CODE OF PRACTICE
FOR
CONTROL OF DANGEROUS GOODS
ON LAND

January 2026

[Published under Section 5A of the Dangerous Goods Ordinance (Cap. 295)]

Fire Services Department website : http://www.hkfsd.gov.hk/dg/

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This revision January 2026

About the Code of Practice

Foreword

This Code of Practice shall be titled “The Code of Practice for Control of Dangerous Goods on Land” hereinafter referred to as “The Code”.

The Code is a statutory document issued under section 5A of the Dangerous Goods Ordinance (Cap. 295), by the Director of Fire Services who reserves the right to revise the whole or any part of this document. It provides practical guidance in respect of any one or more of the requirements of Cap. 295 or of regulations made under Cap. 295.

The Code has a special legal status, although failure to observe any guideline given in the Code is not of itself incur any criminal liability, that failure may be taken by a court in criminal proceedings as a relevant factor in determining whether or not a person has breached any of the provisions of the Dangerous Goods Ordinance and its subsidiary legislation to which the guideline relates.

Using the Code

The Code shall be read in conjunction with the Dangerous Goods Ordinance and its subsidiary legislation and shall be effective from 1.1.2026.

The Code is an important technical resource to help the Dangerous Goods (DG) practitioners in Hong Kong to comply with the legal requirements of the Dangerous Goods Ordinance. It is important that all DG practitioners understand and comply with the requirements of the Code, including the consignors, packers, drivers and users, along with DG professionals and trainers.

Due to the inherent hazardous nature of DG, it is important to pay special care in the handling of these DG so as to minimise any danger to life and property.

Acknowledgements

The Code is the beneficiary of the support of many stakeholders including trade organisations, industry players, advisory/consultative bodies and various Hong Kong Government's departments. Thus, we would like to express our sincere gratitude, listed in alphabetical order, to the following parties for their insightful suggestions and careful reading of the manuscript which finally bring the Code into completion:

- Advisory/Consultative Bodies
    - Dangerous Goods Standing Committee (DGSC)
    - FSD/Oil Industry Liaison Group
    - Standing Advisory Committee (Oil Storage Installations)
    - Tertiary Institutions Safety Advisory Group (TISAG)

- Government Departments
    - Buildings Department
    - Civil Engineering and Development Department
    - Department of Justice
    - Environmental Protection Department
    - Government Laboratory
    - Labour Department
    - Marine Department
    - Trade and Industry Department

Enquiries

Enquiries concerning the Code may be addressed to the following office:

Dangerous Goods Legislation Division (DGLD)

Address: 5/F, Fire Services Headquarters Building, 1 Hong Chong Road, Tsim Sha Tsui East, Kowloon.
Telephone: 2733 7697
Fax: 2367 3631
Email: hkfsd_dg_enq@hkfsd.gov.hk

Complaints

Please call 2723 8787 (24 hours hotline) for making fire hazard complaints about DG.

Table of Contents

Part IV PACKING AND SPECIAL PACKING REQUIREMENTS FOR PRESSURE RECEPTACLE CONTAINING CLASS 2

Part I GENERAL PROVISIONS

Chapter 1.1 Scope and Application

1.1.1 Structure

1.1.1.1 The Code consists of Parts I to VI. Each part is subdivided into chapters and each chapter into sections and sub-sections. Each paragraph is numbered with the numbers of the part, chapter, section and sub-section, for example, Part II, Chapter 1, Section 5 is numbered "2.1.5".

1.1.2 Scope

1.1.2.1 The Code provides detailed technical specifications and requirements for dangerous goods (DG) specified in Schedule 2 of the Dangerous Goods (Application and Exemption) Regulation 2012 (Cap. 295E) on land in Hong Kong covering:

(a) the definition and classification of DG as well as the mixed storage restriction;
(b) the packing, marking and labelling requirements for DG;
(c) the special packing requirements for Class 2 DG;
(d) the decommissioning of tank previously used for storing DG; and
(e) the safety precautions for conveyance of Classes 2, 3 and 3A DG.

1.1.2.2 The provisions in the Code will be taken into consideration in the enforcement of the Dangerous Goods Ordinance (Cap. 295), and its subsidiary legislation. The details of the legislation can be found on Hong Kong e-Legislation website at: https://www.elegislation.gov.hk.

1.1.3 Application

1.1.3.1 Where there is any conflict between the Dangerous Goods Ordinance and its subsidiary legislation and the provisions of the Code, the Ordinance and its subsidiary legislation take precedence.

1.1.3.2 Where the application of a standard is required and there is any conflict between the standard and the provisions of the Code, the Code takes precedence.

1.1.3.3 Regarding the classification of DG, reference has been made to the International Maritime Dangerous Goods Code (IMDG Code) for aligning with international DG classification. However, not all the chemicals or substances which are classified as DG under IMDG Code are regulated by the Fire Services Department (FSD). Generally, the following listed chemical types or substances are not subject to the regulation of FSD under the Dangerous Goods Ordinance:

- Ammunition or bombs
- Batteries or fuel cells
- Elevated temperature substances
- Environmentally / health hazardous substances
- Fire extinguishers
- Gases regulated under Cap. 51 (e.g. town gas, liquefied petroleum gas, natural gas etc.)
- Infectious substances
- Machine, equipment or articles containing DG
- Medicines, plants, animals or food
- Non-pressurized gases
- Pesticides / insecticides
- Radioactive materials
- Substances giving off harmful substance when involved in fire

1.1.3.4 As the list in 1.1.3.3 is not exhaustive, further reference shall be made to the Schedule 2 of Cap. 295E for clarifications.

1.1.4 Discretionary Powers of the Director of Fire Services

1.1.4.1 Compliance with the prescriptive provisions in the Code may be regarded as a reliable way to satisfy the requirements of the Dangerous Goods Ordinance and its subsidiary legislation. However, due to the rapid technological development around the world, the Director of Fire Services may, in the case of any particular DG, vary any of the requirements of the Code (whether by adding to the Code, substituting its provisions, relaxing any of the requirements in the Code or otherwise) where, in his opinion, such a variation is required.

Chapter 1.2 Units of Measurement

1.2.1 Table for Units of Measurement

1.2.1.1 The following units of measurement* are applicable in the Code:

Measurement of:	**SI Unit [a]**	**Acceptable alternative unit**	**Relationship between units**
Length	m (metre)	–	–
Area	m^2 (square metre)	–	–
Volume	m^3 (cubic metre)	L [b] (litre)	$1\ L = 10^{-3}\ m^3$
Time	s (second)	min (minute)	1 min = 60 s
		h (hour)	1 h = 3600 s
		d (day)	1 d = 86,400 s
Mass	kg (kilogram)	g (gram)	$1\ g = 10^{-3}\ kg$
		t (tonne)	$1\ t = 10^3\ kg$
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
Difference of temperature	K (kelvin)	°C (degree Celsius)	1°C = 1 K
Force	N (newton)	–	$1\ N = 1\ kg \cdot m/s^2$
Pressure	Pa (pascal)	bar (bar)	$1\ bar = 10^5\ Pa$
			$1\ Pa = 1\ N/m^2$
Stress	N/m^2	N/mm^2	$1\ N/mm^2 = 1\ MPa$
Work	J (joule)	kWh (kilowatt hour)	1 kWh = 3.6 MJ
Energy	J (joule)	–	$1\ J = 1\ N \cdot m = 1\ W \cdot s$
Quantity of heat	J (joule)	eV (electronvolt)	$1\ eV = 0.1602 \times 10^{-18}\ J$
Power	W (watt)	–	$1\ W = 1\ J/s = 1\ N \cdot m/s$
Electrical resistance	Ω (ohm)	–	$1\Omega = 1\ kg \bullet m^2 \bullet s^{-3} \bullet A^{-2}$
Kinematic viscosity	m^2/s	mm^2/s	$1\ mm^2/s = 10^{-6}\ m^2/s$
Dynamic viscosity	$Pa \cdot s$	$mPa \cdot s$	$1\ mPa \cdot s = 10^{-3} Pa \cdot s$

Conductivity	S/m (siemens/metre)	–	–

* The following round figures are applicable for the conversion of the units hitherto used into The International System of Units (SI).

[a] SI is the result of decisions taken at the General Conference on Weights and Measures.

[b] The abbreviation "*l*" for litre may also be used in place of the abbreviation "L".

Force

1 kg = 9.807 N

1 N = 0.102 kg

Stress

1 kg/mm^2 = 9.807 N/mm^2

1 N/mm^2 = 0.102 kg/mm^2

Pressure

1 Pa = 1 N/m^2 = 10^{-5} bar = 1.02 x 10^{-5} kg/cm^2 = 0.75 x 10^{-2} torr

1 bar = 10^5 Pa = 1.02 kg/cm^2 = 750 torr

1 kg/cm^2 = 9.807 x 10^4 Pa = 0.9807 bar = 736 torr

1 torr = 1.33 x 10^2 Pa = 1.33 x 10^{-3} bar = 1.36 x 10^{-3}kg/cm^2

Work, Energy, Quantity of heat

1 J = 1 N·m = 0.278 x 10^{-6} kWh = 0.102 kg·m = 0.239 x 10^{-3} kcal

1 kWh = 3.6 x 10^6 J = 367 x 10^3 kg·m = 860 kcal

1 kg·m = 9.807 J = 2.72 x 10^{-6} kWh = 2.34 x 10^{-3} kcal

1 kcal = 4.19 x 10^3 J = 1.16 x 10^{-3} kWh = 427 kg·m

Power

1 W = 0.102 kg·m/s = 0.86 kcal/h

1 kg·m/s = 9.807 W = 8.43 kcal/h

1 kcal/h = 1.16 W = 0.119 kg·m/s

Kinematic viscosity

1 m^2/s = 10^4 St (Stokes)

1 St = 10^{-4} m^2/s

Dynamic viscosity

1 Pa·s = 1 N·s/m^2 = 10 P (poise) = 0.102 kg·s/m^2

1 P = 0.1 Pa·s = 0.1 N·s/m^2 = 1.02 x 10^{-2}

			kg·s/m^2
1 kg·s/m^2 = 9.807 Pa·s	= 9.807 N·s/m^2	=	98.07 P

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:

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

1.2.1.2 Whenever the mass of a package is mentioned, the gross mass is meant unless otherwise stated.

1.2.1.3 Unless expressly stated otherwise, the sign “%” 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 gases dissolved under pressure: the proportion of the mass indicated as a percentage of the total mass of the mixture.

1.2.1.4 Pressures of all kinds relating to pressure 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.

Chapter 1.3 Interpretations

In the Code, unless otherwise specified:

"Aggregate EQ"[1], in relation to the storage or conveyance of multiple types of DG, means the following quantities:

<table>
<tr><td colspan="3">For storage of multiple types of DG:</td></tr>
<tr><td></td><td>General & Special Premises</td><td>Industrial Premises</td></tr>
<tr><td>Class 2 DG</td><td>300 L
(water capacity)</td><td>450 L
(water capacity)</td></tr>
<tr><td>Class 3 DG</td><td>100 L</td><td>150 L</td></tr>
<tr><td>Class 4, 5, 6.1, 8 or 9 DG (except Special Class 5.1, 6.1 or 8 DG)</td><td>100 L (liquid) /kg (solid)</td><td>1000 L (liquid) /kg (solid)</td></tr>
<tr><td>Special Class 5.1, 6.1 or 8 DG[2]</td><td>250 L (liquid) /kg (solid)</td><td>1000 L (liquid) /kg (solid)</td></tr>
<tr><td>Paint Materials</td><td colspan="2">250 L</td></tr>
<tr><td colspan="3">For conveyance of multiple types of DG:</td></tr>
<tr><td>Class 2 DG</td><td colspan="2">300 L (water capacity)</td></tr>
<tr><td>Class 3 DG</td><td colspan="2">100 L</td></tr>
<tr><td>Class 4, 5, 6.1, 8 or 9 DG (except Special Class 5.1, 6.1 or 8 DG)</td><td colspan="2">100 L (liquid) /kg (solid)</td></tr>
<tr><td>Special Class 5.1, 6.1 or 8 DG</td><td colspan="2">250 L (liquid) /kg (solid)</td></tr>
<tr><td>Paint Materials</td><td colspan="2">250 L</td></tr>
</table>

"Box" means packaging with complete rectangular or polygonal faces, made of metal, wood, plywood, reconstituted wood, fibreboard, plastics, or other suitable materials. Small holes for purposes such as ease of the handling or opening of the box or to meet classification

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[1] Sections 10, 13, 17 and 22 of Cap. 295E.

[2] Special Class 5.1 DG means: UN 1748, UN 2208, UN 2880, UN 3212, UN 3485, UN 3486 or UN 3487
Special Class 6.1 DG means: UN 1671, UN 2022, UN 2076, UN 2312, UN 2821, UN 3430 or UN 3455
Special Class 8 DG means: UN 1791 or UN 2693

provisions are permitted as long as they do not compromise the integrity of the packaging.

"Bag" means flexible packaging made of paper, plastic film, textiles, woven material, or other suitable materials.

"Cap. 295E" means the Dangerous Goods (Application and Exemption) Regulation 2012.

"Cap. 295G" means the Dangerous Goods (Control) Regulation.

"Combination packaging" means a combination of packagings consisting of one or more inner packagings secured in an outer packaging.

"Composite packaging" means 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, conveyed and emptied as such.

"Consumer packs", in relation to S2DG, means—

(a) for pre-packed Schedule 2 dangerous goods—the capacity of the receptacle forming part of the pre-packed Schedule 2 dangerous goods does not exceed the maximum package size (if any) specified in column 9 of the table in Part 2, 3 or 4 of Schedule 2 of Cap. 295E in relation to the dangerous goods; or

(b) for the dangerous goods that are contained directly without any form of intermediate containment in a receptacle—the capacity of the receptacle does not exceed the maximum package size (if any) specified in column 9 of the table in relation to the dangerous goods;

"Control temperature" means the maximum temperature at which certain substances (such as organic peroxides and self-reactive and related substances) can be safely handled during a prolonged period of time.

“Dangerous Goods”(DG) means DG specified in Schedule 2 of Cap. 295E.

“Degree of filling” means the ratio, expressed in %, of the volume of liquid or solid introduced at 15°C into the means of containment and the volume of the means of containment ready for use.

“DG List” means the DG Lists in Appendices 1, 2 and 3 of the Code.

“Drum” means flat-ended or convex-ended cylindrical packaging made of metal, fibreboard, plastics, plywood or other suitable materials. This definition also includes packaging of other shapes, such as round taper-necked packagings, or pail-shaped packagings. Wooden barrel and jerrican are not covered by this definition.

“Effectively closed” means liquid-tight closure.

“Emergency temperature” means the temperature at which emergency procedures shall be implemented.

“Filling ratio” means:

(a) For liquefied gases and dissolved gases, 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; and

(b) For compressed gases, the working pressure in a pressure receptacle.

“Flashpoint” is the lowest temperature of a liquid at which its vapour forms an ignitable mixture with air.

“General exempt quantity”(GEQ), in relation to S2DG, means the quantity specified in column 5 of the table in Part 2, 3 or 4 of Schedule 2 of Cap. 295E in relation to those dangerous goods.

“Hermetically sealed” means vapour-tight closure.

“High pressure liquefied gas” means a gas with a critical temperature

between -50°C and +65°C.

"IMDG Code" means the International Maritime Dangerous Goods Code published by the International Maritime Organization, as amended or revised by the Organization from time to time.

"Industrial exempt quantity"(IEQ), in relation to S2DG, means the quantity specified in column 6 of the table in Part 2, 3 or 4 of Schedule 2 of Cap. 295E in relation to those dangerous goods.

"Jerrican" means metal or plastics packaging of rectangular or polygonal cross-section.

"Limited packs", in relation to S2DG, means—

(a) for pre-packed Schedule 2 dangerous goods—the capacity of the receptacle forming part of the pre-packed Schedule 2 dangerous goods does not exceed the limited quantity (if any) specified in column 8 of the table in Part 2, 3 or 4 of Schedule 2 of Cap. 295E in relation to the dangerous goods; or

(b) for the dangerous goods that are contained directly without any form of intermediate containment in a receptacle—the capacity of the receptacle does not exceed the limited quantity (if any) specified in column 8 of the table in relation to the dangerous goods.

"Low pressure liquefied gas" means a gas with a critical temperature above +65°C.

"*Maximum capacity*" means the maximum inner volume of receptacles or packagings expressed in 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 and is expressed in kilograms.

"Non-refillable pressure receptacle" means a pressure receptacle that:

(a) contains or has contained Class 2 S2DG; and

(b) is not constructed or intended to be refilled with Class 2 S2DG.

"Package" means the complete product of the packing operation, consisting of the packaging and its contents.

"Packaging" and *"S2DG packaging"* means any receptacle (including a receptacle that forms part of pre-packed S2DG), tank or material for receiving, holding or enclosing S2DG, but does not include any freight container, aircraft container or vehicle.

"Pressure receptacle" means a receptacle used for containing Class 2 S2DG under pressure, other than a boiler or a pressure vessel as defined by section 2(1) of the Boilers and Pressure Vessels Ordinance (Cap. 56).

"Proper shipping name" refers to the description of a DG in CAPITAL letters (plus any numbers, Greek letters, "sec", "tert", and the letters m, n, o, p, which form an integral part of the name) as stated in column 2 of the DG List.

"S2DG" means Schedule 2 dangerous goods which are DG specified in Schedule 2 of Cap. 295E.

"Securely closed" means so closed that dry contents cannot escape during normal handling.

"Service equipment" of a pressure receptacle means closure(s), manifold(s), piping, porous, absorbent or adsorbent material and any structural devices, e.g. for handling.

"*Sift-proof packaging*" means the packaging which is impermeable to dry contents, including fine solid material.

"Special exempt quantity"(SEQ), in relation to S2DG, means the quantity specified in column 7 of the table in Part 2, 3 or 4 of Schedule 2 of Cap. 295E in relation to those dangerous goods.

"Suitable", in relation to S2DG packaging, means the packaging is—

(a) well constructed so as to prevent any loss of contents from the S2DG packaging, unless the packaging is designed to release some contents for safety reason;

(b) in good condition;

(c) of such a character and construction that any interior surface with which the contents may come into contact is not adversely affected by the contents;

(d) capable of withstanding ordinary risks during storage, handling or conveyance; and

(e) capable of withstanding any pressure likely to be generated in it in the course of normal use.

"Tank" means a static tank or a reservoir used to contain S2DG.

"Tank-container" means a movable freight container designed for containing S2DG directly without any form of intermediate containment.

"Test pressure" means the required pressure applied to a packaging during a pressure test for qualification or requalification.

"Type of DG"[3] is identified by the combination of the following information of the DG:

(a) the UN number / HK number;
(b) the packing group (if any);
(c) proper shipping name;
(d) the class; and
(e) the subsidiary hazard (if any).

"UN number" in relation to Schedule 2 dangerous goods, means the number specified in column 1 of the table in Part 2 or 3 of Schedule 2 in relation to the dangerous goods and preceded by the alphabets "UN".

"Working pressure" (i) for a compressed gas, means the settled pressure at a reference temperature of 15°C in a pressure receptacle; (ii) for UN1001 acetylene, dissolved, means the calculated settled pressure at a uniform reference temperature of 15°C in an acetylene cylinder

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[3] Section 3 of Cap. 295E.

containing the specified solvent content and the maximum acetylene content; and (iii) for UN3374 acetylene, solvent free, means the working pressure which was calculated for the equivalent cylinder for UN1001 acetylene, dissolved.

Chapter 1.4 Abbreviations

BP - basic packing instruction
CG - compatibility group
CR - compatibility rule
DG - dangerous goods
EQ - exempt quantity
FSD - Fire Services Department
GEQ - general exempt quantity
IEQ - industrial exempt quantity
IMDG Code - International Maritime Dangerous Goods Code
LQ - limited quantity
MPS - maximum package size
N.O.S. - not otherwise specified
OSI - oil storage installation
PFS - petrol filling station
PG - packing group
PML - packing, marking and labelling
PSN - proper shipping name
SADT - self-accelerating decomposition temperature
SAPT - self-accelerating polymerization temperature
SDA - static dissipative additive
SEQ - special exempt quantity
SN - supplementary note
SP - special packing instruction

Part II CLASSIFICATION AND COMPATIBILITY OF DG

Chapter 2.1 General Provisions

2.1.1 Classes, Proper Shipping Name and Packing Groups

DG presenting a danger of a particular class is assigned to that class and packing group, if applicable. For the purpose of the Ordinance, DG are substances listed in the Schedule 2 of Cap. 295E and are specifically listed and identified by UN number(s) / HK number(s) and proper shipping names (PSN) with their appropriate classes, subsidiary hazard(s) and, when applicable, packing groups, etc.

2.1.1.1 Classes

2.1.1.1.1 Substances (including mixtures and solutions) subject to Cap. 295E are assigned to different classes according to the hazard or the most predominant of the hazards they present. Those classes are:

Class 2: Gases
- Class 2.1: Flammable gases
- Class 2.2: Non-flammable and non-toxic gases
- Class 2.3: Toxic gases

Class 3: Flammable liquids

Class 3A: Diesel, fuel oil and furnace oil, having flashpoints exceeding 60°C (closed-cup test)

Class 4: Flammable solids; substances liable to spontaneous combustion; substances which, in contact with water, emit flammable gases
- Class 4.1: Flammable solids, self-reactive substances, solid desensitized explosives and polymerizing substances
- Class 4.2: Substances liable to spontaneous combustion

- Class 4.3: Substances which in contact with water emit flammable gases

Class 5: Oxidizing substances and organic peroxides
- Class 5.1: Oxidizing substances
- Class 5.2: Organic peroxides

Class 6.1: Toxic substances

Class 8: Corrosive substances

Class 9: Miscellaneous dangerous substances or materials

2.1.1.2 Proper Shipping Name

2.1.1.2.1 DG are assigned with UN number(s) / HK number(s) and proper shipping name(s) (PSN) according to their hazard classification and their composition as listed in the DG List.

2.1.1.2.2 Where a DG is specifically listed by name, it shall be identified by the proper shipping name in the DG List. Such DG 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 DG listed by name containing technical impurities or additives for stability or other purposes affecting its classification shall be considered a mixture or solution. For DG not specifically listed by name, "generic" or "not otherwise specified" (N.O.S.) entries are provided to identify the DG.

2.1.1.2.3 Proper shipping names are of the following four types:

(a) Single entries for well-defined substances:
e.g. UN 1090 ACETONE
UN 1194 ETHYL NITRITE SOLUTION;

(b) Generic entries for well-defined group of substances:

e.g.	UN 1133	ADHESIVES
	UN 1266	PERFUMERY PRODUCT
	UN 3101	ORGANIC PEROXIDE, TYPE B, LIQUID;

(c) Specific N.O.S. entries covering a group of substances of a particular chemical or technical nature:

e.g.	UN 1477	NITRATES, INORGANIC, N.O.S.
	UN 1987	ALCOHOLS, N.O.S.

(d) General N.O.S. entries covering a group of substances meeting the criteria of one or more hazard classes:

e.g.	UN 1325	FLAMMABLE SOLID, ORGANIC, N.O.S.
	UN 1993	FLAMMABLE LIQUID, N.O.S.

2.1.1.2.4 Substances, including mixture and solution, which are not specifically listed by name in the DG List shall be classified under a “generic” or “N.O.S.” entry which most appropriately describes the substance. This means that a substance is only be assigned to an entry of type (c) if it cannot be assigned to an entry of type (b), and to an entry of type (d) if it cannot be assigned to an entry of type (b) or (c).

2.1.1.2.5 If test data showed that a substance listed by proper shipping name in the DG List does not meet the classification criteria for any hazard class or subsidiary hazard(s) identified in the DG List, the substance may be assigned:

(a) Under the most appropriate generic or N.O.S. entry reflecting all hazards; or

(b) Under the same UN number and proper shipping name but with additional hazard information as appropriate to reflect the additional subsidiary hazard(s) provided that the primary hazard class remains unchanged and that any other conditions (e.g. limited quantity, etc.) that would normally apply to substances possessing such a combination of hazards are the same as those applicable to the DG listed.

2.1.1.3 Packing Groups

2.1.1.3.1 Most substances other than those of Classes 2, 3A, 5.2 and self-reactive substances of Class 4.1 are assigned to three packing groups, which are indicated in the corresponding packing group entries in the DG List, in accordance with the degree of danger they present:

Packing group I (PG I): Substances presenting high danger;
Packing group II (PG II): Substances presenting medium danger; and
Packing group III (PG III): Substances presenting low danger.

2.1.1.3.2 The packing group to which a substance is assigned is indicated in Column 2 of the DG List.

2.1.1.3.3 When a substance is specifically listed by name in the DG List, its class, subsidiary hazard(s) and, when applicable, packing group are taken from that List.

2.1.1.3.4 DG meeting the defining criteria of more than one hazard class and which are not listed by name in the DG List, are assigned to a class and subsidiary hazard(s) on the basis of the precedence of hazards prescribed in 2.1.2.

2.1.2 Precedence of Hazard Characteristics

2.1.2.1 The table below should be used to determine the class of a substance, mixture or solution having more than one hazard, when it is not named in the DG List. For substance having multiple hazards which are not specifically listed by name in the DG List, the most stringent packing group denoted to the respective hazards of the substance takes precedence over other packing groups, irrespective of the Table for Precedence of Hazards in this Chapter. The precedence of hazard characteristics of the following has not been dealt with in the Table for Precedence of Hazards in 2.1.2.3, as these primary characteristics always take precedence:

(a) Gases of Class 2;
(b) Liquid desensitised explosives of Class 3;
(c) Self-reactive substances and solid desensitised explosives of Class 4.1;

(d) Pyrophoric substances of Class 4.2;

(e) Substances of Class 5.2;

(f) Substances of Class 6.1 with a packing group I inhalation toxicity (Except for substances or preparations meeting the criteria of Class 8 having an inhalation toxicity of dust 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, which shall be allocated to Class 8).

2.1.2.2 The Table for Precedence of Hazards indicates which of the hazards shall be regarded as the primary hazard. The class which appears at the intersection of the horizontal line and the vertical column is the primary hazard and the remaining class is the subsidiary hazard. The packing groups for each of the hazards associated with the substance, mixture or solution shall be determined by reference to the appropriate criteria. The most stringent of the groups so indicated shall then become the packing group of the substance, mixture or solution.

2.1.2.3 Table for Precedence of Hazards

Class and Packing Group		4.2	4.3	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 Liquid	8, I Solid	8, II Liquid	8, II Solid	8, III Liquid	8, III Solid
3	I[a]		4.3				3	3	3	3	3	–	3	–	3	–
3	II[a]		4.3				3	3	3	3	8	–	3	–	3	–
3	III[a]		4.3				6.1	6.1	6.1	3	8	–	8	–	3	–
4.1	II[a]	4.2	4.3	5.1	4.1	4.1	6.1	6.1	4.1	4.1	–	8	–	4.1	–	4.1
4.1	III[a]	4.2	4.3	5.1	4.1	4.1	6.1	6.1	6.1	4.1	–	8	–	8	–	4.1
4.2	II		4.3	5.1	4.2	4.2	6.1	6.1	4.2	4.2	8	8	4.2	4.2	4.2	4.2
4.2	III		4.3	5.1	5.1	4.2	6.1	6.1	6.1	4.2	8	8	8	8	4.2	4.2
4.3	I			5.1	4.3	4.3	6.1	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
4.3	II			5.1	4.3	4.3	6.1	4.3	4.3	4.3	8	8	4.3	4.3	4.3	4.3
4.3	III			5.1	5.1	4.3	6.1	6.1	6.1	4.3	8	8	8	8	4.3	4.3
5.1	I						5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
5.1	II						6.1	5.1	5.1	5.1	8	8	5.1	5.1	5.1	5.1
5.1	III						6.1	6.1	6.1	5.1	8	8	8	8	5.1	5.1
6.1	I Dermal										8	6.1	6.1	6.1	6.1	6.1
6.1	I Oral										8	6.1	6.1	6.1	6.1	6.1
6.1	II Inhalation										8	6.1	6.1	6.1	6.1	6.1
6.1	II Dermal										8	6.1	8	6.1	6.1	6.1
6.1	II Oral										8	8	8	6.1	6.1	6.1
6.1	III										8	8	8	8	8	8

Table notes: [a] Substances of Class 4.1 other than self-reactive substances and solid desensitised explosives and substances of Class 3 other than liquid desensitised explosives.

– Denotes an impossible combination.

For hazards not shown in this table, see 2.1.2.1.

2.1.3 Supplementary Notes

2.1.3.1 Supplementary notes (SN) of some DG are provided in column 6 of the DG List in Appendices 1 to 3. The meanings of those SN are listed in Appendix 4. The SN apply regardless of the quantity of that DG, unless otherwise specified.

Chapter 2.2 Class Specific Provisions

2.2.1 (Reserved)

2.2.2 Class 2 – Gases

2.2.2.1 Scope

2.2.2.1.1 Class 2 includes gas substance which at 50°C has a vapour pressure greater than 300 kPa or is completely gaseous at 20°C at a standard pressure of 101.3 kPa. It comprises compressed gases, liquefied gases, dissolved gases, refrigerated liquefied gases, adsorbed gases, mixtures of one or more gases with one or more vapours of substances of other classes, articles charged with a gas, aerosols and chemicals under pressure.

2.2.2.1.2 A gas is described according to its physical state as:

(a) **Compressed gas**: a gas which when packaged under pressure is entirely gaseous at -50°C; this category includes all gases with a critical temperature less than or equal to -50°C;
(b) **Liquefied gas**: a gas which when packaged under pressure is partially liquid at temperatures above -50°C;
(c) **Refrigerated liquefied gas**: a gas which when packaged is made partially liquid because of its low temperature;
(d) **Dissolved gas**: a gas which when packaged under pressure is dissolved in a liquid phase solvent; or
(e) **Adsorbed gas**: a gas which when packaged is adsorbed onto a solid porous material resulting in an internal receptacle pressure of less than 101.3 kPa at 20°C and 300 kPa at 50°C.

2.2.2.1.3 According to their chemical properties or physiological effects, gases may be flammable; non-flammable; non-toxic; toxic; supporters of combustion; corrosive; or may possess two or more of these properties simultaneously.

2.2.2.2 Class subdivisions

Class 2 is subdivided according to the primary hazard of the gas:

2.2.2.2.1 Class 2.1 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 flammability limit.[4]

2.2.2.2.2 Class 2.2 Non-flammable, non-toxic gases

Gases which:

(a) are asphyxiant: gases which dilute or replace the oxygen normally in the atmosphere; or
(b) are oxidizing: gases which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does[5]; or
(c) do not come under the other classes.

2.2.2.2.3 Class 2.3 Toxic gases[6]

Gases which:
(a) are known to be so toxic or corrosive to humans as to pose a hazard to health; or

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[4] Flammability shall be determined by tests or calculation in accordance with methods adopted by the International Organization for Standardization (see ISO 10156:2017). Where insufficient data are available to use these methods, tests by a comparable method recognised by a national competent authority may be used. In this regard, it is necessary to provide the test report as the proof upon request.

[5] "Gases which may cause or contribute to the combustion of other material more than air does" means pure gases or gas mixtures with an oxidizing power greater than 23.5% as determined by a method specified in ISO 10156:2017.

[6] Gases meeting the criteria 2.2.2.2.3 (a) or (b) owing to their corrosivity are to be classified as toxic with a subsidiary corrosive hazard.

(b) are presumed to be toxic or corrosive to humans because they have a LC_{50} value equal to or less than 5,000 ml/m^3 (ppm).

2.2.2.2.4 Gases and gas mixtures with hazards associated with more than one class take the following precedence:

(a) Class 2.3 takes precedence over all other classes;
(b) Class 2.1 takes precedence over Class 2.2.

2.2.2.2.5 Pursuant to Cap. 295E, the following Class 2 DG are not subject to Dangerous Goods Ordinance:

(a) Class 2 DG contained in inflated pneumatic tyres;
(b) Class 2 DG contained in inflated balls or balloons intended to be used for educational, recreational, scientific or other non-industrial purpose;
(c) Class 2 DG contained in lighting devices to enable the device to operate;
(d) Class 2 DG contained in inflated rubber cushions made of natural or synthetic rubber; and
(e) Class 2.2 DG compressed to the state of being not exceeding 200 kPa (2 bar) gauge pressure at 20ºC.

2.2.2.2.6 As the list in 2.2.2.2.5 is not exhaustive, further reference shall be made to Cap. 295E for clarifications.

2.2.2.3 Mixtures of gases

Gas items having specific UN numbers shall be classified as stated in the DG List, including the packing groups, subsidiary hazards etc. For the classification of gas mixtures (including vapours of substances from other classes) or other gas items not specified in the DG List, the following principles shall be used:

(a) Flammability shall be determined by tests or calculation in accordance with methods adopted by the International Organization for Standardization (see ISO Standard 10156:2017). Where insufficient data are available to use these methods, tests by a comparable method recognised by a national competent authority may be used. In this regard, it is necessary to provide the test report as the proof upon request; and

(b) The level of toxicity is determined either by tests to measure the LC_{50} value or by a calculation method in 2.2.3.2 in IMDG Code or 2.2.3(b) in Recommendations on the Transport of Dangerous Goods Model Regulations.

2.2.2.3.1 A gas mixture has a subsidiary hazard of corrosivity when the mixture is known by human experience to be destructive to the skin, eyes or mucous membranes or when the LC_{50} value of the corrosive components of the mixture is equal to or less than 5,000 ml/m^3 (ppm) by calculation in 2.2.3.2 in IMDG Code or 2.2.3(c) in Recommendations on the Transport of Dangerous Goods Model Regulations.

2.2.2.3.2 Oxidizing ability is determined either by tests or by calculation methods adopted by ISO (see the Note in 2.2.2.2.2(b) and ISO 10156:2017).

2.2.3 Class 3 – Flammable Liquids

2.2.3.1 Scope

2.2.3.1.1 Class 3 includes flammable liquids and liquid desensitized explosives. Flammable liquid items/liquid desensitized explosives having specific UN numbers shall be classified as stated in the DG List, including the packing groups, subsidiary hazards etc. For the items which are not specified in DG List but possible to be classified as Class 3 DG, the flashpoint, initial boiling point and viscosity shall be determined. In general, flammable liquids are liquids, or mixture of liquids, or liquids containing solids in solution or suspension (such as paints, varnishes, lacquers, etc., but not including substances which, on account of their other dangerous characteristics, have been included in other classes) which have a flashpoint at or below 60°C (closed-cup test). In countries where it is customary to determine flashpoints by the open-cup method, the temperatures given by that method would need to be reduced to correspond with those in the Code.

2.2.3.1.2 The flashpoint of a flammable liquid is the lowest temperature of the liquid at which its vapour forms an ignitable mixture with air. It gives a measure of the risk of formation of explosive or ignitable mixtures when the liquid escapes from its packing. A flammable liquid cannot be ignited so long as its temperature remains below the flashpoint.

2.2.3.1.3 The test methods of flashpoint determination can be divided into two groups, depending on the use in an apparatus of an open receptacle (open-cup methods) or a closed one which is only opened to admit the flame (closed-cup methods). As a rule, the flashpoints found in an open-cup test are a few degrees higher than in a closed-cup test. In general, reproducibility in closed-cup apparatus is better than in open-cup. It is therefore flashpoints shall be determined by means of closed-cup methods.

2.2.3.1.4 Liquid desensitized explosives are explosive substances (UN 1204, UN 2059, UN 3064, UN 3343, UN 3357, UN 3379 and UN 3555 in the DG List) which are dissolved or suspended in water or other liquid substances, to form a homogeneous liquid mixture to suppress their explosive properties.

2.2.3.1.5 Liquids meeting the definition in 2.2.3.1.1 with a flashpoint of more than 35°C which do not sustain combustion need not be considered as flammable liquid. Liquids are considered to be unable to sustain combustion for the purposes of the Code if:

(a) they have passed the suitable combustibility test[7]; or
(b) their fire point according to ISO 2592:2017 is greater than 100°C; or
(c) they are water-miscible solutions with a water content of more than 90%, by mass.

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[7] The Sustained Combustibility Test prescribed in Part III, sub-section 32.5.2 of the United Nations Manual of Tests and Criteria.

2.2.3.2 Assignment of packing group of Class 3 DG

2.2.3.2.1 Flammable liquids are grouped for packing purposes according to their flashpoint, their initial boiling point, and their viscosity[8]. Table in 2.2.3.2.2 shows the packing group for the substance whose only hazard is flammability.

2.2.3.2.2 Packing group based on flammability

Packing Group	Flashpoint in °C (closed-cup)	Initial Boiling Point in °C
I	–	≤ 35
II	< 23	> 35
III	≥ 23 to ≤ 60	> 35

2.2.3.2.3 For a liquid with additional hazard(s), the packing group determined from 2.2.3.2.2 and the packing group based on the severity of the additional hazard(s) shall be considered, and the classification and packing group determined in accordance with the provisions in Chapter 2.1.

2.2.3.2.4 Viscous flammable liquids such as paints, enamels, lacquers, varnishes, adhesives and polishes with a flashpoint of less than 23°C may be placed in packing group III in conformity with the procedures prescribed in the United Nations Manual of Tests and Criteria, Part III sub-section 32.3, which provided that:

(a) less than 3% of the clear solvent layer separates in the solvent separation test;
(b) the mixture or any separated solvent does not meet the criteria for Class 6.1 or Class 8;
(c) the capacity of the receptacle used does not exceed 450 L; and

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[8] Reference method for viscosity determination may be found in Part III, sub-section 32.4.3 of the United Nations Manual of Tests and Criteria. Where the substance concerned is non-Newtonian, or when a flow cup method of viscosity determination is 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.

(d) the viscosity and flashpoint are in accordance with the following table:

Kinematic Viscosity (extrapolated) (υ) (at near-zero shear rate) mm^2/s at 23°C	Flow time (t) in seconds	Jet Diameter in mm	Flashpoint in °C (closed-cup test)
$20 < \upsilon \leq 80$	$20 < t \leq 60$	4	above 17
$80 < \upsilon \leq 135$	$60 < t \leq 100$	4	above 10
$135 < \upsilon \leq 220$	$20 < t \leq 32$	6	above 5
$220 < \upsilon \leq 300$	$32 < t \leq 44$	6	above –1
$300 < \upsilon \leq 700$	$44 < t \leq 100$	6	above –5
$700 < \upsilon$	$100 < t$	6	–5 and below

2.2.3.2.5 The flashpoint of a flammable liquid may be altered by the presence of an impurity. The substances listed in Class 3 DG in the DG List shall generally be regarded as chemically pure. Since commercial products may contain added substances or impurities, flashpoints may vary, and this may have an effect on classification or determination of the packing group for the product. In the event of doubt regarding the classification or packing group of a substance, the flashpoint of the substance shall be determined experimentally. The reference methods for determining the flashpoint of flammable liquids may be found in 2.3.3.6 in IMDG Code or 2.3.3 in Recommendations on the Transport of Dangerous Goods Model Regulations.

2.2.3.2.6 The reference methods for determining the initial boiling point of flammable liquids may be found in 2.3.4 in IMDG Code or 2.3.4 in Recommendations on the Transport of Dangerous Goods Model Regulations.

2.2.3a Class 3A – Diesel or Fuel Oil or Furnace Oil

2.2.3a.1 Scope

2.2.3a.1.1 For the purposes of the Ordinance, Class 3A DG include diesel oils (distillates and/or light residuals), furnace oils and other fuel oils having a flashpoint exceeding 60°C (closed-cup test). Class 3A DG are assigned with HK number H301 and listed in Part 4 of Schedule 2 of Cap. 295E.

HK No.	**Proper Shipping Name**	**Packing Group**
H301	DIESEL or FUEL OIL or FURNACE OIL	III

2.2.4 *Class 4 – Flammable Solids; Substances Liable to Spontaneous Combustion; Substances which, in Contact with Water, Emit Flammable Gases*

2.2.4.1 Scope

2.2.4.1.1 Class 4 DG are subdivided as follows:

(a) Class 4.1 – Flammable solids
Solids which are readily combustible or may cause or contribute to fire through friction; self-reactive substances (solids and liquids) and polymerizing substances which are liable to undergo a strong exothermic reaction; solid desensitized explosives which may explode if not diluted sufficiently;

(b) Class 4.2 – Substances liable to spontaneous combustion
Substances (solids and liquids) which are liable to spontaneous heating, or to heating up in contact with air, and being then liable to catch fire;

(c) Class 4.3 – Substances which, in contact with water, emit flammable gases
Substances (solids and liquids) which, by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities.

2.2.4.1.2 Class 4 DG having specific UN numbers shall be classified as stated in the DG List, including the packing groups, subsidiary hazards etc. However, for following substances which are not specified in the DG List but have properties possible to be classified as Class 4 DG, the corresponding test methods and criteria including advice on application of the tests are given in the United Nations Manual of Tests and Criteria for the classification[9]:

(a) flammable solids (Class 4.1);

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[9] Test methods and criteria for self-reactive substances and polymerizing substances are given in Part II of the United Nations Manual of Tests and Criteria, and test methods and criteria for the other types of substances of Class 4 DG are given in the United Nations Manual of Tests and Criteria, Part III, section 33.

(b) self-reactive substances (Class 4.1);
(c) polymerizing substances (Class 4.1);
(d) pyrophoric solids (Class 4.2);
(e) pyrophoric liquids (Class 4.2);
(f) self-heating substances (Class 4.2); and
(g) substances which, in contact with water, emit flammable gases (Class 4.3).

2.2.4.1.3 Class 4.1 DG include the following:

(a) flammable solids;
(b) self-reactive substances;
(c) solid desensitized explosives; and
(d) polymerizing substances.

2.2.4.1.4 Flammable solids under Class 4.1

2.2.4.1.4.1 Flammable solids mean readily combustible solids and solids which may cause fire through friction.

2.2.4.1.4.2 Readily combustible solids mean fibres, powdered, granular, or pasty substances which are dangerous if they can be easily ignited by brief contact with an ignition source, 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.

2.2.4.1.4.3 Metal powders means powders of metals or metal alloys.

2.2.4.1.4.4 Powdered, granular or pasty substances shall be classified as readily combustible solids of Class 4.1 when the time of burning of one or more of the test runs, performed in accordance with the test method described in the United Nations Manual of Tests and Criteria, Part III, sub-section 33.2.1, is less than 45 s or the rate of burning is more than 2.2 mm/s. Metal powders shall be classified as Class 4.1 when they can be ignited and the reaction spreads over the whole length of the sample in 10 minutes or less.

2.2.4.1.4.5 Solids which may cause fire through friction shall be classified as Class 4.1 by analogy with existing entries until definitive criteria are established.

2.2.4.1.4.6 Assignment of packing groups of flammable solids

2.2.4.1.4.6.1 Criteria for the packing group assignment of Class 4.1 flammable solids are specified in the test method described in the United Nations Manual of Tests and Criteria, Part III, sub-section 33.2.1. For readily combustible solids (other than metal powders), packing group II shall be assigned if the burning time is less than 45 s and the flame passes the wetted zone. Packing group II shall be assigned to metal powders if the zone of reaction spreads over the whole length of the sample in five minutes or less.

2.2.4.1.4.6.2 For readily combustible solids (other than metal powders), packing group III shall be assigned if the burning time is less than 45 s and the wetted zone stops the flame propagation for at least four minutes. Packing group III shall be assigned to metal powders if the reaction spreads over the whole length of the sample in more than five minutes but not more than ten minutes.

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

2.2.4.1.4.6.4 Pyrophoric metal powders, if wetted with sufficient water to suppress their pyrophoric properties, may be classified as Class 4.1.

2.2.4.1.5 Self-reactive substances under Class 4.1

2.2.4.1.5.1 Self-reactive substances[10] are thermally unstable substances liable to undergo a strong exothermic decomposition even without participation of oxygen (air). Substances are not considered to be self-reactive

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[10] 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 2.2.4.2.3 – 2.2.4.2.7 for inclusion in Class 4.2.

substances of Class 4.1, if:

(a) they are Class 1 explosives;
(b) they are Class 5.1 oxidizing substances except that mixtures of oxidizing substances which contain 5.0% or more of combustible organic substances[11];
(c) they are Class 5.2 organic peroxides;
(d) their heat of decomposition[12] is less than 300 J/g; or
(e) their self-accelerating decomposition temperature (SADT) (see 2.2.4.1.5.11) is greater than 75°C for a 50 kg package.

2.2.4.1.5.2 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.

2.2.4.1.5.3 A mixture showing the properties of a self-reactive substance, type G, but not listed in 2.2.4.5 shall be considered for classification as a substance of Class 5.1 (see 2.2.5.2).

2.2.4.1.5.4 The decomposition of self-reactive substances can be initiated by heat, contact with catalytic impurities (such as 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. Some self-reactive substances burn vigorously. Self-reactive substances are, for example, some compounds of the types listed below:

(a) aliphatic azo compounds (–C–N=N–C–);
(b) organic azides ($–C–N_3$);
(c) diazonium salts ($–CN_2^+Z^-$);

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[11] Mixtures of oxidizing substances meeting the criteria of Class 5.1 which contain 5.0% or more of combustible organic substances, which do not meet the criteria mentioned in 2.2.4.1.5.1 (a), (c), (d) or (e) above, shall be subject to the self-reactive substance classification procedure.

[12] The heat of decomposition may be determined using any internationally recognised method such as differential scanning calorimetry and adiabatic calorimetry.

(d) *N*-nitroso compounds (–N–N=O); and

(e) 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.

2.2.4.1.5.5 Self-reactive substances are classified into seven types according to the degree of danger they present. The types of self-reactive substance range from type A, which is prohibited goods, 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.

2.2.4.1.5.6 Permitted self-reactive substances are listed in 2.2.4.5. For each permitted substance listed, the appropriate generic entry of the DG List (UN 3221 to UN 3240) is assigned, and appropriate subsidiary risks and remarks are given.[13] In 2.2.4.5, the permitted substances are classified as technically pure substances (except where the concentration of less than 100% is specified).

2.2.4.1.5.7 For other concentrations, the substances may be classified differently. Classification of these self-reactive substances shall be made by the competent authority of the country of origin on the basis of a test report. The applicable classification procedures, test methods and criteria, and an example of a suitable test report, are given in the United Nations Manual of Tests and Criteria, Part II. The statement of approval shall contain the classification and other relevant conditions. Such statement of approval and the corresponding test report shall be provided as proof upon request.

2.2.4.1.5.8 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 the thermal stability or explosive properties of self-reactive substances are altered by adding

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[13] Generic entries specify self-reactive substance type (B to F); physical state (liquid or solid); and temperature control, when required.

activators, the new formulation shall be assessed in accordance with this classification procedure.

2.2.4.1.5.9 Samples of self-reactive substances or formulations of self-reactive substances not listed in 2.2.4.5, for which a complete set of test results is not available and which is required for further testing or evaluation, may be assigned to one of the appropriate entries for self-reactive substances type C provided the following conditions are met:

(a) the available data indicate that the sample would be no more dangerous than self-reactive substances type B;
(b) the sample is appropriately packaged and the quantity is limited to 10 kg; and
(c) 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.

2.2.4.1.5.10 A self-reactive substance is regarded as possessing explosive properties when, in laboratory testing, the formulation is liable to detonate, to deflagrate rapidly or to show a violent effect when heated under confinement. These properties shall be determined experimentally.[14]

2.2.4.1.5.11 Self-reactive substances are subject to temperature control if their SADT is less than or equal to 55°C. Test methods for determining the SADT are given in the Manual of Tests and Criteria, Part II, Chapter 28. For currently assigned self-reactive substances, the control and emergency temperatures are shown in 2.2.4.5. Self-reactive substances requiring temperature control shall refer to 7.3.7.2 in IMDG Code or 7.1.5.3 in Recommendations on the Transport of Dangerous Goods Model Regulations.

2.2.4.1.5.12 Self-reactive substances may be desensitized through the use of a diluent. If a diluent is used, the self-reactive substance shall be tested with the diluent present in the concentration and form used.

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[14] Suitable test methods with pertinent evaluation criteria are given in the United Nations Manual of Tests and Criteria, Part II.

2.2.4.1.5.13 Diluents which may allow a self-reactive substance to concentrate to a dangerous extent in the event of leakage from a package shall not be used.

2.2.4.1.5.14 The 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.

2.2.4.1.5.15 Liquid diluents in liquid formulations requiring temperature control shall have a boiling point of at least 60°C and a flashpoint 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.

2.2.4.1.6 Solid desensitized explosives under Class 4.1

2.2.4.1.6.1 Solid desensitized explosives are explosive substances which are wetted with water or alcohols or are diluted with other substances to form a homogeneous solid mixture to suppress their explosive properties. Suitable and compatible solvent, such as alcohol, may have to be added to lower the freezing point of the liquid. Some of these substances, when in a dry state, are classified as explosives. Where reference is made to a substance which is wetted with water, or some other liquid, it shall be assigned as a Class 4.1 substance only when in the wetted condition specified. Entries in the DG List for solid desensitized explosives are UN 1310, UN 1320, UN 1321, UN 1322, UN 1336, UN 1337, UN 1344, UN 1347, UN 1348, UN 1349, UN 1354, UN 1355, UN 1356, UN 1357, UN 1517, UN 1571, UN 2555, UN 2556, UN 2557, UN 2852, UN 2907, UN 3317, UN 3319, UN 3344, UN 3364, UN 3365, UN 3366, UN 3367, UN 3368, UN 3369, UN 3370, UN 3376, UN 3380 and UN 3474.

2.2.4.1.6.2 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 Class 5;

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

2.2.4.1.7 Polymerzing substances and mixture (stabilized) under Class 4.1

2.2.4.1.7.1 Polymerizing substances are substances which, without stabilization, are liable to undergo a strong exothermic reaction resulting in the formation of larger molecules or resulting the formation of polymers under conditions normally encountered. 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) and in appropriate packaging;
(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.

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

2.2.4.1.7.3 Polymerizing substances requiring temperature control shall refer to 7.3.7.2 in IMDG Code or 7.1.5.3 in Recommendations on the Transport of Dangerous Goods Model Regulations.

2.2.4.2 Class 4.2 – Substances liable to spontaneous combustion

2.2.4.2.1 Class 4.2 DG comprises:

(a) Pyrophoric substances, which are substances, including mixtures and solutions (liquid or solid), which, even in small quantities, ignite within 5 minutes of coming into contact with air. These substances are the most liable to spontaneous combustion; and
(b) Self-heating substances, which are substances, other than pyrophoric substances, which, in contact with air without energy supply, are liable to self-heating. These substances will ignite only when in large amounts (kilograms) and after long periods of time (hours or days).

2.2.4.2.2 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.

2.2.4.2.3 Solids are considered pyrophoric solids which shall be classified in Class 4.2 if, in tests performed in accordance with the test method given in the United Nations Manual of Tests and Criteria, Part III, Section 33 Test N.2, the sample ignites in one of the tests.

2.2.4.2.4 Liquids are considered pyrophoric liquids which shall be classified in Class 4.2 if, in tests performed in accordance with the test method given in the United Nations Manual of Tests and Criteria, Part III, Section 33 Test N.3, the liquid ignites in the first part of the test, or if it ignites or chars the filter paper.

2.2.4.2.5 A substance shall be classified as a self-heating substance of Class 4.2 if, in tests performed in accordance with the test method given in the United Nations Manual of Tests and Criteria, Part III, Section 33 Test N.4:

(a) a positive result is obtained using a 25 mm cube sample at 140°C;
(b) a positive result is obtained in a test using a 100 mm cube sample at 140°C and a negative result is obtained in a test using a 100 mm cube sample at 120°C and the substance is in packages with a volume of more than 3 m^3;
(c) a positive result is obtained in a test using a 100 mm cube sample at 140°C and a negative result is obtained in a test using a 100 mm cube sample at 100°C and the substance is in packages with a volume of more than 450 L;
(d) a positive result is obtained in a test using a 100 mm cube sample at 140°C and a positive result is obtained using a 100 mm cube sample at 100°C.

2.2.4.2.6 Self-reactive substances, giving also a positive result with this test method shall not be classified in Class 4.2 but in Class 4.1 (see 2.2.4.1.5).

2.2.4.2.7 A substance shall not be classified in Class 4.2 if:

(a) a negative result is obtained in a test using a 100 mm cube sample at 140°C;
(b) a positive result is obtained in a test using a 100 mm cube sample at 140°C and a negative result is obtained in a test using a 25 mm cube sample at 140°C, a negative result is obtained in a test using a 100 mm cube sample at 120°C and the substance is in packages with a volume not more than 3 m^3;
(c) a positive result is obtained in a test using a 100 mm cube sample at 140°C and a negative result is obtained in a test using a 25 mm cube sample at 140°C, a negative result is obtained in a test using a 100 mm cube sample at 100°C and the substance is in packages with a volume not more than 450 L.

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

2.2.4.3.1 Class 4.3 substances are either liquids or solids which, by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities.

2.2.4.3.2 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 and the resulting blast wave and flames may endanger people and the environment.

2.2.4.3.3 Substances which, in contact with water, emit flammable gases shall be classified in Class 4.3 if, in tests performed in accordance with the test method given in the United Nations Manual of Tests and Criteria, Part III, Section 33 Test N.5[15]:

(a) spontaneous ignition takes place in any step of the test procedure;

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[15] This test method shall not be applied to pyrophoric substances.

or

(b) evolution of flammable gas at a rate greater than 1 litre per kilogram of the substance per hour.

2.2.4.3.4 Assignment of packing groups of substances which, in contact with water, emit flammable gases

Packing Group	**Criteria**
I	(i) any substance which reacts vigorously with water at ambient temperatures and demonstrates generally a tendency for the gas produced to ignite spontaneously, or (ii) reacts readily with water at ambient temperatures such that the rate of evolution of flammable gas ≥ 10 litres per kilogram of substances over any one minute.
II	(i) any substance which reacts readily with water at ambient temperatures such that the maximum rate of evolution of flammable gas ≥ 20 litres per kilogram of substances per hour, and (ii) does not meet the criteria for packing group I.
III	(i) any substance which reacts slowly with water at ambient temperatures such that the maximum rate of evolution of flammable gas >1 litre per kilogram of substances per hour, and (ii) does not meet the criteria for packing group I or II.

2.2.4.4 Organometallic Substances

2.2.4.4.1 Depending on their properties, organometallic substances can be classified in Class 4.2 or Class 4.3 (UN 3391 to UN 3400) with additional subsidiary hazards. The required tests methods (N1 to N5) can be found in the Manual of Tests and Criteria, Part III, Section 33.

2.2.4.5 List of currently assigned self-reactive substances

Note 1: 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 substances may be classified differently following the procedures in 2.2.4.1.5.10 to 2.2.4.1.5.11.

Note 2: In the column "Packing Method", codes "OP1" to "OP8" refer to packing methods in basic packing instruction BP520.

SELF-REACTIVE SUBSTANCE	**Concentration (%)**	**Packing method (BP520)**	**Control temperature (°C)**	**Emergency temperature (°C)**	**UN**	**Remarks**
ACETONE-PYROGALLOL COPOLYMER 2- DIAZO-1-NAPHTHOL-5-SULPHONATE	100	OP8			3228	
AZODICARBONAMIDE FORMULATION TYPE B, TEMPERATURE CONTROLLED	< 100	OP5			3232	(1)
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-METHOXYVALERONITRILE)	100	OP7	–5	+5	3236	
2,2' -AZODI(2,4-DIMETHYLVALERONITRILE)	100	OP7	+10	+15	3236	
2,2' -AZODI(ETHYL-2-METHYLPROPIONATE)	100	OP7	+20	+25	3235	
1,1' -AZODI(HEXAHYDROBENZONITRILE)	100	OP7			3226	

SELF-REACTIVE SUBSTANCE	Concentration (%)	Packing method (BP520)	Control temperature (°C)	Emergency temperature (°C)	UN	Remarks
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	
BENZENESULPHONYL HYDRAZIDE	100	OP7			3226	
4-(BENZYL(ETHYL)AMINO)-3-ETHOXY-BENZENEDIAZONIUM ZINC CHLORIDE	100	OP7			3226	
4-(BENZYL(METHYL)AMINO)-3-ETHOXYBENZENEDIAZONIUM ZINC CHLORIDE	100	OP7	+40	+45	3236	
3-CHLORO-4-DIETHYLAMINOBENZENEDIAZONIUM ZINC CHLORIDE	100	OP7			3226	
2-DIAZO-1-NAPHTHOL-4-SULPHONYL CHLORIDE	100	OP5			3222	
2-DIAZO-1-NAPHTHOL-5-SULPHONYL CHLORIDE	100	OP5			3222	
2-DIAZO-1-NAPHTHOLSULPHONIC 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	

SELF-REACTIVE SUBSTANCE	Concentration (%)	Packing method (BP520)	Control temperature (°C)	Emergency temperature (°C)	UN	Remarks
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(ALLYLCARBONATE) + DI-ISOPROPYL PEROXYDICARBONATE	≥ 88 + ≤ 12	OP8	−10	0	3237	
2,5-DIMETHOXY-4-(4-METHYLPHENYL-SULPHONYL)BENZENEDIAZONIUM ZINC CHLORIDE	79	OP7	+40	+45	3236	
4-(DIMETHYLAMINO)-BENZENEDIAZONIUM TRICHLOROZINCATE(−1)	100	OP8			3228	
4-DIMETHYLAMINO-6-(2-DIMETHYLAMINOETHOXY)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)BENZENE-DIAZONIM ZINC CHLORIDE	63-92	OP7	+40	+45	3236	
2-(*N,N*-ETHOXYCARBONYL- PHENYLAMINO)-3-METHOXY-4-(*N*-METHYL-*N*-CYCLOHEXYLAMINO)BENZENE-DIAZONIUM ZINC CHLORIDE	62	OP7	+35	+40	3236	

SELF-REACTIVE SUBSTANCE	**Concentration (%)**	**Packing method (BP520)**	**Control temperature (°C)**	**Emergency temperature (°C)**	**UN**	**Remarks**
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) BORNIC ACID	88-100	OP7			3230	(11)
2-(*N,N*-METHYLAMINOETHYL-CARBONYL)-4-(3,4-DIMETHYL-PHENYLSULPHONYL)BENZENE-DIAZONIUM HYDROGEN SULPHATE	96	OP7	+45	+50	3236	
4-METHYLBENZENESULPHONYL- HYDRAZIDE	100	OP7			3226	
3-METHYL-4-(PYRROLIDIN-1-YL) BENZENEDIAZONIUM TETRAFLUOROBORATE	95	OP6	+45	+50	3234	
4-NITROSOPHENOL	100	OP7	+35	+40	3236	
PHOSPHOROTHIOIC ACID, *O*-[(CYANOPHENYLMETHYLENE)- 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	
TETRAMINEPALLADIUM(II) NITRATE	100	OP6	+30	+35	3234	

Remarks:

(1) Azodicarbonamide formulations which fulfill the criteria of 20.4.2(b) of the Manual of Tests and Criteria. The control and emergency temperatures depend on their SADT determined by the Manual of Tests and Criteria, Part II, Section 20 and Section 28.4 and if required, it shall refer to the control requirements in 7.3.7.2 in IMDG Code or 7.1.5.3 in Recommendations on the Transport of Dangerous Goods Model Regulations.
(2) *(reserved)*
(3) Azodicarbonamide formulations which fulfil the criteria of 20.4.2(c) of the Manual of Tests and Criteria.
(4) Azodicarbonamide formulations which fulfil the criteria of 20.4.2(c) of the Manual of Tests and Criteria. The control and emergency temperatures depend on their SADT determined by the Manual of Tests and Criteria, Part II, Section 20 and Section 28.4 and if required, it shall refer to the control requirements in 7.3.7.2 in IMDG Code or 7.1.5.3 in Recommendations on the Transport of Dangerous Goods Model Regulations.
(5) Azodicarbonamide formulations which fulfil the criteria of 20.4.2(d) of the Manual of Tests and Criteria.
(6) Azodicarbonamide formulations which fulfil the criteria of 20.4.2(d) of the Manual of Tests and Criteria. The control and emergency temperatures depend on their SADT determined by the Manual of Tests and Criteria, Part II, Section 20 and Section 28.4 and if required, it shall refer to the control requirements in 7.3.7.2 in IMDG Code or 7.1.5.3 in Recommendations on the Transport of Dangerous Goods Model Regulations.
(7) With compatible diluent having a boiling point of not less than 150°C.
(8) See 2.2.4.1.5.9.
(9) This entry applies to mixtures of esters of 2-diazo-1-naphthol-4-sulphonic acid and 2-diazo-1-naphthol-5-sulphonic acid meeting the criteria of 20.4.2(d) of the Manual of Tests 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.

2.2.5 *Class 5 - Oxidizing Substances and Organic Peroxides*

2.2.5.1 Scope

2.2.5.1.1 Class 5 substances include oxidizing substances (Class 5.1) and organic peroxides (Class 5.2). Oxidizing substances are themselves not necessarily combustible. However, they may generally yield oxygen to support combustion of other materials. Organic peroxides are substances containing 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. Organic peroxides are thermally unstable substances which may undergo exothermic self-accelerating decomposition.

2.2.5.2 Oxidizing substances under Class 5.1

2.2.5.2.1 Classification of Class 5.1 oxidizing substances

2.2.5.2.1.1 Class 5.1 substances with specific UN numbers shall be classified as stated in the DG List, including the packing groups, subsidiary hazards etc. However, for other substances which are not specified in the DG List but have properties possible to be classified as Class 5.1 DG, the corresponding test methods and criteria including advice on application of the tests are given in the United Nations Manual of Tests and Criteria for the classification. For solid substances, tests are performed to measure the potential for the substance to increase the burning rate or burning intensity of a combustible substance when the two are thoroughly mixed.[16] Classification is based on the test results whether the mixture of substance and cellulose ignites and burns and the mean burning time (for the test O.1) or burning rate (for the test O.3) comparing with those of the reference mixtures.

2.2.5.2.1.2 A solid substance is classified in Class 5.1 if the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested ignites and burns, and exhibits a mean burning time equal to or less than the mean burning time of a 3:7 mixture

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[16] The procedure is given in the United Nations Manual of Tests and Criteria, Part III, section 34.4.1 (test O.1) or alternatively in the section 34.4.3 (test O.3). Tests are conducted on the substance to be evaluated mixed with dry fibrous cellulose in mixing ratios of 1:1 and 4:1, by mass, of sample to cellulose, and compare with the burning characteristics of the mixtures.

(by mass) of potassium bromate and cellulose in the test O.1, or 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 in the test O.3.

2.2.5.2.1.3 For liquid substances, a test is performed to determine the potential for a liquid substance to increase the burning rate or burning intensity of a combustible substance or for spontaneous ignition to occur when the two are thoroughly mixed.[17] Classification is based on test results whether the mixture of substance and cellulose spontaneously ignites, and the mean time taken for the pressure to rise from 690 kPa to 2070 kPa gauge (test O.2) comparing with those of the reference substances.

2.2.5.2.1.4 A liquid substance is classified in Class 5.1 if 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.

2.2.5.2.2 Assignment of packing groups for Class 5.1 DG (oxidizing substances)

2.2.5.2.2.1 Solid oxidizing substances are assigned to a packing group according to the criteria based on the test results of the methods in the United Nations Manual of Tests and Criteria, Part III, Section 34 (test O.1) or alternatively (test O.3).

2.2.5.2.2.2 Liquid oxidizing substances are assigned to a packing group according to the criteria based on the test results of the method in the United Nations Manual of Tests and Criteria, Part III, Section 34 (test O.2).

2.2.5.3 Organic peroxides under Class 5.2

2.2.5.3.1 Organic peroxides are liable to exothermic decomposition at normal or elevated temperatures. The decomposition can be initiated by heat, contact with impurities, friction or impact. The rate of decomposition increases with temperature and varies with the organic peroxide formulation. For certain organic peroxides the temperature shall be

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[17] The procedure is given in the United Nations Manual of Tests and Criteria, Part III, 34.4.2 (test O.2). It measures the pressure rise time during combustion. Whether a liquid is an oxidizing substance of Class 5.1 and, if so, whether packing group I, II or III shall be assigned, is decided on the basis of the test result (see also Precedence of hazard characteristics in 2.1.2).

controlled. 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.

2.2.5.3.2 Classification of organic peroxides

2.2.5.3.2.1 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; or
(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.

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
m_i = molecular mass of organic peroxide i

2.2.5.3.2.2 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 prohibited goods, to type G, which is not subject to the provisions for organic peroxides of Class 5.2. The classification of types B to F is directly related to the maximum quantity allowed in one packaging.

2.2.5.3.2.3 Organic peroxides permitted in packagings are listed in 2.2.5.4 of the Code. For each permitted substance listed, the generic entry of the DG

List (UN 3101 to UN 3120) is assigned, appropriate subsidiary hazards and remarks providing relevant information are given.[18]

2.2.5.3.2.4 Mixtures of the listed formulations may be classified as the same type of organic peroxide as that of the most dangerous component under the conditions given for this type. However, as two stable components can form a thermally less stable mixture, the SADT of the mixture shall be determined[19] and, if necessary, temperature control applied as required. For currently assigned organic peroxides, control and emergency temperatures are shown in the list in 2.2.5.4. Peroxide substances requiring temperature control shall refer to 7.3.7.2 in IMDG Code or 7.1.5.3 in Recommendations on the Transport of Dangerous Goods Model Regulations.

2.2.5.3.2.4.1 The following organic peroxides shall be subject to temperature control:

(a) organic peroxides types B and C with an SADT ≤ 50°C;
(b) organic peroxides type D showing a medium effect when heated under confinement[20] with an SADT ≤ 50°C or showing a low or no effect when heated under confinement with an SADT ≤ 45°C; and
(c) organic peroxides types E and F with an SADT ≤ 45°C.

2.2.5.3.2.4.2 The actual temperature during handling may be lower than the control temperature but shall be selected so as to avoid dangerous separation of phases.

2.2.5.3.2.5 Samples of new organic peroxides or new formulations of currently assigned organic peroxides for which complete test data are not available and which are needed for further testing or evaluation may be assigned to one of the appropriate entries for ORGANIC PEROXIDE TYPE C provided the following conditions are met:

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[18] Generic entries specify organic peroxide type (B to F); physical state (liquid or solid); and temperature control, when required.

[19] Test methods for determining the SADT are given in the United Nations Manual of Tests and Criteria, Part II, chapter 28. The test selected shall be conducted in a manner which is representative, both in size and material, of the package to be transported.

[20] 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 Sub-section 28.4.

(a) the available data indicate that the sample would be no more dangerous than ORGANIC PEROXIDE TYPE B;
(b) the sample is appropriately packaged; and
(c) 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.

2.2.5.3.2.6 Principles for classification of organic peroxides

2.2.5.3.2.6.1 Any organic peroxide formulation shall be regarded as possessing explosive properties when, in laboratory testing, the formulation is liable to detonate, to deflagrate rapidly or to show a violent effect when heated under confinement. These decisive properties shall be determined experimentally[21] by the competent authority of the country of origin on the basis of a test report. The applicable classification procedures, test methods and criteria, and an example of a suitable test report, are given in the United Nations Manual of Tests and Criteria, Part II. The statement of approval shall contain the classification and other relevant conditions. Such statement of approval and the corresponding test report shall be provided as proof upon request.

2.2.5.3.2.7 Desensitization of organic peroxides

2.2.5.3.2.7.1 For safety reason, 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.

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

(a) diluents type A are organic liquids which are compatible with the organic peroxide and which have a boiling point of not less than

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[21] Suitable test methods with pertinent evaluation criteria are given in the United Nations Manual of Tests and Criteria, Part II.

150°C. Type A diluents may be used for desensitizing all organic peroxides.

(b) 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.

2.2.5.3.2.7.3 Diluents, other than type A or type B, may be added to organic peroxide formulations as listed in 2.2.5.4 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.

2.2.5.3.2.7.4 Water may only be used for the desensitization of organic peroxides which are listed in 2.2.5.4 or in the competent authority decision according to 2.2.5.3.2.6.1 as being “with water” or “as a stable dispersion in water”.

2.2.5.3.2.7.5 Organic and inorganic solids may be used for desensitization of organic peroxides provided that they are compatible.

2.2.5.3.2.7.6 Compatible liquids and solids are those which have no detrimental influence on the thermal stability and hazard type of the organic peroxide formulation.

2.2.5.4 List of currently assigned organic peroxides

Note 1: In the column “Packing Method”, codes “OP1” to “OP8” refer to packing methods in basic packing instruction BP520.

ORGANIC PEROXIDE	**Concentration (%)**	**Diluent Type A (%)**	**Diluent Type B (%)**	**Inert Solid (%)**	**Water (%)**	**Packing Method (BP520)**	**Control Temperature (°C)**	**Emergency Temperature (°C)**	**UN**	**Subsidiary Hazards and Remarks**
ACETYL ACETONE PEROXIDE	≤ 42	≥ 48			≥8	OP7			3105	(2)
ACETYL ACETONE PEROXIDE	≤ 35	≥ 57			≥8	OP8			3107	(32)
ACETYL ACETONE PEROXIDE	≤ 32 as a paste					OP7			3106	(20)
ACETYL CYCLOHEXANESULPHONYL PEROXIDE	≤ 82				≥ 12	OP4	−10	0	3112	
ACETYL CYCLOHEXANESULPHONYL PEROXIDE	≤ 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	

ORGANIC PEROXIDE	**Concentration (%)**	**Diluent Type A (%)**	**Diluent Type B (%)**	**Inert Solid (%)**	**Water (%)**	**Packing Method (BP520)**	**Control Temperature (°C)**	**Emergency Temperature (°C)**	**UN**	**Subsidiary Hazards and Remarks**
tert-AMYL PEROXY ISOPROPYL CARBONATE	≤ 77	≥ 23				OP5			3103	
tert-AMYL PEROXYNEODECANOATE	≤ 77		≥ 23			OP7	0	+10	3115	
tert-AMYL PEROXYNEODECANOATE	≤ 47	≥ 53				OP8	0	+10	3119	
tert-AMYL PEROXYPIVALATE	≤ 77		≥ 23			OP5	+10	+5	3113	
tert-AMYL PEROXY-3,5,5-TRIMETHYLHEXANOATE	≤ 100					OP7			3105	
tert-BUTYL CUMYL PEROXIDE	> 42 – 100					OP8			3109	
tert-BUTYL CUMYL PEROXIDE	≤ 52			≥ 48		OP8			3108	
n-BUTYL 4,4-DI-(*tert*-BUTYLPEROXY)VALERATE	> 52 – 100					OP5			3103	
n-BUTYL 4,4-DI-(*tert*-BUTYLPEROXY)VALERATE	≤ 52			≥ 48		OP8			3108	
tert-BUTYL HYDROPEROXIDE	>79 – 90				≥ 10	OP5			3103	(13)
tert-BUTYL HYDROPEROXIDE	≤ 80	≥ 20				OP7			3105	(4) (13)
tert-BUTYL HYDROPEROXIDE	≤ 79				> 14	OP8			3107	(13) (23)

ORGANIC PEROXIDE	Concentration (%)	Diluent Type A (%)	Diluent Type B (%)	Inert Solid (%)	Water (%)	Packing Method (BP520)	Control Temperature (°C)	Emergency Temperature (°C)	UN	Subsidiary Hazards and Remarks
tert-BUTYL HYDROPEROXIDE	≤ 72				≥ 28	OP8			3109	(13)
tert-BUTYL HYDROPEROXIDE + DI-*tert*-BUTYLPEROXIDE	< 82 + > 9				≥ 7	OP5			3103	(13)
tert-BUTYL MONOPEROXYMALEATE	> 52 – 100					OP5			3102	
tert-BUTYL MONOPEROXYMALEATE	≤ 52	≥ 48				OP6			3103	
tert-BUTYL MONOPEROXYMALEATE	≤ 52			≥ 48		OP8			3108	
tert-BUTYL MONOPEROXYMALEATE	≤ 52 as a paste					OP8			3108	
tert-BUTYL PEROXYACETATE	> 52 – 77	≥ 23				OP5			3101	
tert-BUTYL PEROXYACETATE	> 32 – 52	≥ 48				OP6			3103	
tert-BUTYL PEROXYACETATE	≤ 32		≥ 68			OP8			3109	
tert-BUTYL PEROXYBENZOATE	> 77 – 100					OP5			3103	
tert-BUTYL PEROXYBENZOATE	> 52 – 77	≥ 23				OP7			3105	
tert-BUTYL PEROXYBENZOATE	≤ 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-	> 52 – 100					OP6	+20	+25	3113	

ORGANIC PEROXIDE	Concentration (%)	Diluent Type A (%)	Diluent Type B (%)	Inert Solid (%)	Water (%)	Packing Method (BP520)	Control Temperature (°C)	Emergency Temperature (°C)	UN	Subsidiary Hazards and Remarks
ETHYLHEXANOATE										
tert-BUTYL PEROXY-2-ETHYLHEXANOATE	> 32 – 52		≥ 48			OP8	+30	+35	3117	
tert-BUTYL PEROXY-2-ETHYLHEXANOATE	≤ 52			≥ 48		OP8	+20	+25	3118	
tert-BUTYL PEROXY-2-ETHYLHEXANOATE	≤ 32		≥ 68			OP8	+40	+45	3119	
tert-BUTYL PEROXY-2-ETHYLHEXANOATE + 2,2-DI-(*tert*-BUTYLPEROXY)BUTANE	≤ 12 + ≤ 14	≥ 14		≥ 60		OP7			3106	
tert-BUTYL PEROXY-2-ETHYLHEXANOATE + 2,2-DI-(*tert*-BUTYLPEROXY)BUTANE	≤ 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	
tert-BUTYL PEROXYISOBUTYRATE	≤ 52		≥ 48			OP7	+15	+20	3115	
tert-BUTYL PEROXY	≤ 77	≥ 23				OP5			3103	

ORGANIC PEROXIDE	Concentration (%)	Diluent Type A (%)	Diluent Type B (%)	Inert Solid (%)	Water (%)	Packing Method (BP520)	Control Temperature (°C)	Emergency Temperature (°C)	UN	Subsidiary Hazards and Remarks
ISOPROPYLCARBONATE										
tert-BUTYL PEROXY ISOPROPYLCARBONATE	≤ 62		≥ 38			OP7			3105	
1-(2-*tert*-BUTYLPEROXYISOPROPYL)-3-ISOPROPENYLBENZENE	≤ 77	≥ 23				OP7			3105	
1-(2-*tert*-BUTYLPEROXYISOPROPYL)-3-ISOPROPENYLBENZENE	≤ 42			≥ 58		OP8			3108	
tert-BUTYL PEROXY-2-METHYLBENZOATE	≤ 100					OP5			3103	
tert-BUTYL PEROXYNEODECANOATE	> 77 – 100					OP7	–5	+5	3115	
tert-BUTYL PEROXYNEODECANOATE	≤ 77		≥ 23			OP7	0	+10	3115	
tert-BUTYL PEROXYNEODECANOATE	≤ 52 as a stable dispersion in water					OP8	0	+10	3119	
tert-BUTYL PEROXYNEODECANOATE	≤ 42 as a stable dispersion in water (frozen)					OP8	0	+10	3118	
tert-BUTYL PEROXYNEODECANOATE	≤ 32	≥ 68				OP8	0	+10	3119	
tert-BUTYL PEROXYNEOHEPTANOATE	≤ 77	≥ 23				OP7	0	+10	3115	

ORGANIC PEROXIDE	Concentration (%)	Diluent Type A (%)	Diluent Type B (%)	Inert Solid (%)	Water (%)	Packing Method (BP520)	Control Temperature (°C)	Emergency Temperature (°C)	UN	Subsidiary Hazards and Remarks
tert-BUTYL PEROXYNEOHEPTANOATE	≤ 42 as a stable dispersion in water					OP8	0	+10	3117	
tert-BUTYL PEROXYPIVALATE	> 67 – 77	≥ 23				OP5	0	+10	3113	
tert-BUTYL PEROXYPIVALATE	> 27 – 67		≥ 33			OP7	0	+10	3115	
tert-BUTYL PEROXYPIVALATE	≤ 27		≥ 73			OP8	+30	+35	3119	
tert-BUTYL PEROXY STEARYLCARBONATE	≤ 100					OP7			3106	
tert-BUTYL PEROXY-3,5,5-TRIMETHYLHEXANOATE	> 37 – 100					OP7			3105	
tert-BUTYL PEROXY-3,5,5-TRIMETHYLHEXANOATE	≤ 42			≥ 58		OP7			3106	
tert-BUTYL PEROXY-3,5,5-TRIMETHYLHEXANOATE	≤ 37		≥ 63			OP8			3109	
3-CHLOROPEROXYBENZOIC ACID	> 57 – 86			≥ 14		OP1			3102	
3-CHLOROPEROXYBENZOIC ACID	≤ 57			≥ 3	≥ 40	OP7			3106	
3-CHLOROPEROXYBENZOIC ACID	≤ 77			≥ 6	≥ 17	OP7			3106	
CUMYL HYDROPEROXIDE	> 90 - 98	≤ 10				OP8			3107	(13)

ORGANIC PEROXIDE	Concentration (%)	Diluent Type A (%)	Diluent Type B (%)	Inert Solid (%)	Water (%)	Packing Method (BP520)	Control Temperature (°C)	Emergency Temperature (°C)	UN	Subsidiary Hazards and Remarks
CUMYL HYDROPEROXIDE	≤ 90	≥ 10				OP8			3109	(13) (18)
CUMYL PEROXYNEODECANOATE	≤ 87	≥ 13				OP7	– 10	0	3115	
CUMYL PEROXYNEODECANOATE	≤ 77		≥ 23			OP7	–10	0	3115	
CUMYL PEROXYNEODECANOATE	≤ 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)
CYCLOHEXANONE PEROXIDE(S)	≤ 72	≥ 28				OP7			3105	(5)
CYCLOHEXANONE PEROXIDE(S)	≤ 72 as a paste					OP7			3106	(5) (20)
CYCLOHEXANONE PEROXIDE(S)	≤ 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)

ORGANIC PEROXIDE	Concentration (%)	Diluent Type A (%)	Diluent Type B (%)	Inert Solid (%)	Water (%)	Packing Method (BP520)	Control Temperature (°C)	Emergency Temperature (°C)	UN	Subsidiary Hazards and Remarks
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	
DIBENZOYL PEROXIDE	> 77 – 94				≥ 6	OP4			3102	
DIBENZOYL PEROXIDE	≤ 77				≥ 23	OP6			3104	
DIBENZOYL PEROXIDE	≤ 62			≥ 28	≥ 10	OP7			3106	
DIBENZOYL PEROXIDE	> 52 – 62 as a paste					OP7			3106	(20)
DIBENZOYL PEROXIDE	> 35 – 52			≥ 48		OP7			3106	
DIBENZOYL PEROXIDE	> 36 – 42	≥ 18			≤ 40	OP8			3107	
DIBENZOYL PEROXIDE	≤ 56.5 as a paste				≥ 15	OP8			3108	
DIBENZOYL PEROXIDE	≤ 52 as a paste					OP8			3108	(20)
DIBENZOYL PEROXIDE	≤ 42 as a stable dispersion in water					OP8			3109	
DIBENZOYL PEROXIDE	≤ 42	≥ 38			≥ 13	OP8			3109	
DIBENZOYL PEROXIDE	≤ 35			≥ 65					Exempt	(29)

ORGANIC PEROXIDE	**Concentration (%)**	**Diluent Type A (%)**	**Diluent Type B (%)**	**Inert Solid (%)**	**Water (%)**	**Packing Method (BP520)**	**Control Temperature (°C)**	**Emergency Temperature (°C)**	**UN**	**Subsidiary Hazards and Remarks**
DI-(4-*tert*-BUTYLCYCLOHEXYL) PEROXYDICARBONATE	≤ 100					OP6	+30	+35	3114	
DI-(4-*tert*-BUTYLCYCLOHEXYL) PEROXYDICARBONATE	≤ 42 as a stable dispersion in water					OP8	+30	+35	3119	
DI-*(4-tert*-BUTYLCYCLOHEXYL) PEROXYDICARBONATE	≤ 42 as a paste					OP8	+35	+40	3118	
DI-*tert*-BUTYL PEROXIDE	> 52 – 100					OP8			3107	
DI-*tert*-BUTYL PEROXIDE	≤ 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	
1,1-DI-(*tert*-	≤ 72		≥ 28			OP5			3103	(30)

ORGANIC PEROXIDE	Concentration (%)	Diluent Type A (%)	Diluent Type B (%)	Inert Solid (%)	Water (%)	Packing Method (BP520)	Control Temperature (°C)	Emergency Temperature (°C)	UN	Subsidiary Hazards and Remarks
BUTYLPEROXY)CYCLOHEXANE										
1,1-DI-(*tert*-BUTYLPEROXY)CYCLOHEXANE	> 52 – 80	≥ 20				OP5			3103	
1,1-DI-(*tert*-BUTYLPEROXY)CYCLOHEXANE	> 42 – 52	≥ 48				OP7			3105	
1,1-DI-(*tert*-BUTYLPEROXY)CYCLOHEXANE	≤ 42	≥ 13		≥ 45		OP7			3106	
1,1-DI-(*tert*-BUTYLPEROXY)CYCLOHEXANE	≤ 42	≥ 58				OP8			3109	
1,1-DI-(*tert*-BUTYLPEROXY)CYCLOHEXANE	≤ 27	≥ 25				OP8			3107	(21)
1,1-DI-(*tert*-BUTYLPEROXY)CYCLOHEXANE	≤ 13	≥ 13	≥ 74			OP8			3109	
1,1-DI-(*tert*-BUTYLPEROXY)CYCLOHEXANE + *tert*-BUTYL PEROXY-2-ETHYLHEXANOATE	≤ 43 + ≤ 16	≥ 41				OP7			3105	
DI-*n*-BUTYL PEROXYDICARBONATE	> 27 – 52		≥ 48			OP7	–15	–5	3115	

ORGANIC PEROXIDE	**Concentration (%)**	**Diluent Type A (%)**	**Diluent Type B (%)**	**Inert Solid (%)**	**Water (%)**	**Packing Method (BP520)**	**Control Temperature (°C)**	**Emergency Temperature (°C)**	**UN**	**Subsidiary Hazards and Remarks**
DI-*n*-BUTYL PEROXYDICARBONATE	≤ 42 as a stable dispersion in water (frozen)					OP8	–15	–5	3118	
1,1-DI-(*tert*-BUTYLPEROXY)CYCLOHEXANE	≤ 42 as a stable dispersion in water (frozen)					OP8	–15	–5	3118	
1,1-DI-(*tert*-BUTYLPEROXY)CYCLOHEXANE	≤ 27		≥ 73			OP8	–10	0	3117	
DI-*sec*-BUTYL PEROXYDICARBONATE	> 52 – 100					OP4	–20	–10	3113	
DI-*sec*-BUTYL PEROXYDICARBONATE	≤ 52		≥ 48			OP7	–15	–5	3115	
DI-(*tert*-BUTYLPEROXYISOPROPYL)BENZENE(S)	> 42 – 100			≤ 57		OP7			3106	
DI-(*tert*-BUTYLPEROXYISOPROPYL)BENZENE(S)	≤ 42			≥ 58					Exempt	(29)
DI-(*tert*-BUTYLPEROXY)PHTHALATE	> 42 – 52	≥ 48				OP7			3105	
DI-(*tert*-BUTYLPEROXY)PHTHALATE	≤ 52 as a paste					OP7			3106	(20)
DI-(*tert*-BUTYLPEROXY)PHTHALATE	≤ 42	≥ 58				OP8			3107	

ORGANIC PEROXIDE	Concentration (%)	Diluent Type A (%)	Diluent Type B (%)	Inert Solid (%)	Water (%)	Packing Method (BP520)	Control Temperature (°C)	Emergency Temperature (°C)	UN	Subsidiary Hazards and Remarks
2,2-DI-(*tert*-BUTYLPEROXY)PROPANE	≤ 52	≥ 48				OP7			3105	
2,2-DI-(*tert*-BUTYLPEROXY)PROPANE	≤ 42	≥ 13		≥ 45		OP7			3106	
1,1-DI-(*tert*-BUTYLPEROXY)-3,3,5-TRIMETHYLCYCLOHEXANE	> 90 – 100					OP5			3101	
1,1-DI-(*tert*-BUTYLPEROXY)-3,3,5-TRIMETHYLCYCLOHEXANE	≤ 90		≥ 10			OP5			3103	(30)
1,1-DI-(*tert*-BUTYLPEROXY)-3,3,5-TRIMETHYLCYCLOHEXANE	> 57 – 90	≥ 10				OP5			3103	
1,1-DI-(*tert*-BUTYLPEROXY)-3,3,5-TRIMETHYLCYCLOHEXANE	≤ 77		≥ 23			OP5			3103	
1,1-DI-(*tert*-BUTYLPEROXY)-3,3,5-TRIMETHYLCYCLOHEXANE	≤ 57			≥ 43		OP8			3110	
1,1-DI-(*tert*-BUTYLPEROXY)-3,3,5-TRIMETHYLCYCLOHEXANE	≤ 57	≥ 43				OP8			3107	
1,1-DI-(*tert*-BUTYLPEROXY)-3,3,5-TRIMETHYLCYCLOHEXANE	≤ 32	≥ 26	≥ 42			OP8			3107	

ORGANIC PEROXIDE	Concentration (%)	Diluent Type A (%)	Diluent Type B (%)	Inert Solid (%)	Water (%)	Packing Method (BP520)	Control Temperature (°C)	Emergency Temperature (°C)	UN	Subsidiary Hazards and Remarks
DICETYL PEROXYDICARBONATE	≤ 100					OP8	+30	+35	3120	
DICETYL PEROXYDICARBONATE	≤ 42 as a stable dispersion in water					OP8	+30	+35	3119	
DI-4-CHLOROBENZOYL PEROXIDE	≤ 77				≥ 23	OP5			3102	
DI-4-CHLOROBENZOYL PEROXIDE	≤ 52 as a paste					OP7			3106	(20)
DI-4-CHLOROBENZOYL PEROXIDE	≤ 32			≥ 68					Exempt	(29)
DICUMYL PEROXIDE	> 52 – 100					OP8			3110	(12)
DICUMYL PEROXIDE	≤ 52			≥ 48					Exempt	(29)
DICYCLOHEXYL PEROXYDICARBONATE	> 91 – 100					OP3	+10	+15	3112	
DICYCLOHEXYL PEROXYDICARBONATE	≤ 91				≥ 9	OP5	+10	+15	3114	
DICYCLOHEXYL PEROXYDICARBONATE	≤ 42 as a stable dispersion in water					OP8	+15	+20	3119	
DIDECANOYL PEROXIDE	≤ 100					OP6	+30	+35	3114	
2,2-DI-(4,4-DI-(*tert*-BUTYLPEROXY)CYCLOHEXYL)-PROPANE	≤ 42			≥ 58		OP7			3106	
2,2-DI-(4,4-DI-(*tert*-	≤ 22		≥ 78			OP8			3107	

ORGANIC PEROXIDE	Concentration (%)	Diluent Type A (%)	Diluent Type B (%)	Inert Solid (%)	Water (%)	Packing Method (BP520)	Control Temperature (°C)	Emergency Temperature (°C)	UN	Subsidiary Hazards and Remarks
BUTYLPEROXY)CYCLOHEXYL)-PROPANE										
DI-2,4-DICHLOROBENZOYL PEROXIDE	≤ 77				≥ 23	OP5			3102	
DI-2,4-DICHLOROBENZOYL PEROXIDE	≤ 52 as a paste					OP8	+ 20	+ 25	3118	
DI-2,4-DICHLOROBENZOYL PEROXIDE	≤ 52 as a paste with silicon oil					OP5			3104	
DI-(2-ETHOXYETHYL) PEROXYDICARBONATE	≤ 52		≥ 48			OP7	–10	0	3115	
DI-(2-ETHYLHEXYL) PEROXYDICARBONATE	> 77 – 100					OP5	–20	–10	3113	
DI-(2-ETHYLHEXYL) PEROXYDICARBONATE	≤ 77		≥ 23			OP7	–15	–5	3115	
DI-(2-ETHYLHEXYL) PEROXYDICARBONATE	≤ 62 as a stable dispersion in water					OP8	–15	–5	3119	
DI-(2-ETHYLHEXYL) PEROXYDICARBONATE	≤ 52 as a stable dispersion in water (frozen)					OP8	–15	–5	3120	

ORGANIC PEROXIDE	Concentration (%)	Diluent Type A (%)	Diluent Type B (%)	Inert Solid (%)	Water (%)	Packing Method (BP520)	Control Temperature (°C)	Emergency Temperature (°C)	UN	Subsidiary Hazards and Remarks
2,2-DIHYDROPEROXYPROPANE	≤ 27			≥ 73		OP5			3102	
DI-(1-HYDROXYCYCLOHEXYL) PEROXIDE	≤ 100					OP7			3106	
DIISOBUTYRYL PEROXIDE	> 32 – 52		≥ 48			OP5	–20	–10	3111	
DIISOBUTYRYL PEROXIDE	≤ 42 (as a stable dispersion in water)					OP8	–20	–10	3119	
DIISOBUTYRYL PEROXIDE	≤ 32		≥ 68			OP7	–20	–10	3115	
DIISOPROPYLBENZENE DIHYDROPEROXIDE	≤ 82	≥ 5			≥ 5	OP7			3106	(24)
DIISOPROPYL PEROXYDICARBONATE	> 52 – 100					OP2	–15	-5	3112	
DIISOPROPYL PEROXYDICARBONATE	≤ 52		≥ 48			OP7	–20	–10	3115	
DIISOPROPYL PEROXYDICARBONATE	≤ 32	≥ 68				OP7	–15	–5	3115	
DILAUROYL PEROXIDE	≤ 100					OP7			3106	
DILAUROYL PEROXIDE	≤ 42 as a stable dispersion in water					OP8			3109	
DI-(3-METHOXYBUTYL) PEROXYDICARBONATE	≤ 52		≥ 48			OP7	–5	+5	3115	

ORGANIC PEROXIDE	Concentration (%)	Diluent Type A (%)	Diluent Type B (%)	Inert Solid (%)	Water (%)	Packing Method (BP520)	Control Temperature (°C)	Emergency Temperature (°C)	UN	Subsidiary Hazards and Remarks
DI-(2-METHYLBENZOYL) PEROXIDE	≤ 87				≥ 13	OP5	+30	+35	3112	
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	
2,5-DIMETHYL-2,5-DI-(BENZOYLPEROXY)HEXANE	≤ 82			≥ 18		OP7			3106	
2,5-DIMETHYL-2,5-DI-(BENZOYLPEROXY)HEXANE	≤ 82				≥ 18	OP5			3104	
2,5-DIMETHYL-2,5-DI-(*tert*-BUTYLPEROXY)HEXANE	> 90 – 100					OP5			3103	
2,5-DIMETHYL-2,5-DI-(*tert*-BUTYLPEROXY)HEXANE	> 52 – 90	≥ 10				OP7			3105	
2,5-DIMETHYL-2,5-DI-(*tert*-BUTYLPEROXY)HEXANE	≤ 77			≥ 23		OP8			3108	

ORGANIC PEROXIDE	Concentration (%)	Diluent Type A (%)	Diluent Type B (%)	Inert Solid (%)	Water (%)	Packing Method (BP520)	Control Temperature (°C)	Emergency Temperature (°C)	UN	Subsidiary Hazards and Remarks
2,5-DIMETHYL-2,5-DI-(*tert*-BUTYLPEROXY)HEXANE	≤ 52	≥ 48				OP8			3109	
2,5-DIMETHYL-2,5-DI-(*tert*-BUTYLPEROXY)HEXANE	≤ 47 as a paste					OP8			3108	
2,5-DIMETHYL-2,5-DI-(*tert*-BUTYLPEROXY)HEXANE	≤ 22			≥ 78					Exempt	(29)
2,5-DIMETHYL-2,5-DI-(*tert*-BUTYLPEROXY)HEXYNE-3	> 86 – 100					OP5			3101	
2,5-DIMETHYL-2,5-DI-(*tert*-BUTYLPEROXY)HEXYNE-3	>52 – 86	≥ 14				OP5			3103	(26)
2,5-DIMETHYL-2,5-DI-(*tert*-BUTYLPEROXY)HEXYNE-3	≤ 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)	≤ 77	≥ 23				OP7			3105	

ORGANIC PEROXIDE	Concentration (%)	Diluent Type A (%)	Diluent Type B (%)	Inert Solid (%)	Water (%)	Packing Method (BP520)	Control Temperature (°C)	Emergency Temperature (°C)	UN	Subsidiary Hazards and Remarks
HEXANE										
1,1-DIMETHYL-3-HYDROXYBUTYL PEROXYNEOHEPTANOATE	≤ 52	≥ 48				OP8	0	+10	3117	
DIMYRISTYL PEROXYDICARBONATE	≤ 100					OP7	+20	+25	3116	
DIMYRISTYL PEROXYDICARBONATE	≤ 42 as a stable dispersion in water					OP8	+20	+25	3119	
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	
DI-(2-PHENOXYETHYL) PEROXYDICARBONATE	≤ 85				≥ 15	OP7			3106	
DIPROPIONYL PEROXIDE	≤ 27		≥ 73			OP8	+15	+20	3117	
DI-*n*-PROPYL PEROXYDICARBONATE	≤ 100					OP3	−25	−15	3113	

ORGANIC PEROXIDE	Concentration (%)	Diluent Type A (%)	Diluent Type B (%)	Inert Solid (%)	Water (%)	Packing Method (BP520)	Control Temperature (°C)	Emergency Temperature (°C)	UN	Subsidiary Hazards and Remarks
DI-*n*-PROPYL PEROXYDICARBONATE	≤ 77		≥ 23			OP5	−20	−10	3113	
DISUCCINIC ACID PEROXIDE	> 72 – 100					OP4			3102	(17)
DISUCCINIC ACID PEROXIDE	≤ 72				≥ 28	OP7	+10	+15	3116	
DI-(3,5,5-TRIMETHYLHEXANOYL) PEROXIDE	> 52 – 82	≥ 18				OP7	0	+10	3115	
DI-(3,5,5-TRIMETHYLHEXANOYL) PEROXIDE	≤ 52 as a stable dispersion in water					OP8	+10	+15	3119	
DI-(3,5,5-TRIMETHYLHEXANOYL) PEROXIDE	> 38 – 52	≥ 48				OP8	+10	+15	3119	
DI-(3,5,5-TRIMETHYLHEXANOYL) PEROXIDE	≤ 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	
ETHYL 3,3-DI-(*tert*-	≤ 77	≥ 23				OP7			3105	