostatic test after assembly in accordance with 6.8.6.4.3.

The hydrostatic test shall be carried out separately on each compartment of compartmented shells.

6.8.6.4.2 Shells and their equipment shall undergo periodic inspections no later than every five years.

These periodic inspections shall include:

- An external and internal examination;
- A hydrostatic test of the shell with its equipment and check of the satisfactory operation of all the equipment, in accordance with the design standard;

  NOTE: *AS 2809.1 requires a separate corrosion inspection for bitumen tanks.*

- A review of the tank to its design standard(s) and its approval; and
- Any other tests or inspections required by the design standard.

Sheathing for thermal or other insulation shall be removed only to the extent required for reliable appraisal of the characteristics of the shell.

Protective linings shall be visually examined for defects. In case defects appear the condition of the lining shall be evaluated by appropriate test(s).

6.8.6.4.3 Shells and their equipment shall undergo intermediate inspections no later than two and a half years after the initial inspection and each periodic inspection.

However, the intermediate inspection may be performed at any time before the specified date.

If an intermediate inspection is performed more than three months before the specified date, another intermediate inspection shall be performed no later than two and a half years after this earlier date or alternatively a periodic inspection may be performed in accordance with 6.8.6.4.2.

These intermediate inspections shall include:

- An external examination of the tank
- A hydrostatic test of the shell with its equipment and check of the satisfactory operation of all the equipment, in accordance with the design standard;
- In cases where a hydrostatic test is not appropriate, inspection of the pressure-tightness of every hatch, vent and valve may be substituted;
    - ***NOTE:*** *A hydrostatic tests are not used for certain tanks, such as for bitumen-based products;*
- Pressure-vacuum vent cleaning, dismantling, new seals and gaskets; and
- Any other tests or inspections required by the design standard.

Protective linings shall be visually examined for defects. In case defects appear the condition of the lining shall be evaluated by appropriate test(s).

6.8.6.4.4 When the safety of the tank or of its equipment may have been impaired as a result of repairs, alterations or accident, an exceptional inspection shall be carried out. If an exceptional inspection fulfilling the requirements of 6.8.6.4.2 has been performed, then the exceptional inspection may be considered to be a periodic inspection. If an exceptional inspection fulfilling the requirements of 6.8.6.4.3 has been performed then the exceptional inspection may be considered to be an intermediate inspection.

6.8.6.4.5 Certificates shall be issued by the inspection body referred to in 6.8.1.5.4 or 6.8.1.5.6 and shall show the results of the inspections in accordance with 6.8.6.4.1 to 6.8.6.4.4, even in the case of negative results.

A copy of these certificates shall be attached to the tank record of each tank, tube-vehicle or MEGC tested (see 4.3.2.1.7).

6.8.6.4.6 A tank that is subject to an inspection program instituted in accordance with the requirements of AS/NZS 3788, AS/NZS 4481, AS 3992, or AS 4037 (as appropriate for the tank) is deemed to comply with section 6.8.6.4.2 and 6.8.6.4.3, provided all requirements of the inspection program are followed. Records shall be kept in accordance with section 6.8.6.4.5.

6.8.6.4.7 All hydrostatic tests carried out in accordance with 6.8.6.4.1 – 6.8.6.4.4 shall be marked on a plate fitted to the tank.

6.8.4.6.8 A tank which fails one or more items of inspection shall have all such failures investigated and corrected. It shall then be retested for all such inspection items. If the repair may have affected other inspection items, they shall also be retested.

A tank that does not pass all required inspections and tests shall be taken out of service.

6.8.6.5 ***Marking***

6.8.6.5.1 Every tank shall be fitted with a corrosion-resistant metal plate (or plates) permanently attached to the tank in a place readily accessible for inspection. The following particulars at least shall be marked on the plate by stamping or by any other similar method. These particulars may be engraved directly on the walls of the shell itself, if the walls are so reinforced that the strength of the shell is not impaired:

(a) the name of the manufacturer of the tank;

(b) the date on which the tank was manufactured;

(c) the tank serial number;

(d) the maximum allowable working pressure for the tank;

(e) the test pressure;

(f) the metallurgical design temperature of the tank if the temperature is above 50°C or below -20°C;

(g) the capacity of the tank;

a. in the case of multiple-compartment tanks, the capacity of each compartment;

b. followed by the symbol "S" when the shells or the compartments of more than 8,600 litres are divided by surge plates into sections of not more than 8,600 litres capacity;

c. the maximum amount that may be filled into each compartment shall be clearly marked;

(h) the maximum mass of dangerous goods that may be transported in the tank under the design approval;

(i) the maximum gross mass of the tank;

(j) the name of the Competent Authority who granted the approval and the approval number;

(k) the initial hydraulic test date and subsequent test dates for the tank;

(l) the name of the authority or organisation that witnessed the last hydrostatic test; and

(m) if the design approval is based on compliance with an Australian Standard or other standard or code, the standard or code to which the tank or vehicle has been designed; and

(n) The types of dangerous goods the tank is approved to transport.

The units of measurement shall be included after numerical values.

6.8.2.5.2

The following particulars shall be inscribed on the tank-vehicle (on the tank itself or on plates):	The following particulars shall be inscribed on the tank-container (on the tank itself or on plates):
- name of owner or operator;	- names of owner and of operator;
- unladen mass of the tank-vehicle.	- capacity of the shell;
	- tare of the tank;
The following particulars shall be inscribed on a demountable tank (on the tank itself or on plates):	
- name of owner or operator;	
- "demountable tank";	
- tare of the tank;	

The units of measurement shall be included after numerical values.

6.8.6.6 **Requirements for tanks which are designed, constructed, inspected and tested according to referenced standards**

Design and construction

The use of the referenced standards is mandatory. Exceptions are dealt with in 6.8.6.7 and 6.8.7.7.

Type approval certificates shall be issued in accordance with 1.8.7 and 6.8.6.3. For the issuance of a type approval certificate, standards applicable according to the indication in column (4) shall be chosen from the table below. Where column (4) reads “until further notice”, a later published edition of the standard may be used.

Column (3) shows the paragraphs of Chapter 6.8 to which the standard conforms.

Column (5) gives the latest date when existing type approvals shall be withdrawn according to 1.8.7.2.2.2; if no date is shown the type approval remains valid until it expires.

Standards shall be applied in accordance with 1.1.5. They shall be applied in full unless otherwise specified in the table below.

The scope of application of each standard is defined in the scope clause of the standard unless otherwise specified in the table below.

Reference	Title of document	Requirements the standard complies with	Applicable for new type approvals or for renewals	Latest date for withdrawal of existing type approvals
(1)	(2)	(3)	(4)	(5)
For design and construction of tanks				
AS 2809.2:2023	Road tank vehicles for dangerous goods, Part 2: Road tank vehicles for flammable liquids	6.8.6.1	Until further notice	
AS 2809.3:2021	Road tank vehicles for dangerous goods, Part 3: Road tank vehicles for compressed liquefied gases	6.8.6.1	Until further notice	
AS 2809.4:2022	Road tank vehicles for dangerous goods, Part 4: Road tank vehicles for toxic, corrosive or ammonium nitrate emulsion, suspension or gel cargoes	6.8.6.1	Until further notice	
AS 2809.5:2022	Road tank vehicles for dangerous goods, Part 5: Road tank vehicles for bitumen-based products	6.8.6.1	Until further notice	
AS 2809.6:2019	Road tank vehicles for dangerous goods, Part 6: Tankers for cryogenic liquids	6.8.6.1	Until further notice	
AS/NZS 2022:2002	Anhydrous ammonia – Storage and Handling	6.8.6.1 (for UN 1005 only)	Until further notice	
For the design and construction of tank-containers				
AS 1210:2010	Pressure Vessels	6.8.6.1	Until further notice	

6.8.6.7 ***Requirements for tanks which are not designed, constructed, inspected and tested according to referenced standards***

To reflect scientific and technical progress or where no standard is referenced in 6.8.6.6 or to deal with specific aspects not addressed in a standard referenced in 6.8.6.6, the competent authority may recognize the use of an alternative design that demonstrates, to the satisfaction of the competent authority, compliance with other criteria or a technical code providing the same level of safety. Tanks shall, however, comply with the minimum requirements of 6.8.6.

NOTE: *Tank designers should review the requirements for ADR-style tanks to determine if an inability to conform to AS 2809 may be addressed by using an ADR-style tank.*

6.8.7 **Special requirements applicable to Class 2 (Australian Standards designs)**

6.8.7.1 ***Construction of shells***

6.8.7.1.1 Shells intended for the carriage of compressed or liquefied gases or dissolved gases shall conform to the requirements of AS 1210 as in force at the time of manufacture, and as qualified by the applicable parts of the standards referenced in 6.8.6.6.

6.8.7.1.2 (Reserved, not applicable to Australian Standards tanks)

6.8.7.1.3 (Reserved in ADR)

Construction of tube-vehicles and MEGCs

6.8.7.1.4 Cylinders, tubes, pressure drums and bundles of cylinders, as elements of a tube-vehicle or MEGC, shall be constructed in accordance with Chapter 6.2.

NOTE 1: *Bundles of cylinders which are not elements of a tube-vehicle or of a MEGC shall be subject to the requirements of Chapter 6.2.*

NOTE 2: *Tanks as elements of tube-vehicles and MEGCs shall be constructed in accordance with 6.8.6.1 and 6.8.7.1.*

NOTE 3: *Demountable tanks are not to be considered elements of tube-vehicles or MEGCs.*

6.8.7.1.5 Elements and their fastenings

of tube-vehicles	and the frame of MEGCs

shall be capable of absorbing under the maximum permissible load the forces defined in 6.8.6.1.2. Under each force the stress at the most severely stressed point of the element and its fastenings shall not exceed the value defined in 6.2.5.3 for cylinders, tubes, pressure drums and bundles of cylinders and for tanks the stress values defined in the design standard.

6.8.7.2 ***Items of equipment***

6.8.7.2.1-17 (Reserved, included in referenced Australian standards)

Items of equipment for tube-vehicles and MEGCs

6.8.7.2.18 Service and structural equipment shall be configured or designed to prevent damage that could result in the release of the pressure receptacle contents during normal conditions of handling and carriage. When the connection between the frame of the tube-vehicle or MEGC and the elements allows relative movement between the sub-assemblies, the equipment shall be so fastened as to permit such movement without damage to working parts. Manifold piping leading to shut-off valves shall be sufficiently flexible to protect the valves and the piping from shearing, or releasing the pressure receptacle contents. The filling and discharge devices (including flanges or threaded plugs) and any protective caps shall be capable of being secured against unintended opening.

6.8.7.2.19 In order to avoid any loss of content in the event of damage, the manifolds, the discharge fittings (pipe sockets, shut-off devices), and the stop-valves shall be protected or arranged from being wrenched off by external forces or designed to withstand them.

6.8.7.2.20 The manifold shall be designed for service in a temperature range of -20 °C to +50 °C.

The manifold shall be designed, constructed and installed so as to avoid the risk of damage due to thermal expansion and contraction, mechanical shock and vibration. All piping shall be of suitable metallic material. Welded pipe joints shall be used wherever possible.

Joints in copper tubing shall be brazed or have an equally strong metal union. The melting point of brazing materials shall be no lower than 525 °C. The joints shall not decrease the strength of tubing as may happen when cutting threads.

6.8.7.2.21 Except for UN No.1001 acetylene, dissolved, the permissible maximum stress σ of the manifolding arrangement at the test pressure of the receptacles shall not exceed 75 % of the guaranteed yield strength of the material.

The necessary wall thickness of the manifolding arrangement for the carriage of UN No.1001 acetylene, dissolved shall be calculated according to an appropriate standard or code of practice.

6.8.7.2.22 For cylinders, tubes, pressure drums and bundles of cylinders (frames) forming a tube-vehicle or MEGC, the required closing devices may be provided for within the manifolding arrangement.

6.8.7.2.23 If one of the elements is equipped with a safety valve and shut-off devices are provided between the elements, every element shall be so equipped.

6.8.7.2.24 The filling and discharge devices may be affixed to a manifold.

6.8.7.2.25 Each element, including each individual cylinder of a bundle, intended for the carriage of toxic gases, shall be capable of being isolated by a shut-off valve.

6.8.7.2.26 Tube-vehicles or MEGCs intended for the carriage of toxic gases shall not have safety valves, unless the safety valves are preceded by a bursting disc. In the latter case, the arrangement of the bursting disc and safety valve shall be satisfactory to the competent authority.

NOTE: *AS 1210 includes detailed information on the use of bursting discs and protective equipment.*

6.8.7.2.27 When tube-vehicles or MEGCs are intended for carriage by sea, the requirements of 6.8.3.2.26 shall not prohibit the fitting of safety valves conforming to the IMDG Code.

6.8.7.2.28 Receptacles which are elements of a tube-vehicle or MEGC intended for the carriage of flammable gases shall be combined in groups of not more than 5 000 litres which are capable of being isolated by a shut-off valve.

Each element of a tube-vehicle or MEGC intended for the carriage of flammable gases, when consisting of tanks conforming to this Chapter, shall be capable of being isolated by a shut-off valve.

6.8.7.3 ***Type examination and type approval***

No special requirements.

6.8.7.4 ***Inspections and tests***

6.8.7.4.1-11 (Reserved, included in referenced Australian standards)

Inspections and tests for tube-vehicles and MEGCs

6.8.7.4.12 Inspections shall be carried out as part of a program instituted in accordance with the requirements of AS/NZS 3788, AS/NZS 4481, AS 3992, or AS 4037 (as relevant for the tube vehicle or MEGC) in force at the time of inspection. These shall include:

- commissioning inspections when the tube-vehicle or MEGC is put into service;
- periodic external inspections of the tube-vehicle or MEGC;
- periodic internal inspections of the tube-vehicle or MEGC;
- recommissioning inspections following damage, repairs, alterations or changes in duty.

6.8.7.4.13-17 (Reserved, requirements included in referenced Australian standards)

6.8.7.4.18 The tests, inspections and checks in accordance with 6.8.7.4.12 shall be carried out by a suitably qualified person. Certificates shall be issued showing the results of these operations, even in the case of negative results.

These certificates shall refer to the list of the substances permitted for carriage in this tube-vehicle or MEGC in accordance with 6.8.6.3.2.

A copy of these certificates shall be attached to the tank record of each tank, tube-vehicle or MEGC tested (see 4.3.2.1.7).

6.8.7.5 ***Marking***

6.8.7.5.1 The following additional particulars shall be marked by stamping or by any other similar method on the plate prescribed in 6.8.2.5.1.

6.8.7.5.2 On tanks intended for the carriage of only one substance:

the proper shipping name of the gas and, in addition for gases classified under an n.o.s. entry, the technical name

This indication shall be supplemented:

in the case of tanks intended for the carriage of compressed gases filled by volume (pressure), by an indication of the maximum filling pressure at 15 °C permitted for the tank; and

in the case of tanks intended for the carriage of compressed gases filled by mass, and of liquefied gases, refrigerated liquefied gases or dissolved gases by an indication of the maximum permissible load mass in kg and of the filling temperature if below –20 °C.

6.8.7.5.3 On multipurpose tanks:

the proper shipping names of the gases and, in addition for gases classified under an n.o.s. entry, the technical name of the gases for whose carriage the tank is approved

These particulars shall be supplemented by an indication of the maximum permissible load mass in kg for each gas.

6.8.7.5.4 On tanks intended for the carriage of refrigerated liquefied gases:

the maximum working pressure allowed.

reference holding time (in days or hours) for each gas;

the associated initial pressures (in bar gauge or kPa gauge)

6.8.7.5.5 On tanks equipped with thermal insulation:

the inscription "thermally insulated" or "thermally insulated by vacuum".

6.8.7.5.6 In addition to the particulars prescribed in 6.8.6.5.2, the following shall be inscribed on the tank-vehicle or tank-container (on the tank itself or on plates):

(a)
- the tank code according to the certificate (see 6.8.6.3.2) with the actual test pressure of the tank;
- the inscription: "minimum filling temperature allowed: …";

(b) where the tank is intended for the carriage of one substance only:
- the proper shipping name of the gas and, in addition for gases classified under an n.o.s. entry, the technical name;
- for compressed gases which are filled by mass, and for liquefied gases, refrigerated liquefied gases or dissolved gases, the maximum permissible load mass in kg;

(c) where the tank is a multipurpose tank:
- the proper shipping name of the gas and, for gases classified under an n.o.s. entry, the technical name18 of all gases to whose carriage the tank is assigned with an indication of the maximum permissible load mass in kg for each of them;

(d) where the shell is equipped with thermal insulation:
- the inscription "thermally insulated" (or "thermally insulated by vacuum"),

6.8.7.5.7 (Reserved in ADR)

6.8.7.5.8 These particulars shall not be required in the case of a vehicle carrying demountable tanks.

6.8.7.5.9 (Reserved in ADR)

6.8.7.5.10 Every tube-vehicle and every MEGC shall be fitted with a corrosion-resistant metal plate permanently attached in a place readily accessible for inspection. The following particulars at least shall be marked on the plate by stamping or by any other similar method:

- approval number;
- manufacturer's name or mark;
- manufacturer's serial number;
- year of manufacture;
- test pressure (gauge pressure)
- design temperature (only if above +50 °C or below -20 °C);
- date (month and year) of initial inspection and most recent periodic inspection in accordance with 6.8.7.4.12
- stamp of the inspection body that carried out the inspection.

6.8.7.5.11

The following particulars shall be inscribed on a plate:	The following particulars shall be inscribed on a plate:
- names of owner or of operator;	- names of owner and of operator;
- number of elements;	- number of elements;
- total capacity of the elements;	- total capacity of the elements;
	- maximum permissible laden mass;
	- the tank code according to the certificate of approval (see 6.8.6.3.2) with the actual test pressure of the MEGC;
	- the proper shipping name of the gases, and in addition, for gases classified under an n.o.s. entry, the technical name of the gases for whose carriage the MEGC is used;
and for tube-vehicles filled by mass:	and for MEGCs filled by mass:
- unladen mass;	- tare.
- maximum permissible mass.	

6.8.7.5.12 The frame of a tube-vehicle or MEGC shall bear near the filling point a plate specifying:

- the maximum filling pressure at 15 °C allowed for elements intended for compressed gases;
- the proper shipping name of the gas in accordance with Chapter 3.2 and, in addition for gases classified under an n.o.s. entry, the technical name;

and, in addition, in the case of liquefied gases:

- the permissible maximum load per element.

6.8.7.5.13 Cylinders, tubes and pressure drums, and cylinders as part of bundles of cylinders, shall be marked according to 6.2.2.7. These receptacles need not be labelled individually with the danger labels as required in Chapter 5.2.

Tube-vehicles and MEGCs shall be placarded and marked according to Chapter 5.3.

6.9 Chapter 6.9 - Requirements for the design, construction, inspection and testing of portable tanks with shells made of fibre-reinforced plastics (FRP) materials

6.9.1 Application and general requirements

6.9.1.1 The requirements of section 6.9.2 apply to portable tanks with an FRP shell intended for the carriage of dangerous goods of Classes 1, 3, 5.1, 6.1, 6.2, 8 and 9 by all modes of transport. In addition to the requirements of this Chapter, unless otherwise specified, the applicable requirements of the International Convention for Safe Containers (CSC) 1972, as amended, shall be fulfilled by any multimodal portable tank with FRP shell which meets the definition of a "container" within the terms of that Convention.

6.9.1.2 The requirements of this Chapter do not apply to offshore portable tanks.

6.9.1.3 The requirements of Chapter 4.2 and section 6.7.2 apply to FRP portable tank shells except for those concerning the use of metal materials for the construction of a portable tank shell and additional requirements stated in this Chapter.

6.9.1.4 In recognition of scientific and technological advances, the technical requirements of this Chapter may be varied by alternative arrangements. These alternative arrangements shall offer a level of safety not less than that given by the requirements of this Chapter with respect to compatibility with substances carried and the ability of the FRP portable tank to withstand impact, loading and fire conditions. For international carriage, alternative arrangement FRP portable tanks shall be approved by the applicable competent authorities.

6.9.2 Requirements for the design, construction, inspection and testing of FRP portable tanks

6.9.2.1 ***Definitions***

For the purposes of this section, the definitions of 6.7.2.1 apply except for definitions related to metal materials ("Fine grain steel", "Mild steel" and "Reference steel") for the construction of the shell of a portable tank.

Additionally, the following definitions apply to portable tanks with an FRP shell: External layer means the part of the shell which is directly exposed to the atmosphere; Fibre-reinforced plastics (FRP), see 1.2.1;

Filament winding means a process for constructing FRP structures in which continuous reinforcements (filament, tape, or other), either previously impregnated with a matrix material or impregnated during winding, are placed over a rotating mandrel. Generally, the shape is a surface of revolution and may include ends (heads);

FRP shell means a closed part of cylindrical shape with an interior volume intended for carriage of chemical substances;

FRP tank means a portable tank constructed with an FRP shell and ends (heads), service equipment, safety relief devices and other installed equipment;

Glass transition temperature (Tg) means a characteristic value of the temperature range over which the glass transition takes place;

Hand layup means a process for moulding reinforced plastics in which reinforcement and resin are placed on a mould;

Liner means a layer on the inner surface of an FRP shell preventing contact with the dangerous goods being carried;

Mat means a fibre reinforcement made of random, chopped or twisted fibres bonded together as sheets of various length and thickness;

Parallel shell-sample means an FRP specimen, which must be representative of the shell, constructed in parallel to the shell construction if it is not possible to use cut-outs from the shell itself. The parallel shell-sample may be flat or curved;

Representative sample means a sample cut out from the shell;

Resin infusion means an FRP construction method by which dry reinforcement is placed into a matched mould, single sided mould with vacuum bag, or otherwise, and liquid resin is supplied to the part through the use of external applied pressure at the inlet and/or application of full or partial vacuum pressure at the vent;

Structural layer means FRP layers of a shell required to sustain the design loads;

Veil means a thin mat with high absorbency used in FRP product plies where polymeric matrix surplus fraction content is required (surface evenness, chemical resistance, leakage-proof, etc.).

6.9.2.2 ***General design and construction requirements***

6.9.2.2.1 The requirements of 6.7.1 and 6.7.2.2 apply to FRP portable tanks. For areas of the shell that are made from FRP, the following requirements of Chapter 6.7 are exempt: 6.7.2.2.1, 6.7.2.2.9.1, 6.7.2.2.13 and 6.7.2.2.14.

Shells shall be designed and constructed in accordance with the requirements of a pressure vessel code, applicable to FRP materials, recognized by the competent authority.

In addition, the following requirements apply.

6.9.2.2.2 *Manufacturer's quality system*

6.9.2.2.2.1 The quality system shall contain all the elements, requirements, and provisions adopted by the manufacturer. It shall be documented in a systematic and orderly manner in the form of written policies, procedures, and instructions.

6.9.2.2.2.2 The contents shall in particular include adequate descriptions of:

(a) The organizational structure and responsibilities of personnel with regard to design and product quality;

(b) The design control and design verification techniques, processes, and procedures that will be used when designing the portable tanks;

(c) The relevant manufacturing, quality control, quality assurance and process operation instructions that will be used;

(d) Quality records, such as inspection reports, test data and calibration data;

(e) Management reviews to ensure the effective operation of the quality system arising from the audits in accordance with 6.9.2.2.2.4;

(f) The process describing how customer requirements are met; (g) The process for control of documents and their revision;

(g) The means for control of non-conforming portable tanks, purchased components, in-process and final materials; and

(h) Training programmes and qualification procedures for relevant personnel.

6.9.2.2.2.3 Under the quality system, the following minimum requirements shall be met for each FRP portable tank manufactured:

(a) Use of an inspection and test plan (ITP);

(b) Visual inspections;

(c) Verification of fibre orientation and mass fraction by means of documented control process;

(d) Verification of fibre and resin quality and characteristics by means of certificates or other documentation;

(e) Verification of liner quality and characteristics by means of certificates or other documentation;

(f) Verification of whichever is applicable of formed thermoplastic resin characteristic or degree of cure of thermoset resin, by direct or indirect means (e.g. Barcol test or differential scanning calorimetry) to be determined in accordance with 6.9.2.7.1.2 (h), or by creep testing of a representative sample or parallel shell-sample in accordance with 6.9.2.7.1.2 (e) for a period of 100 hours;

(g) Documentation of whichever is applicable of thermoplastic resin forming processes or thermoset resin cure and post-cure processes; and

(h) Retention and archiving of shell samples for future inspection and shell verification (e.g. from manhole cut out) for a period of 5 years.

6.9.2.2.2.4 Audit of the quality system

The quality system shall be initially assessed to determine whether it meets the requirements in 6.9.2.2.2.1 to 6.9.2.2.2.3 to the satisfaction of the competent authority.

The manufacturer shall be notified of the results of the audit. The notification shall contain the conclusions of the audit and any corrective actions required.

Periodic audits shall be carried out, to the satisfaction of the competent authority, to ensure that the manufacturer maintains and applies the quality system. Reports of the periodic audits shall be provided to the manufacturer.

6.9.2.2.2.5 Maintenance of the quality system

The manufacturer shall maintain the quality system as approved in order that it remains adequate and efficient.

The manufacturer shall notify the competent authority that approved the quality system of any intended changes. The proposed changes shall be evaluated to determine whether the amended quality system will still satisfy the requirements in 6.9.2.2.2.1 to 6.9.2.2.2.3.

6.9.2.2.3 *FRP Shells*

6.9.2.2.3.1 FRP shells shall have a secure connection with structural elements of the portable tank frame. FRP shell supports and attachments to the frame shall cause no local stress concentrations exceeding the design allowables of the shell structure in accordance with the provisions stated in this Chapter for all operating and test conditions.

6.9.2.2.3.2 Shells shall be made of suitable materials, capable of operating within a minimum design temperature range of -40 °C to +50 °C, unless temperature ranges are specified for specific more severe climatic or operating conditions (e.g. heating elements), by the competent authority of the country where the transport operation is being performed.

6.9.2.2.3.3 If a heating system is installed, it shall comply with 6.7.2.5.12 to 6.7.2.5.15 and with the following requirements:

The maximum operating temperature of the heating elements integrated or connected to the shell shall not exceed the maximum design temperature of the tank;

The heating elements shall be designed, controlled and utilized so that the temperature of the carried substance cannot exceed the maximum design temperature of the tank or a value at which the internal pressure exceeds MAWP; and

Structures of the tank and its heating elements shall allow examination of the shell with respect to possible effects of overheating.

6.9.2.2.3.4 Shells shall consist of the following elements:

- Liner;

- Structural layer;

- External layer.

NOTE: The elements may be combined if all applicable functional criteria are met.

6.9.2.2.3.5 The liner is the inner element of the shell designed as the primary barrier to provide for the long-term chemical resistance in relation to the substances to be carried, to prevent any dangerous reaction with the contents or the formation of dangerous compounds and any substantial weakening of the structural layer owing to the diffusion of products through the liner. Chemical compatibility shall be verified in accordance with 6.9.2.7.1.3.

The liner may be an FRP liner or a thermoplastic liner.

6.9.2.2.3.6 FRP liners shall consist of the following two components:

(a) Surface layer ("gel-coat"): adequate resin rich surface layer, reinforced with a veil, compatible with the resin and contents. This layer shall have a maximum fibre mass content of 30 % and have a minimum thickness of 0.25 mm and a maximum thickness of 0.60 mm;

(b) Strengthening layer(s): layer or several layers with a minimum thickness of 2 mm, containing a minimum of 900 g/m² of glass mat or chopped fibres with a mass content in glass of not less than 30 % unless equivalent safety is demonstrated for a lower glass content.

6.9.2.2.3.7 If the liner consists of thermoplastic sheets, they shall be welded together in the required shape, using a qualified welding procedure and personnel. Welded liners shall have a layer of electrically conductive media placed against the non-liquid contact surface of the welds to facilitate spark testing. Durable bonding between liners and the structural layer shall be achieved by the use of an appropriate method.

6.9.2.2.3.8 The structural layer shall be designed to withstand the design loads according to 6.7.2.2.12, 6.9.2.2.3.1, 6.9.2.3.2, 6.9.2.3.4 and 6.9.2.3.6.

6.9.2.2.3.9 The external layer of resin or paint shall provide adequate protection of the structural layers of the tank from environmental and service exposure, including to UV radiation and salt fog, and occasional splash exposure to cargoes.

6.9.2.2.3.10 Resins

The processing of the resin mixture shall be carried out in compliance with the recommendations of the supplier. These resins can be:

- Unsaturated polyester resins;

- Vinyl ester resins;

- Epoxy resins;

- Phenolic resins;

- Thermoplastic resins.

The resin heat distortion temperature (HDT), determined in accordance with 6.9.2.7.1.1 shall be at least 20 °C higher than the maximum design temperature of the shell as defined in 6.9.2.2.3.2, but shall in any case not be lower than 70 °C.

6.9.2.2.3.11 Reinforcement material

The reinforcement material of the structural layers shall be selected such that they meet the requirements of the structural layer.

For the liner glass fibres of at a minimum type C or ECR according to ISO 2078:1993 + Amd 1:2015 shall be used. Thermoplastic veils may only be used for the liner when their compatibility with the intended contents has been demonstrated.

6.9.2.2.3.12 Additives

Additives necessary for the treatment of the resin, such as catalysts, accelerators, hardeners and thixotropic substances as well as materials used to improve the tank, such as fillers, colours, pigments etc. shall not cause weakening of the material, taking into account lifetime and temperature expectancy of the design.

6.9.2.2.3.13 FRP shells, their attachments and their service and structural equipment shall be designed to withstand the loads mentioned in 6.7.2.2.12, 6.9.2.2.3, 6.9.2.3.2, 6.9.2.3.4 and 6.9.2.3.6 without loss of contents (other than quantities of gas escaping through any degassing vents) during the design lifetime.

6.9.2.2.3.14 Special requirements for the carriage of substances with a flash-point of not more than 60 °C

6.9.2.2.3.14.1 FRP tanks used for the carriage of flammable liquids with a flash-point of not more than 60 °C shall be constructed to ensure the elimination of static electricity from the various component parts to avoid the accumulation of dangerous charges.

6.9.2.2.3.14.2 The electrical surface resistance of the inside and outside of the shell as established by measurements shall not be higher than 10^9 Ω. This may be achieved by the use of additives in the resin or interlaminate conducting sheets, such as metal or carbon network.

6.9.2.2.3.14.3 The discharge resistance to earth as established by measurements shall not be higher than 10^7 Ω.

6.9.2.2.3.14.4 All components of the shell shall be electrically connected to each other and to the metal parts of the service and structural equipment of the tank and to the vehicle. The electrical resistance between components and equipment in contact with each other shall not exceed 10 Ω.

6.9.2.2.3.14.5 The electrical surface-resistance and discharge resistance shall be measured initially on each manufactured tank or a specimen of the shell in accordance with the procedure recognized by the competent authority. In the event of damage to the shell, requiring repair, the electrical resistance shall be re-measured.

6.9.2.2.3.15 The tank shall be designed to withstand, without significant leakage, the effects of a full engulfment in fire for 30 minutes as specified by the test requirements in 6.9.2.7.1.5. Testing may be waived with the agreement of the competent authority, where sufficient proof can be provided by tests with comparable tank designs.

6.9.2.2.3.16 Construction process for FRP shells

6.9.2.2.3.16.1 Filament winding, hand layup, resin infusion or other appropriate composite production processes shall be used for construction of FRP shells.

6.9.2.2.3.16.2 The weight of the fibre reinforcement shall conform to that set forth in the procedure specification with a tolerance of +10 % and −0 %. One or more of the fibre types specified in 6.9.2.2.3.11 and in the procedure specification shall be used for reinforcement of shells.

6.9.2.2.3.16.3 The resin system shall be one of the resin systems specified in 6.9.2.2.3.10. No filler, pigment or dye additions shall be used which will interfere with the natural colour of the resin except as permitted by the procedure specification.

6.9.2.3 ***Design criteria***

6.9.2.3.1 FRP shells shall be of a design capable of being stress-analysed mathematically or experimentally by resistance strain gauges or by other methods approved by the competent authority.

6.9.2.3.2 FRP shells shall be designed and constructed to withstand the test pressure. Specific provisions are laid down for certain substances in the applicable portable tank instruction indicated in column (10) of Table A of Chapter 3.2 and described in 4.2.5, or by a portable tank special provision indicated in column (11) of Table A of Chapter 3.2 and described in 4.2.5.3. The minimum wall thickness of the FRP shell shall not be less than that specified in 6.9.2.4.

6.9.2.3.3 At the specified test pressure the maximum tensile relative deformation measured in mm/mm in the shell shall not result in the formation of microcracks, and therefore not be greater than the first measured point of elongation based fracture or damage of the resin, measured during tensile tests prescribed under 6.9.2.7.1.2 (c).

6.9.2.3.4 For internal test pressure, external design pressure specified in 6.7.2.2.10, static loads specified in 6.7.2.2.12 and static gravity loads caused by the contents with the maximum density specified for the design and at maximum filling degree, failure criteria (FC) in the longitudinal direction, circumferential direction, and any other in-plane direction of the composite layup shall not exceed the following value:

$$FC \leq \frac{1}{K}$$

Where:

$$K = K_0 \times K_1 \times K_2 \times K_3 \times K_4 \times K_5$$

Where:

K shall have a minimum value of 4;

K₀ is the safety coefficient. For the general design, if the tanks are referred to in Column (12) of Table A of Chapter 3.2 by a tank code including the letter "G" in its second part (see 4.3.4.1.1), the value for S shall be equal to or more than 1.5. For tanks intended for the carriage of substances which require an increased safety level, i.e. if the tanks are referred to in Column (12) of Table A of Chapter 3.2 by a tank code including the number "4" in its second part (see 4.3.4.1.1), the value of S shall be multiplied by a factor of two, unless the shell is provided with protection against damage consisting of a complete metal skeleton including longitudinal and transverse structural members;

K₁ is a factor related to the deterioration in the material properties due to creep and ageing and as a result of the chemical action of the substances to be carried. It shall be determined by the formula:

$$K_0 = \frac{1}{\alpha\beta}$$

where α is the creep factor and β is the ageing factor determined in accordance with 6.13.4.2.2 (e) and (f), respectively. Alternatively, a conservative value of K0 = 2 may be applied. When used in calculation, factors α and β shall be between 0 and 1;

K_2 is a factor related to the service temperature and the thermal properties of the resin, determined by the following equation, with a minimum value of 1:

$$K_1 = 1.25 - 0.0125(HDT - 70)$$

where HDT is the heat distortion temperature of the resin, in ºC;

K_3 is a factor related to the fatigue of the material; the value of K2 = 1.75 shall be used unless otherwise agreed with the competent authority. For the dynamic design as outlined in 6.7.2.2.12 the value of K3 = 1.1 shall be used;

K_4 is a factor related to resin curing and has the following values:

1.0 where curing is carried out in accordance with an approved and documented process, and the quality system described under 6.9.2.2.2 includes verification of degree of cure for each FRP tank using a direct measurement approach, such as differential scanning calorimetry (DSC) determined via ISO 11357-2:2016, as per 6.13.4.2.2 (h) (i);

1.1 where thermoplastic resin forming or thermoset resin curing is carried out in accordance with an approved and documented process, and the quality system described under 6.13.1.2 includes verification of whichever is applicable formed thermoplastic resin characteristics or degree of cure of thermoset resin, for each FRP tank using an indirect measurement approach as per 6.13.4.2.2 (h) (ii), such as Barcol testing via ASTM D2583:2013-03 or EN 59:2016, HDT via ISO 75-1:2020, thermo-mechanical analysis (TMA) via ISO 11359-1:2014, or dynamic thermo-mechanical analysis (DMA) via ISO 6721-11:2019;

1.5 in other cases.

K_5 is a factor related to the portable tank instruction in 4.2.5.2.6:

1.0 for T1 to T19;

1.33 for T20;

1.67 for T21 to T22.

A design validation exercise using numerical analysis and a suitable composite failure criterion is to be undertaken to verify that the stresses in the plies in the shell are below the allowables. Suitable composite failure criteria include, but are not limited to, Tsai-Wu, Tsai-Hill, Hashin, Yamada-Sun, Strain Invariant Failure Theory, Maximum Strain, or Maximum Stress. Other relations for the strength criteria are allowed upon agreement with the competent authority. The method and results of this design validation exercise are to be submitted to the competent authority.

The allowables are to be determined using experiments to derive parameters required by the chosen failure criteria combined with factor of safety K, the strength values measured as per 6.9.2.7.1.2 (c), and the maximum elongation strain criteria prescribed in 6.9.2.3.5. The analysis of joints is to be undertaken in accordance with the allowables determined in 6.9.2.3.7 and the strength values measured as per 6.9.2.7.1.2 (g). Buckling is to be considered in accordance with 6.9.2.3.6. Design of openings and metallic inclusions is to be considered in accordance with 6.9.2.3.8.

6.9.2.3.5 At any of the stresses as defined in 6.7.2.2.12 and 6.9.2.3.4, the resulting elongation in any direction shall not exceed the value indicated in the following table or one tenth of the elongation at fracture of the resin determined by ISO 527-2:2012, whichever is lower.

Examples of known limits are presented in the table below.

Type of resin	**Maximum strain in tension (%)**
Unsaturated polyester or phenolic	0.2
Vinylester	0.25
Epoxy	0.3
Thermoplastic	See 6.9.2.3.3

6.9.2.3.6 For the external design pressure the minimum safety factor for linear buckling analysis of the shell shall be as defined in the applicable pressure vessel code but not less than three.

6.9.2.3.7 The adhesive bondlines and/or overlay laminates used in the joints, including the end joints, connection between the equipment and shell, the joints of the surge plates and the partitions with the shell shall be capable of withstanding the loads of 6.7.2.2.12, 6.9.2.2.3.1, 6.9.2.3.2, 6.9.2.3.4 and 6.9.2.3.6. In order to avoid concentrations of stresses in the overlay lamination, the applied taper shall not be steeper than 1:6. The shear strength between the overlay laminate and the tank components to which it is bonded shall not be less than:

$$\tau = \gamma \frac{Q}{l} \leq \frac{\tau_R}{K}$$

Where:

τ_R is the interlaminar shear strength according to ISO 14130:1997 and Cor 1:2003;

Q is the load per unit width that the joint shall carry under the static and dynamic loads;

K is the factor calculated in accordance with 6.9.2.3.4 for the static and dynamic stresses;

l is the length of the overlay laminate;

γ is the notch factor relating average joint stress to peak joint stress at failure initiation location.

6.9.2.3.8 Metallic flanges and their closures are permitted to be used in FRP shells, under design requirements of 6.7.2. Openings in the FRP shell shall be reinforced to provide at least the same safety factors against the static and dynamic stresses as specified in 6.7.2.2.12, 6.9.2.3.2, 6.9.2.3.4 and 6.9.2.3.6 as that for the shell itself. The number of openings shall be minimized. The axis ratio of oval-shaped openings shall be not more than 2.

If metallic flanges or componentry are integrated into the FRP shell using bonding, then the characterisation method stated in 6.9.2.3.7 shall apply to the joint between the metal and FRP. If the metallic flanges or componentry are fixed in an alternative fashion, e.g. threaded fastener connections, then the appropriate provisions of the relevant pressure vessel standard shall apply.

6.9.2.3.9 Check calculations of the strength of the shell shall be performed by finite element method simulating the shell layups, joints within FRP shell, joints between the FRP shell and the container frame, and openings. Treatment of singularities shall be undertaken using an appropriate method according to the applicable pressure vessel code.

6.9.2.4 ***Minimum wall thickness of the shell***

6.9.2.4.1 Minimum thickness of the FRP shell shall be confirmed by check calculations of the strength of the shell considering strength requirements given in 6.9.2.3.4.

6.9.2.4.2 Minimum thickness of the FRP shell structural layers shall be determined in accordance with 6.9.2.3.4, however, in any case the minimum thickness of the structural layers shall be at least 3 mm.

6.9.2.5 ***Equipment components for portable tanks with FRP shell***

Service equipment, bottom openings, pressure relief devices, gauging devices, supports, frameworks, lifting and tie-down attachments of portable tanks shall meet the requirements of 6.7.2.5 to 6.7.2.17. If any other metallic features are required to be integrated into the FRP shell, then the provisions of 6.9.2.3.8 shall apply.

6.9.2.6 ***Design approval***

6.9.2.6.1 Design approval of FRP portable tanks shall be as per 6.7.2.18 requirements. The following additional requirements apply to FRP portable tanks.

6.9.2.6.2 The prototype test report for the purpose of the design approval shall additionally include the following:

(a) Results of the material tests used for FRP shell fabrication in accordance with 6.9.2.7.1 requirements;

(b) Results of the ball drop test in accordance with the requirements of 6.9.2.7.1.4.

(c) Results the fire resistance test in accordance with provisions of 6.9.2.7.1.5.

6.9.2.6.3 A service life inspection programme shall be established, which shall be a part of the operation manual, to monitor the condition of the tank at periodic inspections. The inspection programme shall focus on the critical stress locations identified in the design analysis performed under 6.9.2.3.4. The inspection method shall take into account the potential damage mode at the critical stress location (e.g. tensile stress or interlaminate stress). The inspection shall be a combination of visual and non-destructive testing (e.g. acoustic emissions, ultrasonic

evaluation, thermographic). For heating elements, the service life inspection programme shall allow an examination of the shell or its representative locations to take into account the effects of overheating.

6.9.2.6.4 A representative prototype tank shall be subjected to tests as specified below. For this purpose, service equipment may be replaced by other items if necessary.

6.9.2.6.4.1 The prototype shall be inspected for compliance with the design type specification. This shall include an internal and external inspection and measurement of the main dimensions.

6.9.2.6.4.2 The prototype, equipped with strain gauges at all locations of high strain, as identified by the design validation exercise in accordance with 6.9.2.3.4, shall be subjected to the following loads and the strain shall be recorded:

(a) Filled with water to the maximum filling degree. The measuring results shall be used to calibrate the design calculations according to 6.9.2.3.4;

(b) Filled with water to the maximum filling degree and subjected to static loads in all three directions mounted by the base corner castings without additional mass applied external to the shell. For comparison with the design calculation according to 6.9.2.3.4 the strains recorded shall be extrapolated in relation to the quotient of the accelerations required in 6.7.2.2.12 and measured;

(c) Filled with water and subjected to the specified test pressure. Under this load, the shell shall exhibit no visual damage or leakage.

The stress corresponding to the measured strain level shall not exceed the minimum factor of safety calculated in 6.9.2.3.4 under any of these loading conditions.

6.9.2.7 ***Additional provisions applicable to FRP portable tanks***

6.9.2.7.1 *Material testing*

6.9.2.7.1.1 Resins

Resin tensile elongation shall be determined in accordance with ISO 527-2:2012. The heat distortion temperature (HDT) of the resin shall be determined in accordance with ISO 75-1:2013.

6.9.2.7.1.2 Shell-samples

Prior to testing, all coatings shall be removed from the samples. If shell samples are not possible then parallel shell-samples may be used. The tests shall cover:

(a) The thickness of the laminates of the central shell wall and the ends;

(b) The mass content and composition of composite reinforcement by ISO 1172:1996 or ISO 14127:2008, as well as orientation and arrangement of reinforcement layers;

(c) The tensile strength, elongation at fracture and modulus of elasticity according to ISO 527- 4:1997 or ISO 527-5:2009 for the circumferential and longitudinal directions of the shell. For areas of the FRP shell, tests shall be performed on representative laminates in accordance with ISO 527-4:1997 or ISO 527-5:2009, to permit evaluation of the suitability of safety factor (K). A minimum of six specimens per measure of tensile strength shall be used, and the tensile strength shall be taken as the average minus two standard deviations;

(d) The bending deflection and strength shall be established by the three-point or four-point bending test according to ISO 14125:1998 + Amd 1:2011 using a sample with a minimum width of 50 mm and a support distance of at least 20 times the wall thickness. A minimum of five specimens shall be used.

(e) The creep factor α determined by taking the average result of at least two specimens with the configuration described in (d), subject to creep in three-point or four-point bending, at the maximum design temperature nominated under 6.9.2.2.3.2, for a period of 1 000 hours. The following test is to be undertaken for each specimen:

(i) Place specimen into bending apparatus, unloaded, in oven set to maximum design temperature and allow to acclimatise for a period of not less than 60 minutes;

(ii) Load specimen bending in accordance with ISO 14125:1998 + Amd 1:2011 at flexural stress equal to the strength determined in (d) divided by four. Maintain mechanical load at maximum design temperature without interruption for not less than 1 000 hours;

(iii) Measure the initial deflection six minutes after full load application in (e) (ii). Specimen shall remain loaded in test rig;

(iv) Measure the final deflection 1 000 hours after full load application in (e) (ii); and

(v) Calculate the creep factor α by dividing the initial deflection from (e) (iii) by the final deflection from (e) (iv);

(f) The ageing factor β determined by taking the average result of at least two specimens with the configuration described in (d), subject to loading in static three-point or four-point bending, in conjunction with immersion in water at the maximum design temperature nominated under 6.9.2.2.3.2 for a period of 1 000 hours. The following test is to be undertaken for each specimen:

(i) Prior to testing or conditioning, specimens shall be dried in an oven at 80 °C for a period of 24 hours;

(ii) The specimen shall be loaded in three-point or four-point bending at ambient temperature, in accordance with ISO 14125:1998 + Amd 1:2011, at the flexural stress level equal to the strength determined in (d) divided by four. Measure the initial deflection six minutes after full load application. Remove specimen from test rig;

(iii) Immerse unloaded specimen in water at the maximum design temperature for a period of not less than 1 000 hours without interruption to the water conditioning period. When conditioning period has lapsed, remove specimens, keep damp at ambient temperature, and complete (f) (iv) within three days;

(iv) The specimen shall be subject to second round of static loading, in a manner identical to (f) (ii). Measure the final deflection six minutes after full load application. Remove specimen from test rig; and

(v) Calculate the ageing factor β by dividing the initial deflection from (f) (ii) by the final deflection from (f) (iv);

(g) The interlaminar shear strength of the joints measured by testing representative samples in accordance with ISO 14130:1997;

(h) The efficiency of whichever is applicable of thermoplastic resin forming characteristics or thermoset resin cure and post-cure processes for laminates determined using one or more of the following methods:

(i) Direct measurement of formed thermoplastic resin characteristics or thermoset resin degree of cure: glass transition temperature (Tg) or melting temperature (Tm) determined using differential scanning calorimetry (DSC) via ISO 11357-2:2016; or

(ii) Indirect measurement of formed thermoplastic resin characteristics or thermoset resin degree of cure:

- HDT via ISO 75-1:2013;
- Tg or Tm using thermo-mechanical analysis (TMA) via ISO 11359-1:2014;
- Dynamic thermo-mechanical analysis (DMA) via ISO 6721-11:2019;
- Barcol testing via ASTM D2583:2013-03 or EN 59:2016.

6.9.2.7.1.3 The chemical compatibility of the liner and chemical contact surfaces of service equipment with the substances to be carried shall be demonstrated by one of the following methods. This demonstration shall account for all aspects of the compatibility of the materials of the shell and its equipment with the substances to be carried, including chemical deterioration of the shell, initiation of critical reactions of the contents and dangerous reactions between both.

(a) In order to establish any deterioration of the shell, representative samples taken from the shell, including any liners with welds, shall be subjected to the chemical compatibility test according to EN 977:1997 for a period of 1 000 hours at 50 °C or the maximum temperature at which a particular substance is approved for carriage. Compared with a virgin sample, the loss of strength and elasticity modulus measured by the bending test according to EN 978:1997 shall not exceed 25 %. Cracks, bubbles, pitting effects as well as separation of layers and liners and roughness shall not be acceptable;

(b) Certified and documented data of positive experiences on the compatibility of filling substances in question with the materials of the shell with which they come into contact at given temperatures, times and other relevant service conditions;

(c) Technical data published in relevant literature, standards or other sources, acceptable to the competent authority;

(d) Upon agreement with the competent authority other methods of chemical compatibility verification may be used.

6.9.2.7.1.4 Ball drop test as per EN 976-1:1997

The prototype shall be subjected to the ball drop test according to EN 976-1:1997, No. 6.6. No visible damage inside or outside the tank shall occur.

6.9.2.7.1.5 Fire resistance test

6.9.2.7.1.5.1 A representative prototype tank with its service and structural equipment in place and filled to 80 % of its maximum capacity with water, shall be exposed to a full engulfment in fire for 30 minutes, caused by an open heating oil pool fire or any other type of fire with the same effect. The fire shall be equivalent to a theoretical fire with a flame temperature of 800 °C, emissivity of 0.9 and to the tank a heat transfer coefficient of 10 W/(m²K) and surface absorptivity of 0.8. A minimum net heat flux of 75 kW/m² shall be calibrated according to ISO 21843:2018. The dimensions of the pool shall exceed those of the tank by at least 50 cm to each side and the distance between fuel level and tank shall be between 50 cm and 80 cm. The rest of the tank below liquid level, including openings and closures, shall remain leakproof except for drips.

6.9.2.8 ***Inspection and testing***

6.9.2.8.1 Inspection and testing of portable FRP tanks shall be carried out as per provisions of 6.7.2.19. In addition, welded thermoplastic liners shall be spark tested under a suitable standard, after pressure tests performed in accordance with the periodic inspections specified in 6.7.2.19.4.

6.9.2.8.2 In addition, the initial and periodic inspections shall follow the service life inspection programme and any associated inspection methods per 6.9.2.6.3.

6.9.2.8.3 The initial inspection and test shall verify that construction of the tank is made in accordance with the quality system required by 6.9.2.2.2.

6.9.2.8.4 Additionally, during inspection of the shell the position of the areas heated by heating elements shall be indicated or marked, be available on design drawings or shall be made visible by a suitable technique (e.g. infrared). Examination of the shell shall take into account the effects of overheating, corrosion, erosion, overpressure and mechanical overloading.

6.9.2.9 ***Retention of samples***

Shell samples (e.g. from manhole cut out) for each tank manufactured shall be maintained for future inspection and shell verification for a period of five years from the date of the initial inspection and test and until successful completion of the required five-year periodic inspection.

6.9.2.10 ***Marking***

6.9.2.10.1 The requirements of 6.7.2.20.1 apply to portable tanks with an FRP shell except those of 6.7.2.20.1 (f) (ii).

6.9.2.10.2 The information required in 6.7.2.20.1 (f) (i) shall be "Shell structural material: Fibre-reinforced plastic" the reinforcement fibre e.g. "Reinforcement: E-glass" and resin e.g. "Resin: Vinyl Ester".

6.9.2.10.3 Requirements of provision 6.7.2.20.2 apply to portable tank with an FRP shell.

6.10 **Chapter 6.10 – Requirements for the construction, equipment, type approval, inspection and marking of vacuum-operated waste tanks**

NOTE 1: *For portable tanks and UN multiple-element gas containers (MEGCs) see Chapter 6.7; for fixed tanks (tank-vehicles), demountable tanks and tank containers and tank swap bodies, with shells made of metallic materials, and tube-vehicles and multiple element gas containers (MEGCs) other than UN MEGCs see Chapter 6.8; for fibre-reinforced plastic tanks see Chapter 6.9 or Chapter 6.13, as appropriate.*

NOTE 2: *This Chapter applies to fixed tanks, demountable tanks, tank-containers and tank swap bodies.*

6.10.1 General

6.10.1.1 ***Definition***

NOTE: *A tank which fully complies with the requirements of Chapter 6.8 is not considered to be a "vacuum-operated waste tank".*

6.10.1.1.1 The term "protected area" means the areas located as follows:

(a) The lower part of the tank in a zone which extends over a 60° angle on either side of the lower generating line;

(b) The top part of the tank in a zone which extends over a 30° angle on either side of the top generating line;

(c) On the end front of the tank on motor vehicles;

(d) On the rear end of the tank inside the protection volume formed by the device stipulated in 9.7.6.

6.10.1.2 ***Scope***

6.10.1.2.1 The special requirements of 6.10.2 to 6.10.4 complete or modify Chapter 6.8 and are applied to vacuum-operated waste tanks.

Vacuum-operated waste tanks may be equipped with openable ends, if the requirements of Chapter 4.3 allow bottom discharge of the substances to be carried (indicated by letters "A" or "B" in Part 3 of the tank code given in Column (12) of Table A of Chapter 3.2, in accordance with 4.3.4.1.1).

Vacuum-operated waste tanks shall comply with all requirements of Chapter 6.8, except where overtaken by special requirements in this Chapter. However the requirements of 6.8.2.1.19, 6.8.2.1.20, and 6.8.2.1.21 shall not apply.

NOTE: *6.8.2.1.19, 6.8.2.1.20, and 6.8.2.1.21 apply to tanks designed according to ADR.*

6.10.2 Construction

6.10.2.1 Tanks shall be designed for a calculation pressure equal to 1.3 times the filling or discharge pressure but not less than 400 kPa (4 bar) (gauge pressure). For the carriage of substances for which a higher calculation pressure of the tank is specified in Chapter 6.8, this higher pressure shall apply.

6.10.2.2 Tanks shall be designed to withstand a negative internal pressure of 100 kPa (1 bar).

6.10.3 Items of equipment

6.10.3.1 The items of equipment shall be so arranged as to be protected against the risk of being wrenched off or damaged during carriage or handling. This requirement can be fulfilled by placing the items of equipment in a so called "protected area" (see 6.10.1.1.1).

6.10.3.2 The bottom discharge of shells may be constituted by external piping with a stop-valve fitted as close to the shell as practicable and a second closure which may be a blank flange or other equivalent device.

6.10.3.3 The position and closing direction of the stop-valve(s) connected to the shell, or to any compartment in the case of compartmented shells, shall be unambiguous, and be able to be checked from the ground.

6.10.3.4 In order to avoid any loss of contents in the event of damage to the external filling and discharge fittings (pipes, lateral shut-off devices), the internal stop-valve, or the first external stop-valve (where applicable), and its seatings shall be protected against the danger of being wrenched off by external stresses or shall be so designed as to withstand them. The filling and discharge devices (including flanges or threaded plugs) and protective caps (if any) shall be capable of being secured against any unintended opening.

6.10.3.5 The tanks may be equipped with openable ends. Openable ends shall comply with the following conditions:

(a) The ends shall be designed to be secured leaktight when closed;

(b) Unintentional opening shall not be possible;

(c) Where the opening mechanism is power operated the end shall remain securely closed in the event of a power failure;

(d) A safety or breakseal device shall be incorporated to ensure that the openable end cannot be opened when there is still a residual over pressure in the tank. This requirement does not apply to openable ends which are power-operated, where the movement is positively controlled. In this case the controls shall be of the dead-man type and be so positioned that the operator can observe the movement of the openable end at all times and is not endangered during opening and closing of the openable end; and

(e) Provisions shall be made to protect the openable end and prevent it from being forced open during a roll-over of the vehicle, tank-container or tank swap body.

6.10.3.6 Vacuum-operated waste tanks which are fitted with an internal piston to assist in the cleaning of the tank or discharging shall be provided with stop-devices to prevent the piston in every operational position being ejected from the tank when a force equivalent to the maximum working pressure of the tank is applied to the piston. The maximum working pressure for tanks or compartments with pneumatic operated piston shall not exceed 100 kPa (1.0 bar). The internal piston shall be constructed in a manner and of materials which will not cause an ignition source when the piston is moved.

The internal piston may be used as a compartment provided it is secured in position. Where any of the means by which the internal piston is secured is external to the tank, it shall be placed in a position not liable to accidental damage.

6.10.3.7 The tanks may be equipped with suction booms if:

(a) The boom is fitted with an internal or external stop-valve fixed directly to the shell, or directly to a bend that is welded to the shell; a rotation crown wheel can be fitted between the shell or the bend and the external stop valve, if this rotation crown wheel is located in the protected area and the stop-valve control device is protected with a housing or cover against the danger hof being wrenched off by external loads;

(b) The stop-valve mentioned in (a) is so arranged that carriage with the valve in an open position is prevented; and

(c) The boom is constructed in such a way that the tank will not leak as a result of accidental impact on the boom.

6.10.3.8 The tanks shall be fitted with the following additional service equipment:

(a) The outlet of a pump/exhauster unit shall be so arranged as to ensure that any flammable or toxic vapours are diverted to a place where they will not cause a danger. This may consist of:

(i) A venting system capable of discharging 15 m from, and directed away from the vehicle, or

(ii) A raiseable stack capable of being raised at least 3.7 m above the vehicle.

NOTE: *This requirement may, for example, be complied with by the use of a vertical pipe discharging at the top, or a low-level outlet with a connection which allows attachment of a hose.*

(b) A device to prevent immediate passage of flame shall be fitted to all openings of a vacuum pump/exhauster unit which may provide a source of ignition and which is fitted on a tank used for the carriage of flammable wastes, or the tank shall be explosion pressure shock resistant, which means being capable of withstanding without leakage, but allowing deformation, an explosion resulting from the passage of the flame;

(c) Pumps which can deliver a positive pressure shall have a safety device fitted in the pipework which can be pressurised. The safety device shall be set to discharge at a pressure not exceeding the maximum working pressure of the tank;

(d) A stop-valve shall be fitted between the shell, or the outlet of the overfill prevention device fitted to the shell, and the pipework connecting the shell to the pump/exhauster unit;

(e) The tank shall be fitted with a suitable pressure/vacuum manometer which shall be mounted in a position where it can be easily read by the person operating the pump/exhauster unit. A distinguishing line shall be marked on the scale to indicate the maximum working pressure of the tank;

(f) The tank, or in case of compartmented tanks, every compartment, shall be equipped with a level indicating device. Glass level-gauges and level-gauges of other suitable transparent material may be used as level indicating devices provided:

(i) they form a part of the tank wall and have a resistance to the pressure comparable to that of the tank; or they are fitted external to the tank;

(ii) the top and bottom connections to the tank are equipped with shut-off valves fixed directly to the shell and so arranged that carriage with the valves in an open position is prevented;

(iii) are suitable for operation at the maximum working pressure of the tank; and

(iv) are placed in a position where they will not be liable to accidental damage.

6.10.3.9 The shells of vacuum-operated waste tanks shall be fitted with a safety valve preceded by a bursting disc.

The valve shall be capable of opening automatically at a pressure between 0.9 and 1.0 times the test pressure of the tank to which it is fitted. The use of dead weight or counterweight valves is prohibited.

The bursting disc shall burst at the earliest when the initial opening pressure of the valve is reached and at the latest when this pressure reaches the test pressure of the tank to which it is fitted.

Safety devices shall be of such a type as to resist dynamic stresses, including liquid surge.

The space between the bursting disc and the safety valve shall be provided with a pressure gauge or suitable tell-tale indicator for the detection of disc rupture, pinholing or leakage wich could cause a malfunction of the safety valve.

6.10.4 Inspection

Vacuum-operated waste tanks shall be subject no later than every two and a half years for fixed tanks or demountable tanks, tank-containers and tank swap bodies to an examination of the internal condition, in addition to the inspection according to 6.8.2.4.3 or 6.8.6.4.3.

6.11 Chapter 6.11 – Requirements for the design, construction, inspection and testing of bulk containers

6.11.1 (Reserved in ADR)

6.11.2 Application and general requirements

6.11.2.1 Bulk containers and their service and structural equipment shall be designed and constructed to withstand, without loss of contents, the internal pressure of the contents and the stresses of normal handling and carriage.

6.11.2.2 Where a discharge valve is fitted, it shall be capable of being made secure in the closed position and the whole discharge system shall be suitably protected from damage. Valves having lever closures shall be able to be secured against unintended opening and the open or closed position shall be readily apparent.

6.11.2.3 Code for designating types of bulk container

The following table indicates the codes to be used for designating types of bulk containers:

Types of bulk containers	Code
Sheeted bulk container	BK1
Closed bulk container	BK2
Flexible bulk container	BK3

6.11.2.4 In order to take account of progress in science and technology, the use of alternative arrangements which offer at least equivalent safety as provided by the requirements of this chapter may be considered by the competent authority.

6.11.3 Requirements for the design, construction, inspection and testing of containers conforming to the CSC used as BK1 or BK2 bulk containers

6.11.3.1 ***Design and construction requirements***

6.11.3.1.1 The general design and construction requirements of this sub-section are deemed to be met if the bulk container complies with the requirements of ISO 1496-4:1991 "Series 1 Freight containers- Specification and testing – Part 4: Non pressurized containers for dry bulk" and the container is siftproof.

6.11.3.1.2 Containers designed and tested in accordance with ISO 1496-1:1990 "Series 1 Freight containers- Specification and testing - Part 1: General cargo containers for general purposes" shall be equipped with operational equipment which is, including its connection to the container, designed to strengthen the end walls and to improve the longitudinal restraint as necessary to comply with the test requirements of ISO 1496-4:1991 as relevant.

6.11.3.1.3 Bulk containers shall be siftproof. Where a liner is used to make the container siftproof it shall be made of a suitable material. The strength of material used for, and the construction of, the liner shall be appropriate to the capacity of the container and its intended use. Joins and closures of the liner shall withstand pressures and impacts liable to occur under normal conditions of handling and carriage. For ventilated bulk containers any liner shall not impair the operation of ventilating devices.

6.11.3.1.4 The operational equipment of bulk containers designed to be emptied by tilting shall be capable of withstanding the total filling mass in the tilted orientation.

6.11.3.1.5 Any movable roof or side or end wall or roof section shall be fitted with locking devices with securing devices designed to show the locked state to an observer at ground level.

6.11.3.2 ***Service equipment***

6.11.3.2.1 Filling and discharge devices shall be so constructed and arranged as to be protected against the risk of being wrenched off or damaged during carriage and handling. The filling and discharge devices shall be capable of being secured against unintended opening. The open and closed position and direction of closure shall be clearly indicated.

6.11.3.2.2 Seals of openings shall be so arranged as to avoid any damage by the operation, filling and emptying of the bulk container.

6.11.3.2.3 Where ventilation is required bulk containers shall be equipped with means of air exchange, either by natural convection, e.g. by openings, or active elements, e.g. fans. The ventilation shall be designed to prevent negative pressures in the container at all times. Ventilating elements of bulk containers for the carriage of flammable substances or substances emitting flammable gases or vapours shall be designed so as not to be a source of ignition.

6.11.3.3 ***Inspection and testing***

6.11.3.3.1 Containers used, maintained and qualified as bulk containers in accordance with the requirements of this section shall be tested and approved in accordance with the CSC.

6.11.3.3.2 Containers used and qualified as bulk containers shall be inspected periodically according to the CSC.

6.11.3.4 ***Marking***

6.11.3.4.1 Containers used as bulk containers shall be marked with a Safety Approval Plate in accordance with the CSC.

6.11.4 **Requirements for the design, construction and approval of BK1 or BK2 bulk containers other than containers conforming to the CSC**

NOTE: *When containers conforming to the provisions of this section are used for the carriage of solids in bulk, the following statement shall be shown on the transport document:*

"Bulk container BK(x) approved by the competent authority of …..". (see 5.4.1.1.17).

6.11.4.1 Bulk containers covered in this section include skips, offshore bulk containers, bulk bins, swap bodies, trough shaped containers, roller containers, and load compartments of vehicles.

NOTE: *These bulk containers also include containers conforming to IRS 50591 (Roller units for horizontal transhipment – Technical conditions governing their use in international traffic)1 and IRS 50592 (Intermodal Transport Units (other than semi-trailers) for vertical transhipment and suitable for carriage on wagons – Minimum requirements) published by UIC as mentioned in 7.1.3 which do not conform to the CSC.*

6.11.4.2 These bulk containers shall be designed and constructed so as to be strong enough to withstand the shocks and loadings normally encountered during carriage including, as applicable, transhipment between modes of transport.

6.11.4.3 (Reserved in ADR)

6.11.4.4 These bulk containers shall be approved by the competent authority and the approval shall include the code for designating types of bulk containers in accordance with 6.11.2.3 and the requirements for inspection and testing as appropriate.

6.11.4.5 Where it is necessary to use a liner in order to retain the dangerous goods it shall meet the provisions of 6.11.3.1.3.

6.11.4.6 For transport only by road or rail within Australia, if the statement required to be included on the transport document by 5.4.1.1.17 is clearly and prominently marked on the outside of the bulk container, it may be omitted from the transport document.

6.11.5 **Requirements for the design, construction, inspection and testing of BK3 flexible bulk containers**

6.11.5.1 ***Design and construction requirements***

6.11.5.1.1 Flexible bulk containers shall be sift-proof.

6.11.5.1.2 Flexible bulk containers shall be completely closed to prevent the release of contents.

6.11.5.1.3 Flexible bulk containers shall be waterproof.

6.11.5.1.4 Parts of the flexible bulk container which are in direct contact with dangerous goods:

(a) shall not be affected or significantly weakened by those dangerous goods;

(b) shall not cause a dangerous effect, e.g. catalysing a reaction or reacting with the dangerous goods; and

(c) shall not allow permeation of the dangerous goods that could constitute a danger under normal conditions of carriage.

6.11.5.2 ***Service equipment and handling devices***

6.11.5.2.1 Filling and discharge devices shall be so constructed as to be protected against damage during carriage and handling. The filling and discharge devices shall be secured against unintended opening.

6.11.5.2.2 Slings of the flexible bulk container, if fitted, shall withstand pressure and dynamic forces, which can appear in normal conditions of handling and carriage.

6.11.5.2.3 The handling devices shall be strong enough to withstand repeated use.

6.11.5.3 ***Inspection and testing***

6.11.5.3.1 The design type of each flexible bulk container shall be tested as provided for in 6.11.5 in accordance with procedures established by the competent authority allowing the allocation of the mark and shall be approved by this competent authority.

6.11.5.3.2 Tests shall also be repeated after each modification of the design type, which alters the design, material or manner of construction of a flexible bulk container.

6.11.5.3.3 Tests shall be carried out on flexible bulk containers prepared as for carriage. Flexible bulk containers shall be filled to the maximum mass at which they may be used and the contents shall be evenly distributed. The substances to be carried in the flexible bulk container may be replaced by other substances except where this would invalidate the results of the test. When another substance is used it shall have the same physical characteristics (mass, grain size, etc.) as the substance to be carried. It is permissible to use additives, such as bags of lead shot, to achieve the requisite total mass of the flexible bulk container so long as they are placed so that the test results are not affected.

6.11.5.3.4 Flexible bulk containers shall be manufactured and tested under a quality assurance program which satisfies the competent authority, in order to ensure that each manufactured flexible bulk container meets the requirements of this Chapter.

6.11.5.3.5 *Drop test*

6.11.5.3.5.1 Applicability

For all types of flexible bulk containers, as a design type test.

6.11.5.3.5.2 Preparation for testing

The flexible bulk container shall be filled to its maximum permissible gross mass.

6.11.5.3.5.3 Method of testing

The flexible bulk container shall be dropped onto a target surface that is non-resilient and horizontal.

The target surface shall be:

(a) Integral and massive enough to be immovable;

(b) Flat with a surface kept free from local defects capable of influencing the test results;

(c) Rigid enough to be non-deformable under test conditions and not liable to become damaged by the tests; and

(d) Sufficiently large to ensure that the test flexible bulk container falls entirely upon the surface.

Following the drop, the flexible bulk container shall be restored to the upright position for observation.

6.11.5.3.5.4 Drop height shall be:

Packing group III: 0.8 m

6.11.5.3.5.5 Criteria for passing the test

There shall be no loss of contents. A slight discharge, e.g. from closures or stitch holes, upon impact shall not be considered to be a failure of the flexible bulk container provided that no further leakage occurs after the container has been restored to the upright position;

There shall be no damage, which renders the flexible bulk container unsafe to be carried for salvage or for disposal.

6.11.5.3.6 *Top lift test*

6.11.5.3.6.1 Applicability

For all types of flexible bulk containers as a design type test.

6.11.5.3.6.2 Preparation for testing

Flexible bulk containers shall be filled to six times the maximum net mass, the load being evenly distributed.

6.11.5.3.6.3 Method of testing

A flexible bulk container shall be lifted in the manner for which it is designed until clear of the floor and maintained in that position for a period of five minutes.

6.11.5.3.6.4 Criteria for passing the test

There shall be no damage to the flexible bulk container or its lifting devices which renders the flexible bulk container unsafe for carriage or handling, and no loss of contents.

6.11.5.3.7 *Topple test*

6.11.5.3.7.1 Applicability

For all types of flexible bulk containers as a design type test.

6.11.5.3.7.2 Preparation for testing

The flexible bulk container shall be filled to its maximum permissible gross mass.

6.11.5.3.7.3 Method of testing

Flexible bulk container shall be toppled onto any part of its top by lifting the side furthest from the drop edge upon a target surface that is non-resilient and horizontal. The target surface shall be:

(a) Integral and massive enough to be immovable;

(b) Flat with a surface kept free from local defects capable of influencing the test results;

(c) Rigid enough to be non-deformable under test conditions and not liable to become damaged by the tests; and

(d) Sufficiently large to ensure that the tested flexible bulk container falls entirely upon the surface.

6.11.5.3.7.4 For all flexible bulk containers, the topple height is specified as follows:

Packing group III: 0.8 m

6.11.5.3.7.5 Criterion for passing the test

There shall be no loss of contents. A slight discharge, e.g. from closures or stitch holes, upon impact shall not be considered to be a failure of the flexible bulk container provided that no further leakage occurs.

6.11.5.3.8 *Righting test*

6.11.5.3.8.1 Applicability

For all types of flexible bulk containers designed to be lifted by the top or side part, as a design type test.

6.11.5.3.8.2 Preparation for testing

The flexible bulk container shall be filled to not less than 95 % of its capacity and to its maximum permissible gross mass.

6.11.5.3.8.3 Method of testing

The flexible bulk container, lying on its side, shall be lifted at a speed of at least 0.1 m/s to an upright position, clear of the floor, by no more than half of the lifting devices.

6.11.5.3.8.4 Criterion for passing the test

There shall be no damage to the flexible bulk container or its lifting devices which renders the flexible bulk container unsafe for carriage or handling.

6.11.5.3.9 *Tear test*

6.11.5.3.9.1 Applicability

For all types of flexible bulk containers as a design type test.

6.11.5.3.9.2 Preparation for testing

The flexible bulk container shall be filled to its maximum permissible gross mass.

6.11.5.3.9.3 Method of testing

With the flexible bulk container placed on the ground, a 300 mm cut shall be made, completely penetrating all layers of the flexible bulk container on a wall of a wide face. The cut shall be made at a 45° angle to the principal axis of the flexible bulk container, halfway between the bottom surface and the top level of the contents. The flexible bulk container shall then be subjected to a uniformly distributed superimposed load equivalent to twice the maximum gross mass. The load must be applied for at least fifteen minutes. A flexible bulk container which is designed to be lifted from the top or the side shall, after removal of the superimposed load, be lifted clear of the floor and maintained in that position for a period of fifteen minutes.

6.11.5.3.9.4 Criterion for passing the test

The cut shall not propagate more than 25 % of its original length.

6.11.5.3.10 *Stacking test*

6.11.5.3.10.1 Applicability

For all types of flexible bulk containers as a design type test.

6.11.5.3.10.2 Preparation for testing

The flexible bulk container shall be filled to its maximum permissible gross mass.

6.11.5.3.10.3 Method of testing

The flexible bulk container shall be subjected to a force applied to its top surface that is four times the design load-carrying capacity for 24 hours.

6.11.5.3.10.4 Criterion for passing the test

There shall be no loss of contents during the test or after removal of the load.

6.11.5.4 ***Test report***

6.11.5.4.1 A test report containing at least the following particulars shall be drawn up and shall be available to the users of the flexible bulk container:

1. Name and address of the test facility;
2. Name and address of applicant (where appropriate);
3. Unique test report identification;
4. Date of the test report;
5. Manufacturer of the flexible bulk container;
6. Description of the flexible bulk container design type (e.g. dimensions, materials, closures, thickness, etc) and/or photograph(s);
7. Maximum capacity/maximum permissible gross mass;
8. Characteristics of test contents, e.g. particle size for solids;
9. Test descriptions and results;
10. The test report shall be signed with the name and status of the signatory.

6.11.5.4.2 The test report shall contain statements that the flexible bulk container prepared as for carriage was tested in accordance with the appropriate provisions of this Chapter and that the use of other containment methods or components may render it invalid. A copy of the test report shall be available to the competent authority.

6.11.5.5 ***Marking***

6.11.5.5.1 Each flexible bulk container manufactured and intended for use according to the provisions of ADR shall bear marks that are durable, legible and placed in a location so as to be readily visible. Letters, numerals and symbols shall be at least 24 mm high and shall show:

(a) The United Nations packaging symbol  .

This symbol shall not be used for any purpose other than certifying that a packaging, a flexible bulk container, a portable tank or a MEGC complies with the relevant requirements in Chapters 6.1, 6.2, 6.3, 6.5, 6.6, 6.7 or 6.11;

(b) The code BK3;

(c) A capital letter designating the packing group(s) for which the design type has been approved:

Z for packing group III only;

(d) The month and year (last two digits) of manufacture;

(e) The character(s) identifying the country authorizing the allocation of the mark; as indicated by the distinguishing sign used on vehicles in international road traffic3;

(f) The name or symbol of the manufacturer and other identification of the flexible bulk container as specified by the competent authority;

(g) The stacking test load in kg;

(h) The maximum permissible gross mass in kg.

Marks shall be applied in the sequence shown in (a) to (h); each mark, required in these subparagraphs, shall be clearly separated, e.g. by a slash or space and presented in a way that ensures that all of the parts of the mark are easily identified.

6.11.5.5.2 Example of marking

BK3/Z/11 09

RUS/NTT/MK-14-10

56000/14000

6.13 **Chapter 6.13 – Requirements for the design, construction, equipment, type approval, testing and marking of fibre-reinforced plastics (FRP) fixed tanks (tank-vehicles) and demountable tanks**

NOTE: *For portable tanks and UN multiple-element gas containers (MEGCs) see Chapter 6.7; for FRP portable tanks see Chapter 6.9; for fixed tanks (tank-vehicles), demountable tanks and tank-containers and tank swap bodies, with shells made of metallic materials, and tube-vehicles and multiple element gas containers (MEGCs) other than UN MEGCs see Chapter 6.8; for vacuum operated waste tanks see Chapter 6.10.*

6.13.1 **General**

6.13.1.1 FRP tanks shall be designed, manufactured and tested in accordance with a quality system in accordance with 6.9.2.2.2; in particular, lamination work and welding of thermoplastic liners shall only be carried out by qualified personnel in accordance with a procedure recognized by the competent authority.

6.13.1.2 For the design and testing of FRP tanks, the provisions of 6.8.2.1.1, 6.8.2.1.7, 6.8.2.1.13, 6.8.2.1.14 (a) and (b), 6.8.2.1.25, 6.8.2.1.27, 6.8.2.1.28, 6.8.2.2.3, 6.8.6.1.1, 6.8.6.1.7, 6.8.6.1.25, 6.8.6.1.27, 6.8.6.1.28 and 6.8.6.2.3, shall also apply.

6.13.1.3 For the stability of tank-vehicles, the requirements of 9.7.5.1 shall apply.

6.13.1.4 In this Chapter, where reference is made to calculation or test pressures, for tanks designed according to Australian standards these shall be determined by the designer and shall be appropriate for the tank design and intended service of the tank.

NOTE: *there are a number of references to pressures that are provided by ADR in this chapter, such as 6.8.2.1.14 (a) and (b). This section is included to ensure that for tanks designed according to Australian standards, appropriate calculations are made.*

6.13.2 **Construction**

6.13.2.1 FRP shells shall be designed and constructed in accordance with the requirements of 6.9.2.2.3.2 to 6.9.2.2.3.7 and 6.9.2.3.6.

6.13.2.2 The structural layer of the shell is the zone specially designed according to 6.13.2.4 and 6.13.2.5 to withstand the mechanical stresses. This part normally consists of several fibre-reinforced layers in determined orientations.

6.13.2.2.1 The external layer of resin or paint is the part of the shell which is directly exposed to the atmosphere.

It shall be capable of withstanding exterior conditions, in particular the occasional contact with the substance to be carried. The resin shall contain fillers or additives to provide protection against deterioration of the structural layer of the shell by ultra-violet radiation.

6.13.2.3 *Raw materials*

6.13.2.3.1 All materials used for the manufacture of FRP tanks shall be of known origin and specifications.

6.13.2.3.2 *Resins*

The requirements of 6.9.2.2.3.10 shall apply.

6.13.2.3.3 *Reinforcement fibres*

The requirements of 6.9.2.2.3.11 shall apply.

6.13.2.3.4 *Thermoplastic liner material*

Thermoplastic liners, such as unplastified polyvinyl chloride (PVC-U), polypropylene (PP), polyvinylidene fluoride (PVDF), polytetrafluoroethylene (PTFE) etc. may be used as lining materials.

6.13.2.3.5 *Additives*

The requirements of 6.9.2.2.3.12 shall apply.

6.13.2.4 Shells, their attachments and their service and structural equipment shall be designed to withstand without loss of contents (other than quantities of gas escaping through any degassing vents) during the design lifetime:

- the static and dynamic loads in normal conditions of carriage;
- the prescribed minimum loads as defined in 6.13.2.5 to 6.13.2.9.

6.13.2.5 At the pressures as indicated in 6.8.2.1.14 (a) and (b), and under the static gravity forces caused by the contents with maximum density specified for the design and at maximum filling degree, failure criteria (FC) in the longitudinal direction, circumferential direction, and any other in-plane direction of the composite layup shall not exceed the following value:

$$FC \leq \frac{1}{K}$$

Where:

$$K = S \times K_0 \times K_1 \times K_2 \times K_3$$

Where:

K shall have a minimum value of 4;

S is the safety coefficient. For the general design, if the tanks are referred to in Column (12) of Table A of Chapter 3.2 by a tank code including the letter "G" in its second part (see 4.3.4.1.1), the value for S shall be equal to or more than 1.5. For tanks intended for the carriage of substances which require an increased safety level, i.e. if the tanks are referred to in Column (12) of Table A of Chapter 3.2 by a tank code including the number "4" in its second part (see 4.3.4.1.1), the value of S shall be multiplied by a factor of two, unless the shell is provided with protection against damage consisting of a complete metal skeleton including longitudinal and transverse structural members;

K_0 is a factor related to the deterioration in the material properties due to creep and ageing and as a result of the chemical action of the substances to be carried. It shall be determined by the formula:

$$K_0 = \frac{1}{\alpha\beta}$$

where α is the creep factor and β is the ageing factor determined in accordance with 6.13.4.2.2 (e) and (f), respectively. Alternatively, a conservative value of K0 = 2 may be applied. When used in calculation, factors α and β shall be between 0 and 1;

K_1 is a factor related to the service temperature and the thermal properties of the resin, determined by the following equation, with a minimum value of 1:

$$K_1 = 1.25 - 0.0125(HDT - 70)$$

where HDT is the heat distortion temperature of the resin, in ºC;

K_2 is a factor related to the fatigue of the material; the value of K2 = 1.75 shall be used unless otherwise agreed with the competent authority. For the dynamic design as outlined in 6.8.2.1.2 or 6.8.6.1.2 the value of K2 = 1.1 shall be used;

K_3 is a factor related to resin curing and has the following values:

1.0 where curing is carried out in accordance with an approved and documented process, and the quality system described under 6.9.2.2.2 includes verification of degree of cure for each FRP tank using a direct measurement approach, such as differential scanning calorimetry (DSC) determined via ISO 11357-2:2016, as per 6.13.4.2.2 (h) (i);

1.1 where thermoplastic resin forming or thermoset resin curing is carried out in accordance with an approved and documented process, and the quality system described under 6.13.1.2 includes verification of whichever is applicable formed thermoplastic resin characteristics or degree of cure of thermoset resin, for each FRP tank using an indirect measurement approach as per 6.13.4.2.2 (h) (ii), such as Barcol testing via ASTM D2583:2013-03 or EN 59:2016, HDT via ISO 75-1:2020, thermo-mechanical analysis (TMA) via ISO 11359-1:2014, or dynamic thermo-mechanical analysis (DMA) via ISO 6721-11:2019;

1.5 in other cases.

A design validation exercise using numerical analysis and a suitable composite failure criterion is to be undertaken to verify that that the stresses in the plies in the shell are below the allowables. Suitable composite failure criteria include, but are not limited to, Tsai-Wu, Tsai-Hill, Hashin, Yamada-Sun, Strain Invariant Failure Theory, Maximum Strain or Maximum Stress. Other relations for the strength criteria are allowed upon agreement with the competent authority. The method and results of this design validation exercise are to be submitted to the competent authority.

The allowables are to be determined using experiments to derive parameters required by the chosen failure criteria combined with factor of safety K, the strength values measured as per 6.13.4.2.2 (c), and the maximum elongation strain criteria prescribed in 6.13.2.6. The analysis of joints is to be undertaken in accordance with the allowables determined in 6.13.2.9 and the strength values measured as per 6.13.4.2.2 (g). Buckling is to be considered in accordance with 6.9.2.3.6. Design of openings and metallic inclusions is to be considered in accordance with 6.13.2.10.

6.13.2.6 At any of the stresses as defined in 6.8.2.1.2, 6.8.6.1.2 and 6.13.2.5, the resulting elongation in any direction shall not exceed the value indicated in the following table or one tenth of the elongation at fracture of the resin determined by EN ISO 527-2:2012, whichever is lower.

Examples of known limits are presented in the table below.

Type of resin	Maximum strain in tension (%)
Unsaturated polyester or phenolic	0.2
Vinylester	0.25
Epoxy	0.3
Thermoplastic	See 6.13.2.7

6.13.2.7 At the specified test pressure, which shall not be less than the relevant calculation pressure as specified in 6.8.2.1.14 (a) and (b) the maximum strain in the shell shall not be greater than the elongation at fracture of the resin.

6.13.2.8 The shell shall be capable of withstanding the ball drop test according to 6.13.4.3.3 without any visible internal or external defects.

6.13.2.9 The adhesive bondlines and/or overlay laminates used in the joints, including the end joints, the joints of the surge plates and the partitions with the shell shall be capable of withstanding the static and dynamic stresses mentioned above. In order to avoid concentrations of stresses in the overlay lamination, the applied tapper shall not be steeper than 1:6.

The shear strength between the overlay laminate and the tank components to which it is bonded shall not be less than:

$$\tau = \gamma \frac{Q}{l} \leq \frac{\tau_R}{K}$$

Where:

τ_R is the interlaminar shear strength according to ISO 14130:1997 and Cor 1:2003;

Q is the load per unit width that the joint shall carry under the static and dynamic loads;

K is the factor calculated in accordance with 6.13.2.5 for the static and dynamic stresses;

l is the length of the overlay laminate;

γ is the notch factor relating average joint stress to peak joint stress at failure initiation location.

6.13.2.10 Metallic flanges and their closures are permitted to be used in FRP shells, under design requirements of 6.8.2. Openings in the shell shall be reinforced to provide at least the same safety factors against the static and dynamic stresses as specified in 6.13.2.5 as that for the shell itself. The number of openings shall be minimized. The axis ratio of oval-shaped openings shall be not more than 2.

If metallic flanges or componentry are integrated into the FRP shell using bonding, then the characterisation method stated in 6.13.2.9 shall apply to the joint between the metal and FRP. If the metallic flanges or componentry are fixed in an alternative fashion, e.g. threaded fastener connections, then the appropriate provisions of the relevant pressure vessel standard shall apply.

6.13.2.11 For the design of flanges and pipework attached to the shell, handling forces and the fastening of bolts shall also be taken into account.

6.13.2.12 Check calculations of the strength of the shell shall be performed by finite element method simulating the shell layups, joints within FRP shell, joints between the FRP shell, the attachments and the structure equipment, and openings.

6.13.2.13 The tank shall be designed to withstand, without significant leakage, the effects of a full engulfment in fire for 30 minutes as specified by the test requirements in 6.13.4.3.4. Testing may be waived with the agreement of the competent authority, where sufficient proof can be provided by tests with comparable tank designs.

6.13.2.14 ***Special requirements for the carriage of substances with a flash-point of not more than 60 °C***

6.13.2.14.1 FRP tanks used for the carriage of substances with a flash-point of not more than 60°C shall fulfil the requirements of 6.9.2.2.3.14.

6.13.2.14.2 The electrical surface-resistance and discharge resistance shall be measured initially on each manufactured tank or a specimen of the shell in accordance with a procedure recognized by the competent authority.

6.13.2.14.3 The discharge resistance to earth of each tank shall be measured as part of the periodic inspection in accordance with a procedure recognized by the competent authority.

6.13.3 Items of equipment

6.13.3.1 The requirements of 6.8.2.2.1, 6.8.2.2.2, 6.8.2.2.4, 6.8.2.2.6 to 6.8.2.2.8, 6.8.6.2.1, 6.8.6.2.2, 6.8.6.2.4 and 6.8.6.2.6 shall apply.

6.13.3.2 In addition, when they are shown under an entry in Column (13) of Table A of Chapter 3.2, the special provisions of 6.8.4 (b) (TE) shall also apply.

6.13.4 Type testing and approval

6.13.4.1 For any design of a FRP tank type, its materials and a representative prototype shall be subjected to the design type testing as outlined below.

6.13.4.2 ***Material testing***

6.13.4.2.1 The elongation at fracture according to EN ISO 527-2:2012 and the heat distortion temperature according to EN ISO 75-1:2020 shall be determined for the resins to be used.

6.13.4.2.2 The following characteristics shall be determined for samples cut out of the shell. Samples manufactured in parallel may only be used, if it is not possible to use cut-outs from the shell. Prior to testing, any liner shall be removed.

The tests shall cover:

(a) The thickness of the laminates of the central shell wall and the ends;

(b) The mass content and composition of composite reinforcement by EN ISO 1172:1998 or ISO 14127:2008, orientation and arrangement of reinforcement layers;

(c) The tensile strength, elongation at fracture and modulus of elasticity according to EN ISO 527-4:1997 or EN ISO 527-5:2009 for the circumferential and longitudinal directions of the shell. For areas of the FRP shell, tests shall be performed on representative laminates in accordance with EN ISO 527-4:1997 or EN ISO 527-5:2009, to permit evaluation of the suitability of safety factor (K). A minimum of six specimens per measure of tensile strength shall be used, and the tensile strength shall be taken as the average minus two standard deviations;

(d) The bending strength and deflection established by the bending creep test according to EN ISO 14125:1998 + AC:2002 + A1:2011 for a period of 1 000 hours using a sample with a minimum width of 50 mm and a support distance of at least 20 times the wall thickness;

(e) The creep factor α determined by taking the average result of at least two specimens with the configuration described in (d), subject to creep in three-point or four-point bending, at the maximum design temperature nominated under 6.13.2.1, for a period of 1 000 hours. The following test is to be undertaken for each specimen:

(i) Place specimen into bending apparatus, unloaded, in oven set to maximum design temperature and allow to acclimatise for a period of not less than 60 minutes;

(ii) Load specimen bending in accordance with EN ISO 14125:1998 + AC:2002 + A1:2011 at flexural stress equal to the strength determined in (d) divided by four. Maintain mechanical load at maximum design temperature without interruption for not less than 1,000 hours;

(iii) Measure the initial deflection six minutes after full load application in (e) (ii). Specimen shall remain loaded in test rig;

(iv) Measure the final deflection 1,000 hours after full load application in (e) (ii); and

(v) Calculate the creep factor α by dividing the initial deflection from (e) (iii) by the final deflection from (e) (iv);

(f) The ageing factor β determined by taking the average result of at least two specimens with the configuration described in (d), subject to loading in static three-point or four-point bending, in conjunction with immersion in water at the maximum design temperature nominated under 6.13.2.1 for a period of 1,000 hours. The following test is to be undertaken for each specimen:

(i) Prior to testing or conditioning, specimens shall be dried in an oven at 80 °C for a period of 24 hours;

(ii) The specimen shall be loaded in three-point or four-point bending at ambient temperature, in accordance with to EN ISO 14125:1998 + AC:2002 + A1:2011, at the flexural stress level equal to the strength determined in (d) divided by four. Measure the initial deflection 6 minutes after full load application. Remove specimen from test rig;

(iii) Immerse unloaded specimen in water at the maximum design temperature for a period of not less than 1,000 hours without interruption to the water conditioning period. When conditioning period has lapsed, remove specimens, keep damp at ambient temperature, and complete (f) (iv) within three days;

(iv) The specimen shall be subject to second round of static loading, in a manner identical to (f) (ii). Measure the final deflection six minutes after full load application. Remove specimen from test rig; and

(v) Calculate the ageing factor β by dividing the initial deflection from (f) (ii) by the final deflection from (f) (iv);

(g) The interlaminar shear strength of the joints measured by testing representative samples in accordance with EN ISO 14130:1997;

(h) The efficiency of whichever is applicable of thermoplastic resin forming characteristics or thermoset resin cure and post-cure processes for laminates determined using one or more of the following methods:

(i) Direct measurement formed thermoplastic resin characteristics or thermoset resin degree of cure: glass transition temperature (Tg) or melting temperature (Tm) determined using differential scanning calorimetry (DSC) via EN ISO 11357-2:2020; or

(ii) Indirect measurement of formed thermoplastic resin characteristics or thermoset resin degree of cure:

- HDT via EN ISO 75-1:2020;
- Tg or Tm using thermo-mechanical analysis (TMA) via ISO 11359-1:2014;
- Dynamic thermo-mechanical analysis (DMA) via ISO 6721-11:2019:
- Barcol testing via ASTM D2583:2013-03 or EN 59:2016.

6.13.4.2.3 The requirements of 6.9.2.7.1.3 on the chemical compatibility shall apply.

6.13.4.3 ***Type testing***

A representative prototype tank shall be subjected to tests as specified below. For this purpose service equipment may be replaced by other items if necessary.

6.13.4.3.1 The prototype shall be inspected for compliance with the design type specification. This shall include an internal and external visual inspection and measurement of the main dimensions.

6.13.4.3.2 The prototype, equipped with strain gauges at all locations where a comparison with the design calculation is required, shall be subjected to the following loads and the strains shall be recorded:

(a) Filled with water to the maximum filling degree. The measuring results shall be used to calibrate the design calculation according to 6.13.2.5;

(b) Filled with water to the maximum filling degree and subjected to accelerations in all three directions by means of driving and braking exercises with the prototype attached to a vehicle. For comparison with the design calculation according to 6.13.2.5 the strains recorded shall be extrapolated in relation to the quotient of the accelerations required in 6.8.2.1.2 or 6.8.6.1.2 and measured;

(c) Filled with water and subjected to the specified test pressure. Under this load, the shell shall exhibit no visual damage or leakage.

6.13.4.3.3 The requirements of 6.9.2.7.1.4 on the ball drop test shall apply.

6.13.4.3.4 The requirements of 6.9.2.7.1.5 on the fire resistance test shall apply.

6.13.4.4 ***Type approval***

6.13.4.4.1 The competent authority shall issue in respect of each new type of tank an approval attesting that the design is suitable for the purpose for which it is intended and meets the construction and equipment requirements of this chapter as well as the special provisions applicable to the substances to be carried.

6.13.4.4.2 The approval shall be based on the calculation and the test report, including all material and prototype test results and its comparison with the design calculation, and shall refer to the design type specification and the quality system.

6.13.4.4.3 The approval shall include the substances or group of substances for which compatibility with the shell is provided. Their chemical names or the corresponding collective entry (see 2.1.1.2), and their class and classification code shall be indicated.

6.13.4.4.4 In addition, it shall include design and threshold values (such as life-time, service temperature range, working and test pressures, material data) specified and all precautions to be taken for the manufacture, testing, type approval, marking and use of any tank, manufactured in accordance with the approved design type.

6.13.4.4.5 A service life inspection program shall be established, which shall be a part of the operation manual, to monitor the condition of the tank at periodic inspections. The inspection program shall focus on the critical stress locations identified in the design analysis performed under 6.13.2.5. The inspection method shall take into account the potential damage mode at the critical stress location (e.g. tensile stress or interlaminate stress). The inspection shall be a combination of visual and non-destructive testing (e.g., acoustic emissions, ultrasonic evaluation, thermographic). For heating elements, the service life inspection program shall allow an examination of the shell or its representative locations to take into account the effects of overheating.

6.13.5 **Inspections**

6.13.5.1 For every tank, manufactured in conformity with the approved design, material tests and inspections shall be performed as specified below.

6.13.5.1.1 The material tests according to 6.13.4.2.2, except for the tensile test and for a reduction of the testing time for the bending creep test to 100 hours shall be performed with samples taken from the shell. Samples manufactured in parallel may only be used, if no cut-outs from the shell are possible. The approved design values shall be met.

6.13.5.1.2 The initial inspection and test shall verify that construction of the tank is made in accordance with the quality system required by 6.9.2.2.2. Shells and their equipment shall either together or separately undergo an initial inspection before being put into service. This inspection shall include:

6.13.5.1.2.1 For tanks designed according to ADR:

(a) a check of conformity to the approved design;

(b) a check of the design characteristics;

(c) an internal and external examination;

(d) a hydraulic pressure test at the test pressure indicated on the plate prescribed in 6.8.2.5.1 or 6.8.6.5.1;

(e) a check of operation of the equipment;

(f) a leakproofness test, if the shell and its equipment have been pressure tested separately.

6.13.5.1.2.2 For tanks designed according to Australian standards, the initial inspection requirements of 6.8.6.4.1.

6.13.5.2 For the periodic inspection of tanks the requirements of 6.8.2.4.2 to 6.8.2.4.4 or 6.8.6.4.2 to 6.8.6.4.4 shall apply. In addition, the inspection in accordance with 6.8.2.4.3 or 6.8.2.4.3 shall include an examination of the internal condition of the shell.

6.13.5.3 In addition, the initial and periodic inspections shall follow the service life inspection program and any associated inspection methods per 6.13.4.4.5.

6.13.5.4 The inspections and tests in accordance with 6.13.5.1 and 6.13.5.2 shall be carried out by the inspection body. Certificates shall be issued showing the results of these operations. These certificates shall refer to the list of the substances permitted for carriage in this shell in accordance with 6.13.4.4.

6.13.6 Marking

6.13.6.1 The requirements of 6.8.2.5 or 6.8.6.5 shall apply to the marking of FRP tanks, with the following amendments:

(a) the tank plate may also be laminated to the shell or be made of suitable plastics materials;

(b) the design temperature range shall always be marked;

(c) where a tank code is required in accordance with 6.8.2.5.2, the second part of the tank code shall indicate the highest value of the calculation pressure for the substance(s) permitted for carriage according to the type approval certificate.

6.13.6.2 The information required on materials shall be "Shell structural material: Fibre-reinforced plastic", the reinforcement fibre e.g. "Reinforcement: E-glass", and resin e.g. "Resin: Vinyl Ester".

6.13.6.3 In addition, when they are shown under an entry in Column (13) of Table A of Chapter 3.2, the special provisions of 6.8.4 (e) (TM) shall also apply.

CHAPTER 6.14

(RESERVED)

CHAPTER 6.15

REQUIRMENTS FOR THE DESIGN, CONSTRUCTION, INSPECTION AND TESTING OF SEGREGATION DEVICES

6.15.1 General and definitions

A segregation device may be:

(a) an overpack for segregation described in 6.11.2;

(b) a Type I segregation device as detailed in 6.11.3;

(c) a Type II removable segregation device in accordance with 6.11.4; or

(d) a Type II attached segregation device.

The segregation devices in this chapter do not provide segregation for class 1 substances or articles.

6.15.2 Overpack for segregation

NOTE 1: *An overpack for segregation only provides segregation for dangerous goods that are properly packed in accordance with the appropriate packing instructions. A salvage packaging that is used for damaged or leaking containers is not also a packaging for segregation.*

NOTE 2: *This provision replaces both the overpacking drum segregation device and the packaging for segregation requirements from ADG 7. Approved packagings for segregation may continue to be used in accordance with relevant transitional provisions in 1.6.*

Overpacks for segregation shall be tested and marked in accordance with the requirements applicable to packing group II packagings intended for the carriage of solids or inner packagings, except as follows:

(a) The test substance used in performing the tests shall be water, and the packagings shall be filled to not less than 98 % of their maximum capacity. It is permissible to use additives, such as bags of lead shot, to achieve the requisite total package mass so long as they are placed so that the test results are not affected. Alternatively, in performing the drop test, the drop height may be varied in accordance with 6.1.5.3.5 (b), or 6.6.5.3.4.4.2 (b) in the case of large packagings.

(b) Packagings shall, in addition, have been successfully subjected to the leakproofness test at 30 kPa, with the results of this test reflected in the test report required by 6.1.5.8 or 6.6.5.4 in the case of large packagings;

(c) Packagings shall be marked as a "SEGREGATION DEVICE" as required by 5.1.2.

6.15.3 Type I segregation device

6.15.3.1 A Type I segregation device shall not exceed 450 litres in capacity. It need not be performance tested or approved.

6.15.3.2 The device shall be rigid, of substantial construction, liquid tight, with a permanently attached hinged lid and at least two suitable closing devices.

6.15.3.3 The device shall be fixed to the vehicle by bolting, clamping or other suitable means and shall not be lifted onto or from the vehicle when filled, except where it has been designed to do so.

6.15.3.4 The interior of the segregation device shall be smooth and free of any protrusion or fitting likely to cause damage to the packages within. It shall allow for easy cleaning and be free of any cavities wherein spillage, dirt or contaminants might collect.

6.15.4 Type II removable segregation device

6.15.4.1 General requirements

6.15.4.1.1 A Type II removable segregation device shall not exceed 3000 litres in capacity.

6.15.4.1.2 A Type II removable segregation device may include a packaging, a large packaging, a tank, an intermediate bulk container or a freight container provided it meets the requirements of this sub-section and is approved by the competent authority.

6.15.4.1.3 A Type II removable segregation device shall be design-type approved in accordance with 6.15.6.

6.15.4.2 Design and construction requirements

6.15.4.2.1 The device shall be of suitable design, construction, materials and strength for the intended service.

6.15.4.2.2 The device shall be solid, substantial, liquid tight and resistant to penetration. Mesh, crate construction or similar is not acceptable but mesh reinforcing layers may be used. The body and panels shall be resistant to or adequately protected from environmental deterioration.

NOTE: A device that is not inherently liquid tight shall be fitted with a robust leak-proof liner closed to prevent leakage (e.g. a tightly closed plastics bag).

6.15.4.2.3 The device may be of fixed construction or may be designed to be folded, dismantled or collapsed for return transport.

6.15.4.2.4 The device shall incorporate a base (which may also function as a lifting device) which raises the floor of the device at least 100mm above the floor of the transport unit.

6.15.4.2.5 The device shall be designed for safe mechanical handling when fully loaded.

6.15.4.2.6 If intended to be stacked the device shall be designed for safe stacking and be sufficiently strong to support the load imposed by similar devices to the maximum height likely to occur in transport.

6.15.4.2.7 The device shall be able to be restrained on or attached to the transport vehicle. Restraint components shall be of sufficient strength to securely restrain the device when it is loaded to twice the approved gross load. Restraints shall be of a type and so positioned that no distortion or undue stress is imposed on the device.

6.15.4.2.8 The interior of the device shall be smooth and free of any protrusion or fitting likely to cause damage to the packages transported within. It shall allow for cleaning and be free of any cavities in which spillage, dirt or contaminants may collect.

6.15.4.2.9 Each type of device shall be designed, manufactured and tested under a quality assurance program in order to ensure that each meets the requirements of this Code.

6.15.4.3 Design tests for Type II removable segregation devices

6.15.4.3.1 The tests to which Type II removable segregation devices shall be subjected are those specified for large packagings in Chapter 6.6, except that:

(a) the preparation for testing shall be in accordance with 6.15.4.3.9; and

(b) irrespective of the intended contents, the drop height shall be based on the requirements for packing group III.

6.15.4.3.2 Subject to 6.15.4.3.9, tests shall be carried out on a segregation device design-type as it would be prepared for transport.

6.15.4.3.3 One Type II removable segregation device of each type, size and manner of construction shall be subjected to the tests specified in order in the table below, as set out in the clauses indicated in the table.

Test	**Reference Clause**	**Applicability**
Bottom lift	6.6.5.3.1	Optional [a]
Top lift	6.6.5.3.2	Optional [a]
Stacking	6.6.5.3.3	Optional [b]
Drop	6.6.5.3.4	Mandatory
Table notes: [a] Mandatory if the device is designed for this means of lifting. [b] Mandatory if the device is designed to be stacked.		

6.15.4.3.4 A segregation device shall be design type tested to a minimum rating of 0.75 kg per litre of available capacity. The person submitting the segregation device for approval shall nominate any higher test rating required, before testing is initiated.

6.15.4.3.5 These tests shall be repeated after each modification which significantly alters the design, material or manner of construction of the device.

6.15.4.3.6 The competent authority may at any time require proof, by tests in accordance with this section, that a Type II Segregation Device meets the requirements of the design type tests.

6.15.4.3.7 The design type tests shall be performed in accordance with the requirements of 1.8.9.

6.15.4.3.8 The Competent Authority may permit the selective testing of segregation devices which differ only in minor aspects from the tested design type.

6.15.4.3.9 Preparation of Test Samples

6.15.4.3.9.1 Liner Bag

A 70-micron linear low-density polyethylene bag shall be inserted into the test sample. The liner bag may be a pillow or gusseted bag of the following dimensions:

For pillow bags:

$$Length = H + 1.5 \times W$$

$$Width = 1.2 \times (L + W)$$

For gusseted bags

$$Length = H + 1.5 \times W$$

$$Width = 1.2 \times (L + W) - G$$

Where:

L	=	Length of segregation device
W	=	Width of segregation device
H	=	Height of segregation device
G	=	gusset width (for gusseted bags)

6.15.4.3.9.2 Filling Material

High flow plastic granules of approximately 0.75kg/L bulk density are to be used as the bulk filling material. For lift tests it is permissible to use additives such as bags of lead shot to achieve the requisite total contained mass with the condition that they are placed so that the test results are not affected in any way.

6.15.4.3.9.3 Filling

The segregation device is to be filled so that the filling material occupies not less than 95% of the total volume of the test sample (see 6.11.5.4).

6.15.5 Type II attached segregation device

6.15.5.1 A Type II attached segregation device shall be design-type approved in accordance with 6.15.6.

6.15.5.2 The device shall be fitted with a permanently attached door and be liquid tight.

6.15.5.3 The device shall have a door fitted with at least 2 securing devices and be capable of being locked against unauthorised access.

6.15.5.4 The device shall be attached to the vehicle to withstand a 2g force in any direction when loaded to its maximum design load. It shall not be possible to remove the device from the vehicle while loaded with dangerous goods.

6.15.5.5 The device shall have a smooth interior free of any protrusion or fitting likely to damage packages within.

6.15.5.6 The device shall be easy to clean and free from cavities where spillage or dirt or contaminants might collect.

6.15.5.7 The device shall have a means of draining any liquid from the device which may accumulate due to leakage of any contents. When the device is in use the drainage facility shall be tightly sealed.

6.15.5.8 The device, including supports and attachments, shall have a ground clearance of at least 350mm and not project beyond the perimeter of the vehicle.

6.15.6 Application for approval

6.15.6.1 An application for the approval of a Type II segregation device shall be in writing and shall include:

(a) a full description and detailed drawings of the device;

(b) details of the dimensions, volumetric capacity and maximum design load (kg) of the device;

(c) details of the materials used in the device;

(d) details of the construction of the device;

(e) details of how the device is to be attached to the vehicle;

(f) the results of any tests required by this Code;

(g) any other information required by the competent authority.

6.15.6.2 In approving a segregation device, the competent authority may restrict the use of a particular device to certain specified dangerous goods or specified classes of dangerous goods.

6.15.6.3 Marking

An approved segregation device shall be clearly and permanently marked, in a conspicuous position, in lettering not less than 25mm high with the following:

AUSTRALIAN COMPETENT AUTHORITIES

APPROVED SEGREGATION DEVICE

FOR USE IN AUSTRALIA ONLY

DO NOT LIFT WHEN LOADED

APPROVAL XXX

MAX LOAD YYY

TARE MASS ZZZ

where:

XXX is the approval number issued by the Competent Authority

YYY is the maximum gross mass of goods, in kg, that the device may be loaded with

ZZZ is the tare mass, in kg, of the segregation device

"DO NOT LIFT WHEN LOADED" may be omitted for devices designed and approved to be lifted when loaded.

PART 7

Provisions concerning the conditions of carriage, loading, unloading and handling

CHAPTER 7.1

GENERAL PROVISIONS

7.1.1 The carriage of dangerous goods is subject to the mandatory use of a particular type of transport equipment in accordance with the provisions of this Chapter and Chapter 7.2 for carriage in packages, Chapter 7.3 for carriage in bulk and Chapter 7.4 for carriage in tanks. In addition, the provisions of Chapter 7.5 concerning loading, unloading and handling shall be observed.

Columns (16), (17) and (18) of Table A of Chapter 3.2 show the particular provisions of this Part that apply to specific dangerous goods.

7.1.2 In addition to the provisions of this Part, vehicles used for the carriage of dangerous goods shall, as regards their design, construction and, if appropriate, their approval, conform to the relevant requirements of Part 9.

7.1.3 Large containers, portable tanks, MEGCs and tank-containers which meet the definition of "container" given in the CSC (1972), as amended, or in IRS 50591 (Roller units for horizontal transhipment – Technical conditions governing their use in international traffic)[1] and IRS 50592 (Intermodal Transport Units (other than semi-trailers) for vertical transhipment and suitable for carriage on wagons – Minimum requirements)[2] published by UIC may not be used to carry dangerous goods unless the large container or the frame of the portable tank, MEGC or tank-container satisfies the provisions of the CSC or of IRS 50591 and IRS 50592 of UIC.

7.1.4 *(Deleted)*

7.1.5 Large containers shall meet the requirements concerning the body of the vehicle laid down in this Part and, if appropriate, those laid down in Part 9 for the load in question; the body of the vehicle need not then satisfy those provisions.

However, large containers carried on vehicles whose platforms have insulation and heat-resistant qualities which satisfy those requirements need not then satisfy the said requirements.

This provision also applies to small containers for the carriage of explosive substances and articles of Class 1.

7.1.6 Subject to the provisions of the last part of the first sentence of 7.1.5, the fact that dangerous goods are contained in one or more containers shall not affect the conditions to be met by the vehicle by reason of the nature and quantities of the dangerous goods carried.

[1] *First edition of IRS (International Railway Solution) applicable as from 1 June 2020.*

[2] *Second edition of IRS (International Railway Solution) applicable as from 1 December 2020.*

7.1.7 Special provisions applicable to the carriage of self-reactive substances of Class 4.1, organic peroxides of Class 5.2 and substances stabilized by temperature control (other than self-reactive substances and organic peroxides)

7.1.7.1 All self-reactive substances, organic peroxides and polymerizing substances shall be protected from direct sunlight and all sources of heat, and placed in adequately ventilated areas.

7.1.7.2 Where a number of packages are assembled in a container, closed vehicle or closed-wagon, the total quantity of substance, the type and number of packages and the stacking arrangement shall not create an explosion hazard.

7.1.7.3 Temperature control provisions

7.1.7.3.1 These provisions apply to certain self-reactive substances when required by 2.2.41.1.17, and certain organic peroxides when required by 2.2.52.1.15 and certain polymerizing substances when required by 2.2.41.1.21 or special provision 386 of Chapter 3.3 which may only be carried under conditions where the temperature is controlled.

7.1.7.3.2 These provisions also apply to the carriage of substances for which:

(a) The proper shipping name as indicated in column 2 of Table A of Chapter 3.2 or according to 3.1.2.6 contains the words "TEMPERATURE CONTROLLED"; and

(b) The SADT or SAPT determined for the substance (with or without chemical stabilization) as offered for carriage is:

(i) 50 °C or less for single packagings and IBCs; or

(ii) 45 °C or less for tanks.

When chemical inhibition is not used to stabilize a reactive substance which may generate dangerous amounts of heat and gas, or vapour, under normal carriage conditions, this substance needs to be carried under temperature control. These provisions do not apply to substances which are stabilized by the addition of chemical inhibitors such that the SADT or the SAPT is greater than that prescribed in (b) (i) or (ii), above.

7.1.7.3.3 In addition, if a self-reactive substance or organic peroxide or a substance the proper shipping name of which contains the word "STABILIZED" and which is not normally required to be carried under temperature control is carried under conditions where the temperature may exceed 55 °C, it may require temperature control.

7.1.7.3.4 The "control temperature" is the maximum temperature at which the substance can be safely carried. It is assumed that during carriage the temperature of the immediate surroundings of the package does not exceed 55 °C and attains this value for a relatively short time only during each period of 24 hours. 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.

7.1.7.3.5 Derivation of control and emergency temperatures

Type of receptacle	**SADT[a] /SAPT[a]**	**Control temperature**	**Emergency temperature**
Single packagings and IBCs	20 °C or less over 20 °C to 35 °C over 35 °C	20 °C below SADT/SAPT 15 °C below SADT/SAPT 10 °C below SADT/SAPT	10 °C below SADT/SAPT 10 °C below SADT/SAPT 5 °C below SADT/SAPT
Tanks	≤ 45 °C	10 °C below SADT/SAPT	5 °C below SADT/SAPT

[a] *i.e. the SADT/SAPT of the substance as packed for carriage.*

7.1.7.3.6 The control and emergency temperatures are derived using the table in 7.1.7.3.5 from the SADT or from the SAPT which are defined as the lowest temperatures at which self-accelerating decomposition or self-accelerating polymerization may occur with a substance in the packaging, IBC or tank as used in carriage. An SADT or SAPT shall be determined in order to decide if a substance shall be subjected to temperature control during carriage. Provisions for the determination of the SADT and SAPT are given in Part II, section 28 of the Manual of Tests and Criteria.

7.1.7.3.7 Control and emergency temperatures, where appropriate, are provided for currently assigned self-reactive substances in 2.2.41.4 and for currently assigned organic peroxide formulations in 2.2.52.4.

7.1.7.3.8 The actual carriage temperature may be lower than the control temperature but shall be selected so as to avoid dangerous separation of phases.

7.1.7.4 *Carriage under temperature control*

7.1.7.4.1 Maintenance of the prescribed temperature is an essential feature of the safe carriage of substances stabilized by temperature control. In general, there shall be:

(a) Thorough inspection of the cargo transport unit prior to loading;

(b) Instructions to the carrier about the operation of the refrigeration system including a list of the suppliers of coolant available en route;

(c) Procedures to be followed in the event of loss of control;

(d) Regular monitoring of operating temperatures; and

(e) Provision of a back-up refrigeration system or spare parts.

7.1.7.4.2 Any control and temperature sensing devices in the refrigeration system shall be readily accessible and all electrical connections weather-proof. The temperature of air space within the cargo transport unit shall be measured by two independent sensors and the output shall be recorded so that temperature changes are readily detectable. The temperature shall be checked every four to six hours and logged. When substances having a control temperature of less than +25 °C are carried, the cargo transport unit shall be equipped with visible and audible alarms, powered independently of the refrigeration system, set to operate at or below the control temperature.

7.1.7.4.3 If during carriage the control temperature is exceeded, an alert procedure shall be initiated involving any necessary repairs to the refrigeration equipment or an increase in the cooling capacity (e.g. by adding liquid or solid refrigerants). The temperature shall also be checked frequently and preparations made for implementation of the emergency procedures. If the emergency temperature is reached, the emergency procedures shall be initiated.

7.1.7.4.4 The suitability of a particular means of temperature control for carriage depends on a number of factors. Factors to be considered include:

(a) The control temperature(s) of the substance(s) to be carried;

(b) The difference between the control temperature and the anticipated ambient temperature conditions;

(c) The effectiveness of the thermal insulation;

(d) The duration of carriage; and

(e) Allowance of a safety margin for delays.

7.1.7.4.5 Suitable methods for preventing the control temperature being exceeded are, in order of increasing control capability:

(a) Vehicle, container, packaging or overpack with thermal insulation provided that the initial temperature of the substance(s) to be carried is sufficiently below the control temperature;

(b) Vehicle, container, packaging or overpack with thermal insulation and coolant system provided that:

(i) An adequate quantity of non-flammable coolant (e.g. liquid nitrogen or solid carbon dioxide), allowing a reasonable margin for delay, is carried or a means of replenishment is assured;

(ii) Liquid oxygen or air is not used as coolant;

(iii) There is a uniform cooling effect even when most of the coolant has been consumed; and

(iv) The need to ventilate the transport unit before entering is clearly indicated by a warning on the door(s) of the transport unit;

(c) Vehicle or container with thermal insulation and single mechanical refrigeration provided that for substance(s) to be carried with a flash point lower than the sum of the emergency temperature plus 5 °C explosion-proof electrical fittings, EEx IIB T3 are used within the cooling compartment to prevent ignition of flammable vapours from the substances;

(d) Vehicle or container with thermal insulation and combined mechanical refrigeration system with coolant system; provided that:

(i) The two systems are independent of one another;

(ii) The provisions in (b) and (c) are complied with;

(e) Vehicle or container with thermal insulation and dual mechanical refrigeration system; provided that:

(i) Apart from the integral power supply unit, the two systems are independent of one another;

(ii) Each system alone is capable of maintaining adequate temperature control; and

(iii) For substance(s) to be carried with a flash point lower than the sum of the emergency temperature plus 5 °C explosion-proof electrical fittings, EEx IIB T3, are used within the cooling compartment to prevent ignition of flammable vapours from the substances.

7.1.7.4.6 The methods described in 7.1.7.4.5 (d) and (e) may be used for all organic peroxides and self-reactive substances and polymerizing substances.

The method described in 7.1.7.4.5 (c) may be used for organic peroxides and self-reactive substances of Types C, D, E and F and, when the maximum ambient temperature to be expected during carriage does not exceed the control temperature by more than 10 °C, for organic peroxides and self-reactive substances of Type B and polymerizing substances.

The method described in 7.1.7.4.5 (b) may be used for organic peroxides and self-reactive substances of Types C, D, E and F and polymerizing substances when the maximum ambient temperature to be expected during carriage does not exceed the control temperature by more than 30 °C.

The method described in 7.1.7.4.5 (a) may be used for organic peroxides and self-reactive substances of Types C, D, E and F and polymerizing substances when the maximum ambient temperature to be expected during carriage is at least 10 °C below the control temperature.

7.1.7.4.7 Insulated, refrigerated and mechanically refrigerated containers intended for the carriage of temperature controlled substances shall conform to the following conditions:

(a) The overall heat transfer coefficient of an insulated container shall be not more than 0.4 W/m²/K;

(b) The refrigerant used shall not be flammable; and

(c) Where containers are provided with vents or ventilation valves care shall be taken to ensure that refrigeration is not impaired by the vents or ventilation valves.

Where substances are required to be carried in insulated, refrigerated or mechanically-refrigerated vehicles, these vehicles shall satisfy the requirements of Chapter 9.6.

7.1.7.4.8 If substances are contained in protective packagings filled with a coolant, they shall be loaded in closed or sheeted vehicles or closed or sheeted containers. If the vehicles or containers used are closed they shall be adequately ventilated. Sheeted vehicles and containers shall be fitted with sideboards and a tailboard. The sheets of these vehicles and containers shall be of an impermeable and non-combustible material.

CHAPTER 7.2

PROVISIONS CONCERNING CARRIAGE IN PACKAGES, INCLUDING INTERMEDIATE BULK CONTAINERS (IBC) AND LARGE PACAKGINGS

7.2.1 Unless otherwise provided in 7.2.2 to 7.2.4, packages may be loaded:

(a) in closed vehicles, closed wagons or in closed containers; or

(b) in sheeted vehicles, sheeted wagons or in sheeted containers; or

(c) in open vehicles, open wagons or in open containers (unsheeted).

7.2.2 Packages comprising packagings made of materials sensitive to moisture shall be loaded on to closed or on to sheeted vehicles, closed or sheeted wagons or into closed or sheeted containers.

7.2.3 *(Reserved)*

7.2.4 When they are shown under an entry in Column (16) of Table A of Chapter 3.2, the following special provisions apply:

V1 Packages shall be loaded on to closed or sheeted vehicles, closed or sheeted wagons, or into closed or sheeted containers.

V2 (1) Packages shall only be loaded on to EX/II or EX/III vehicles which satisfy the relevant requirements of Part 9. The choice of vehicle depends on the quantity to be carried, which is limited per transport unit in accordance with the provisions concerning loading (see 7.5.5.2). Where a transport unit consists of an EX/II vehicle and an EX/III vehicle, both carrying explosive substances or articles, the quantity limit of 7.5.5.2.1 applicable for an EX/II transport unit applies for the entire transport unit.

(2) Trailers, except semi-trailers, which satisfy the requirements for EX/II or EX/III vehicles may be drawn by motor vehicles which do not satisfy those requirements.

For carriage in containers, see also 7.1.3 to 7.1.6.

Where substances or articles of Class 1 in quantities requiring a transport unit made up of EX/III vehicle(s) are being carried in containers to or from harbour areas, rail terminals or airports of arrival or departure as part of a multimodal journey, a transport unit made up of EX/II vehicle(s) may be used instead, provided that the containers being carried comply with the appropriate requirements of the IMDG Code, the RID or the ICAO Technical Instructions.

V3 For free-flowing powdery substances and for fireworks the floor of a container shall have a non-metallic surface or covering.

V4 *(Reserved)*

V5 Packages may not be carried in small containers.

V6 *(Deleted)*

V7 *(Reserved)*

V8 See 7.1.7.

NOTE: *This special provision V8 does not apply to substances referred to in 3.1.2.6 when substances are stabilized by the addition of chemical inhibitors such that the SADT is greater than 50 °C. In this case, temperature control may be required under conditions of carriage where the temperature may exceed 55 °C.*

V9 (*Reserved*)

V10 IBCs shall be carried in closed or sheeted vehicles, closed or sheeted wagons or closed or sheeted containers.

V11 IBCs other than metal or rigid plastics IBCs shall be carried in closed or sheeted vehicles, closed or sheeted wagons or closed or sheeted containers.

V12 IBCs of type 31HZ2 (31HA2, 31HB2, 31HN2, 31HD2 and 31HH2) shall be carried in closed vehicles, closed wagons or containers.

V13 When packed in 5H1, 5L1 or 5 M1 bags, shall be carried in closed vehicles, closed wagons or containers.

V14 Aerosols carried for the purposes of reprocessing or disposal under special provision 327 in Chapter 3.3 shall only be carried in ventilated or open vehicles, ventilated or open wagons or containers.

V15 IBCs shall be carried in closed vehicles, closed wagons or in closed containers.

V50A IBCs shall only be loaded onto AN vehicles.

CHAPTER 7.3

PROVISIONS CONCERNING CARRIAGE IN BULK

7.3.1 General provisions

7.3.1.1 Goods may not be carried in bulk in bulk containers, containers, vehicles or wagons unless:

(a) either a special provision, identified by the code "BK" or a reference to a specific paragraph, explicitly authorizing this mode of carriage is indicated in column (10) of Table A of Chapter 3.2 and the relevant conditions of 7.3.2 are satisfied in addition to those of this section; or

(b) a special provision, identified by the code "VC" or a reference to a specific paragraph, explicitly authorizing this mode of carriage is indicated in column (17) of Table A of Chapter 3.2 and the conditions of this special provision, together with any additional provision identified by the code "AP", as laid down in 7.3.3 are satisfied in addition to those of this section.

Nevertheless, empty packagings, uncleaned, may be carried in bulk if this mode of carriage is not explicitly prohibited by other provisions of this Code.

NOTE: *For carriage in tanks, see Chapters 4.2 and 4.3.*

7.3.1.2 Substances which may become liquid at temperatures likely to be encountered during carriage, are not permitted for carriage in bulk.

7.3.1.3 Bulk containers, containers, bodies of vehicles or bodies of wagons shall be siftproof and shall be so closed that none of the contents can escape under normal conditions of carriage including the effect of vibration, or by changes of temperature, humidity or pressure.

7.3.1.4 Substances shall be loaded and evenly distributed in a manner that minimises movement that could result in damage to the bulk container, container, vehicle or wagon or leakage of the dangerous goods.

7.3.1.5 Where venting devices are fitted they shall be kept clear and operable.

7.3.1.6 Substances shall not react dangerously with the material of the bulk container, container, vehicle, wagon, gaskets, equipment including lids and tarpaulins and with protective coatings which are in contact with the contents or significantly weaken them. Bulk containers, containers, vehicles or wagons shall be so constructed or adapted that the goods cannot penetrate between wooden floor coverings or come into contact with those parts of the bulk container, container, vehicle or wagon that may be affected by the materials or residues thereof.

7.3.1.7 Before being filled and handed over for carriage, each bulk container, container, vehicle or wagon shall be inspected and cleaned to ensure that it does not contain any residue on the interior or exterior of the bulk container, container, vehicle or wagon that could:

- cause a dangerous reaction with the substance intended for carriage;
- detrimentally affect the structural integrity of the bulk container, container, vehicle or wagon; or
- affect the dangerous goods retention capabilities of the bulk container, container, vehicle or wagon.

7.3.1.8 During carriage, no dangerous residues shall adhere to the outer surfaces of bulk containers, containers, or of the bodies of vehicles or wagons.

7.3.1.9 If several closure systems are fitted in series, the system which is located nearest to the substance to be carried shall be closed first before filling.

7.3.1.10 Empty bulk containers, containers, vehicles or wagons which have carried a dangerous solid substance in bulk shall be treated in the same manner as is required by this Code for a filled bulk container, container, vehicle or wagon, unless adequate measures have been taken to nullify any hazard.

7.3.1.11 If bulk containers, containers, vehicles or wagons are used for the carriage in bulk of goods liable to cause a dust explosion, or evolve flammable vapours (e. g. for certain wastes) measures shall be taken

to exclude sources of ignition and prevent dangerous electrostatic discharge during carriage, filling or discharge of the substance.

7.3.1.12 Substances, for example wastes, which may react dangerously with one another and substances of different classes and goods not subject to this Code, which are liable to react dangerously with one another shall not be mixed together in the same bulk container, container, vehicle or wagon. Dangerous reactions are:

(a) Combustion and/or evolution of considerable heat;

(b) Emission of flammable and/or toxic gases;

(c) Formation of corrosive liquids; or

(d) Formation of unstable substances.

7.3.1.13 Before a bulk container, container, vehicle or wagon is filled it shall be visually examined to ensure it is structurally serviceable, its interior walls, ceiling and floors are free from protrusions or damage and that any inner liners or substance retaining equipment are free from rips, tears or any damage that would compromise its cargo retention capabilities. Structurally serviceable means the bulk container, container, vehicle or wagon does not have major defects in its structural components, such as top and bottom side rails, top and bottom end rails, door sill and header, floor cross members, corner posts, and corner fittings in a bulk container or container. Major defects include:

(a) Bends, cracks or breaks in the structural or supporting members, or any damage to service or operational equipment that affect the integrity of the bulk container, container or of the body of the vehicle or wagon;

(b) Any distortion of the overall configuration or any damage to lifting attachments or handling equipment interface features great enough to prevent proper alignment of handling equipment, mounting and securing on a chassis or wagon or vehicle, or insertion into ships' cells; and, where applicable

(c) Door hinges, door seals and hardware that are seized, twisted, broken, missing, or otherwise inoperative.

7.3.2 Provisions for the carriage in bulk when the provisions of 7.3.1.1 (a) are applied

7.3.2.1 In addition to the general provisions of section 7.3.1, the provisions of this section are applicable. The codes BK1, BK2 and BK3 in column (10) of Table A of Chapter 3.2 have the following meanings:

BK1: Carriage in bulk in sheeted bulk containers is permitted;

BK2: Carriage in bulk in closed bulk containers is permitted.

BK3: Carriage in flexible bulk containers is permitted

7.3.2.2 The bulk container used shall conform to the requirements of Chapter 6.11.

7.3.2.3 ***Goods of Class 4.2***

The total mass carried in a bulk container shall be such that its spontaneous ignition temperature is greater than 55 °C.

7.3.2.4 ***Goods of Class 4.3***

These goods shall be carried in bulk containers which are waterproof.

7.3.2.5 ***Goods of Class 5.1***

Bulk containers shall be so constructed or adapted that the goods cannot come into contact with wood or any other incompatible material.

7.3.2.6 ***Goods of Class 6.2***

7.3.2.6.1 Animal material containing infectious substances (UN Nos. 2814, 2900 and 3373) is authorized for carriage in bulk containers provided the following conditions are met:

(a) Sheeted bulk containers BK1 are permitted provided that they are not filled to maximum capacity to avoid substances coming into contact with the sheeting. Closed bulk containers BK2 are also permitted;

(b) Closed and sheeted bulk containers, and their openings, shall be leak-proof by design or by the fitting of a suitable liner;

(c) The animal material shall be thoroughly treated with an appropriate disinfectant before loading prior to carriage;

(d) Sheeted bulk containers shall be covered by an additional top liner weighted down by absorbent material treated with an appropriate disinfectant;

(e) Closed or sheeted bulk containers shall not be re-used until after they have been thoroughly cleaned and disinfected.

NOTE: *Additional provisions may be required by appropriate national health authorities.*

7.3.2.6.2 *Wastes of Class 6.2 (UN 3291)*

(a) *(Reserved)*;

(b) Closed bulk containers and their openings shall be leakproof by design. These bulk containers shall have non porous interior surfaces and shall be free from cracks or other features which could damage packagings inside, impede disinfection or permit inadvertent release;

(c) Wastes of UN No. 3291 shall be contained within the closed bulk container in UN type tested and approved sealed leakproof plastics bags tested for solids of packing group II and marked in accordance with 6.1.3.1. Such plastics bags shall be capable of passing the tests for tear and impact resistance according to ISO 7765-1:1988 "Plastics film and sheeting - Determination of impact resistance by the free-falling dart method - Part 1: Staircase methods" and ISO 6383-2:1983 "Plastics - Film and sheeting - Determination of tear resistance. Part 2: Elmendorf method". Each bag shall have an impact resistance of at least 165 g and a tear resistance of at least 480 g in both parallel and perpendicular planes with respect to the length of the bag. The maximum net mass of each plastics bag shall be 30 kg;

(d) Single articles exceeding 30 kg such as soiled mattresses may be carried without the need for a plastics bag when authorized by the competent authority;

(e) Wastes of UN No. 3291 which contain liquids shall only be carried in plastics bags containing sufficient absorbent material to absorb the entire amount of liquid without it spilling in the bulk container;

(f) Wastes of UN No. 3291 containing sharp objects shall only be carried in UN type tested and approved rigid packagings meeting the provisions of packing instructions P621, IBC620 or LP621;

(g) Rigid packagings specified in packing instructions P621, IBC620 or LP621 may also be used. They shall be properly secured to prevent damage during normal conditions of carriage. Wastes carried in rigid packagings and plastics bags together in the same closed bulk container shall be adequately segregated from each other, e.g. by suitable rigid barriers or dividers, mesh nets or otherwise securing, such that they prevent damage to the packagings during normal conditions of carriage;

(h) Wastes of UN No. 3291 in plastics bags shall not be compressed in a closed bulk container in such a way that bags may be rendered no longer leakproof;

(i) The closed bulk container shall be inspected for leakage or spillage after each journey. If any wastes of UN No. 3291 have leaked or been spilled in the closed bulk container, it shall not be re-used until after it has been thoroughly cleaned and, if necessary, disinfected or decontaminated

with an appropriate agent. No other goods shall be carried together with UN No. 3291 other than medical or veterinary wastes. Any such other wastes carried in the same closed bulk container shall be inspected for possible contamination.

7.3.2.7 ***Material of Class 7***

For the carriage of unpackaged radioactive material, see 4.1.9.2.4.

7.3.2.8 ***Goods of Class 8***

These goods shall be carried in bulk containers which are watertight.

7.3.2.9 ***Goods of Class 9***

7.3.2.9.1 For UN 3509, only closed bulk containers (code BK2) may be used. Bulk containers shall be made leak tight or fitted with a leak tight and puncture resistant sealed liner or bag, and shall have a means of retaining any free liquid that might escape during carriage, e.g. absorbent material. Packagings, discarded, empty, uncleaned with residues of Class 5.1 shall be carried in bulk containers which have been so constructed or adapted that the goods cannot come into contact with wood or any other combustible material.

7.3.2.10 ***Use of flexible bulk containers***

7.3.2.10.1 Before a flexible bulk container is filled it shall be visually examined to ensure it is structurally serviceable, its textile slings, load-bearing structure straps, body fabric, lock device parts including metal and textile parts are free from protrusions or damage and that inner liners are free from rips, tears or any damage.

7.3.2.10.2 For flexible bulk containers, the period of use permitted for the carriage of dangerous goods shall be two years from the date of manufacture of the flexible bulk container.

7.3.2.10.3 A venting device shall be fitted if a dangerous accumulation of gases may develop within the flexible bulk container. The vent shall be so designed that the penetration of foreign substances or ingress of water is prevented under normal conditions of carriage.

7.3.2.10.4 Flexible bulk containers shall be filled in such a way that when loaded the ratio of height to width does not exceed 1.1. The maximum gross mass of the flexible bulk containers shall not exceed 14 tonnes.

7.3.3 Provisions for carriage in bulk when the provisions of 7.3.1.1 (b) are applied

7.3.3.1 In addition to the general provisions of section 7.3.1, the provisions of this section are applicable, when they are shown under an entry in column (17) of Table A of Chapter 3.2. Sheeted or closed vehicles, sheeted or closed wagons or sheeted or closed containers used under this section need not be in conformity with the requirements of Chapter 6.11. The codes VC1, VC2 and VC3 in column (17) of Table A of Chapter 3.2 have the following meanings:

VC1 Carriage in bulk in sheeted vehicles, sheeted wagons, sheeted containers or sheeted bulk containers is permitted;

VC2 Carriage in bulk in closed vehicles, closed wagons, closed containers or closed bulk containers is permitted;

VC3 Carriage in bulk is permitted in specially equipped vehicles or containers in accordance with standards specified by the competent authority.

NOTE: *Where a VC1 code is shown in column (17) of Table A of Chapter 3.2, a BK1 bulk container may therefore also be used for land transport provided the additional provisions in 7.3.3.2 are fulfilled. Where a VC2 code is shown in column (17) of Table A of Chapter 3.2, a BK2 bulk container may therefore also be used for land transport provided the additional provisions in 7.3.3.2 are fulfilled.*

7.3.3.2 When the VC bulk codes are used, the following additional provisions shown in column (17) of Table A of Chapter 3.2 shall apply:

7.3.3.2.1 *Goods of Class 4.1*

AP1 Vehicles, wagons and containers shall have a metal body and where fitted the sheet shall be non-combustible.

AP2 Vehicles, wagons and containers shall have adequate ventilation.

7.3.3.2.2 *Goods of Class 4.2*

AP1 Vehicles, wagons and containers shall have a metal body and where fitted the sheet shall be non-combustible.

7.3.3.2.3 *Goods of Class 4.3*

AP2 Vehicles, wagons and containers shall have adequate ventilation.

AP3 Sheeted vehicles, sheeted wagons and sheeted containers shall be used only when the substance is in pieces (not in powder, granular, dust or ashes form).

AP4 Closed vehicles, closed wagons and closed containers shall be equipped with hermetically closed openings used for filling and discharging to prevent the exit of gas and exclude the ingress of moisture.

AP5 The cargo doors of the closed vehicles or closed containers shall be marked with the following in letters not less than 25 mm high:

"WARNING
NO VENTILATION
OPEN WITH CAUTION"

7.3.3.2.4 *Goods of Class 5.1*

AP6 If the vehicle, wagon or container is made of wood or other combustible material, an impermeable surfacing resistant to combustion or a coating of sodium silicate or similar substance shall be provided. Sheeting shall also be impermeable and non-combustible.

AP7 Carriage in bulk shall only be as a full load.

AP50A Vehicles used for carriage in bulk shall only use an AN vehicle.

7.3.3.2.5 *Goods of Class 6.1*

AP7 Carriage in bulk shall only be as a full load.

7.3.3.2.6 *Goods of Class 8*

AP7 Carriage in bulk shall only be as a full load.

AP8 The design of the load compartment of vehicles, wagons or containers shall take account of any residual currents and impacts from the batteries.

The load compartments of vehicles, wagons or containers shall be of steel resistant to the corrosive substances contained in the batteries. Less resistant steels may be used when there is a sufficiently great wall thickness or a plastics lining/layer resistant to the corrosive substances.

NOTE: *Steel exhibiting a maximum rate of progressive reduction of 0.1 mm per year under the effects of the corrosive substances may be considered as resistant.*

The load compartments of vehicles, wagons or containers shall not be loaded above the top of their walls.

Carriage is also permitted in small plastics containers which shall be capable of withstanding, when fully loaded, a drop from a height of 0.8 m onto a hard surface at -18 °C, without breakage.

7.3.3.2.7 *Goods of Class 9*

AP2 Vehicles, wagons and containers shall have adequate ventilation.

AP9 Carriage in bulk is permitted for solids (substances or mixtures, such as preparations or wastes) containing on average not more than 1 000 mg/kg of substance to which this UN number is assigned. At no point of the load shall the concentration of this substance or these substances be higher than 10 000 mg/kg.

AP10 Vehicles, wagons and containers shall be made leak tight or fitted with a leak tight and puncture resistant sealed liner or bag, and shall have a means of retaining any free liquid that might escape during carriage, e.g. absorbent material. Packagings, discarded, empty, uncleaned with residues of Class 5.1 shall be carried in vehicles, wagons and containers which have been so constructed or adapted that the goods cannot come into contact with wood or any other combustible material.

CHAPTER 7.4

PROVISIONS CONCERNING CARRIAGE IN TANKS

7.4.1 Dangerous goods may only be carried in tanks when a portable tank instruction is shown in column (10) or when a tank code is shown in column (12) of Table A of Chapter 3.2, or when a competent authority has issued an approval in accordance with the conditions specified in 6.7.1.3. The carriage shall be in accordance with the provisions of Chapters 4.2, 4.3, 4.4 or 4.5 as applicable. The vehicles, whether they be rigid vehicles, drawing vehicles, trailers or semi-trailers, shall satisfy the relevant requirements of Chapters 9.1, 9.2 and 9.7 concerning the vehicle to be used, as indicated in Column (14) of Table A in Chapter 3.2.

7.4.2 The vehicles designated by the codes EX/III, FL, AT or AN in 9.1.1.2 shall be used as follows:

- Where an EX/III vehicle is prescribed, only an EX/III vehicle may be used;
- Where a FL vehicle is prescribed, only an FL vehicle may be used;
- Where an AT vehicle is prescribed, AT and FL vehicles may be used.
- Where an AN vehicle is prescribed, only an AN may be used

CHAPTER 7.5

PROVISIONS CONCERNING LOADING, UNLOADING AND HANDLING

7.5.1 General provisions concerning loading, unloading and handling

7.5.1.1 The vehicle and the vehicle crew, as well as the container(s), bulk-container(s), MEGC(s), tank-container(s) or portable tank(s) if any, shall comply with the regulatory provisions (especially those concerning safety, security, cleanliness and satisfactory operation of the equipment used in loading and unloading) upon arrival at the loading and unloading sites, which include container terminals.

7.5.1.2 Unless otherwise specified in this Code, the loading shall not be carried out if:

- an examination of the documents; or
- a visual inspection of the vehicle, wagon or of the container(s), bulk-container(s), MEGC(s), tank-container(s) or portable tank(s) if any, as well as of their equipment used in loading and unloading,

shows that the vehicle and the vehicle crew, wagon, a container, a bulk-container, a MEGC, a tank-container, a portable tank or their equipment do not comply with the regulatory provisions. The interior and the exterior of a vehicle, wagon or container shall be inspected prior to loading to ensure that there is no damage that could affect its integrity or that of the cargo to be loaded in it.

The cargo transport unit shall be checked to ensure it is structurally serviceable, that it is free of possible residues incompatible with the cargo and that the interior floor, walls and ceiling, where applicable, are free from protrusions or deterioration that could affect the cargo inside and that large containers are free of damages that affect the weather-tight integrity of the container, when required.

Structurally serviceable means that the cargo transport unit is free from major defects in its structural components. Structural components of cargo transport units for multimodal purpose are e.g. top and bottom side rails, top and bottom end rails, corner posts, corner fittings and, for large containers, door sill, door header and floor cross members. Major defects include:

(a) Bends, cracks or breaks in structural or supporting members and any damage to service or operational equipment that affect the integrity of the cargo transport unit;

(b) Any distortion of the over-all configuration or any damage to lifting attachments or handling equipment interface features great enough to prevent proper alignment of handling equipment, mounting and securing on a chassis or wagon or vehicle, or insertion into ships' cells; and, where applicable;

(c) Door hinges, door seals and hardware that are seized, twisted, broken, missing or otherwise inoperative.

7.5.1.3 Unless otherwise specified in this Code, the unloading shall not be carried out, if the above-mentioned inspections reveal deficiencies that might affect the safety or the security of the unloading.

7.5.1.4 In accordance with the special provisions of 7.3.3 or 7.5.11, in conformity with Columns (17) and (18) of Table A of Chapter 3.2, certain dangerous goods shall only be forwarded as a "full load" (see definition in 1.2.1). In such a case, the competent authorities may require the vehicle or large container used for such carriage to be loaded at only one point and unloaded at only one point.

7.5.1.5 When orientation arrows are required packages and overpacks shall be oriented in accordance with such marks.

NOTE: *Liquid dangerous goods shall be loaded below dry dangerous goods whenever practicable.*

7.5.1.6 All means of containment shall be loaded and unloaded in conformity with a handling method for which they have been designed and, where required, tested.

7.5.2 Mixed loading prohibition

7.5.2.1 Packages bearing different danger labels shall not be loaded together in the same vehicle or container unless mixed loading is permitted according to the following Table based on the danger labels they bear.

Substances and articles of class 1 shall not be loaded together with other dangerous goods or non-dangerous goods in the same vehicle or container, unless mixed loading is permitted according to 7.5.2.2.

NOTE 1: *In accordance with 5.4.1.4.2, separate transport documents shall be drawn up for consignments that cannot be loaded together in the same vehicle or container.*

NOTE 2: *For packages containing substances or articles only of Class 1 and bearing a label conforming to models Nos. 1, 1.4, 1.5 or 1.6, irrespective of any other danger labels required for these packages, mixed loading shall be permitted in accordance with 7.5.2.2. The Table in 7.5.2.1 shall only apply when such packages are loaded together with packages containing substances or articles of other classes.*

Labels Nos.					**2.1**	**2.2**	**2.3**	**3**	**4.1**	**4.1 + l**	**4.2**	**4.3**	**5.1**	**5.2**	**5.2 + 1**	**6.1**	**6.2**	**7 A, B, C**	**8**	**9, 9A**
2.1					Y	1	Y	1	N	N	N	N	N	N	N	Y	N	N	Y	Y
2.2					1	Y	1	Y	Y	N	N	Y	Y	N	N	Y	N	Y	Y	Y
2.3					Y	1	Y	N	Y	N	N	Y	N	N	N	Y	N	Y	Y	Y
3					N	Y	N	Y	Y	N	N	Y	N	N	N	3	N	N	Y	Y
4.1					N	Y	Y	Y	Y	N	N	Y	N	N	N	Y	N	N	Y	Y
4.1 + 1					N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N
4.2					N	N	N	N	N	N	Y	Y	N	N	N	Y	N	N	Y	Y
4.3					N	Y	Y	Y	Y	N	Y	Y	N	N	N	Y	N	N	N	Y
5.1					N	Y	N	N	N	N	N	N	3	N	N	2	N	N	N	2
5.2					N	N	N	N	N	N	N	N	N	Y	Y	2	N	N	N	2
5.2 + 1					N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N	N
6.1					Y	Y	Y	3	Y	N	Y	Y	2	2	N	Y	N	Y	3	Y
6.2					N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	X
7A, B, C					N	Y	Y	N	N	N	N	N	N	N	N	Y	N	Y	N	Y
8					Y	Y	Y	Y	Y	N	Y	N	N	N	N	3	N	N	3	Y
9, 9A					Y	Y	Y	Y	Y	N	Y	Y	2	2	N	Y	Y	Y	Y	Y

Y *Mixed loading permitted.*

N *Mixed loading not permitted*

1 Mixed loading permitted provided all are contained in pressure receptacles, tanks or packages with a capacity not exceeding 500 l

2 Mixed loading not permitted for Class 5.1 or Class 5.2 with Class 6 or Class 9 materials that are fire-risk substances

3 Mixed loading permitted other than for substances listed in the following table:

Dangerous Goods or Group of Dangerous Goods	Incompatible Dangerous Goods (see Table C of section 3.2.3)
Ammonium Nitrate meeting UN Nos. 1942, 2067, 2426 or 3375	bromates chlorates chlorites hypochlorites nitrites perchlorates permanganates powdered metals combustible materials
Calcium hypochlorite meeting UN Nos. 1748, 2208, 2880, 3485, 3486 or 3487	acids ammonium compounds cyanides peroxides combustible materials
Cyanides	acids
Strong acids	alkalis
Class 8 substances meeting UN Nos. 1976, 1802, 1826 or 1873	Substances of Class 4.1
Class 8 substances meeting UN Nos. 1798, 2032, 2240 or 2308	Substances of Class 4.1 Substances of Class 5.1

7.5.2.2 Packages containing substances or articles of Class 1, bearing a label conforming to models Nos. 1, 1.4, 1.5 or 1.6 which are assigned to different compatibility groups shall not be loaded together in the same vehicle or container, unless mixed loading is permitted in accordance with the following Table for the corresponding compatibility groups.

Compatibility Group	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**L**	**N**	**S**
A	X											
B		X		[a]								X
C			X	X	X		X				[b] [c]	X
D		[a]	X	X	X		X				[b] [c]	X
E			X	X	X		X				[b] [c]	X
F						X						X
G			X	X	X		X					X
H								X				X
J									X			X
L										[d]		
N			[b] [c]	[b] [c]	[b] [c]						[b]	X
S		X	X	X	X	X	X	X	X		X	X

X *Mixed loading permitted.*

[a] *Packages containing articles of compatibility group B and those containing substances or articles of compatibility group D may be loaded together on one vehicle or in one container provided they are effectively segregated such that there is no danger of transmission of detonation from the articles of compatibility group B to the substances or articles of compatibility group D. Segregation shall be achieved by the use of separate compartments or by placing one of the two types of explosive in a special containment system. Either method of segregation shall be approved by the competent authority.*

[b] *Different types of articles of division 1.6, compatibility group N, may be carried together as articles of division 1.6, compatibility group N, only when it is proven by testing or analogy that there is no additional hazard of sympathetic detonation between the articles. Otherwise they should be treated as hazard division 1.1.*

[c] *When articles of compatibility group N are carried with substances or articles of compatibility groups C, D or E, the articles of compatibility group N should be considered as having the characteristics of compatibility group D.*

[d] *Packages containing substances and articles of Compatibility Group L may be loaded together on one vehicle or in one container with packages containing the same type of substances and articles of that compatibility group.*

7.5.2.3 Application of prohibitions on mixed loading

7.5.2.3.1 (Reserved)

7.5.2.3.2. For mixed loading prohibitions laid down in 7.5.2.1 concerning mixed loading of packages, other than those specified in 7.5.2.3.1, Segregation of incompatible goods can be achieved by one of the following methods:

(a) Placing the dangerous goods in a separate vehicle or separate trailer of a combination vehicle to the incompatible goods;
(b) Segregating the dangerous goods from the incompatible goods through the use a segregation method conforming to Chapter 6.15 of this Code.

7.5.2.3.2 For mixed loading prohibitions laid down in 7.5.2.1 concerning mixed loading of dangerous goods in tanks, the incompatible goods shall not be loaded on the same vehicle or combination vehicle.

7.5.2.4 (Reserved)

7.5.2.5 Application of prohibitions on mixed loading for substances and articles of class 1

7.5.2.5.1 For mixed loading prohibitions laid down in 7.5.2.1 concerning mixed loading of packages bearing labels conforming to models Nos. 1, 1.4, 1.5 or 1.6 with other packages, and in 7.5.2.2 concerning mixed loading of explosives of different compatibility groups, the incompatible goods shall not be loaded on the same vehicle or combination vehicle.

7.5.2.5.2 Additional prohibitions on mixed loading of substances and articles of class 1.

(a) Ammonium nitrate, ammonium nitrate mixtures or ammonium nitrate based explosives shall not be carried with chlorates or chlorate based explosives.

(b) Substances and articles of class 1 shall not be transported in the same load compartment as domestic, commercial or industrial waste, including empty packagings or pallets not part of an overpack.

(c) Explosives shall not be transported on the same vehicle or combination road vehicle as other Classes of dangerous goods, fire risk substances or any other materials likely to cause, communicate or intensify fire, except as permitted by 7.5.2.5.3.

(d) Detonators of Classification Code 1.1B shall not be transported on the same vehicle as other explosives except as permitted by 7.5.2.5.3 (g)

(e) Mixed loading of dangerous goods packed in limited quantities with any type of explosive substances and articles, except those of Division 1.4 and UN Nos. 0161 and 0499, is prohibited.

7.5.2.5.3 Mixed loading of substances and articles of class 1 that would otherwise contravene 7.5.2.2 or 7.5.2.5.2 is permitted in the following circumstances:

(a) Mixed loading is permitted between blasting explosives (except UN No. 0083 explosive, blasting, type C) and ammonium nitrate (UN Nos. 1942 and 2067), ammonium nitrate emulsion or suspension or gel (UN No. 3375) and alkali metal nitrates and alkaline earth metal nitrates provided the aggregate is treated as blasting explosives under Class 1 for the purposes of placarding, segregation, stowage and maximum permissible load . Alkali metal nitrates include caesium nitrate (UN 1451), lithium nitrate (UN 2722), potassium nitrate (UN 1486), rubidium nitrate (UN 1477) and sodium nitrate (UN 1498). Alkaline earth metal nitrates include barium nitrate (UN 1446), beryllium nitrate (UN 2464), calcium nitrate (UN 1454), magnesium nitrate (UN 1474) and strontium nitrate (UN 1507).

(b) on articulated rail vehicles where the applicable separation distances specified in table 7.3 can be provided on the one vehicle;

(c) where dangerous goods are carried:

(i) under the exemptions in 1.1.3.1 (a) or (c),

(ii) do not exceed 1 kilogram/litre in aggregate;

(iii) and are in a separate compartment to the explosives;

NOTE: the exemptions in 1.1.3.1 (a) and (c) apply to dangerous goods carried by private individuals or where carriage is ancillary to the main activity of the carrier.

(d) where wooden pallets are used to carry explosives in overpacks; or

(e) in other circumstances specifically approved by the Competent Authority

(f) Substances and articles of class 1 not permitted to be transported together under 7.5.2.2 or 7.5.2.5.2 may be transport on the same vehicle [or combination] provided that the incompatible explosives are:

(i) stored in separate compartments that are segregated by an effective means of segregation demonstrated to prevent sympathetic detonation of the incompatible explosives; or

(ii) segregated by other means specifically approved by a Competent Authority for that purpose.

(g) Detonators of classification code 1.1B may be transported with other explosives using a method approved under 7.5.2.5.3(f)(ii), or in accordance with the following:

(i) the quantity of detonators does not exceed 125 detonators;

(ii) the total quantity of explosives does not exceed the upper limit for Explosives Category 2, as determined according to 1.1.7; and

(iii) detonators shall be placed in a separate carry box or compartment and separated from other explosives by at least 2 metres from other explosives.

(h) Substances and articles of classification code 1.4S (other than detonators), or other low hazard explosives may be transported without application of the segregation provisions in a load meeting the definition of explosives category 1.

7.5.3 Protective distance

Every wagon, large container, portable tank or road vehicle containing substances or articles of Class 1 and bearing a placard conforming to models Nos. 1,1.5, or 1.6 shall be separated on the same train from wagons, large container, portable tanks, tank containers, MEGCs or road vehicles bearing a placard conforming to models Nos. 2.1, 3, 4.1, 4.3, 5.1 or 5.2 or road vehicles for which the transport document indicates that they contain packages bearing a label conforming to models Nos. 2.1, 3, 4.1, 4.2, 4.3, 5.1 or 5.2 by a protective distance.

The requirement for this protective distance is met if the space between the buffer head of a wagon or the end wall of a large container, portable tank or road vehicle and the buffer head of another wagon or the end wall of another large container, portable tank, tank-container, MEGC or road vehicle is:

(a) at least 18 m, or

7.5.4 Precautions with respect to foodstuffs, other articles of consumption and animal feeds

If special provision CV28 is indicated for a substance or article in Column (18) of Table A of Chapter 3.2, precautions with respect to foodstuffs, other articles of consumption and animal feeds shall be taken as follows.

Packages as well as uncleaned empty packagings, including large packagings and intermediate bulk containers (IBCs), bearing labels conforming to models Nos. 6.1 or 6.2 and those bearing labels conforming to model No. 9 containing goods of UN Nos. 2212, 2315, 2590, 3151, 3152 or 3245, shall not be stacked on or loaded in immediate proximity to packages known to contain foodstuffs, other articles of consumption or animal feeds in vehicles, in wagons, in containers and at places of loading, unloading or transhipment.

When these packages, bearing the said labels, are loaded in immediate proximity of packages known to contain foodstuffs, other articles of consumption or animal feeds, they shall be kept apart from the latter:

(a) By complete partitions which should be as high as the packages bearing the said labels;

(b) By packages not bearing labels conforming to models Nos. 6.1, 6.2 or 9 or packages bearing labels conforming to model No.9 but not containing goods of UN Nos. 2212, 2315, 2590, 3151, 3152 or 3245; or

(c) By a space of at least 0.8 m;

unless the packages bearing the said labels are provided with an additional packaging or are completely covered (e.g. by a sheeting, a fibreboard cover or other measures).

7.5.5 Limitation of the quantities carried

7.5.5.1 If the provisions below, or the additional provisions of 7.5.11 to be applied according to Column (18) of Table A of Chapter 3.2 require a limitation of the quantity of specific goods that can be carried, the fact that dangerous goods are contained in one or more containers shall not affect the mass limitations per transport unit laid down by these provisions.

7.5.5.2 Limitations with respect to explosive substances and articles

7.5.5.2.1 *Substances and quantities carried*

The total net mass in kg of explosive substance (or in the case of explosive articles, the total net mass of explosive substance contained in all the articles combined) which may be carried on one transport unit shall be limited as indicated in the table below (see also 7.5.2.2 as regards the prohibition of mixed loading):

Type of transport unit	Load division according to 1.1.7	Quantity
(1)	(2)	(3)
Road vehicle or combination	1.1, 1.2 or 1.3	25 tonnes

Road vehicle or combination	1.5 or 1.6	40 tonnes
Rail wagon	1.1, 1.2, 1.3, 1.5 or 1.6	40 tonnes
Road vehicle, combination vehicle or rail wagon	1.4	Unlimited

7.5.5.2.2 (Reserved)

7.5.5.2.3 *Carriage of explosives on MEMUs*

Carriage of explosives on MEMUs is only permitted subject to the following conditions:

(a) The competent authority shall authorize the transport operation within its territory;

(b) The type and quantity of packaged explosives carried shall be limited to those necessary for the quantity of material to be manufactured on the MEMU, and in any case shall not exceed:

- 200 kg of explosives of compatibility group D; and
- a total of 400 units of detonators or detonator assemblies, or a mixture of both,

unless otherwise approved by the competent authority;

(c) Packaged explosives shall only be carried in compartments that meet the requirements of 6.12.5;

(d) No other dangerous goods may be carried in the same compartment as the packaged explosives;

(e) Packaged explosives shall only be loaded onto the MEMU once the loading of other dangerous goods has been completed and immediately prior to carriage;

(d) When mixed loading is permitted between explosives and substances of Class 5.1 (UN 1942 and UN 3375) the aggregate is treated as blasting explosives under Class 1 for the purposes of segregation, stowage and maximum permissible load.

7.5.5.3 ***Limitations with respect to organic peroxides, self-reactive substances and polymerizing substances***

The maximum quantity of organic peroxides of Class 5.2 and self-reactive substances of Class 4.1 of Types B, C, D, E or F and of polymerizing substances of Class 4.1 is limited to 20 000 kg per transport unit.

7.5.6 *(Reserved)*

7.5.7 Handling and stowage

7.5.7.1 Where appropriate the vehicle, wagon or container shall be fitted with devices to facilitate securing and handling of the dangerous goods. Packages containing dangerous substances and unpackaged dangerous articles shall be secured by suitable means capable of restraining the goods (such as fastening straps, sliding slatboards, adjustable brackets) in the vehicle, wagon or container in a manner that will prevent any movement during carriage which would change the orientation of the packages or cause them to be damaged. When dangerous goods are carried with other goods (e.g. heavy machinery or crates), all goods shall be securely fixed or packed in the vehicles, wagons or containers so as to prevent the release of dangerous goods. Movement of packages may also be prevented by filling any voids by the use of dunnage or by blocking and bracing. Where restraints such as banding or straps are used, these shall not be over-tightened to cause damage or deformation of the package[1].

[1] *Guidance on the stowage of dangerous goods can be found in the IMO/ILO/UNECE Code of Practice for Packing of Cargo Transport Units (CTU Code) (see e.g., Chapter 9 Packing cargo into CTUs and Chapter 10 Additional advice on the packing of dangerous goods) and in the "European Best Practice Guidelines on Cargo Securing for Road Transport" published by the European Commission. Other guidance is also available from competent authorities and industry bodies.*

All loads must be restrained in compliance with the performance standards specified in the Heavy Vehicle (Mass, Dimension and Loading) National Regulation.

***Note**: the performance standards for light vehicles are the same as those for heavy vehicles. Further guidance can be found in the Load Restraint Guide.*

7.5.7.2 Packages shall not be stacked unless designed for that purpose. Where different design types of packages that have been designed for stacking are to be loaded together, consideration shall be given to their compatibility for stacking with each other. Where necessary, stacked packages shall be prevented from damaging the package below by the use of load-bearing devices.

7.5.7.3 During loading and unloading, packages containing dangerous goods shall be protected from being damaged.

***NOTE:** Particular attention shall be paid to the handling of packages during their preparation for carriage, the type of vehicle or container on which they are to be carried and to the method of loading or unloading, so that accidental damage is not caused through dragging or mishandling the packages.*

7.5.7.4 The provisions of 7.5.7.1 shall also apply to the loading, stowage and removal of containers, tank-containers, portable tanks and MEGCs on to and from vehicles. When tank-containers, portable tanks and MEGCs do not include, by construction, corner castings as defined in ISO 1496-1 *Series 1 freight containers – Specification and testing – Part 1: General cargo containers for general purposes*, it shall be verified that the systems used on the tank-containers, portable tanks or MEGCs are compatible with the system on the vehicle and in compliance with the requirements in 9.7.3.

7.5.7.5 Members of the vehicle crew may not open a package containing dangerous goods.

7.5.7.6 Loading of flexible bulk containers

7.5.7.6.1 Flexible bulk containers shall be carried within a vehicle, wagon or container with rigid sides and ends that extend at least two-thirds of the height of the flexible bulk container. The vehicles used for carriage shall be equipped with a vehicle stability function approved in accordance with UN Regulation No. 13[2].

***NOTE:** When loading flexible bulk containers in a vehicle or container particular attention shall be paid to the guidance on the handling and stowage of dangerous goods referred to in 7.5.7.1.*

7.5.7.6.2 Flexible bulk containers shall be secured by suitable means capable of restraining them in the vehicle or container in a manner that will prevent any movement during carriage which would change the position of the flexible bulk container or cause it to be damaged. Movement of the flexible bulk containers may also be prevented by filling any voids by the use of dunnage or by blocking and bracing. Where restraints such as banding or straps are used, these shall not be over-tightened to cause damage or deformation to the flexible bulk containers.

7.5.7.6.3 Flexible bulk containers shall not be stacked.

7.5.8 Cleaning after unloading

7.5.8.1 If, when a vehicle, wagon or container which has contained packaged dangerous goods is unloaded, some of the contents are found to have escaped, the vehicle, wagon or container shall be cleaned as soon as possible and in any case before reloading.

If it is not possible to do the cleaning locally, the vehicle, wagon or container shall be carried, with due regard to adequate safety, to the nearest suitable place where cleaning can be carried out.

Carriage is adequately safe if suitable measures have been taken to prevent the uncontrolled release of the dangerous goods that have escaped.

7.5.8.2 Vehicles, wagons or containers which have been loaded with dangerous goods in bulk shall be properly cleaned before reloading unless the new load consists of the same dangerous goods as the preceding load.

[2] *UN Regulation No. 13 (Uniform provisions concerning the approval of vehicles of categories M, N and O with regards to braking).*

7.5.9 Prohibition of smoking

Smoking shall be prohibited during handling operations in the vicinity of vehicles or containers and inside the vehicles or containers. This prohibition of smoking is also applicable to the use of electronic cigarettes and similar devices.

7.5.10 Precautions against electrostatic charges

In the case of flammable gases, or liquids with a flash-point of 60 °C or below, or UN No. 1361, carbon or carbon black, packing group II, a good electrical connection from the chassis of the vehicle, the portable tank or the tank-container to earth shall be established before tanks are filled or emptied. In addition, the rate of filling shall be limited.

7.5.11 Additional provisions applicable to certain classes or specific goods

In addition to the provisions of sections 7.5.1 to 7.5.10, the following provisions shall apply when they are shown under an entry indicated in Column (18) of Table A of Chapter 3.2.

CV1

(1) The following operations are prohibited:

(a) Loading or unloading goods in a public place in a built-up area without special permission from the competent authorities;

(b) Loading or unloading goods in a public place elsewhere than in a built-up area without prior notice thereof having been given to the competent authorities, unless these operations are urgently necessary for reasons of safety.

(2) If, for any reason, handling operations have to be carried out in a public place, then substances and articles of different kinds shall be separated according to the labels.

CV2

(1) Before loading, the loading surface of the vehicle, wagon or container shall be thoroughly cleaned.

(2) The use of fire or naked flame shall be prohibited on vehicles and containers carrying goods, in their vicinity and during the loading and unloading of these goods.

(3) Packages stowed in a freight container shall be arranged so as to distribute the load evenly over the container floor, or otherwise arranged to ensure that the weight distribution is symmetrical in relation to the lifting of the container.

(4) Dunnage used in the stowage of substances and articles of class 1 shall be:
(i) kept dry before use;
(ii) securely restrained during transport; and
(iii) the amount used must be minimised.

(5) Stowage of substances and articles of class 1 in the same compartment as other goods likely to cause damage, including other equipment and articles:
(i) For fireworks and detonators, is prohibited without exception; or
(ii) Other than for fireworks and detonators, is prohibited with the exception of manual handling equipment (such as pallet jacks and conveyor rollers), that are securely positioned behind a segregating partition so as to prevent movement during transport. The height of the segregating partition must exceed the highest point of the load.

CV3 See 7.5.5.2.

CV4 Substances and articles of compatibility group L shall only be carried as a full load.

CV5 to CV8 *(Reserved)*

CV9 Packages shall not be thrown or subjected to impact.

Receptacles shall be so stowed in the vehicle, wagons or container that they cannot overturn or fall.

CV10 Cylinders as defined in 1.2.1, shall be transported upright in a suitable device, such as a stillage, that effectively prevents them from overturning, except where:

(a) The cylinder may be safely transported in another configuration; and

(b) The safety valve remains in communication with the vapour space, or the cylinder only contains compressed gas.

CV11 Receptacles shall always be placed in the position for which they were designed and be protected against any possibility of being damaged by other packages.

CV12 When pallets loaded with articles are stacked, each tier of pallets shall be evenly distributed over the lower tier, if necessary by the interposition of a material of adequate strength.

CV13 If any substances have leaked and been spilled in a vehicle or container, it may not be re-used until after it has been thoroughly cleaned and, if necessary, disinfected or decontaminated. Any other goods and articles carried in the same vehicle, wagon or container shall be examined for possible contamination.

CV14 Goods shall be shielded from direct sunlight and heat during carriage.

Packages shall be stored only in cool, well-ventilated places away from heat sources.

CV15 See 7.5.5.3.

CV16 to CV19 *(Reserved)*

CV20 The provisions of Chapter 5.3 and 7.1.7.4.7 and 7.1.7.4.8 as well as special provision V1 of Chapter 7.2 shall not apply provided that the substance is packaged in accordance with packing method OP1 or OP2 of packing instruction P520 in 4.1.4.1, as required, and the total quantity of substances to which this derogation applies per transport unit is limited to 10 kg.

CV21 The transport unit shall be thoroughly inspected prior to loading.

Before carriage, the carrier shall be informed:

- about the operation of the refrigeration system, including a list of the suppliers of coolant available en route;
- procedures to be followed in the event of loss of temperature control.

In the case of temperature control in accordance with the methods described in 7.1.7.4.5 (b) or (d), a sufficient quantity of non-flammable refrigerant (e.g. liquid nitrogen or dry ice), including a reasonable margin for possible delays, shall be carried unless a means of replenishment is assured.

Packages shall be so stowed as to be readily accessible.

The specified control temperature shall be maintained during the whole transport operation, including loading and unloading, as well as any intermediate stops.

CV22 Packages shall be loaded so that a free circulation of air within the loading space provides a uniform temperature of the load. If the contents of one vehicle, wagon or large container exceed 5 000 kg of flammable solids, of polymerizing substances and/or organic peroxides, the load shall be divided into stacks of not more than 5 000 kg separated by air spaces of at least 0.05 m.

CV23 When handling packages, special measures shall be taken to ensure that they do not come into contact with water.

CV24 Before loading, vehicles, wagons and containers shall be thoroughly cleaned and in particular be free of any combustible debris (straw, hay, paper, etc.).

The use of readily flammable materials for stowing packages is prohibited.

CV25 (1) Packages shall be so stowed that they are readily accessible.

(2) When packages are to be carried at an ambient temperature of not more than 15 °C or refrigerated, the temperature shall be maintained when unloading or during storage.

(3) Packages shall be stored only in cool places away from sources of heat.

CV26 The wooden parts of a vehicle, wagon or container which have come into contact with these substances shall be removed and burnt.

CV27 (1) Packages shall be so stowed that they are readily accessible.

(2) When packages are to be carried refrigerated, the functioning of the cooling chain shall be ensured when unloading or during storage.

(3) Packages shall only be stored in cool places away from sources of heat.

CV28 See 7.5.4.

CV29 to CV32 *(Reserved)*

CV33 ***NOTE 1:*** *"Critical group" means a group of members of the public which is reasonably homogeneous with respect to its exposure for a given radiation source and given exposure pathway and is typical of individual receiving the highest effective dose by the given exposure pathway from the given source.*

NOTE 2: *"Members of the public" means in a general sense, any individuals in the population except when subject to occupational or medical exposure.*

NOTE 3: *"Workers" are any persons who work, whether full time, part-time or temporarily, for an employer and who have recognised rights and duties in relation to occupational radiation protection.*

(1) *Segregation*

(1.1) Packages, overpacks, containers and tanks containing radioactive material and unpacked radioactive material shall be segregated during carriage:

(a) from workers in regularly occupied working areas:

(i) in accordance with Table A below; or

(ii) by distances calculated using a dose criterion of 5 mSv in a year and conservative model parameters;

NOTE: *Workers subject to individual monitoring for the purposes of radiation protection shall not be considered for the purposes of segregation.*

(b) from members of the public, in areas where the public has regular access:

(i) in accordance with Table A below; or

(ii) by distances calculated using a dose criterion of 1 mSv in a year and conservative model parameters;

(c) from undeveloped photographic film and mailbags:

(i) in accordance with Table B below; or

(ii) by distances calculated using a radiation exposure criterion for undeveloped photographic film due to the transport of radioactive material for 0.1 mSv per consignment of such film; and

NOTE: *Mailbags shall be assumed to contain undeveloped film and plates and therefore be separated from radioactive material in the same way.*

(d) from other dangerous goods in accordance with 7.5.2.

Table A: Minimum distances between packages of category II-YELLOW or of category III-YELLOW and persons

Sum of transport indexes not more than	**Exposure time per year (hours)**			
	Areas where members of the public have regular access		**Regularly occupied working areas**	
	50	250	50	250
	Segregation distance in metres, no shielding material intervening, from:			
2	1	3	0.5	1
4	1.5	4	0.5	1.5
8	2.5	6	1.0	2.5
12	3	7.5	1.0	3
20	4	9.5	1.5	4
30	5	12	2	5
40	5.5	13.5	2.5	5.5
50	6.5	15.5	3	6.5

Table B: Minimum distances between packages of category II-YELLOW or of category III-YELLOW and packages bearing the word "FOTO", or mailbags

Total number of packages not more than		**Sum of transport indexes not more than**	**Journey or storage duration, in hours**							
Category			1	2	4	10	24	48	120	240
III-yellow	II-yellow		Minimum distances in metres							
		0.2	0.5	0.5	0.5	0.5	1	1	2	3
		0.5	0.5	0.5	0.5	1	1	2	3	5
	1	1	0.5	0.5	1	1	2	3	5	7
	2	2	0.5	1	1	1.5	3	4	7	9
	4	4	1	1	1.5	3	4	6	9	13
	8	8	1	1.5	2	4	6	8	13	18
1	10	10	1	2	3	4	7	9	14	20
2	20	20	1.5	3	4	6	9	13	20	30
3	30	30	2	3	5	7	11	16	25	35
4	40	40	3	4	5	8	13	18	30	40
5	50	50	3	4	6	9	14	20	32	45

(1.2) Category II-YELLOW or III-YELLOW packages or overpacks shall not be carried in compartments occupied by passengers, except those exclusively reserved for couriers specially authorized to accompany such packages or overpacks.

(1.3) No persons other than members of the vehicle crew shall be permitted in vehicles carrying packages, overpacks or containers bearing category II-YELLOW or III-YELLOW labels.

(2) *Activity limits*

The total activity in a vehicle, for carriage of LSA material or SCO in Industrial Packages Type 1 (Type IP-1), Type 2 (Type IP-2), Type 3 (Type IP-3) or unpackaged, shall not exceed the limits shown in Table C below. For SCO-III, the limits in Table C below may be exceeded provided that the transport plan contains precautions which are to be employed during carriage to obtain an overall level of safety at least equivalent to that which would be provided if the limits had been applied.

Table C: Vehicle activity limits for LSA material and SCO in industrial packages or unpackaged

Nature of material or object	Activity limit for vehicle
LSA-I	No limit
LSA-II and LSA-III non-combustible solids	No limit
LSA-II and LSA-III combustible solids, and all liquids and gases	100 A_2
SCO	100 A_2

(3) *Stowage during carriage and storage in transit*

(3.1) Consignments shall be securely stowed.

(3.2) Provided that its average surface heat flux does not exceed 15 W/m² and that the immediately surrounding cargo is not in bags, a package or overpack may be carried or stored among packaged general cargo without any special stowage provisions except as may be specifically required by the competent authority in an applicable certificate of approval.

(3.3) Loading of containers and accumulation of packages, overpacks and containers shall be controlled as follows:

(a) Except under the condition of exclusive use, and for consignments of LSA-I material, the total number of packages, overpacks and containers aboard a single vehicle shall be so limited that the total sum of the transport indexes aboard the vehicle does not exceed the values shown in Table D below;

(b) The dose rate under routine conditions of carriage shall not exceed 2 mSv/h at any point on the external surface of the vehicle or container, and 0.1 mSv/h at 2 m from the external surface of the vehicle or container, except for consignments carried under exclusive use, for which the dose rate limits around the vehicle are set forth in (3.5) (b) and (c);

(c) The total sum of the criticality safety indexes in a container and aboard a vehicle shall not exceed the values shown in Table E below.

Table D: Transport Index limits for containers and vehicles not under exclusive use

Type of container or vehicle	Limit on total sum of transport indexes in a container or aboard a vehicle
Small container	50
Large container	50
Vehicle	50

Table E: Criticality Safety Index for containers and vehicles containing fissile material

Type of container or vehicle	Limit on total sum of criticality safety indexes	
	Not under exclusive use	Under exclusive use
Small container	50	n.a.
Large container	50	100
Vehicle	50	100

(3.4) Any package or overpack having either a transport index greater than 10, or any consignment having a criticality safety index greater than 50, shall be carried only under exclusive use.

(3.5) For consignments under exclusive use, the dose rate shall not exceed:

(a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:

(i) the vehicle is equipped with an enclosure which, during routine conditions of carriage, prevents the access of unauthorized persons to the interior of the enclosure;

(ii) provisions are made to secure the package or overpack so that its position within the vehicle enclosure remains fixed during routine conditions of carriage, and

(iii) there is no loading or unloading during the shipment;

(b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle; and

(c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is carried in an open vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle.

(4) *Additional requirements relating to carriage and storage in transit of fissile material*

(4.1) Any group of packages, overpacks, and containers containing fissile material stored in transit in any one storage area shall be so limited that the total sum of the CSIs in the group does not exceed 50. Each group shall be stored so as to maintain a spacing of at least 6 m from other such groups.

(4.2) Where the total sum of the criticality safety indexes on board a vehicle or in a container exceeds 50, as permitted in Table E above, storage shall be such as to maintain a spacing of at least 6 m from other groups of packages, overpacks or containers containing fissile material or other vehicles carrying radioactive material.

(4.3) Fissile material meeting one of the provisions (a) to (f) of 2.2.7.2.3.5 shall meet the following requirements:

(a) Only one of the provisions (a) to (f) of 2.2.7.2.3.5 is allowed per consignment;

(b) Only one approved fissile material in packages classified in accordance with 2.2.7.2.3.5 (f) is allowed per consignment unless multiple materials are authorized in the certificate of approval;

(c) Fissile material in packages classified in accordance with 2.2.7.2.3.5 (c) shall be carried in a consignment with no more than 45 g of fissile nuclides;

(d) Fissile material in packages classified in accordance with 2.2.7.2.3.5 (d) shall be carried in a consignment with no more than 15 g of fissile nuclides;

(e) Unpackaged or packaged fissile material classified in accordance with 2.2.7.2.3.5 (e) shall be carried under exclusive use on a vehicle with no more than 45 g of fissile nuclides.

(5) *Damaged or leaking packages, contaminated packagings*

(5.1) If it is evident that a package is damaged or leaking, or if it is suspected that the package may have leaked or been damaged, access to the package shall be restricted and a qualified person shall, as soon as possible, assess the extent of contamination and the resultant dose rate of the package. The scope of the assessment shall include the package, the vehicle, the adjacent loading and unloading areas, and, if necessary, all other material which has been carried in the vehicle. When necessary, additional steps for the protection of people, property and the environment, in accordance with provisions established by the competent authority, shall be taken to overcome and minimize the consequences of such leakage or damage.

(5.2) Packages damaged or leaking radioactive contents in excess of allowable limits for normal conditions of carriage may be removed to an acceptable interim location under supervision, but shall not be forwarded until repaired or reconditioned and decontaminated.

(5.3) A vehicle and equipment used regularly for the carriage of radioactive material shall be periodically checked to determine the level of contamination. The frequency of such checks shall be related to the likelihood of contamination and the extent to which radioactive material is carried.

(5.4) Except as provided in paragraph (5.5), any vehicle, or equipment or part thereof which has become contaminated above the limits specified in 4.1.9.1.2 in the course of carriage of radioactive material, or which shows a dose rate in excess of 5 µSv/h at the surface, shall be decontaminated as soon as possible by a qualified person and shall not be re-used unless the following conditions are fulfilled:

(a) the non-fixed contamination shall not exceed the limits specified in 4.1.9.1.2;

(b) the dose rate resulting from the fixed contamination shall not exceed 5 µSv/h at the surface.

(5.5) A container or vehicle dedicated to the carriage of unpackaged radioactive material under exclusive use shall be excepted from the requirements of the previous paragraph (5.4) and in 4.1.9.1.4 solely with regard to its internal surfaces and only for as long as it remains under that specific exclusive use.

(6) *Other provisions*

Where a consignment is undeliverable, the consignment shall be placed in a safe location and the competent authority shall be informed as soon as possible and a request made for instructions on further action.

CV34 Prior to carriage of pressure receptacles it shall be ensured that the pressure has not risen due to potential hydrogen generation.

CV35 If bags are used as single packagings, they shall be adequately separated to allow for the dissipation of heat.

CV36 Packages shall preferably be loaded in open or ventilated vehicles, open or ventilated wagons or open or ventilated containers. If this is not feasible and packages are carried in other closed vehicles, closed wagons or containers, gas exchange between the load compartment and the driver's cab, or the load compartment and accessible compartments shall be prevented and the cargo doors of the vehicles, wagons or containers shall be marked with the following in letters not less than 25 mm high:

"WARNING
NO VENTILATION
OPEN WITH CAUTION"

For UN Nos. 2211 and 3314 this mark is not required when the vehicle, wagon or container is already marked according to special provision 965 of the IMDG Code[3].

CV37 Before loading, these by-products shall be cooled to ambient temperature, unless they have been calcined to remove moisture. Vehicles, wagons and containers containing bulk loads shall be adequately ventilated and protected against ingress of water throughout the journey. The cargo doors of the closed vehicles, closed wagons and closed containers shall be marked with the following in letters not less than 25 mm high:

"WARNING
CLOSED MEANS OF CONTAINMENT
OPEN WITH CAUTION"

[3] *Warning mark including the words "CAUTION – MAY CONTAIN FLAMMABLE VAPOUR" with lettering not less than 25 mm high, affixed at each access point in a location where it will be easily seen by persons prior to opening or entering the vehicle or container.*

PART 8
Requirements for vehicle crews, equipment, operation and documentation

CHAPTER 8.1

GENERAL REQUIREMENTS CONCERNING TRANSPORT UNITS AND EQUIPMENT ON BOARD

8.1.1 (Reserved, not applicable to this Code)

8.1.2 Documents to be carried on the transport unit

8.1.2.1 In addition to the documents required under other regulations, the following documents shall be carried on the transport unit:

(a) The transport documents prescribed in 5.4.1, covering all the dangerous goods carried;

(b) The instructions in writing and emergency information prescribed in 5.4.3;

(c) (Reserved by ADR);

(d) Means of identification, which include a photograph, for each member of the vehicle crew, in accordance with 1.10.1.4.

NOTE: *The transport documents need to accurately reflect the quantity of dangerous goods being transported. When the load changes, the transport documentation needs to be amended to clearly reflect the types and quantities of dangerous goods remaining on the vehicle.*

8.1.2.2 Where the provisions of this code require the following documents to be drawn up, they shall likewise be carried on the transport unit:

(a) The certificate of approval referred to in 9.1.3 for each transport unit or element thereof;

(b) The driver's dangerous goods driver licence referred to in 8.2.2;

(c) A copy of the competent authority approval, when required in 5.4.1.2.1 (c) or (d) or 5.4.1.2.3.3.

(d) A copy of any competent authority approvals, exemptions or determinations that are required to be carried during transport.

8.1.2.3 Where the vehicle is fitted with an emergency information holder prescribed in 8.1.6, the documents prescribed in 5.4.3 (a) and (b) shall be kept in the emergency information holder.

In all other cases, the documents prescribed in 5.4.3 (a) and (b) shall be kept readily available in a prominent location in the cabin.

The emergency information holder shall not be used to carry any items other than those listed in 8.1.2.1 or 8.1.2.2.

8.1.2.4 (Deleted in ADR)

8.1.3 Placarding and marking

Transport units carrying dangerous goods shall be placarded and marked in conformity with Chapter 5.3.

8.1.4 Fire-fighting equipment

8.1.4.1 The following are the minimum provisions for fire-fighting equipment for fire classes[1] A, B and C that apply to transport units carrying dangerous goods, except for those transporting substances or articles of class 1, which are provided in 8.1.4.2.

The capacity requirements provided are for dry chemical powder fire extinguishing agent, unless substituted in accordance with 8.1.4.3.

NOTE 1: *8.1.4.3 permits substitution of extinguishing agent in the load area. Foam or water may be a more appropriate choice of extinguishing agent where the expected use of the extinguisher is to combat a wheel or tyre fire. AS 1850 may also be consulted for additional information on selection of extinguishing agent.*

NOTE 2: *A 9L foam or water extinguisher is considered equivalent to a 9 kg dry chemical powder extinguisher.*

8.1.4.1.1 For a transport unit no more than 4.5 tonnes (GVM or GCM), the load area of the vehicle shall be equipped with at least one fire extinguisher with a capacity of no less than 2 kg.

8.1.4.1.2 For a transport unit greater than 4.5 tonnes (GVM or GCM):

(a) If carrying dangerous goods in packages only, the load area of each vehicle shall be equipped with at least one fire extinguisher with a capacity of no less than 4.5 kg.

(b) If carrying dangerous goods in tanks or bulk containers, the load area of each vehicle shall be equipped with at least two fire extinguishers, with a total combined capacity of no less than 9 kg.
One of these extinguishers shall have a capacity of no less than 4.5 kg.

The load area of each vehicle carrying dangerous goods in a combination shall be equipped with the extinguishers required by either (a) or (b) as appropriate.

8.1.4.1.3 In addition to the fire extinguishers referred to in 8.1.4.1.1 and 8.1.4.1.2, the vehicle shall carry at least one fire extinguisher suitable for fighting an engine or cab fire. The fire extinguisher shall have a capacity of no less than 2 kg. It shall be located in or adjacent to the cabin.

8.1.4.2 *Fire extinguishers for vehicles transporting substances and articles of class 1*

A vehicle transporting a load meeting explosives category 2 shall be fitted with fire extinguishers in the load area that comply with 8.1.4.1.2 (a), regardless of the mass of the transport unit.

A vehicle transporting a load meeting explosives category 3 shall be fitted with fire extinguishers in the load area that comply with 8.1.4.1.2 (b), regardless of the mass of the transport unit.

A vehicle transporting a load meeting explosives category 2 or 3 shall be fitted with additional extinguisher(s) that comply with 8.1.4.1.3.

8.1.4.3 *Selection of fire extinguishers*

8.1.4.3.1 The portable fire extinguishers shall be suitable for use on a vehicle and shall comply with the relevant requirements of AS/NZS 1841 or 1850.

8.1.4.3.2 The portable fire extinguishers referred to in 8.1.4.1.1 and 8.1.4.1.2 may be partially or wholly substituted with an equivalent capacity of foam or water fire extinguishers.

8.1.4.3.3 The portable fire extinguishers referred to in 8.1.4.1.1 and 8.1.4.1.2 may be replaced with a foam or water fire-fighting system designed for the vehicle and the load using

[1] Flammability classes are defined in AS 1850.

compressed air, electric pumps or other means. The capacity shall be appropriate for the vehicle, but in no case shall be less than the capacity in 8.1.4.1.1 or 8.1.4.1.2.

This fire-fighting system shall be operational even when the engine of the vehicle is turned off and shall be suitable for the types of fire scenarios likely to be encountered with the aim of preventing the spread of fire to the load.

NOTE: *A foam or water fire-fighting system in accordance with 8.1.4.3.3 is mandatory for AN vehicles.*

8.1.4.3.4 If the vehicle is equipped with a fixed fire suppression system, whether automatic or easily brought into action for fighting a fire in the engine, the portable extinguisher referred to in 8.1.4.1.3 need not be suitable for fighting a fire in the engine. The extinguishing agents shall be such that they are not liable to release toxic gases into the driver's cab or under the influence of the heat of the fire.

8.1.4.4 The portable fire extinguishers conforming to the provisions of 8.1.4.1 or 8.1.4.2 shall be fitted with a seal or another measure which allows verifying that they have not been used.

The fire extinguishers shall be subjected to inspections and maintenance in accordance with AS/NZS 1851.

8.1.4.5 The fire extinguishers shall be securely installed on the transport units in a way that they are easily accessible to the vehicle crew, such as by fitting in a quick release bracket. The installation shall be carried out in such a way that the fire extinguishers shall be protected against effects of the weather so that their operational safety is not affected. During carriage, the date required in 8.1.4.4 shall not have expired, and a means of verifying this shall be provided.

NOTE: *AS/NZS 1851 requires portable extinguishers to be inspected every six months. The standard contains the detailed requirements for these inspections.*

8.1.4.6 Where two or more fire extinguishers in the load area are fitted in accordance with 8.1.4.1.1 or 8.1.4.1.2, one should be located on the left (near, or passenger) side towards the rear of the vehicle and, wherever practicable, another should be mounted on the right (off, or driver) side towards the front of the vehicle.

8.1.5 Miscellaneous equipment and equipment for personal protection

NOTE 1: *The equipment in this section are the minimum requirements for the transport of dangerous goods. Consideration shall be given to the properties of the dangerous goods, and the nature of the transport operation when selecting appropriate equipment.*

NOTE 2: *Where the vehicle crew undertake other tasks involving dangerous goods (such as filling or emptying tanks, bulk containers or packages), additional personal protective equipment may be required to meet the requirements of other safety legislation. If the equipment under this section also fulfils that purpose, it shall meet these requirements throughout transport.*

8.1.5.1 Each transport unit carrying dangerous goods shall be provided with items of equipment for general and personal protection in accordance with 8.1.5.2. The items of equipment shall be selected in accordance with the danger label number of the goods loaded. The label numbers can be identified through the transport document.

Where the transport emergency response plan prepared in accordance with 1.8.5 has identified emergency equipment:

(a) with particular features (such as resistance to certain chemicals), or
(b) in addition to that specified below to be carried on the transport unit

the transport unit or vehicle crew shall carry this equipment.

8.1.5.2 The following equipment shall be carried on board the transport unit:

- A wheel chock of a size suited to the maximum mass of the vehicle and to the diameter of the wheel.

  For dangerous goods other than class 1, this is only required for each trailer not fitted with brakes;
- Three portable warning triangles;
- Eye rinsing liquid, no less than 250 mL (not required when only transporting goods with danger label numbers 2.1, 2.2 and 2.3); and

for each member of the vehicle crew

- A warning vest, or equivalent high-visibility clothing (e.g. as described in AS/NZS 4602.1);
- A torch conforming to the provisions of 8.3.4;
- A pair of protective gloves;
- Eye protection (e.g. protective goggles as described in AS 1337); and
- Foot protection (e.g. enclosed, protective footwear).

8.1.5.3 Additional equipment required when solids and liquids are being transported:

- A shovel;
- A drain seal;
- A collecting container.

8.1.5.4 Escape breathing apparatus for each member of the vehicle crew shall be carried on the transport unit conforming to the following provisions:

When dangerous goods with special provision S50A listed in column (19) are transported in tanks, pressure drums, MEGCs or tube-vehicles:

- a compressed air or compressed oxygen self-contained breathing apparatus, or chemical oxygen generating self-contained self-rescuer. At a minimum, this shall be certified to comply with AS/NZS 1716 and provide breathable air for not less than 15 minutes.

  NOTE: *Special provision S50A is applied to toxic gases, and those assigned portable tank special provision TP13 in the UN Model Regulations.*

When any other dangerous goods with danger label numbers 2.3, 6.1 or 8 are being transported:

- An emergency escape mask. At a minimum, this shall include a combined gas/dust filter of at least the A2B2E2K2-P2 type.

  NOTE 2: *The apparatus required by special provision S50A is also considered to meet this requirement.*

8.1.5.5 ***Requirements for maintenance and location of equipment***

NOTE: *Equipment for use in an emergency shall be readily able to be deployed without additional steps. For example, eyewash bottles filled, and the torch must work when switched on. Minor steps such as removing a security seal are acceptable, provided they do not hinder use in an emergency.*

8.1.5.5.1 All equipment provided in accordance with this section shall be:

(a) clean;
(b) suitable for purpose; and
(c) maintained and in sound operating condition, ready for use.

8.1.5.5.2 Respiratory protection equipment required to be carried for escape purposes shall be carried securely and in an accessible position in the cabin of the vehicle.

8.1.5.5.3 Other personal protective equipment and safety equipment provided for occupants of a road vehicle transporting dangerous goods shall be carried securely and in a readily accessible position in the vehicle that is appropriate for the intended use of the equipment.

8.1.6 Emergency information holder

8.1.6.1 An emergency information holder shall be securely placed on a road vehicle in one of the following locations:

(a) on the inside of the driver's door of the cabin; or
(b) immediately adjacent to the driver's door of the cabin; or
(c) elsewhere in the cabin of the vehicle, provided that the position of the holder is identified on a notice affixed to the inside of the driver's door of the cabin.

The location permitted in (b) shall be used only if the location in (a) is not possible, and the location in (c) may be used only if the locations in (a) and (b) are not possible.

Any emergency information holder that is located other than in (a) shall be visible and readily accessible.

8.1.6.2 The emergency information shall be of a size and shape suitable for carrying the transport documents, instructions-in-writing and emergency information.

The emergency information holder shall be marked with the words "emergency procedure guides" or "emergency information" in red letters at least 10 millimetres high on a white background.

If the emergency information holder is not located as specified in 8.1.6.1(a), then a notice shall be affixed to the inside of the driver's door that clearly identifies the location of the emergency information holder.

8.1.7 Equipment for the transfer of dangerous goods

8.1.7.1 Hoses and hose assemblies for the transfer of dangerous goods

8.1.7.1.1 Hoses and hose assemblies used for transfer of dangerous goods shall be fit for purpose. A hose that is not safe to use due to:

(a) physical damage;
(b) excessive wear;
(c) excessive flow restriction; or
(d) another reason that makes it unsafe

shall not be used for the transfer of dangerous goods.

8.1.7.1.2 Except where a standard referenced in 8.1.7.3 applies, hose assemblies used to transfer dangerous goods shall have a maximum design pressure of not less than 1.5 times the maximum allowable working pressure of the transfer system in which the hose is used.

8.1.7.1.3 List of referenced standards

Reference	Title of document	Applicable dangerous goods
(1)	**(2)**	**(3)**
AS/NZS 1869.0:2023	Hose and hose assemblies for liquefied petroleum gases (LP Gas), natural gas and town gas, Part 0: General requirements	
AS 1596:2014 + Amd1	The storage and handling of LP Gas	Liquefied hydrocarbon gases, including UN 1011, 1012, 1075, 1077, 1978.
AS/NZS 2022:2003 + Amd1	Anhydrous ammonia – Storage and handling	UN 1005
AS 2683:2000	Hose and hose assemblies for distribution of petroleum and petroleum products (excepting LPG)	Liquid petroleum products of class 3.
AS 2594:1983	Hose and hose assemblies for liquid chemicals	Liquid dangerous goods, other than of class 2, or liquid petroleum products of class 3.

8.1.7.1.4 Hoses shall be subject to an inspection and testing regime according to the standards referenced in 8.1.7.1.3.

If the relevant standard does not specify an inspection frequency, these inspections and tests shall be performed no less frequently than the requirements in 8.1.7.2.

8.1.7.2 Hose inspection and testing

8.1.7.2.1 *Visual inspection*

A hose assembly shall be visually inspected for damage over its entire length at intervals of not more than one month.

8.1.7.2.2 *Hydrostatic pressure testing*

8.1.7.2.2.1 A hose assembly shall undergo a hydrostatic test:

(a) prior to entry into service; and
(b) no later than 12 months after the previous hydrostatic test.

8.1.7.2.2.2 The hydrostatic test shall be carried out at no less than the maximum allowable working pressure of the hose assembly.

8.1.7.2.3 *Electrical continuity testing*

8.1.7.2.3.1 A hose assembly used to transfer dangerous goods of classes 3 or 4 (including subsidiary hazards) shall be tested for electrical continuity:

(a) prior to entry into service; and
(b) no later than 6 months after the previous electrical continuity test.

8.1.7.2.3.2 The resistance of the hose assembly shall comply with the resistance values specified for electrical properties in AS 2683 for the kind[2] of hose assembly being tested.

8.1.7.2.3.3 If a hose assembly consists of two or more Kind 1 hose assemblies coupled together, it shall be constructed, assembled and maintained, so that the resistance between the end couplings does not exceed 10 Ω.

[2] Hose assembly kinds are defined in AS 2683.

8.1.7.2.3.4 If a hose assembly consists of two or more hose assemblies which are not of Kind 1, it shall be constructed, assembled and maintained so that the resistance between the couplings does not exceed the resistance values for electrical properties in AS 2683 for the relevant kind of hose assembly.

8.1.7.3 Pumps for the transfer of dangerous goods

8.1.7.3.1 A pump used for the transfer of dangerous goods of class 3 shall be suitable for the dangerous goods being transferred, and shall meet either of the following provisions:

(a) If fitted to the vehicle, it shall meet all the relevant pump design and use requirements of AS 2809.
(b) If not fitted to the vehicle, it shall conform to all relevant requirements of AS 1940 for the hazardous area in which it is operated.

NOTE: *AS 1940 provides extensive requirements for the design and operation of pumps and other equipment used for the transfer of flammable liquids.*

8.1.7.3.2 A pump used for the transfer of dangerous goods other than class 3 shall be suitable for the goods being transferred, including the physical and chemical properties of the goods, and the conditions of transfer.

8.1.7.3.3 Pumps shall be:

(a) Safe to use; and
(b) Fit for purpose.

8.1.7.3.4 Pumps shall be subject to an appropriate inspection and maintenance program.

8.1.7.4 Other equipment for the transfer of dangerous goods

8.1.7.4.1 All other equipment used to transfer dangerous goods to or from a means of containment that is on a vehicle shall be:

(c) Suitable for the dangerous goods to be transferred;
(d) Safe to use; and
(e) Fit for purpose.

8.1.7.4.2 Equipment shall be subject to an appropriate inspection and maintenance program.

8.1.7.5 Record keeping

8.1.7.5.1 All equipment used for the transfer of dangerous goods shall be marked in a way that allows it to be uniquely identified.

8.1.7.5.2 An accurate record shall be kept by the equipment owner for the life of the equipment of the following:

(a) the date on which any test or inspection required to be carried out was completed;
(b) the nature of the test carried out;
(c) the date on which maintenance work was carried out; and
(d) the nature of the maintenance work.

CHAPTER 8.2

REQUIREMENTS CONCERNING THE TRAINING OF THE VEHICLE CREW

NOTE 1: *The general training requirements in 8.2.1 apply to all dangerous goods drivers. The training requirements in 8.2.2 apply additionally to drivers who require formal training to obtain a dangerous goods driver licence.*

NOTE 2: *Drivers of dangerous goods vehicles may be subject to other training obligations, such as security requirements as set out in Chapter 1.10. Drivers may also require training for other tasks in the transport of dangerous goods, or under other legislation such as other road transport and work health and safety legislation.*

8.2.1 Scope and general requirements concerning the training of drivers

8.2.1.1 A driver of a vehicle transporting dangerous goods subject to this Code shall be trained in accordance with the requirements of this chapter.

8.2.1.2 Training may take one or more of the following forms:

(a) Formal training delivered by a registered training organisation (RTO);
(b) Other training in a formal setting;
(c) Informal training, on-the-job-training, or instruction and supervision.

The level of detail, and the material covered in this training depends on the transport operation. Regardless of the form or combination of training used, the training shall provide a driver with the skills and knowledge required to undertake their tasks safely and in accordance with this Code.

A record of the training provided, regardless of form, shall be kept. This shall include information on who assessed the driver as competent.

NOTE: *The risk of incidents rises significantly whenever a significant change in operations occurs. When such changes occur, for example a new type of vehicle or delivery to a new site, determine whether supplemental training is required.*

8.2.1.3 Drivers shall be provided with training on the following subjects:

(a) Structure and navigation of this Code
(b) General requirements governing the carriage of dangerous goods;
(c) Main types of hazards;
(d) Information on environmental protection;
(e) Preventive and safety measures appropriate to the various types of hazards;
(f) What to do after an accident (first aid, road safety, basic knowledge about the use of protective equipment, instructions in writing, etc.);
(g) Marking, labelling, placarding and emergency information panels;
(h) What a driver should and should not do during the carriage of dangerous goods;
(i) Purpose and the method of operation of technical equipment on vehicles;
(j) Segregation requirements on vehicles;
(k) Precautions to be taken during loading and unloading of dangerous goods;
(l) General information concerning civil liability;
(m) Information on multimodal transport operations;
(n) Handling and stowage of packages;
(o) Traffic and route restrictions, including tunnels.

NOTE: *Strong consideration should be given to using practical training for topics that will benefit from it. Examples include using fire extinguishers or using safety and personal protective equipment.*

8.2.1.4 Drivers of vehicles transporting dangerous goods in tanks or bulk containers shall additionally be provided with training on the following subjects:

(a) Behaviour of vehicles on the road, including movements of the load;
(b) Specific requirements of vehicles used by the carrier;
(c) General theoretical knowledge of the various and different filling and discharge systems;
(d) Specific additional provisions applicable to the use of those vehicles (certificates of approval, approval marking, placarding and emergency information panels, etc.).

8.2.1.5 A driver who is required to hold a dangerous goods driver licence shall additionally undertake training and be assessed as competent in accordance with 8.2.2.

8.2.1.6 A driver who is expected to perform tasks other than driving a dangerous goods vehicle shall be provided with training in accordance with the requirements of Chapter 1.3.

8.2.1.7 A driver of a vehicle fitted with specialised equipment shall be trained to use the equipment if they are expected to use it.

NOTE: *For example, where a vehicle is fitted with a fixed firefighting system, the driver needs to be provided with training in the system, including practical training as appropriate.*

8.2.2 Special requirements concerning the training of drivers required to hold a dangerous goods driver licence

NOTE 1: *The mandatory training required for a dangerous goods driver licence does not necessarily fulfil all training requirements outlined in 8.2.1. Carriers need to ensure that a driver is also provided with task-specific and company-specific training to ensure they are properly prepared to perform their tasks safely and in accordance with this Code.*

NOTE 2: *This section addresses the training as it relates to dangerous goods knowledge and related matters. Other vocational education and training requirements apply to the training that are outside the scope of this code.*

8.2.2.1 The necessary knowledge and skills shall be imparted by training using theoretical courses and/or practical exercises. The knowledge and competence shall be tested in an examination, delivered by an RTO meeting the requirements of this section. The student shall be issued a statement of attainment for the relevant unit of competency.

8.2.2.2 The RTO shall engage an approved assessor to deliver the course on its behalf. The RTO shall ensure that an approved assessor it engages has a good knowledge of, and takes into consideration, recent developments in regulations and training requirements relating to the carriage of dangerous goods.

8.2.2.3 ***Structure of training***

8.2.2.3.1 Training shall be given in the form of a formal training course. Any further training, conducted on the same occasion and by the same training body, shall be additional to the training course.

8.2.2.3.2 Elements to be covered by the training course shall be as defined in the relevant unit of competency.

8.2.2.3.6 The training course may be broken into individual training units for presentation.

8.2.2.3.7 The training may include practical exercises in connection with the theoretical training.

8.2.2.3.8 The training shall include competency assessment using the Mandatory Assessment Instrument approved by the competent authority.

8.2.2.3.9 The training shall only be undertaken provided the student demonstrates a level of use and understanding of the English language and mathematics to ensure that they are readily able to undertake tasks that are required of a driver when transporting and handling dangerous goods.

8.2.2.4 ***Training programme***

8.2.2.4.1 The duration of the training course shall be no less than 16 hours over no less than 2 days.

8.2.2.4.2 The RTO shall develop and maintain:

(a) A training and assessment strategy for the course
(b) Up to date learning materials to support delivery of the course

8.2.2.4.3 The training and assessment strategy shall:

(a) accurately describe in sufficient detail, the RTO's approach to training, delivery and assessment;
(b) meet the requirements of the unit of competency and the competent authority;
(c) ensure the following are addressed:

(i) the requirements set out in this chapter;
(ii) any requirements set out in the terms and conditions attached to the Mandatory Assessment Instrument;
(iii) any requirements set out by the competent authority where the course is conducted;

8.2.2.4.4 The learning materials shall consist of an appropriate range of the following:

(a) presentations
(b) student handbooks, guides or workbooks
(c) exercises, case studies, or simulations
(d) sample materials, tools, equipment or personal protective equipment;
(e) applicable documentation including workplace procedures, regulations, codes of practice and operation manuals

8.2.2.4.5 The Approved Assessor shall:

(a) be assessed by the RTO as competent and meet the requirements of this Code, the Mandatory Assessment Instrument and the competent authority;
(b) be formally engaged by the RTO to conduct the training and assessment for this training;
(c) have successfully completed the Mandatory Assessment Instrument and have been issued with a statement of attainment for the unit of competency;
(d) be certified in training and assessment; and
(e) have 5 years relevant dangerous goods industry experience or be otherwise recognised by the competent authority as having appropriate experience.

8.2.2.4.6 The RTO shall ensure students have access to:

(a) the current edition of this Code
(b) legislation in the jurisdiction where the training is delivered;
(c) any supporting information referenced in the code or legislation that is relevant to the training.

8.2.2.4.7 Recognised prior learning is not accepted for the training course.

8.2.2.4.8 The competency assessment shall consist of:

(a) The Mandatory Assessment Instrument; and
(b) Any additional competency assessment the RTO determines to be necessary

8.2.2.4.9 Prior to commencing each course, the approved assessor shall:

(a) Confirm the date, time, and location of the course and assessment with the student and any relevant stake holders.
(b) Sight and record photo ID (i.e. valid driver licence) front and back of the ID for each student.

8.2.2.5 ***Refresher training programme***

A refresher training course shall only be delivered in the form of the full training course.

8.2.2.6 ***Approval of RTOs***

8.2.2.6.1 The competent authority may approve an RTO to deliver the course for the purpose of issuing a dangerous goods driver licence, provided the RTO:

(a) Holds the scope of registration for the relevant unit of competency;
(b) Can provide evidence of current RTO status;
(c) Is not the subject of an RTO non-compliance order;
(d) Meets the requirements of the competent authority in the jurisdiction;
(e) Uses the Mandatory Assessment Instrument to assess a student as competent; and
(f) Keeps the Mandatory Assessment Instrument and model answers secure.

8.2.2.6.2 The following details shall also be provided to the competent authority:

(a) Name and contact information for the RTO;
(b) Name and contact information for each Approved Assessor for the course delivery

8.2.2.6.3 An RTO shall apply for approval in writing, providing the training and assessment strategy, and learning materials for review and approval by the competent authority.

8.2.2.6.4 The RTO shall inform the competent authority if any of the matters detailed in 8.2.2.6.1 or 8.2.2.6.3 change or are no longer met.

8.2.2.6.5 Where an RTO is already approved in another jurisdiction, the competent authority may approve an RTO on a mutual recognition basis.

In giving this approval, the competent authority may require additional information or jurisdiction specific amendments to be made to the training.

8.2.2.6.6 The competent authority may monitor or audit any aspects of the training process. This may include:

(a) Access to documents and records relating to the course and examinations;
(b) Reasonable access to assessment sites; and
(c) Retesting any student to assess competency.

8.2.2.6.7 A competent authority may engage other persons to undertake monitoring or auditing on its behalf.

8.2.2.7 ***Examinations (the Mandatory Assessment Instrument)***

8.2.2.7.1 *Competence assessment*

Assessment using the Mandatory Assessment Instrument shall only be undertaken as an individual unsupported examination, other than materials permitted by this section.

The approved assessor shall use suitable scenarios and where possible, simulated workplace operational situations that replicate workplace conditions.

A student shall not be assessed as competent unless a 100 % mark is attained on the Mandatory Assessment Instrument.

A student may only be provided with a second attempt if they attain 80% on their first attempt, in accordance with the retesting provisions in 8.2.2.7.2.

Flexibility in assessment strategies is permitted, provided the training is not curtailed or diminished and the integrity of the assessment is not compromised. In all cases, the approved assessor shall be able to demonstrate that the integrity of the assessment has been maintained.

NOTE: *For example, an assessment strategy may allow for the assessment to be conducted in stages throughout the course.*

8.2.2.7.2 *Retesting*

If a student has attained a mark of 80% or more in their first attempt, the approved assessor may provide gap training for the responses which were marked as incorrect.

The student may then undertake one further unsupported attempt on that day.

If the student does not attain 100% on the second unsupported attempt, the student will be required to undertake a further assessment on another day.

If after three unsupported attempts the student has still not attained a mark of 100%, they shall only sit the Mandatory Assessment Instrument as part of a full course at a later date.

Where retesting and gap training has occurred, the approved assessor shall record the process undertaken and attach the record to the assessment along with the record of the student's further attempts.

8.2.2.7.3 *Resources for assessment*

Resources for assessment include:

(a) a range of relevant exercises, case studies and/or simulations
(b) applicable documentation including workplace procedures, regulations, codes of practice and operation manuals
(c) the Mandatory Assessment Instrument (Student Copy)
(d) relevant materials, tools, equipment and personal protective equipment currently used in industry

8.2.2.7.4 *Assessment process*

8.2.2.7.4.1 Each student shall complete the assessment as an individual, “closed book” assessment, apart from the following materials:

(a) current jurisdictional DG transport legislation;
(b) This Code;
(c) Emergency Action Code (Hazchem codes) handouts; and
(d) A student’s own individual notes.

NOTE: *Students shall individually have access to the materials detailed above.*

Student workbooks or student learner guides are not permitted to be utilised whilst undertaking the Mandatory Assessment Instrument.

No model answers are to be provided to the students at any stage.

8.2.2.7.4.2 Assessors shall:

(a) Conduct assessments face-to-face;
(b) Clearly explain the assessment requirements to the students;
(c) Check students have the necessary tools, equipment, and reference materials to complete the assessment;
(d) Advise each student of the expected timeframe to complete this assessment; and
(e) Use the process outlined in Instructions to Assessor to mark the assessment.

8.2.2.8 *Statement of Attainment (Certificate of driver's training)*

8.2.2.8.1 An approved RTO may only issue a statement of attainment based on the approved course provided the assessment was conducted and the student assessed as competent in accordance with the requirements of this Chapter.

8.2.2.8.2 In addition to meeting the other requirements for a statement of attainment, the RTO shall include the following on the statement of attainment:

(a) Reference code issued by the competent authority (if issued to the RTO);
(b) Dates of training and assessment;
(c) Location of training and assessment;
(d) The approved assessor's full name; and
(e) Include the following details on the statement:

This course has met the requirements of the Competent Authority for a Dangerous Good Driver Licence.

Class of Dangerous Goods 2,3,4,5,6,8,9.

Note: This is not a Dangerous Goods Drivers Licence.

***NOTE:** the classes of dangerous goods listed may vary depending on the jurisdiction's requirements.*

CHAPTER 8.3

MISCELLANEOUS REQUIREMENTS TO BE COMPLIED WITH BY THE VEHICLE CREW

8.3.1 Passengers

Apart from members of the vehicle crew, no passengers may be carried in transport units carrying dangerous goods.

This provision does not apply to an authorised officer, police officer or officer of an emergency service or a person authorised to ride in the vehicle by such a person.

NOTE: *A person accompanying a driver for safety, security, training or operational reasons is defined as a member of a vehicle crew in 1.2.1.*

8.3.2 Use of fire-fighting appliances

Members of the vehicle crew shall know how to use the fire-fighting appliances.

8.3.3 Prohibition on opening packages

A driver or a driver's assistant may not open a package containing dangerous goods.

NOTE: *This provision does not apply in circumstances where opening packages forms part of a driver's other duties, and appropriate instruction and training is provided.*

8.3.4 Torch

The torch used shall be suitable for use in a zone 1 hazardous area as defined in AS/NZS 60079.10.1.

The torch need not meet the above requirement for use in a zone 1 hazardous area if the vehicle is not transporting any substances or articles of class 1; or have a flammability or oxidising hazard.

8.3.5 Prohibition on smoking

Smoking shall be prohibited during:

(a) handling operations in the vicinity of vehicles;
(b) inside the vehicles.

This prohibition of smoking is also applicable to the use of electronic cigarettes and similar devices.

Any smoking accessories for the use of the vehicle crew shall be carried in a sealed container to prevent the spreading of any inadvertent ignition, and which shall not be accessible to the vehicle crew while driving, and shall not be carried in the load area.

8.3.6 Running the engine during loading or unloading

Except where the engine has to be used to drive the pumps or other appliances for loading or unloading the vehicle and is otherwise permitted, the engine should be shut off during loading and unloading operations.

NOTE: *There are additional restrictions on running the engine during transfer of dangerous goods in Chapter 8.7.*

8.3.7 Use of the parking brakes

No vehicles carrying dangerous goods may be parked without the parking brakes being applied. Trailers without braking devices shall be restrained from moving.

If the vehicle is powered by a compression ignition engine, the vehicle shall not be parked in gear unless:

(i) the vehicle is fitted with a device to prevent the engine from starting if the vehicle moves; and
(ii) the device is engaged.

8.3.8 Use of cables for electronic braking systems

In the case of a transport unit equipped with an anti-lock or other electronic braking system, consisting of a motor vehicle and one or more trailers with a maximum mass exceeding 4.5 tonnes, the connections referred to in sub-section 9.2.2.8.5 shall connect the towing vehicle and the trailer at all times during carriage.

8.3.9 Breakdowns

8.3.9.1 If a vehicle carrying dangerous goods is disabled on a road, or has stopped and constitutes a traffic hazard, the vehicle crew shall:

(a) if the battery has not been disconnected to prevent danger:
(i) turn the hazard lights on and leaving them on while the vehicle is stopped; or
(ii) if there are no flashing hazard lights on the vehicle, turning the parking lights on and leaving them on while the vehicle is stopped; and
(b) place the portable warning triangles in accordance with the positioning requirements of the Road Rules in the jurisdiction where the breakdown occurs.

NOTE 1: *This requirement to place portable warning triangles applies regardless of any provisions in the road rules relating to vehicle mass.*

NOTE 2: *Rule 227 of the model Australian Road Rules provides the following positioning requirements for portable warning triangles:*

(a) if the speed limit for the road is 80 kilometres per hour or more:
(i) 1 triangle at least 200 metres, but not over 250 metres, behind the vehicle; and
(ii) if the vehicle is on a one-way or divided road, 1 triangle between the triangle required by paragraph (i) and the vehicle; and
(iii) if the vehicle is not on a one-way road or divided road, 1 triangle at least 200 metres, but not over 250 metres, in front of the vehicle or fallen load; and
(iv) 1 triangle at the side of the vehicle closer to traffic;
(b) if the speed limit for the road is less than 80 kilometres per hour:
(i) 1 triangle at least 50 metres, but not over 150 metres, behind the vehicle; and
(ii) if the vehicle is on a one-way or divided road, 1 triangle between the triangle required by paragraph (i) and the vehicle; and
(iii) if the vehicle is not on a one-way road or divided road, 1 triangle at least 50 metres, but not over 150 metres, in front of the vehicle or fallen load; and
(iv) 1 triangle at the side of the vehicle closer to traffic.

8.3.9.2 *Additional requirements for a vehicle transporting an explosives category 2 or 3 load*

8.3.9.2.1 The vehicle crew shall carry out the following as soon as is practicable:

(a) Notify the situation to the police;
(b) Notify the carrier of the situation; and
(c) Take any other actions required by the transport emergency response plan.

8.3.9.2.2 The carrier shall carry out the following as soon as is practicable:

(a) the vehicle shall be repaired to the extent that it may be removed safely from the road taking adequate protections in the course of the

repairs to ensure the safety of the vehicle and the explosives aboard; or

(b) the vehicle shall be towed in a safe manner to a place for repair.

Should a vehicle require to be removed from the site by towing or otherwise, consideration should be given to removing it to a safe area to allow the explosives to be transferred to another vehicle.

The carrier shall inform the operator of the tow vehicle of the hazards associated with the explosives on board the disabled vehicle.

8.3.10 Detaching a trailer

A trailer containing dangerous goods, other than a small load according to 1.1.3.6, shall not be detached from a prime mover or a combination road vehicle, except in the following situations:

(a) at a vehicle marshalling area, designated by a local, State or Territory authority, where the loading and unloading of goods is permitted; or
(b) at a transport depot designed for the loading and unloading of goods; or
(c) for the purposes of immediate exchange of trailers between prime movers or combination road vehicles, provided this is carried out off road and security is maintained; or
(d) in an emergency requiring the trailer to be detached in the interests of safety; or
(e) in the event of the vehicle becoming disabled on a road or street.

8.3.11 Operation of systems to heat dangerous goods

Where a vehicle is equipped with a burner to heat the load, the burner shall not be operated when the vehicle is moving.

A burner shall not be used to heat the load during the transfer of dangerous goods.

Where a system other than a burner to heat the load while in motion, or during transfer is provided, it shall only be operated in a safe manner, in accordance with instructions provided to the vehicle crew.

CHAPTER 8.4

REQUIREMENTS CONCERNING THE SUPERVISION OF VEHICLES

8.4.1 Definitions

8.4.1.1 A vehicle is considered *supervised* when a member of the vehicle crew, or another suitably instructed and trained person, is readily available to attend to any issues involving the vehicle.

NOTE: *A vehicle is not considered unsupervised if a driver secures and leaves the vehicle for no longer than is necessary, to access nearby facilities for required fatigue, rest, refreshment or service purposes, but remains readily available to attend to the vehicle.*

8.4.1.2 A vehicle is considered to be *in an isolated position* when it is separated from:

(a) Buildings and places in which there is or is likely to be a concentration of people by at least 15 metres; and
(b) Other vehicles transporting dangerous goods displaying placards by at least 8 metres.

8.4.2 Supervision of vehicles transporting dangerous goods

8.4.2.1 Vehicles carrying dangerous goods, other than a small load, shall be supervised or alternatively may be parked, unsupervised, in a secure depot or secure factory premises.

If such facilities are not available, the vehicle, after having been properly secured, may be parked, unsupervised, in an isolated position meeting the requirements of (a), or (b) below:

(a) A vehicle parking facility supervised by an attendant who has been notified of the nature of the load and the whereabouts of the driver;
(b) A suitable open space separated from the public highway and from dwellings, where the public does not normally pass or assemble.

The parking facilities permitted in (b) shall be used only if those described in (a) are not available.

8.4.2.2 A driver that is not able to continue driving due to fatigue-related laws may park in a position that is not normally permitted by 8.4.2.1, provided the driver complies with the requirements of 8.4.2.1 as far as is practicable in the circumstances.

8.4.3 Supervision of MPUs

Loaded MPUs shall be supervised or alternatively may be parked, unsupervised, in a secure depot or secure factory premises. Empty uncleaned MPUs are exempted from this requirement.

CHAPTER 8.5

ADDITIONAL REQUIREMENTS RELATING TO PARTICULAR CLASSES OR SUBSTANCES

8.5.1 In addition to the requirements of Chapters 8.1 to 8.4, when reference is made to them in Column (19) of Table A of Chapter 3.2, the following requirements shall apply to the carriage of the substances or articles concerned. In the event of conflict with the requirements of Chapters 8.1 to 8.4, the requirements of this Chapter shall take precedence.

S1: See 8.5.2

S2: **Additional requirements concerning the carriage of flammable liquids or gases**

(1) ***Portable lighting apparatus***

The load compartment of closed vehicles carrying liquids having a flash-point of not more than 60 °C or flammable substances or articles of Class 2, shall not be entered by persons carrying a torch or other portable lighting apparatus other than those so designed and constructed that they cannot ignite any flammable vapours or gases which may have penetrated into the interior of the vehicle.

(2) ***Operation of combustion heaters during loading or unloading***

The operation of combustion heaters of vehicles of type FL (see Part 9) is forbidden during loading and unloading and at loading sites.

(3) ***Precautions against electrostatic charges***

In the case of vehicles of type FL (see Part 9), a good electrical connection from the vehicle chassis to earth shall be established before tanks are filled or emptied. In addition, the rate of filling shall be limited.

S3: **Special provisions concerning the carriage of infectious substances**

The requirements 8.1.4.1.1 and 8.1.4.1.2 and the requirements in 8.3.4 shall not apply.

S4: See 7.1.7.

NOTE: *This special provision S4 does not apply to substances referred to in 3.1.2.6 when substances are stabilized by the addition of chemical inhibitors such that the SADT is greater than 50 °C. In this case, temperature control may be required under conditions of carriage where the temperature may exceed 55 °C.*

S5: **Special provisions common to the carriage of radioactive material of Class 7 in excepted packages (UN Nos. 2908, 2909, 2910 and 2911) only**

The requirements of the instructions in writing of 8.1.2.1 (b) and of 8.2.1, 8.3.1 and 8.3.4 shall not apply.

S6: **Special provisions common to the carriage of radioactive material of Class 7 other than in excepted packages**

The provisions of 8.3.1 shall not apply to vehicles carrying only packages, overpacks or containers bearing category I-WHITE labels.

The provisions of 8.3.4 shall not apply provided there is no subsidiary hazard.

Other additional requirements or special provisions

S7: (Deleted in ADR)

S8: During the carriage of these substances, stops for service requirements shall as far as possible not be made near inhabited places or frequented places. A longer stop near such places is permissible only with the consent of the competent authorities. This special provision only applies when transporting a load that is not a small load according to 1.1.3.6.

S9: During the carriage of these substances, stops for service requirements shall as far as possible not be made near inhabited places or frequented places. A longer stop near such places is permissible only with the consent of the competent authorities.

S10: During the period September to May, when a vehicle is stationary, the packages shall be effectively protected against the action of the sun, e.g. by means of sheets placed not less than 20 cm above the load.

S11: If, according to other regulations applicable in the jurisdiction, a driver has followed equivalent training under a different regime or for a different purpose covering the subjects defined in 8.2.2.3.5, the specialization training course may be totally or partially dispensed with.

S12: If the total number of packages containing radioactive material carried in the transport unit does not exceed 10, the sum of the transport indexes does not exceed 3 and there are no subsidiary hazards, the requirements in 8.2.1 concerning the training of drivers need not be applied. However, drivers shall then receive appropriate training in the requirements governing the carriage of radioactive material, commensurate with their duties. This training shall provide them with an awareness of the radiation hazards involved in the carriage of radioactive material. Such awareness training shall be confirmed by a certificate provided by their employer. See also 8.2.3.

S13: (Deleted in ADR)

S14 - S24: (Reserved, not included in this Code)

S50A: Self-contained breathing apparatus shall be carried when this substance is transported in tanks.

This provision shall be included on the transport document.

S51A: These substances shall only be carried when the following provisions are met:

(1) each load must be accompanied by a gas detector suitable for the detection of the gas(es) being carried, in accordance with AS 1596, and the vehicle crew shall be trained in its operation.
(2) the vehicle crew shall use the gas detector to check for the presence of the gas(es) being carried in the vicinity of the load at each routine stop that the vehicle makes, and on any other occasion when there is a significant risk that a leak may have occurred.

This provision shall be included on the transport document.

8.5.2 Requirements concerning the carriage of explosive substances and articles (Class 1)

8.5.2.1 *General provisions applying to all transport of class 1*

8.5.2.1.1 *Prohibition of smoking, fire, naked flame and ignition sources*

Smoking, the use of fire or of naked flames shall be prohibited on vehicles carrying substances and articles of Class 1, in their vicinity and during the loading and unloading of these substances and articles. This prohibition of smoking is also applicable to the use of electronic cigarettes and similar devices.

Any such accessories for the use of the vehicle crew shall be carried in a sealed container, which would prevent the spreading of any inadvertent ignition, and which shall be carried in the cabin of the vehicle.

A person shall not take a radio transmitter, mobile phone, pager or other radio frequency transmitters into an explosive carrying compartment.

8.5.2.1.2 *Places of loading and unloading*

Loading or unloading of substances and articles of Class 1 shall not take place in a public place in a built-up area without special permission from the competent authorities;

Loading or unloading of substances and articles of Class 1 in a public space elsewhere than in a built-up area without prior notice thereof having been given to the competent authorities shall be prohibited, unless operations are urgently necessary for reasons of safety;

If, for any reason, handling operations have to be carried out in a public place, then substances and articles of different kinds shall be separated according to the labels;

When vehicles carrying substances and articles of Class 1 are obliged to stop for loading or unloading operations in a public place, a distance of at least 50 m shall be maintained between the stationary vehicles. This distance shall not apply to vehicles belonging to the same transport unit.

8.5.2.1.3 *Convoys*

When vehicles carrying substances and articles of Class 1 travel in convoy, a distance of not less than 50 m shall be maintained between each transport unit and the next;

The competent authority may lay down rules for the order or composition of convoys.

8.5.2.1.4 *Locking of vehicles and security*

Doors and rigid covers in the load compartments of explosives vehicles and all openings in the load compartments of explosives vehicles that are transporting carrying substances and articles of Class 1 shall be locked during transport, except for the periods of loading and unloading.

Recorded checks or audits shall be carried out throughout the journey and at the final destination to determine that there has been no breach of any receptacle, carry box, other enclosed portion of a vehicle containing explosives, or closed transport unit used to transport explosives by road or rail. The recorded check at the final destination shall ensure that there is no discrepancy between the quantities and types of explosives loaded and unloaded against the documentation.

Any breach or discrepancy that is discovered during a check or audit which cannot be legitimately explained or reconciled within a short period of time, shall immediately be notify the local police and the relevant Competent Authority in accordance with 1.8.5.

8.5.2.1.5 *Prohibition on loading in passenger compartments*

Explosives shall not be loaded in the following locations:

(a) in the passenger compartment of a vehicle, or

(b) in a location that is accessible from the passenger compartment of the vehicle.

NOTE: *Packages are considered accessible if a package containing explosives can be accessed without physically leaving the passenger compartment.*

8.5.2.1.6 *Vehicles with an electric drive train*

Vehicles with an electric drive train shall not be used when transporting substances and articles of class 1, other than low hazard explosives.

NOTE: *this likewise applies to hybrid vehicles that include an electric power train in the mechanical driveline of an internal combustion engine.*

8.5.2.2 *Additional provisions applying to loads of explosives category 2 or 3*

8.5.2.2.1 *Consignment procedures*

Prior to a load being consigned, the consignor shall:

(a) Notify the proposed shipment to the consignee and the carrier engaged to transport the explosives; and

(b) receive advice that the consignee, or a person authorised by the consignee, is prepared to receive the consignment on arrival, or that arrangements have been made for the driver to store the explosives in a place authorised for that purpose by the Competent Authority.

8.5.2.2.2 *Loading and unloading*

The consignee or a person authorised by the consignee shall be present to receive the consignment of explosives, or the driver shall place and secure the explosives in a place approved for the storage of explosives.

Sources of ignition shall not be brought closer than 6 metres to the point where those explosives are being loaded or unloaded

The loading or unloading operation shall be completed without delay.

The vehicle's engine shall be turned off and the vehicle's brakes or wheel chocks shall be applied to prevent movement.

Unless otherwise approved, or the explosives are of UN 0332, freight containers shall not be handled with forklift tines.

Explosives shall only be loaded or unloaded during hours of daylight, unless adequate artificial lighting is provided.

8.5.2.2.2 *Transport procedures*

8.5.2.2.2.1 Prior to any explosives being loaded on a vehicle, a vehicle shall have sufficient fuel to complete the proposed journey or be carrying its maximum fuel load. If refuelling is necessary during the journey:

(a) the refuelling shall be carried out in a remote location;

(b) the vehicle engine shall be shut down during refuelling;

(c) sources of ignition shall be at least 6 metres from the vehicle;

(d) refuelling shall not be carried out during thunderstorms; and

(e) mobile telephones and radio transmitters shall not be operated during refuelling.

8.5.2.2.2.2 Except where stops are necessary to comply with the requirements of any law or are caused by vehicle breakdown, the driver shall not:

(a) allow the vehicle to remain stationary in a public place within a town or city;

(b) make temporary stops within 100 metres of protected works, other than for refuelling in accordance with S1(9)(a); and

(c) make stops for long periods within 10 metres of a road, street, source of ignition or railway, or within the distances specified in Table 8.1 of other protected works.

8.5.2.2.2.3 A vehicle transporting explosives shall not be left unattended unless the vehicle is guarded, except where the Competent Authority has accepted alternative security arrangements.

8.5.2.2.2.4 A vehicle transporting explosives shall avoid close proximity to any other vehicle displaying Explosives Class labels or “Explosives” placards, except when overtaking or passing the other vehicle.

8.5.2.3 ***Additional provisions applying to explosives category 3 only***

8.5.2.3.1 *Security requirements*

Any load compartment containing an explosives category 3 load of explosives shall be:

(a) locked with a padlock or lockset of a type equivalent to or better than SP7 as described in AS 4145.2 and AS 4145.4; and

(b) fitted with a tamper-evident security seal as described in AS 4225 to detect unauthorised access. Each seal shall be individually numbered and sufficiently robust to resist snapping or breaking.

8.5.2.3.2 *Transport procedures*

During the transport of a load meeting explosives category 3, a telephone advisory service meeting the requirements of 1.8.5.3 shall be available throughout the transport operation.

A vehicle transporting a load meeting explosives category 3 more than 5 km shall carry an attendant who meets the requirements applied to vehicle crews in 8.2.1. In place of the attendant, the vehicle may be equipped with a mobile communication system, provided that:

(a) The system is capable of contact with a base and/or emergency services throughout the journey; and

(b) The driver is provided with a means of radio communication (e.g. portable UHF radio) which can be operated independently, away from the vehicle in cases of emergency; and

(c) The safety of loading and/or unloading operations is not compromised by reduction in available personnel; and

(d) The driver has been trained in the use of the communication system and in the emergency procedures

CHAPTER 8.6

ROUTE PLANNING FOR VEHICLES CARRYING DANGEROUS GOODS

8.6.1 Prohibited routes for dangerous goods

8.6.1.1 Any provisions relating to route selection due to the presence of dangerous goods on a vehicle or train shall be observed during the transport of dangerous goods.

8.6.1.2 The provisions may require that dangerous goods may be or shall or shall not be transported:

(a) on a specified route; or
(b) in or through a specified area; or
(c) at a specified time.

8.6.1.3 The provisions may be subject to conditions concerning the quantity of certain classes or specific dangerous goods being transported.

8.6.1.4 The provisions may be made:

(a) As a determination by the competent authority;
(b) By another authority that is authorised to make such provisions; or
(c) Under other legislation that applies in the jurisdiction.

8.6.2 Route planning for dangerous goods

8.6.2.1 As far as is practicable, routes for road vehicles transporting dangerous goods shall be pre-planned. This route planning shall take into account the factors in this Section.

8.6.2.2 Drivers, and other persons who may be involved in vehicle routing, shall be provided with information on any route restrictions for dangerous goods in the locations where it is reasonably foreseeable that they may drive.

8.6.2.3 Where it is not possible to pre-plan the route in detail, the driver shall nonetheless be made aware of any areas to avoid in localities where travel is anticipated.

8.6.2.4 Routes should be selected to minimise the risk of personal injury or harm to the environment or property during the journey.

8.6.2.5 Routes should wherever practicable avoid heavily populated or environmentally sensitive areas, congested crossings, tunnels, narrow streets, alleys, or sites where there may be a concentration of people.

8.6.2.6 Even where formal restrictions are not in place, consideration should be given to whether a particular route is the most appropriate route to take.

CHAPTER 8.7

TRANSFER OF DANGEROUS GOODS

NOTE 1: *The transfer of dangerous goods is an activity that is also regulated under other legislation, such as work health and safety, dangerous goods storage and handling or other public safety legislation.*

NOTE 2: *The transfer provisions of this code apply when dangerous goods are transferred in a location that is normally accessible to the public, or where there may be off-site impacts from the transfer activity.*

8.7.1 Scope and definitions

8.7.1.1 *Scope*

This chapter applies to the transfer of dangerous goods that is undertaken in a location that is:

(a) accessible to the public;
(b) within 15 metres of a building or any other place where there is likely to be a concentration of people, other than a building on the premises where the transfer takes place; or
(c) on a premises where the transfer takes place, and any part of that premises is used for residential purposes.

8.7.1.2 *Definitions*

"Accessible to the public" means any area that is a *road* or *road related area*; except where that area has been closed off to the public and access is controlled.

NOTE 1: *"Road" and "road related area" are defined in the Road Rules in each jurisdiction, which are derived from the Australian Road Rules.*

"Exclusion zone" means the area around the vehicle and transfer infrastructure from which the public is excluded. In no case shall the exclusion zone be smaller than a hazardous area determined as part of a hazardous area classification as required in 8.7.2.1.

"Occupier of the premises where transfer occurs" means a person responsible for the premises where the dangerous goods transfer takes place.

"Transferor" means a person who has a task in the transfer of dangerous goods.

"Transfer of dangerous goods" means the transfer of dangerous goods into or out of a tank, bulk container or MEGC or package that is on a vehicle, or a tank-vehicle, tank-wagon, tube-vehicle or tube-wagon.

8.7.1.3 Transfer in response to a dangerous situation or an emergency

Where transfer of dangerous goods is necessary as part of a response to a dangerous situation or another emergency, it shall be undertaken at the direction of the emergency services or the competent authority.

Where the transfer does not, or cannot comply with this chapter:

(a) The public shall be excluded from the area where the transfer occurs; and
(b) The transfer shall take place in accordance with plans and procedures appropriate for the dangerous situation or emergency.

NOTE: *The regulations empower emergency services and the competent authority to direct or undertake transport that is not strictly in compliance with this code or the regulations, including transfer to manage a dangerous situation.*

8.7.2 ***General***

NOTE 1: *Transfer of dangerous goods is a complex task, and many aspects of a transfer operation are unique to a particular site or for particular dangerous goods. It is essential that the occupier of the premises where transfer occurs and the carrier operating the vehicle work together to manage the risks arising from transfer.*

NOTE 2: *The coordination required between parties is situational, and the expertise of each party needs to be accounted for. For example, it may be appropriate for the carrier to determine how to undertake the transfer safely, and to inform the site occupant of their obligations to maintain safety. This is especially the case where there is a significant disparity in expertise, such as delivery to a residential setting.*

NOTE 3: *Safe and effective transfer requires that the risk mitigations that are put in place are effectively communicated to the personnel involved in the transfer through robust procedures, training, and appropriate supervision to ensure procedures are followed.*

8.7.2.1 The occupier of the premises where transfer occurs, and the carrier operating the dangerous goods vehicle shall communicate and work together to ensure that:

(a) The transfer of dangerous goods is carried out in a way that eliminates the risks from the transfer of dangerous goods, or if it is not possible to eliminate the risks, minimise the risks so far as is reasonably practicable.
(b) If the transfer of dangerous goods may result in the creation of a hazardous area as defined in AS 60079.10.1, the hazardous areas shall be identified.
(c) An appropriate exclusion zone shall be determined for the transfer location. In no case shall the exclusion zone be smaller than the hazardous areas determined in (b).
(d) Procedures are implemented to ensure that the transfer of dangerous goods is carried out safely and in accordance with this chapter.
(e) The procedures developed are communicated to all personnel involved in the transfer, through appropriate instruction and training.

8.7.2.2 A person undertaking transfer shall only perform a transfer task after they have been provided with instruction and training in the task.

They shall undertake the transfer in accordance with procedures that set out how to undertake the transfer safely.

8.7.3 **Requirements applicable to all classes**

8.7.3.1 ***General***

Packages shall be filled in accordance with Chapter 4.1

Portable tanks and UN MEGCs shall be filled in accordance with Chapter 4.2

Fixed tanks (tank-vehicles), demountable tanks, tank-containers and tank swap bodies with shells made of metallic materials, and tube-vehicles and multiple-element gas containers (MEGCs) shall be filled in accordance with Chapter 4.3

Fibre-reinforced plastics (FRP) tanks, fixed tanks (tank-vehicles), demountable tanks, tank-containers and tank swap bodies shall be filled in accordance with Chapter 4.4

Vacuum operated waste tanks shall be filled in accordance with Chapter 4.5

Equipment used for transfer shall comply with 8.1.7

8.7.3.2 ***Transfer location***

8.7.3.2.1 Transfer shall not be undertaken with the vehicle on a road, except in circumstances where no alternative location is possible.

8.7.3.2.2 *Position of vehicle during transfer*

Dangerous goods shall only be transferred with the vehicle in a position:

(a) so that it can be driven away in a forward direction; or

(b) if it is not reasonably practicable to drive the vehicle in a forward direction owing to the layout of the site so that it can be driven away with minimal manoeuvring.

The area through which the vehicle needs to move or manoeuvre in order to leave the premises on which the transfer takes place shall, as far as practicable, be kept clear while the vehicle is on the premises.

Dangerous goods shall not be transferred into or out of a vehicle that is in an enclosed space if the transfer is likely to give rise to dangerous concentrations of dusts, mists or vapours.

8.7.3.2.3 *Designated transfer area*

A designated transfer area, including the location for the vehicle and exclusion zones determined in accordance with 8.7.2.1 shall be established. These shall be marked where it is practicable to do so, or otherwise clearly communicated to the person undertaking transfer.

If the occupier of the premises where transfer occurs has marked or otherwise designated an area on the premises in which a transfer operation is to take place, the vehicle shall be parked within the designated area during the transfer operation.

8.7.3.2.4 *Transfer in enclosed spaces*

Dangerous goods shall not be transferred into or out of a vehicle that is in an enclosed space if the transfer is likely to give rise to dangerous concentrations of dusts, mists or vapours.

8.7.3.3 *Transfer operation*

8.7.3.3.1 *General*

Dangerous goods shall not be transferred out of one vehicle into another vehicle.

Dangerous goods shall not be transferred into or out of a vehicle unless, throughout the transfer operation:

(a) The vehicle has been secured against movement;
(b) The cabin of the vehicle is unoccupied.

NOTE: *Bitumen tank vehicles may have these systems overridden to allow coupling to road making plant, but this may only occur in a location with restricted access and appropriate procedures in place to ensure safety.*

The level of light at all valves, fittings, gauges and hose connections that are used or may be used during a transfer operation shall be adequate to allow the transfer operation to be conducted safely.

A hose used in connection with a transfer operation should be handled so as to avoid excessive curvature, stress, abrasion or kinking that may damage the hose or its connections.

8.7.3.3.2 *Transfer under gas pressure*

If dangerous goods are transferred under gas pressure into or out of a vehicle:

(a) the design pressure of the supplying receptacle shall not be exceeded; and
(b) the gas used in the transfer operation shall be chemically inert to the dangerous goods being transferred; and
(c) air shall not be used to transfer flammable dangerous goods.

8.7.3.3.3 *Transfer process*

8.7.3.3.3.1 Prior to commencing transfer, the transferor shall:

(a) Establish an exclusion zone in accordance with the site procedures.

(b) Verify that there is sufficient ullage space in the receiving receptacle for the quantity that is to be transferred.
(c) If dangerous goods are to be transferred into or out of a vehicle in an area which is accessible to other vehicles, all reasonably practicable measures shall be taken to prevent any vehicle from driving over the hose assembly or striking its connections.

8.7.3.3.3.2 Throughout the transfer, the transferor shall:

(a) remain in proximity with the vehicle during the transfer operation; and
(b) be in a position to observe all relevant valves, fittings, gauges and hose connections that are used or may be used during the transfer operation; and
(c) have access to all equipment necessary and be prepared to stop the transfer operation in the event of:
(i) an unauthorised person entering the exclusion zone;
(ii) an occurrence that makes it unsafe to continue the transfer; or
(iii) an escape, leak or spill of the dangerous goods.

8.7.3.3.3.3 If the transferor is required to leave the area, the transfer shall be stopped, and the transfer shall only be recommenced after ensuring that the transfer is safe to continue.

NOTE: *The most effective means of ensuring that transfer is safe to continue is to start the transfer process from the beginning, as this reduces the risk of confusion about what has been done.*

8.7.3.3.3.4 All closures and valves that were removed or opened to enable the transfer to take place shall be reinstated or closed after the transfer is completed. The transport unit shall be properly configured for carriage of the dangerous goods prior to transport continuing.

8.7.4 Requirements applicable to certain classes

8.7.4.1 In addition to the requirements in 8.7.1 to 8.7.3, the requirements of 8.7.4 apply to certain substances. In the event of conflict, the requirements of 8.7.4 shall take precedence.

8.7.4.2 ***Requirements applicable to class 2***

8.7.4.2.1 The engine of the vehicle, and any internal combustion auxiliary engine on the vehicle, shall be stopped while hose connections for the transfer of dangerous goods of Division or Subsidiary Hazard 2.1 are coupled to or uncoupled from the vehicle or tank on the vehicle.

8.7.4.2.2 UN 1075 (petroleum gases, liquefied) shall be transferred into or out of a vehicle in accordance with AS/NZS 1596. Where transferred products are not covered under the scope of AS1596 all other requirements of 8.7.4.2 shall apply.

8.7.4.2.3 A person capable of using the transfer equipment shall remain at the vehicle and another person capable of using the transfer equipment shall remain at the storage container, except where an unobstructed line of sight, or another equally effective method, is maintained between the vehicle and the fill point of the storage container; and the transfer can be safely undertaken by a single person.

8.7.4.2.4 A person shall not transfer UN 1073 (liquefied oxygen) into or out of a road vehicle unless, during the transfer operation, there are no combustible substances or surfaces within 1 metre of the transfer hose are made of concrete or other non-combustible material.

8.7.4.2.5 Liquefied gases shall not be transferred into a storage tank or other receptacle housed within a building unless:

(a) the building is designed and used solely for the purpose of storing dangerous goods of Class 2; or

(b) the building may be used for that purpose under a law of the State or Territory in which the building is located that relates to the storage and handling of dangerous goods.

8.7.4.3 ***Requirements applicable to class 3***

8.7.4.3.1 Tanks or other containers shall be bottom filled. Where bottom filling is not possible, the filling shall be through:

(a) A tight fill connection and fill pipe, as described in AS 1692; or
(b) A loading spear that remains in contact with the bottom of the tank throughout the loading process.

8.7.4.3.2 Class 3 dangerous goods shall be transferred in accordance with AS 1940.

8.7.4.3.3 Class 3 dangerous goods shall not be transferred directly into packagings from a vehicle, other than a storage tank.

8.7.4.3.4 Class 3 dangerous goods shall only be transferred into or out of a vehicle through a pipeline and hose connection; except in circumstances where AS 1940 permits the use of a hand-held nozzle.

8.7.4.4 ***Additional requirements applicable to all flammable dangerous goods***

8.7.4.4.1 These provisions apply to the transfer of dangerous goods of class 3, 4 or gases of group F.

8.7.4.4.2 *Ignition sources within a hazardous area*

8.7.4.4.2.1 During a transfer operation into or out of a vehicle there shall be no source of ignition within any hazardous area determined in accordance with AS/NZS 60079.10.11.

8.7.4.4.2.2 If an ignition source, or a person that may be carrying an ignition source enters the hazardous area, the transfer shall be immediately paused or stopped. The transfer shall not recommence until the ignition source has been removed from the hazardous area.

8.7.4.4.3 *Electrical bonding during transfer*

8.7.4.4.3.1 Where flammable dangerous goods are transferred into or out of a vehicle, the supplying receptacle shall be electrically bonded to the receiving receptacle before the transfer commences.

8.7.4.4.3.2 The bonding shall remain in place until all hose assemblies have been uncoupled and all closures have been closed.

8.7.4.4.4 *Engine operation during transfer*

8.7.4.4.4.1 During transfer of dangerous goods out of a road vehicle, the engine of the vehicle shall remain stopped unless the transfer involves the use of a pump or compressor driven by the vehicle's engine.

8.7.4.4.4.2 During transfer of dangerous goods into a road vehicle, the engine of the vehicle shall remain stopped unless the vehicle is a vacuum tank vehicle, or is approved to load the goods.

8.7.4.5 ***Additional requirements applicable to toxic gases and packing group I***

Dangerous goods of packing group I or Division 2.3 shall not be transferred out of a road vehicle in a place with public access, except for:

(a) UN 1005 (ammonia, anhydrous); or
(b) UN 3318 (ammonia solution).

PART 9

Requirements concerning the construction and approval of vehicles

CHAPTER 9.1

SCOPE, DEFINTIONS AND GENERAL REQUIRMENTS FOR VEHICLES

9.1.1 Scope and definitions

9.1.1.1 ***Scope***

The requirements of Part 9 shall apply to road vehicles intended for the carriage of dangerous goods. These requirements refer to vehicles, as regards their construction, approval, and technical inspections.

9.1.1.2 ***Definitions***

For the purposes of Part 9:

"Vehicle" means any vehicle, whether complete, incomplete or completed, intended for the carriage of dangerous goods by road;

"FL vehicle" means:

(a) A vehicle intended for the carriage of liquids having a flash-point of not more than 60 °C in fixed tanks, or demountable tanks with a capacity exceeding 1 m³ or in tank containers or portable tanks with an individual capacity exceeding 3 m³; or

(b) A vehicle intended for the carriage of flammable gases in fixed tanks, or demountable tanks, with a capacity exceeding 1 m³ or in tank-containers, portable tanks or MEGCs with an individual capacity exceeding 3 m³; or

(c) A tube-vehicle with a total capacity exceeding 1 m³ intended for the carriage of flammable gases; or

(d) A vehicle intended for the carriage of hydrogen peroxide, stabilized or hydrogen peroxide, aqueous solution stabilized with more than 60 % hydrogen peroxide (Class 5.1, UN No. 2015) in fixed tanks, or demountable tanks, with a capacity exceeding 1 m³ or in tank-containers or portable tanks with an individual capacity exceeding 3 m³;

"AT vehicle" means:

(a) A vehicle, other than an FL vehicle, intended for the carriage of dangerous goods in fixed tanks or demountable tanks with a capacity exceeding 1 m³ or in tank-containers, portable tanks or MEGCs with an individual capacity exceeding 3 m³; or

(b) A tube-vehicle with a total capacity exceeding 1 m³ other than a FL vehicle;

"AN vehicle" means a vehicle that is intended for the carriage of UN 3375, UN 2426, UN 1942 or UN 2067 in tanks, bulk containers or IBCs. Where an AN vehicle is used for tank transport, it shall additionally comply with the requirements of an AT vehicle.

"Complete vehicle" means any vehicle which does not need any further completion (e.g. one stage built vans, lorries, tractors, trailers);

"Incomplete vehicle" means any vehicle which still needs completion in at least one further stage (e.g. chassis-cab, trailer chassis);

"Completed vehicle" means any vehicle which is the result of a multi-stage process (e.g. chassis or chassis-cab fitted with a bodywork);

"ADG approval" means certification by a competent authority that a vehicle intended for the carriage of dangerous goods satisfies the relevant technical requirements of this Part as an FL or AT vehicle.

"Dangerous goods containment system" means the shell, service and structural equipment of a fixed-tank, demountable tank, tank-container, portable tank, or the elements, service and structural equipment of a tube-vehicle or MEGC.

"Vehicle dossier" is the compilation of information regarding the vehicle, along with the attached tank(s) or other systems. It includes:

(a) Information from the manufacturer regarding the vehicle's compliance with dangerous goods design features and information regarding maintenance;

(b) The record of inspections and maintenance actions undertaken on the vehicle;

(c) Details of any modifications made to the vehicle; and

(d) Any records for the dangerous goods containment, such as the tank record required by Chapter 6.8.

NOTE: The vehicle dossier assists vehicle owners to comply with their obligations, and to ensure that any inspections, maintenance and modification continue to comply with the ADG Code. It may be kept in any form.

9.1.2 Approval of FL and AT vehicles

NOTE: *No special certificates of approval shall be required for vehicles other than FL and AT vehicles, apart from those required by the general safety regulations normally applicable to vehicles in the country of origin.*

NOTE: *Competent authorities may approve tanks and vehicles together as a part of a single process.*

9.1.2.1 *General*

FL and AT vehicles shall comply with the relevant requirements of this Part.

Every completed FL or AT vehicle shall be approved by the competent authority prior to being used for the transport of dangerous goods, in accordance with the procedures in 1.8.7.

The application for approval shall demonstrate compliance with the requirements of Chapter 9.2 for the vehicle, including any relevant requirements for the dangerous goods containment system.

Where the dangerous goods containment system is already approved, the demonstration of compliance may include verification to ensure that the dangerous goods containment system remains in conformance with its approval.

The Competent Authority may also approve an FL or AT vehicle that forms part of, or is used, on a tank vehicle and that does not comply with the relevant requirements specified in Chapter 9.2 if:

(a) the application for design approval of the FL or AT vehicle demonstrates compliance with other criteria which are acceptable to the Competent Authority; and

(b) the Competent Authority is satisfied that the use of the FL or AT vehicle will not result in greater risk than a design that complies with the relevant requirements specified in Chapter 9.2.

The application to the competent authority shall be accompanied by a declaration of conformity with the requirements of Chapter 9.2. This declaration shall be made by a suitably qualified person recognised by the competent authority.

9.1.2.2 (reserved, type-approved vehicles not included in the ADG Code)

9.1.2.3 (reserved, inspections covered in 9.1.6 and 9.1.7)

9.1.3 Certificate of approval

9.1.1.3 <Insert either standard CAP approval template or list of information to include here>

9.1.4 Compliance plates

Every vehicle shall be fitted with any compliance plates required by Chapter 6.8 or AS 2809.1

9.1.5 Modification of vehicles

In the case of a modification of an approved vehicle, the relevant examination, testing, inspection and approval are limited to the parts of the product that have been modified.

All modifications shall meet the provisions of the Code applicable at the time of the modification. For all parts of the product not affected by the modification, the documentation of the initial type approval remains valid.

9.1.6 Initial inspection of completed FL and AT vehicles

9.1.6.1 Every complete or completed vehicle shall be subjected to an initial inspection to verify conformity with the relevant technical requirements of Chapter 9.2. This inspection shall ensure that the vehicle complies with its approval.

9.1.6.2 At the time of this inspection, a vehicle dossier shall be completed, and be provided to the purchaser of the vehicle and kept along with the tank record.

9.1.7 Inspection and maintenance of completed vehicles

9.1.7.1 Completed FL and AT vehicles shall be subject to an inspection and maintenance program to ensure conformance to the requirements of Chapter 9.2. These inspections shall additionally be in accordance with the requirements of AS 2809.1. These inspections shall be determined by distance travelled or time but shall occur at intervals that do not exceed three months.

Note 1: *Tanks are also required to be inspected and maintained in accordance with the requirements of Chapter 6.8.*

Note 2: *AS 2809.1 contains detailed information on items to be inspected and inspection and maintenance intervals.*

9.1.7.2 Vehicles other than FL and AT vehicles shall be subject to an inspection and maintenance program to ensure conformance to the requirements of Chapter 9.4, Chapter 9.5 or Chapter 9.6 as appropriate.

9.1.7.4 When the safety of the vehicle or of its equipment may have been impaired as a result of repairs, alterations or accident, an exceptional inspection shall be carried out.

9.1.7.5 Records of all inspections and maintenance shall be kept by the vehicle owner as part of the vehicle record.

9.1.7.6 When a vehicle is sold or transferred, a copy of all maintenance records shall be provided to the new owner along with the vehicle. If the vehicle is an FL or AT vehicle, a copy of the competent authority approval and the vehicle dossier shall be provided to the new owner.

CHAPTER 9.2

REQUIREMENTS FOR FL AND AT VEHICLES USED FOR THE TRANSPORT OF TANKS

9.2.1 Compliance with the requirements of this Chapter

9.2.1.1 AT vehicles shall comply with the requirements contained in 9.2.2. FL vehicles shall comply with the requirements of 9.2.2 and 9.2.3.

9.2.1.2 FL and AT vehicles shall additionally comply with the requirements of the standards listed below.

For the issuance of a type approval certificate, a standard applicable according to the indication in column (4) shall be chosen from the table below.

Column (5) gives the latest date when existing type approvals shall be automatically withdrawn; if no date is shown the type approval remains valid until it expires.

Reference	Title	Applicable for new type approvals or for renewals	Latest date for withdrawal of existing type approvals
(1)	**(2)**	**(3)**	**(4)**
AS 2809.1:2023	Road tank vehicles for dangerous goods. Part 1: General requirements for all road tank vehicles.	Until further notice	

NOTE: *Withdrawal of an existing type approval means that a vehicle may no longer be built to that approval. Vehicles built earlier may continue to be used in accordance with transitional provisions in Chapter 1.6.*

9.2.2 Requirements applicable to AT and FL vehicles

9.2.2.1 ***General provisions***

In addition to the vehicle proper, or the units of running gear used in its stead, a tank-vehicle comprises one or more shells, their items of equipment and the fittings for attaching them to the vehicle or to the running-gear units.

Once the demountable tank has been attached to the carrier vehicle, the entire unit shall meet the requirements prescribed for tank-vehicles.

The vehicle shall conform to the general vehicle safety regulations and roadworthiness requirements in force in the jurisdiction in which it is used.

9.2.2.2 ***Requirements concerning tanks***

Fixed tanks or demountable tanks made of metal shall meet the relevant requirements of Chapter 6.8.

Elements of tube-vehicles and of MEGCs shall meet the relevant requirements of Chapter 6.2 in the case of cylinders, tubes, pressure drums and bundles of cylinders and the requirements of Chapter 6.8 in the case of tanks.

Tank-containers made of metal shall meet the requirements of Chapter 6.8, portable tanks shall meet the requirements of Chapter 6.7 or, if applicable, those of the IMDG Code (see 1.1.4.2).

Tanks made of fibre-reinforced plastics material shall meet the requirements of Chapter 6.9 or Chapter 6.13, as appropriate.

Vacuum-operated waste tanks shall meet the requirements of Chapter 6.10.

9.2.2.3 ***Fastening***

Fastenings shall be designed to withstand static and dynamic stresses in normal conditions of carriage.

Fastenings also include any supporting frames used for mounting the structural equipment (see definition in 1.2.1) to the vehicle.

Fastenings in the case of tank-vehicles, tube-vehicles and vehicles carrying tank-containers, demountable tanks, portable tanks, MEGCs or UN MEGCs shall be capable of absorbing, under the maximum permissible load, the following separately applied static forces:

- In the direction of travel: twice the total mass multiplied by the acceleration due to gravity (g);
- Horizontally, at right angles to the direction of travel: the total mass multiplied by the acceleration due to gravity (g);
- Vertically upwards: the total mass multiplied by the acceleration due to gravity (g);
- Vertically downwards: twice the total mass multiplied by the acceleration due to gravity (g).

NOTE: *The requirements of this paragraph do not apply to twist lock tie-down devices in compliance with AS 3711.3:2015 "Freight containers Corner fittings". However, the requirements apply to any frames or other devices used for support of such fastenings on the vehicle.*

For tank-vehicles, tube-vehicles and vehicles carrying demountable tanks, the fastenings shall withstand the minimum stresses as defined in 6.8.2.1.11 to 6.8.2.1.13, 6.8.2.1.15 and 6.8.2.1.16.

9.2.2.4 ***Stability of tank-vehicles***

9.2.2.4.1 The stability angle for a tank vehicle is calculated by measuring the base angle of an isosceles triangle, with the base length at ground level equal to the overall width between the outside walls of the outside tyres of the main load bearing axle groups, and the apex of the triangle at the height of the tank centroid.

9.2.2.4.2 The static roll-over threshold for a tank vehicle is calculated using the National Heavy Vehicle Regulator's Performance Based Standards (PBS) methodology for static roll-over threshold (SRT)

9.2.2.4.3 The stability of a tank-vehicle shall meet one of the following parameters:

(a) If calculated using the stability angle method
- For rigid tank vehicles, the stability angle shall be no more than 64°;
- For all other tank vehicles, the stability angle shall be no more than 62°;

(b) If calculated using the SRT method, the SRT value shall be no less than 0.4g.

NOTE: *Where the PBS SRT method is used, information on the input parameters shall be included as part of the vehicle dossier.*

9.2.2.4.4 If the vehicle is a trailer, it shall be stable when disconnected from the towing vehicle.

9.2.2.4.5 The vehicle shall have an operating vehicle stability function (as defined in the relevant Australian Design Rules) if it is required to be fitted.

NOTE: *AS 2809.1 has required a vehicle stability function since AS 2809.1:2020 and at least one jurisdiction has introduced a requirement that a system be fitted to all tank trailers.*

9.2.2.5 ***Rear protection of vehicles***

A bumper sufficiently resistant to rear impact shall be fitted over the full width of the tank at the rear of the vehicle. The rear protection shall also include a rear underrun protection device.

This provision does not apply to vehicles used for the carriage of dangerous goods in tank-containers, MEGCs or portable tanks filled or emptied once in intermodal service.

9.2.2.6 ***Prevention of fire risks***

9.2.2.6.1 *Electric power train*

Measures shall be taken to prevent any danger to the load by heating or ignition.

9.2.2.6.2 *Vehicle endurance braking*

Vehicles equipped with endurance braking systems emitting high temperatures placed behind the rear wall of the driver's cab shall be equipped with a thermal shield securely fixed and located between this system and the tank or load so as to avoid any heating, even local, of the tank wall or the load.

In addition, the thermal shield shall protect the braking system against any outflow or leakage, even accidental, of the load. For instance, a protection including a twin-shell shield shall be considered satisfactory.

9.2.2.7 ***Prevention of other risks***

9.2.2.7.1 Where a tail shaft is present, it shall be fitted with protection to prevent damage to the cargo-carrying components in the event of a failure of the tail shaft.

9.2.2.7.2 Any stowage or restraint devices for accessories or other loose equipment shall be designed to restrain the goods in accordance with the Load Restraint Guide.

9.2.2.7.3 Where an engine is used as a pump drive engine, it shall be capable of being shut down in an emergency.

9.2.2.7.4 Tank ladders, steps and fall arrest systems shall be suitable for the vehicle and the work to be performed on the vehicle.

9.2.2.7.5 Markings shall be provided to make clear the operation of valves that are actuated remotely.

9.2.2.7.6 Vehicles shall be fitted with an interlock system to ensure the vehicle is secured while cargo transfer is undertaken, and the vehicle is not properly configured for on-road use.

9.2.2.7.7 Any heating jackets or ducts shall be provided with:

(a) Markings detailing maximum operational temperatures and pressures.
(b) Pressure relief valves appropriate to the design of the system.

9.2.2.7.8 Fuel systems for engines fuelled by LNG shall be so equipped and situated to avoid any danger to the load due to the gas being refrigerated.

9.2.2.7.9 Combustion heaters shall not be fitted to AT or FL vehicles.

9.2.2.7.10 When any equipment is fitted to the vehicle, measures shall be taken to prevent any danger to the load by heating or ignition, including from systems or energy storage providing power to the equipment.

9.2.2.8 ***Electrical equipment***

9.2.2.8.1 *General provisions*

The installation shall be so designed, constructed and protected that it cannot provoke any unintended ignition or short circuit under normal conditions of use of vehicles.

9.2.2.8.2 *Wiring*

9.2.2.8.2.1 *Cables*

No cable in an electrical circuit shall carry a current in excess of that for which the cable is designed. Conductors shall be adequately insulated.

The cables shall be suitable for the conditions in the area of the vehicle, such as temperature range and fluid compatibility conditions as they are intended to be used.

The cables shall be in conformity with the requirements of AS 2809.

Cables shall be securely fastened and positioned to be protected against mechanical and thermal stresses.

9.2.2.8.2.2 *Additional protection*

Cables located to the rear of the driver's cab and on trailers shall be additionally protected to minimize any unintended ignition or short-circuit in the event of an impact or deformation. They shall consist of both positive and negative wires.

The additional protection shall be suitable for the conditions during normal use of the vehicle.

The additional protection is complied with if multicore cables in conformity with AS 2809 or one of the examples in figures 9.2.2.8.2.2.1 to 9.2.2.8.2.2.4 below or another configuration that offers equally effective protection.

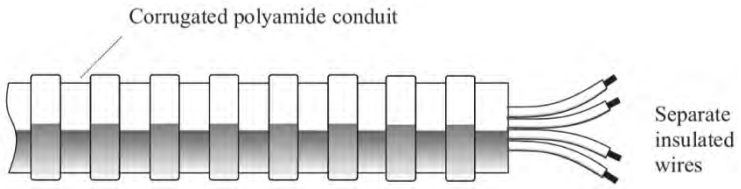


Figure 9.2.2.8.2.2.1

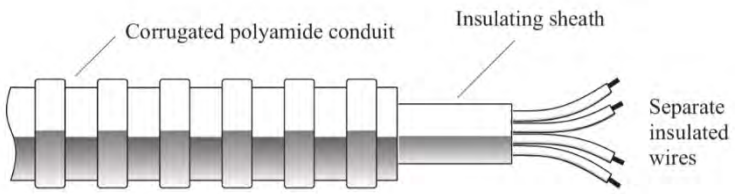


Figure 9.2.2.8.2.2.2

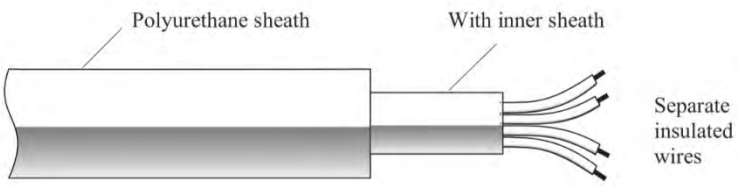


Figure 9.2.2.8.2.2.3

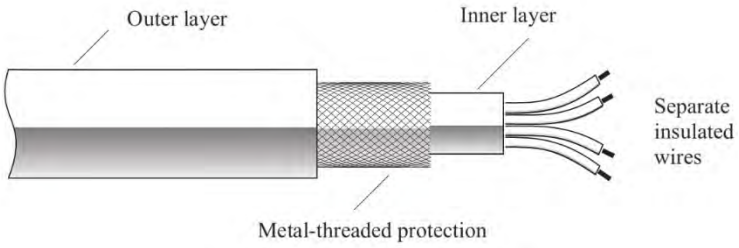


Figure 9.2.2.8.2.2.4

9.2.2.8.3 *Fuses and circuit breakers*

All circuits shall be protected by fuses or automatic circuit breakers, except for the following:

- From the starter battery to the cold start system;
- From the starter battery to the alternator;
- From the alternator to the fuse or circuit breaker box;
- From the starter battery to the starter motor;

The above unprotected circuits shall be as short as possible.

9.2.2.8.4 *Batteries*

Battery terminals shall be electrically insulated or the battery shall be covered by an insulating cover.

Batteries which may develop ignitable gas and are not located under the engine bonnet, shall be fitted in a vented box.

9.2.2.8.5 *Electrical connections between motor vehicles and trailers*

9.2.2.8.5.1 Electrical connections shall be designed to prevent:

- Ingress of moisture and dirt; the connected parts shall have a protection degree of at least IP 54 in accordance with AS 60529;
- Accidental disconnection

9.2.2.8.5.2 Electrical connections for other purposes concerning the proper functioning of the vehicles or their equipment may be used provided they comply with the requirements of 9.2.2.8.5.1.

9.2.2.8.6 *Battery isolation switch*

9.2.2.8.6.1 A switch for breaking the electrical circuits shall be placed as close to the battery as practicable. If a single pole switch is used it shall be placed in the supply lead and not in the earth lead.

9.2.2.8.6.2 A control device to facilitate the disconnecting and reconnecting functions of the switch shall be installed in the driver's cab. It shall be readily accessible to the driver and be distinctively marked. It shall be protected against inadvertent operation by either adding a protective cover, by using a dual movement control device or by other suitable means. Additional control devices may be installed provided they are distinctively marked and protected against inadvertent operation. If the control device(s) are electrically operated, the circuits of the control device(s) are subject to the requirements of 9.2.3.5.4

9.2.2.8.6.3 The switch shall break the circuits within 10 seconds after activation of the control device.

9.2.2.8.6.4 The switch shall have a casing with protection degree IP 65 in accordance with AS 60529.

9.2.2.8.6.5 The cable connections on the switch shall have protection degree IP 54 in accordance with AS 60529. However, this does not apply if these connections are contained in a housing which may be the battery box. In this case it is sufficient to insulate the connections against short circuits, for example with a rubber cap.

9.2.2.8.6.6 The vehicles electrical system shall be fitted with a roll-over device to actuate the battery isolation switch in the event of a vehicle roll-over.

9.2.3 Additional requirements applicable to FL vehicles

9.2.3.1 *Fuel tanks and cylinders*

The fuel tanks and cylinders supplying the engine of the vehicle shall meet the following requirements:

(a) In the event of any leakage under normal conditions of carriage, the liquid fuel or the liquid phase of a gaseous fuel shall drain to the ground and not come into contact with the load or hot parts of the vehicle;

(b) Fuel tanks containing petrol shall be equipped with an effective flame trap at the filler opening or with a closure enabling the opening to be kept hermetically sealed.

(c) The discharge opening(s) of pressure relief devices and/or pressure relief valves of fuel tanks containing gaseous fuels shall be directed away from air intakes, fuel tanks, the load or hot parts of the vehicle and shall not impinge on enclosed areas, other vehicles, exterior-mounted systems with air intake (i.e. air-conditioning systems), engine intakes, or engine exhaust. Pipes of the fuel system shall not be fixed on the shell containing the load.

9.2.3.2 ***Engine***

The engine propelling the vehicle shall be so equipped and situated to avoid any danger to the load through heating or ignition.

Electric power trains shall not be used for FL or AN vehicles

NOTE: *9.2.3.2 likewise applies to hybrid vehicles that include an electric power train in the mechanical driveline of an internal combustion engine.*

9.2.3.3 ***Exhaust system***

The exhaust system (including the exhaust pipes) shall be so directed or protected to avoid any danger to the load through heating or ignition. Parts of the exhaust system situated directly below the fuel tank (diesel) shall have a clearance of at least 100 mm or be protected by a thermal shield.

9.2.3.4 ***Other hot components***

Any other hot component, as defined in AS 2809.1, shall be protected in the event of spills or leaks by a thermal shield or deflector.

9.2.3.5 ***Additional safety requirements concerning FL vehicles***

9.2.3.5.1 The following vehicles shall be equipped with an automatic fire suppression system for the compartment where the internal combustion engine propelling the vehicle is located:

(a) FL vehicles carrying liquefied and compressed flammable gases with a classification code including an F; and

(b) FL vehicles carrying packing group I or packing group II flammable liquids.

9.2.3.5.2 The following vehicles shall be fitted with thermal protection capable of mitigating the propagation of a fire from all the wheels:

(a) FL vehicles carrying liquefied and compressed flammable gases with a classification code including an F; and

(b) FL vehicles carrying packing group I or packing group II flammable liquids.

NOTE: *The aim is to avoid the propagation of the fire to the load, for example with thermal shields or other equivalent systems, either:*

(a) by direct spread from the wheel to the load; or

(b) by indirect spread from the wheel to the cabin and further to the load.

9.2.3.5.3 *Electrical bonding of FL vehicles*

Tanks made of metal or of fibre-reinforced plastics material of FL tank-vehicles and elements of FL tube-vehicles shall be linked to the chassis by means of at least one good electrical connection. Any metal contact capable of causing electrochemical corrosion shall be avoided.

NOTE: *See also 6.13.1.2 and 6.13.2.14.3.*

9.2.3.5.4 *Electrical equipment*

Electrical equipment on FL vehicles, situated in areas where an explosive atmosphere is, or may be expected to be, present in such quantities as to require special precautions, shall be suitable for use in a hazardous area, or be otherwise permitted in accordance with the requirements of AS 2809.

Permanently energized electrical equipment, including the leads, which is situated outside Zones 0 and 1 shall meet the requirements for Zone 1 for electrical equipment in general or meet the requirements for Zone 2 according to AS 60079 part 14 for electrical equipment situated in the driver's cab. The requirements for the relevant group of electrical apparatus according to the substances to be carried shall be met.

9.2.4 **Additional safety requirements concerning AN vehicles**

NOTE: *These requirements apply to vehicles transporting ammonium nitrate that presents an explosion risk in the event of a fire.*

9.2.4.1 ***Additional fire-fighting equipment for AN vehicles***

9.2.4.1.1 AN vehicles shall be fitted with a fixed fire fighting system in accordance with 8.1.4.3.3. This shall be additional to the fire extinguishers required by 8.1.4.1.

9.2.4.1.2 Alternatively, a vehicle may be equipped with an equivalent capacity of additional extinguishing agent in portable extinguishers as required by 8.1.4.3.3, installed in accordance with 8.1.4.5.

9.2.4.1.3 Additional fire-fighting equipment for AN vehicles shall be subjected to a suitable inspection and maintenance regime.

9.2.4.2 ***Tyre temperature monitoring for AN vehicles***

9.2.4.2.1 Tyre temperature monitoring requires a determination of when a tyre or wheel temperature is dangerous. The appropriate values for this shall be determined based on the system and type of monitoring being used.

9.2.4.2.2 AN vehicles shall be fitted with automated temperature monitoring of tyres or wheel assemblies. Such an automated system shall:

(a) provide real time monitoring and alert the driver if a dangerous temperature is recorded;
(b) be suitable for the weather, road and environmental conditions likely to be encountered;
(c) be suitable for the type of vehicle used;
(d) be installed as per manufacturer specifications;
(e) record and store temperature data for analysis; and
(f) monitor individual tyre or wheel hub temperatures

9.2.4.2.3 Alternatively, this may be substituted for a system of manual monitoring of tyre or wheel temperatures using an infrared thermometer or thermal imaging camera. Such a system shall follow an established procedure to:

(a) undertake comprehensive temperature monitoring at defined intervals, including:
    (i) before loading and unloading vehicles; and
    (ii) any time the vehicle is parked, such as for a fatigue break;
(b) identifies dangerous temperatures;
(c) keep a record of tyre temperatures; and
(d) includes maintenance and calibration of the equipment.

9.2.4.3 ***Information about AN vehicle systems***

Information on the use and maintenance of systems required by 9.2.4.1 and 9.2.4.2 shall be developed and communicated to any person required to use or maintain the system. Training in the use of these systems shall be included in the training required by 8.2.1.

CHAPTER 9.3

REQUIREMENTS FOR VEHICLES FOR THE TRANSPORT OF CLASS 1 SUBSTANCES AND ARTICLES

9.3.1 **Materials to be used in the construction of vehicle bodies**

No materials likely to form dangerous compounds with the explosive substances carried shall be used in the construction of the body.

9.3.2 **Combustion heaters and auxiliary air-conditioning equipment**

9.3.2.1 Combustion heaters shall not be fitted to vehicles for the transport of class 1

9.3.2.2 Any auxiliary air-conditioning equipment shall be installed in a way that does not create a risk to the explosives being transported.

9.3.3 **General requirements for all class 1 vehicles**

9.3.3.1 If an enclosed vehicle body is used as an explosives compartment, it shall comply with the requirements of explosives compartments set out in Chapter 6.15.

9.3.3.2 Fastenings of explosives compartments and freight containers shall be capable of absorbing, under the maximum permissible load, the following separately applied static forces:

- In the direction of travel: twice the total mass multiplied by the acceleration due to gravity (g);
- Horizontally, at right angles to the direction of travel: the total mass multiplied by the acceleration due to gravity (g);
- Vertically upwards: the total mass multiplied by the acceleration due to gravity (g);
- Vertically downwards: twice the total mass multiplied by the acceleration due to gravity (g).

NOTE: *The requirements of this paragraph do not apply to twist lock tie-down devices in compliance with AS 3711.3:2015 "Freight containers Corner fittings". However, the requirements apply to any frames or other devices used for support of such fastenings on the vehicle.*

9.3.3.3 Any surfaces of the vehicle in contact with class 1 substances and articles, as packaged for transport, shall be clean, in good condition, and free of any defects or projections likely to cause damage to packages during transport.

9.3.3.4 All load securing devices shall be in good condition and effective for their designed purposes.

9.3.4 **Class 1 vehicles transporting an explosives category 3 load**

NOTE: *9.3.4 only applies to vehicles transporting an explosives category 3 load and does not apply to vehicles registered by the department of defence.*

NOTE 2: *This section is based on the requirements for high security risk loads from the AEC, which has been merged in with explosives category 3.*

9.3.4.1 ***General***

9.3.4.1 The vehicles shall be designed, constructed and equipped so that the explosives are protected from external hazards and the weather. These vehicles shall be closed. The driver's compartment shall be separated from the load compartment by a continuous wall. The loading surface shall be continuous. Load restraint anchorage points may be installed. All joints shall be sealed. All openings shall be capable of being locked. They shall be so constructed and placed as to overlap at the joints.

9.3.4.2 ***Vehicle approval***

The vehicle shall be approved in accordance with the requirements of Chapter 9.1.

9.3.4.3 ***Firescreens***

9.3.4.3.1 The vehicle shall be fitted with both horizontal and vertical fire screens, except where:

(a) All explosives compartments are fitted with an equally effective horizontal firescreen;

(b) All explosives compartments adjacent to the vehicle cabin are fitted with an equally effective firescreen;

(c) The horizontal and vertical firescreen meet for the full length of the contact line of the fire screens.

NOTE 1: *The vehicle tray may function as the horizontal firescreen, provided it meets the performance requirements.*

NOTE 2: *The end wall of a freight container may function as the vertical firescreen, provided it meets the performance requirements. Forward facing container doors are not considered to meet this requirement.*

9.3.4.3.2 Horizontal firescreens shall:

(a) Be made of steel no less than 3 mm thick;
(b) Cover the whole of the vehicle tray or chassis.

9.3.4.3.3 Vertical firescreens shall:

(a) Be made of steel no less than 3 mm thick;
(b) Cover the full width of the vehicle;
(c) Extend from the horizontal firescreen to no lower than the top of the cabin;
(d) Be installed so a 100 mm air gap is present between the rear wall of the cabin and the vertical firescreen.

9.3.4.4 ***Engine, fuel tank and explosives compartment***

9.3.4.4.1 The engine propelling the vehicle shall be placed forward of the front wall of the load compartment; it may nevertheless be placed under the load compartment, provided this is done in such a way that any excess heat does not constitute a hazard to the load by raising the temperature on the inner surface of the load compartment above 80 °C.

9.3.4.4.2 The vehicle engine shall be a compression ignition engine which uses a combustible liquid as a fuel.

NOTE: *Vehicles with an electric drive train are not permitted for the transport of explosives.*

9.3.4.4.3 where the engine is fitted with an alternator, the battery isolation switch shall be of a type which automatically opens the alternator field coil circuit immediately before the battery is isolated.

9.3.4.4.4 Where the vehicle fuel tank is located to the rear of the vertical firescreen, it shall be:

(a) mounted below the horizontal firescreen;
(b) protected so that the likelihood of accidental damage is minimal; and
(c) designed to prevent accumulation of spilt fuel on any part of the vehicle.

9.3.4.5 ***External heat sources and explosives compartment***

9.3.4.5.1 The exhaust system of the vehicle or other parts of these complete or completed vehicles shall be so constructed and situated that any excess heat shall not constitute a hazard to the load by raising the temperature on the inner surface of the load compartment above 80 °C.

9.3.4.5.2 The exhaust shall be located no less than 50 mm below the horizontal firescreen.

9.3.4.6 ***Electrical equipment***

9.3.4.6.1 The electrical installation shall comply with the requirements of 9.2.2.8

9.3.4.6.2 The electrical installation in an explosives compartment shall be dust-protected at least IP 54 according to AS 60529 or equivalent. In the case of carriage of items and articles of compatibility group J, protection to at least IP 65 according to AS 60529 or equivalent shall be provided.

9.3.4.6.3 No wiring shall be positioned inside an explosives compartment. Electrical equipment accessible from the inside of an explosives compartment shall be sufficiently protected from mechanical impact from the inside.

CHAPTER 9.4

ADDITIONAL REQUIREMENTS CONCERNING THE CONSTRUCTION OF THE BODIES OF COMPLETE OR COMPLETED VEHICLES INTENDED FOR THE CARRIAGE OF DANGEROUS GOODS IN PACKAGES (OTHER THAN CLASS 1)

9.4.1 Completed vehicles for the transport of dangerous goods in packages

9.4.1.1 Combustion heaters shall meet the following requirements:

(a) The switch may be installed outside the driver's cab;

(b) The device may be switched off from outside the load compartment; and

(c) It is not necessary to prove that the heat exchanger is resistant to the reduced after running cycle.

9.4.1.2 If the vehicle is intended for the carriage of dangerous goods for which a label conforming to models Nos. 1, 1.4, 1.5, 1.6, 3, 4.1, 4.3, 5.1 or 5.2 is prescribed, no fuel tanks, power sources, combustion air or heating air intakes as well as exhaust tube outlets required for the operation of the combustion heater shall be installed in the load compartment. It shall be ensured that the heating air outlet cannot be blocked by cargo. The temperature to which packages are heated shall not exceed 50º C. Heating devices installed inside the load compartments shall be designed so as to prevent the ignition of an explosive atmosphere under operating conditions.

9.4.1.3 Additional requirements concerning the construction of the bodies of vehicles intended for the carriage of given dangerous goods or specific packagings may be included in Chapter 7.2 in accordance with the indications in Column (16) of Table A, Chapter 3.2, for a given substance.

9.4.1.4 Where a vehicle includes a package and that package is filled or emptied more than once while loaded on the vehicle, the vehicle shall meet the following requirements:

9.4.1.4.1 The vehicle shall meet the requirements of an FL or AT vehicle from Chapter 9.2. The selection of FL or AT vehicle type shall be in accordance with the indications in Column (14) of Table A, Chapter 3.2, for a given substance.

In this case, the use of the package shall be treated as if it was a demountable tank. If the package is not used fully in accordance with its approval, its modified use shall be authorised by the competent authority

9.4.1.4.2 The vehicle shall be subject to the requirements of Chapter 9.1, including the requirement for approval

9.4.1.4.3 The use of the vehicle as a tank-vehicle shall be in accordance with the requirements of Chapter 4.3 for the dangerous goods being transported.

NOTE: *The provisions in 9.4.1.4 require that where a package, such as an IBC, is used as if it was a tank on a tank vehicle, appropriate design and approval is required. Filling or emptying a package only once while on a vehicle is not intended to be captured by these provisions. If the package is modified from standard use (for example by modifying the closure system to use valves), that shall form a part of the competent authority's approval.*

CHAPTER 9.5

ADDITIONAL REQUIREMENTS CONCERNING THE CONSTRUCTION OF THE BODIES OF COMPLETE OR COMPLETED VEHICLES INTENDED FOR THE CARRIAGE OF DANGEROUS SOLIDS IN BULK

9.5.1 Completed vehicles for the transport of dangerous solids in bulk containers

9.5.1.1 Combustion heaters shall meet the following requirements:

(a) The switch may be installed outside the driver's cab;

(b) The device may be switched off from outside the load compartment; and

(c) It is not necessary to prove that the heat exchanger is resistant to the reduced after running cycle.

9.5.1.2 If the vehicle is intended for the carriage of dangerous goods for which a label conforming to models Nos. 4.1, 4.3 or 5.1 is prescribed, no fuel tanks, power sources, combustion air or heating air intakes as well as exhaust tube outlets required for the operation of the combustion heater shall be installed in the load compartment. It shall be ensured that the heating air outlet cannot be blocked by cargo. The temperature to which packages are heated shall not exceed 50º C. Heating devices installed inside the load compartments shall be designed so as to prevent the ignition of an explosive atmosphere under operating conditions.

9.5.1.3 The bodies of vehicles intended for the carriage of dangerous solids in bulk shall meet the requirements of Chapter 6.11 and 7.3, as appropriate, including those of 7.3.2 or 7.3.3 which may be applicable in accordance with the indications in columns (10) or (17) respectively of Table A of Chapter 3.2 for a given substance.

CHAPTER 9.6

ADDITIONAL REQUIREMENTS CONCERNING COMPLETE OR COMPLETED VEHICLES INTENDED FOR THE CARRIAGE OF TEMPERATURE CONTROLLED SUBSTANCES

9.6.1 Completed vehicles for the transport of dangerous goods requiring temperature control

9.6.1.1 Insulated, refrigerated and mechanically-refrigerated vehicles intended for the carriage of temperature-controlled substances shall conform to the following conditions:

(a) the vehicle shall be such and so equipped as regards its insulation and means of refrigeration, that the control temperature prescribed in 2.2.41.1.17 and 2.2.52.1.151 and in 2.2.41.4 and 2.2.52.41 for the substance to be carried is not exceeded. The overall heat transfer coefficient shall be not more than 0.4 W/m²K;

(b) the vehicle shall be so equipped that vapours from the substances or the coolant carried cannot penetrate into the driver's cab;

(c) a suitable device shall be provided enabling the temperature prevailing in the loading space to be determined at any time from the cab;

(d) the loading space shall be provided with vents or ventilating valves if there is any risk of a dangerous excess pressure arising therein. Care shall be taken where necessary to ensure that refrigeration is not impaired by the vents or ventilating valves;

(e) the refrigerant shall not be flammable; and

(f) the refrigerating appliance of a mechanically refrigerated vehicle shall be capable of operating independently of the engine used to propel the vehicle.

9.6.1.2 Suitable methods to prevent the control temperature from being exceeded are listed in 7.1.7.4.5. Depending on the method used, additional provisions concerning the construction of vehicle bodies may be included in Chapter 7.2.

CHAPTER 9.7

RESERVED

Chapter reserved (relevant contents incorporated into Chapter 9.2)

CHAPTER 9.8

ADDITIONAL REQUIREMENTS CONCERNING COMPLETE AND COMPLETED MPUS

9.8.1 General provisions

9.8.1.1 In addition to the vehicle proper, or the units of running gear used in its stead, a MPU comprises one or more tanks and bulk containers, their items of equipment and the fittings for attaching them to the vehicle or to the running-gear units.

9.8.1.2 The design of an MPU shall comply with the requirements of the standards or codes listed below, except that this code shall prevail to the extent of any inconsistency.

Column (5) gives the latest date when existing type approvals shall be automatically withdrawn; if no date is shown the type approval remains valid until it expires.

Reference	Title	Applicable for new type approvals or for renewals	Latest date for withdrawal of existing type approvals
(1)	(2)	(3)	(4)
Placeholder	Placeholder	Until further notice	

9.8.2 Requirements concerning tanks and bulk containers

Tanks, bulk containers and special compartments for packages of explosives of MPUs shall meet the requirements of Chapter 6.12.

9.8.3 Electrical bonding of MEMUs

Tanks, bulk containers and special compartments for packages of explosives made of metal or of fibre-reinforced plastics material shall be linked to the chassis by means of at least one good electrical connection. Any metal contact capable of causing electro-chemical corrosion or reacting with the dangerous goods carried in the tanks and bulk containers shall be avoided.

9.8.4 Stability of MPUs

The stability of the MPU shall meet the requirements of 9.2.2.4, except for 9.2.2.4.3. The design of the MPU shall be such that it is made as stable as practicable, whether determined using stability angle or the SRT method.

9.8.5 Rear protection of MEMUs

A bumper sufficiently resistant to rear impact shall be fitted over the full width of the tank at the rear of the vehicle. There shall be a clearance of at least 100 mm between the rear wall of the tank and the rear of the bumper (this clearance being measured from the rearmost point of the tank wall or from protecting fittings or accessories in contact with the substance being carried). Vehicles with a tilting shell with rear discharge do not require a bumper if the rear fittings of the shell are provided with a means of protection which protects the shell in the same way as a bumper.

NOTE: This provision does not apply to MPUs where the tanks are protected adequately against rear impact by other means, e.g. machinery or piping not containing dangerous goods.

9.8.6 **(Reserved)**

9.8.7 **Additional safety requirements**

9.8.7.1 MPUs shall be equipped with automatic fire extinguisher systems for the engine compartment.

9.8.7.2 Protection of the load by metal thermal shields against tyre fire shall be provided.

9.8.8 **Additional security requirements**

Process equipment and special compartments in MPUs shall be fitted with locks.