EASA
European Union Aviation Safety Agency

Safe Transport of Dangerous Goods by Air

Joseph LE-TONQUEZE – Pascal TATIN

DG Experts (EASA EU-South East Asia Aviation Partnership Project Experts)

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Your safety is our mission.

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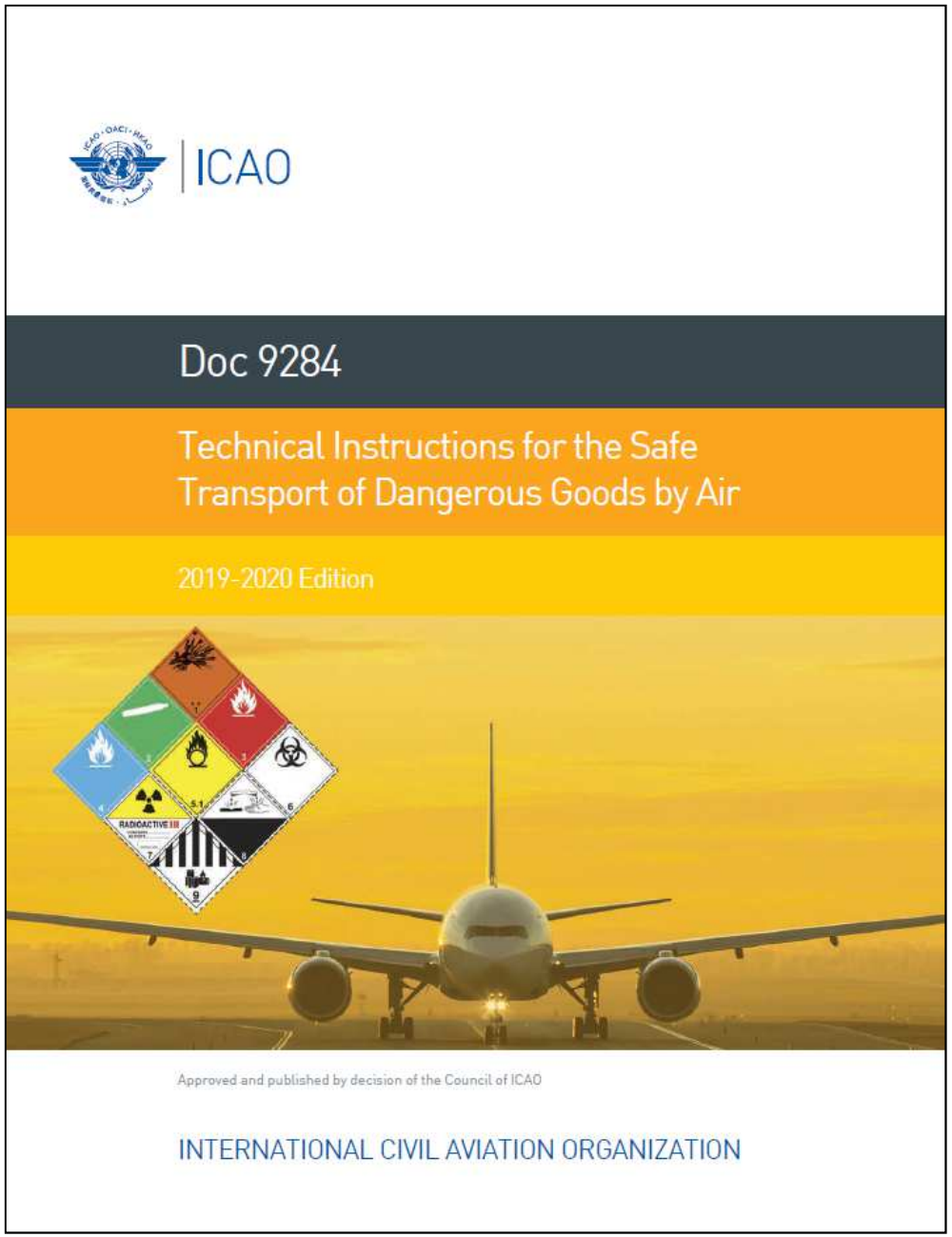
EASA
European Union Aviation Safety Agency

Safe Transport of Dangerous Goods by Air

Part 2 – Classification of DG

SAFE TRANSPORT OF DANGEROUS GOODS BY AIR



- **<u>Part 2</u> = Classification of DG**

- ✓ **Chapter 1 - Explosives**
- ✓ **Chapter 2 - Gases**
- ✓ **Chapter 3 - Flammable Liquids**
- ✓ **Chapter 4 - Flammable solids; Substances liable to spontaneous combustion; Substances which, on contact with water, emit flammable gases**
- ✓ **Chapter 5 - Oxidizing substances; Organic peroxides**
- ✓ **Chapter 6 - Toxic and infectious substances**
- ✓ **Chapter 7 - Radioactive material**
- ✓ **Chapter 8 - Corrosive substances**
- ✓ **Chapter 9 - Miscellaneous dangerous substances and articles, including environmentally hazardous substances**

PART 2 – UN CLASSIFICATION

- **DG Articles and Substances (including mixtures and solutions) are assigned to one of the 9 Hazard Classes**

- **Some of these Classes are subdivided into Divisions**

- **Code I.M.P. (Interline Message Procedure) is assigned for each class or division *(IATA DGR App. B.2.2.4)***

- **Some Classes include different Packing Group (I, II or III) for some UN Numbers**

- **Approximately 3000 items are identified with UN Numbers (4 digits)**

➢ 9 Hazard Classes:

- ✓ **Class 1 – Explosives**
- ✓ **Class 2 – Gases**
- ✓ **Class 3 – Flammable Liquids**
- ✓ **Class 4 – Flammable solids – Substances liable to Spontaneous Combustion – Substances, which, in contact with water, emit Flammable Gases**
- ✓ **Class 5 – Oxidizing substances – Organic Peroxides**
- ✓ **Class 6 – Toxic substances – Infectious substances**
- ✓ **Class 7 – Radioactive material**
- ✓ **Class 8 – Corrosive substances**
- ✓ **Class 9 – Miscellaneous Dangerous substances and articles, including Environmentally hazardous substances**

PART 2 – UN CLASSIFICATION

- **Some Classes have Divisions:**

- ✓ **Class 1 have 6 Divisions (1.1 to 1.6)**
- ✓ **Class 2 have 3 Divisions (2.1, 2.2 and 2.3)**
- ✓ **Class 4 have 3 Divisions (4.1, 4.2 and 4.3)**
- ✓ **Class 5 have 2 Divisions (5.1 and 5.2)**
- ✓ **Class 6 have 2 Divisions (6.1 and 6.2)**

- **Classes 3, 7, 8 and 9 don't have Divisions**

- **A same substance or article can be assigned in more than one hazard class/division**

PART 2 – UN CLASSIFICATION

- **Based on their properties and function with the degree of danger they present, some substances are assigned to three Packing Group**
  - → **P.G. I** **High degree of danger**
  - → **P.G. II** **Medium degree of danger**
  - → **P.G. III** **Low degree of danger**
- **Consequence: For a same substance/article, we can have a different type of usable packaging and different maximum net quantity per package**

Name	UN No.	Class or division	Subsidiary risk	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger aircraft		Cargo aircraft	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4	5	6	7	8	9	10	11	12	13
Amines, solid, corrosive, n.o.s.*	3259	8		Corrosive		A3	I	E0	858	1 kg	862	25 kg
							II	E2	859	15 kg	863	50 kg
									Y844	5 kg		
							III	E1	860	25 kg	864	100 kg
									Y845	5 kg		

PART 2 – UN CLASSIFICATION

- **Based on their properties and function with the degree of danger they present, some substances are assigned to three Packing Group**

→ **P.G. I** **High degree of danger**

→ **P.G. II** **Medium degree of danger**

→ **P.G. III** **Low degree of danger**

- **Methods how to know in which Packing Group a substance/article has to be assigned are described in the UN Manual of Tests and Criteria**

http://www.unece.org/trans/danger/publi/manual/rev6/manrev6-files_e.html

PART 2 – UN CLASSIFICATION

- **Substances and Articles are assigned to "UN Numbers" and "Proper Shipping Names", according to their hazard classification and their composition**

- **± 3000 UN Numbers with "Proper Shipping Names"**

- **Substances and Articles are classified from UN0004 to UN3548, + ID8000 (Consumer Commodity)**

- **These Substances and Articles are listed in the Attachment 1** (IATA section 4;3) **of the Technical Instructions**

✓ **by list of numbers with the associated proper shipping names (chapter 1)**

✓ **by list of proper shipping names and class and/or division (chapter 2)**

PART 2 – UN CLASSIFICATION

LIST OF UN NUMBERS WITH ASSOCIATED PROPER SHIPPING NAMES

0004	**Ammonium picrate** dry or wetted with less than 10% water, by mass
0005	**Cartridges for weapons** with bursting charge
0006	**Cartridges for weapons** with bursting charge
0007	**Cartridges for weapons** with bursting charge
0039	**Bombs, photo-flash**
0042	**Boosters** without detonator
0043	**Bursters**, explosive
0044	**Primers, cap type**
0048	**Charges, demolition**

3258	**Elevated temperature solid, n.o.s., at or above 240°C**
3259	**Amines, solid, corrosive, n.o.s.** *or* **Polyamines, solid, corrosive, n.o.s.**
3260	**Corrosive solid, acidic, inorganic, n.o.s.**
3261	**Corrosive solid, acidic, organic, n.o.s.**
3262	**Corrosive solid, basic, inorganic, n.o.s.**
3294	**Hydrogen cyanide, solution in alcohol** with not more than 45% hydrogen cyanide
3295	**Hydrocarbons, liquid, n.o.s.**
3296	**Heptafluoropropane** *or* **Refrigerant gas R 227**
3297	**Ethylene oxide and chlorotetrafluoroethane mixture**, with not more than 8.8% ethylene oxide

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3543	**Articles containing a substance which emits flammable gas in contact with water, n.o.s.**
3544	**Articles containing oxidizing substance, n.o.s.**
3545	**Articles containing organic peroxide, n.o.s.**
3546	**Articles containing toxic substance, n.o.s.**
3547	**Articles containing corrosive substance, n.o.s.**
3548	**Articles containing miscellaneous dangerous goods, n.o.s.**
8000	**Consumer commodity**

PART 2 – UN CLASSIFICATION

➢ **Dangerous goods are listed in Table 3-1, and could be listed by names, by ''generic'' or ''not otherwise specified (n.o.s.)'' entries**

✓ **Single entries for well-defined substances or articles**

- Acetone UN 1090 - Ethyl Nitrite solution UN 1194

✓ **Generic entries for a well-defined group of substances or articles**

- Adhesives UN 1133 - Perfumery products UN 1266

- Carbamate pesticide, solid, toxic UN 2757

✓ **Specific n.o.s. entries covering a group of substances or articles of a particular chemical or technical nature**

- Nitrates, inorganic, n.o.s. UN 1477 - Alcohols, n.o.s. UN 1987

✓ **General n.o.s. entries covering a group of substances or articles meeting the criteria of one or more classes or divisions**

- Flammable solid, organic, n.o.s. UN 1325

- Flammable liquid, n.o.s. UN 1993

PART 2 – UN CLASSIFICATION

Class or Division	Description
1	**Explosives**
1.1	Articles and substances having a mass explosion hazard
1.2	Articles and substances having a projection hazard but not a mass explosion hazard
1.3	Articles and substance having a fire hazard, a minor blast hazard and/or a minor projection hazard but not a mass explosion hazard
1.4	Articles and substances presenting no significant hazard
1.5	Very insensitive substances having a mass explosion hazard
1.6	Extremely insensitive articles which do not have a mass explosion hazard
2	**Gases**
2.1	Flammable gas
2.2	Non-flammable, non-toxic gas
2.3	Toxic gas
3	**Flammable liquids**
4	**Flammable solids; Substances liable to spontaneous combustion; Substances which, in contact with water, emit flammable gases**
4.1	Flammable solids
4.2	Substances liable to spontaneous combustion
4.3	Substances which, in contact with water, emit flammable gases
5	**Oxidizing substances and Organic Peroxides**
5.1	Oxidizers
5.2	Organic peroxides
6	**Toxic and Infectious substances**
6.1	Toxic substances
6.2	Infectious substances
7	**Radioactive material**
8	**Corrosives**
9	**Miscellaneous dangerous goods**

➢ Class 1: Explosives

- ✓ ***Explosive substance*** **is a solid or liquid substance (or a mixture of substances) which is in itself capable, by chemical reaction, of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings. Pyrotechnic substances are included even when they do not evolve gases**

- ✓ ***Pyrotechnic substance*** **is a substance or a mixture of substances designed to produce an effect by heat, light, sound, gas or smoke or a combination of these as the result of non-detonative, self-sustaining, exothermic, chemical reactions**

- ✓ ***Explosive article*** **is an article containing one or more explosive substances**

- ✓ ***Phlegmatized substance*** **is a substance (or "phlegmatizer") added to an explosive to enhance its safety in handling and transport. The phlegmatizer renders the explosive insensitive, or less sensitive, to heat, shock, impact, percussion or friction (paper, wax, water, polymers, alcohol, petroleum jelly, paraffin, …)**

PART 2 – UN CLASSIFICATION

- **Class 1: Explosives**

✓ **Division 1.1: Substances and Articles which have a Mass explosion hazard → TNT, Pentex, Dynamite**

✓ **Division 1.2: Substances and Articles which have a Projection hazard, but not a Mass explosion hazard → Military Shells**

✓ **Division 1.3: Substances and Articles which have a Fire hazard, and either a minor Blast hazard or a minor Projection hazard or both, but not a Mass explosion hazard → Fireworks**

- **IMP Cargo Codes:**

✓ **REX, RCX, RGX**

➢ Class 1: Explosives

✓ **Division 1.4: Substances or Articles which present no Significant hazard → Ammunitions, Detonator**

✓ **Division 1.5: Very insensitive Substances which have a Mass explosion hazard → Mine's explosives**

✓ **Division 1.6: Extremely insensitive Articles which do not have a Mass explosion hazard → Articles containing low sensible explosive material**

RXB, RXC, RXD

RXE, RXG, RXS

REX

REX

➢ Class 1: Explosives

- ✓ **In addition to be assigned to one of these six divisions, and depending of the type of hazard they present, Explosives goods are also assigned to one of the thirteen Compatibility Group**
- ✓ **Compatibility Groups are describes in Table 2-2, "Classification Codes", with letters A, B, C, D, E, F, G, H, J, K, L, N and S**

PART 2 – UN CLASSIFICATION

- **Class 1: Explosives**

- **Table 2-2: Classification Codes classification into compatibility groups**

(from "A" to "S")

Table 2-2. Classification codes

Description of substance or article to be classified	*Compatibility group*	*Classification code*
Primary explosive substance	A	1.1A
Article containing a primary explosive substance and not containing two or more effective protective features. Some articles, such as detonators for blasting, detonator assemblies for blasting and primers, and cap-type, are included even though they do not contain primary explosives	B	1.1B 1.2B 1.4B
Propellant explosive substance or other deflagrating explosive substance or article containing such explosive substance	C	1.1C 1.2C 1.3C 1.4C
Secondary detonating explosive substance or black powder or article containing a secondary detonating explosive substance, in each case without means of initiation and without a propelling charge, or article containing a primary explosive substance and containing two or more effective protective features	D	1.1D 1.2D 1.4D 1.5D
Article containing a secondary detonating explosive substance, without means of initiation, with a propelling charge (other than one containing a flammable liquid or gel or hypergolic liquids)	E	1.1E 1.2E 1.4E
Article containing a secondary detonating explosive substance with its own means of initiation, with a propelling charge (other than one containing a flammable liquid or gel or hypergolic liquids) or without a propelling charge	F	1.1F 1.2F 1.3F 1.4F

▪▪▪▪ ▪▪▪▪ ▪▪▪▪ ▪▪▪▪

➢ Class 2: Gases

➢ **A gas is a substance which:**

✓ **a) at 50°C has a vapour pressure greater than 300 kPa, or**

✓ **b) is completely gaseous at 20°C at std pressure of 101.3 kPa**

➢ **The transport condition of a Class 2 gas is described according to its physical state as:**

✓ **a) compressed gas**

✓ **b) liquefied gas**

✓ **c) refrigerated liquefied gas (*Cryogenic liquid)***

✓ **d) dissolved gas**

✓ **e) absorbed gas**

→ **This includes mixtures of one or more gases with one or more vapours of substances of other classes, articles charged with a gas, and aerosols**

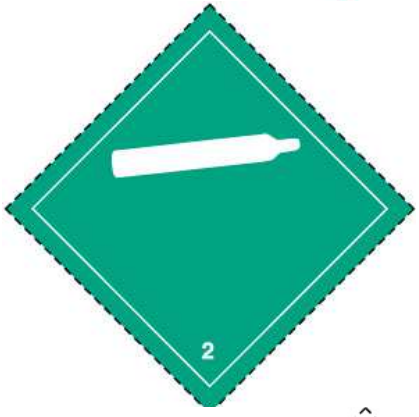
PART 2 – UN CLASSIFICATION

- **Class 2: Gases (3 Divisions)**

✓ **Division 2.1: Flammable Gases**

RFG

✓ **Division 2.2: Non-Flammable, Non-Toxic Gases**



RNG, RCL

✓ **Division 2.3: Toxic Gases**

RPG

PART 2 – UN CLASSIFICATION

- **Class 2: Gases**

RFG

- ✓ **Division 2.1: <u>Flammable Gases</u>**

- **Any compressed gas which:**

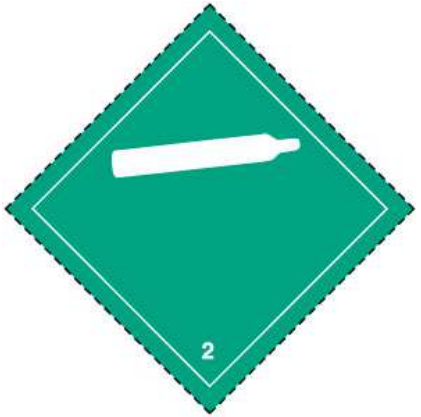
✓ **when mixed with less than 13% of air, is ignitable, or**
✓ **have a flammable range with air**

→ Butane, Hydrogen, Propane, Acetylene, Lighters,...

- ***Most of Aerosols (UN 1950) and Receptacles, small, containing gas (UN 2037)*** **must be assigned as being in Division 2.1**

PART 2 – UN CLASSIFICATION

- **Class 2: Gases**



RNG, RCL

- ✓ **Division 2.2: <u>Non-Flammable,</u>**
  <u>Non-Toxic Gases</u>

- **Any compressed gas which:**

- ✓ **are asphyxiant (when diluting or replacing oxygen)**
- ✓ **are oxidizing (when contributing combustion with oxygen)**
- ✓ **do not come under the other divisions**

→ **carbon dioxide, neon, fire-extinguisher**

→ **low T° liquefied gas such as liquefied nitrogen, or helium, …**

PART 2 – UN CLASSIFICATION

➢ **Gases of Division 2.2 are not subject to these Instructions when contained in the following:**

~~RNG, RCL~~

✓ **foodstuffs, including carbonated beverages (except UN 1950)**

✓ **balls intended for use in sports**

✓ **tyres which meet the provisions of Special Provision A59**

✓ **lamps containing only gases of Division 2.2 provided they are packaged so that the projectile effects of any rupture of the bulb will be contained within the package**

(for lamps, see Part 1, chapter 2.6)

PART 2 – UN CLASSIFICATION

- **Class 2: Gases**

RPG

- ✓ **Division 2.3: <u>Toxic Gases</u>**

- **Gases which:**

✓ **are known to be so toxic or corrosive to humans as to pose a hazard to health; or**

✓ **are presumed to be toxic or corrosive to humans (depending to LC_{50} value)**

→ **carbon monoxide, tear gas devices, sarin gas**

- **Most of Toxic Gases are forbidden for carriage by air**

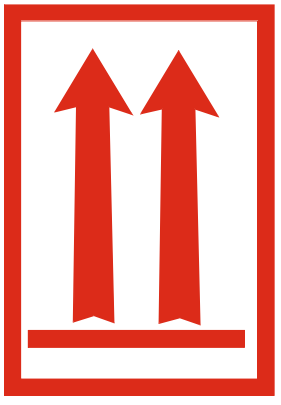
- **Class 2: Gases - Hazard precedence**

- **Gases and gas mixtures, with hazards associated with more than one division take the following precedence :**
  - ✓ **division 2.3 takes precedence over all divisions**
  - ✓ **division 2.1 takes precedence over division 2.2**

- **Class 3: Flammable Liquids**

→ **Including also Liquid Desensitized Explosives**

RFL



- **Any liquids, or mixtures of liquids, or liquids containing solids in solution or suspension:**

✓ **having a closed-cup flash point at 60°C, or not more than a open-cup flash point at 65.6°C (giving off flammable vapour)**

→ **paints, varnishes, lacquers, alcohols, some adhesives, acetone, petrol**

✓ **desensitized explosives (explosive substances which are dissolved or suspended in water or other liquid substances, to form homogeneous liquid mixture to suppress their explosive properties)**

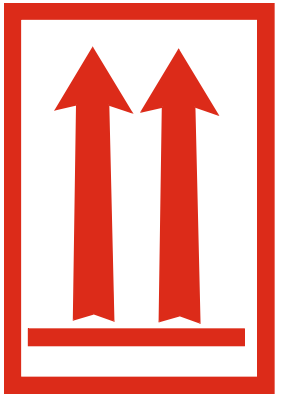
→ **nitro-glycerine mixture desensitized as a flammable liquid or nitro-glycerine solution in alcohol**

PART 2 – UN CLASSIFICATION

- **Class 3: Flammable Liquids**

→ **This Class does not have Divisions**

RFL



- **Class 3 Substances are assigned to a Packing Group depending of their "flash point" and their "initial boiling point" (Table 2-4)**

- **Flash Point definition: (closed-cup or open-cup)**

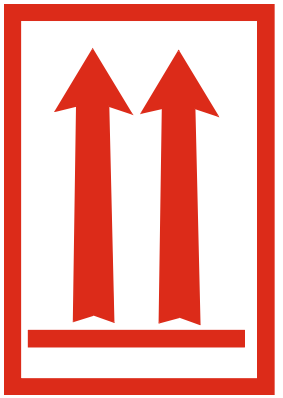
✓ **It is the lowest temperature at which flammable vapour is given off a liquid in a test vessel in sufficient concentration to be ignited in air when exposed momentarily to a source of ignition (flammable vapour at 60°C closed-up test, or at 65.6°C open-cup test)**

PART 2 – UN CLASSIFICATION

- **Class 3: Flammable Liquids**

→ **This Class does not have Divisions**

RFL



- **Class 3 Substances are assigned to a Packing Group depending of their "flash point" and their "initial boiling point" (Table 2-4)**

Packing Group	Flash Point	Initial Boiling Point
I	-----	≤ 35 °C
II	< 23°C	> 35 °C
III	≥ 23°C - ≤ 60°C	> 35 °C

PART 2 – UN CLASSIFICATION

➢ **Class 4 is divided in 3 Divisions, each one is assigned to Packing Groups (except Div. 4.1 Self Reactive substances)**

✓ **Division 4.1: Flammable Solids, Self-reactive substances, Solid desensitized explosives and Polymerizing Substances**

RFS

✓ **Division 4.2: Substances liable to spontaneous combustion**

RSC

✓ **Division 4.3: Substances which in contact with water emit flammable gases**

RFW

➢ Class 4 and Divisions

✓ **Division 4.1: <u>Flammable Solids, Self-reactive substances, Solid desensitized explosives and Polymerizing Substances</u>**

RFS

➢ **Solids which, under conditions encountered in transport, are readily combustible or may cause or contribute to fire through friction**

→ **Matches, Sulphur, Celluloid, Camphor synthetic, some Nitrocellulose and Naphthalene, Zirconium dry, some Powder of Metal, Metal Alloy, …)**

➢ **Self-reactive substances which are liable to undergo a strongly exothermic reaction**

→ **Listed in Table 2-6**

➢ **Desensitized explosives which may explode if not diluted sufficiently**

→ **Nitroglycerin mixture desensitized, Pentaerythrite tetanitrate mixture**

➢ Class 4 and Divisions

RFS

✓ **Division 4.1: <u>Flammable Solids</u>**

✓ **Solids which, under conditions encountered in transport, are readily combustible or may cause or contribute to fire through friction**

➢ **Combustible solids (powdered, granular or pasty substances) which are classified dangerous if they can be easily ignited by brief contact with an ignition source (such as a burning match) and if the flame spreads rapidly**

→ **Note that the danger may not only come from the fire but also from toxic combustion products !**

→ **Metal powders are especially dangerous as it is very difficult to extinguish a fire as normal extinguishing agents such as carbon dioxide or water can increase the hazard !**

➢ Class 4 and Divisions

RFS

✓ **Division 4.1: <u>Flammable Solids</u>**

✓ **Solids which, under conditions encountered in transport, are readily combustible or may cause or contribute to fire through friction**

➢ Assignment to Packing Group

✓ **Packing Group II must be assigned to <u>combustible solids</u> if the burning time is less than 45 seconds and the flame passes the wetted zone**

✓ **Packing Group III must be assigned to <u>combustible solids</u> if the burning time is less than 45 seconds and the wetted zone stops the flame propagation for at least 4 minutes**

✓ **Packing Group II must be assigned to <u>powders of metal or metal alloys</u> if the zone of reaction spreads over the whole length of the sample in 5 minutes or less**

✓ **Packing Group III must be assigned to <u>metal powders</u> if the reaction spreads over the whole length of the sample in more than 5 minutes but not more than 10 minutes.**

➢ Class 4 and Divisions

RFS

✓ **Division 4.1: <u>Self-reactive substances</u>**

➢ **Self-reactive substances which are liable to undergo a strongly exothermic reaction**

- **Self-reactive substances are thermally unstable substances liable to undergo a strongly exothermic decomposition even without the participation of oxygen (air)**
- **Their decomposition can be initiated by heat, contact with catalytic impurities (e.g. acids, heavy-metal compounds, bases), friction or impact**
- **The rate of decomposition increases with Temperature and varies with the substance**
- **Decomposition, particularly if no ignition occurs, may result in the evolution of toxic gases or vapours**
- **For certain of them, temperature must be controlled.**
- **Some may decompose explosively, particularly if confined**

➢ Class 4 and Divisions

RFS

✓ **Division 4.1: <u>Self-reactive substances</u>**

➢ **Self-reactive substances which are liable to undergo a strongly exothermic reaction**

➢ **Self-reactive substances are classified according to the degree of danger they present**

➢ **Related substances like UN 2956, UN 3242, UN 3251 and Self Reactive Liquid type B are forbidden**

➢ **Those which are permitted (UN 3221 to 3240) are listed in Table 2-6**

➢ **These substances of this Division 4.1 are not assign to Packing Group**

- **Class 4 and Divisions**

✓ **Division 4.1: <u>Solid desensitized explosives</u>**

RFS

- **Desensitized explosives which may explode if not diluted sufficiently**

- **They 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**

- **They have UN Numbers entries in the DG List (table 3-1, blue pages)**

- **They are assign to Packing Group**

➢ Class 4 and Divisions

✓ **Division 4.1: <u>Polymerising Substances and Mixtures (Stabilized)</u>**

RFS

➢ **They are substances which, without stabilization, are liable to undergo a strongly exothermic reaction resulting in the formation of larger molecules or in the formation of polymers under conditions normally encountered in transport**

➢ **Their assignment is related to and when:**

- their self-accelerating polymerization temperature (SAPT) is 75°C or less

- they exhibit a heat of reaction of more than 300 J/g

- they do not meet any other criteria for inclusion in Classes 1 to 8

➢ **They are subject to temperature control in transport if their self-accelerating polymerization temperature (SAPT) is 50 °C or less in the packaging in which the substance is to be transported**

➢ Class 4 and Divisions

✓ **Division 4.2: <u>Substances liable to spontaneous combustion</u> (including pyrophoric substances and self-heating substances**

RSC

➢ **Any substance, like:**

✓ **Pyrophoric substances, including mixtures and solutions (liquid or solid), which, even in small quantities, ignite within 5 minutes of coming into contact with air**

➢ **Self-heating substances, which in contact with air without energy supply are liable to self-heating**

→ **white or yellow phosphorus, magnesium diamide, titanium powder dry**

➢ Class 4 and Divisions

✓ **Division 4.2: <u>Substances liable to spontaneous combustion</u> (including pyrophoric substances and self-heating substances**

RSC

➢ Assignment to Packing Group

✓ **Packing Group I must be assigned to all pyrophoric liquids and solids**

✓ **Packing Group II or Packing Group III must be assigned to self-heating substances, depending of the result obtained during the test using a sample cube (from 25 to 100 mm edge, at a temperature from 100°C to 140°C, and depending the volume of the package in which the substance has to be transported)**

➢ Class 4 and Divisions

✓ **Division 4.3: <u>Substances which in contact with water emit flammable gases</u>**

RFW

➢ **Substances which, in contact with water, emit flammable gases which can form explosive mixtures with air**

➢ **They are easily ignited by all ordinary sources of ignition, for example, naked lights, sparking hand tools or unprotected light bulbs**

➢ **Usually called ''water reactive substances'', ''dangerous when wet''**

→ calcium carbide, sodium

➢ Class 4 and Divisions

✓ **Division 4.3: <u>Substances which in contact with water emit flammable gases</u>**

RFW

➢ Assignment to Packing Group

✓ **Packing Group I must be assigned to any substance which reacts vigorously with water at ambient temperatures and demonstrates generally a tendency for the gas produced to ignite spontaneously, or which reacts readily with water at ambient temperatures such that the rate of evolution of flammable gas is equal to or greater than 10 L/kg of substance over anyone minute**

✓ **Packing Group II must be assigned to any substance which reacts readily with water at ambient temperatures such that the maximum rate of evolution of flammable gas is equal to or greater than 20 L/kg of substance per hour, and which does not meet the criteria for Packing Group I**

✓ **Packing Group III must be assigned to any substance which reacts slowly with water at ambient temperatures such that the maximum rate of evolution of flammable gas is equal to or greater than 1 L/kg of substance per hour, and which does not meet the criteria for Packing Groups I or II.**

PART 2 – UN CLASSIFICATION

- **Class 5: Divided in 2 Divisions**

✓ **Division 5.1: Oxidizing substances**

ROX

✓ **Division 5.2: Organic peroxides**

ROP

PART 2 – UN CLASSIFICATION

- **Class 5:**

✓ **Division 5.1: <u>Oxidizing substances</u>**

ROX

- **Substances which, in themselves are not necessarily combustible, may generally, by yielding oxygen, cause or contribute to the combustion of other material**

- **They can be contained in an article**

→ **ammonium nitrate fertilizer, calcium chlorate, bleaches, hydrogen peroxide**

→ **chemical oxygen generators including P.S.U, P.B.E**

PART 2 – UN CLASSIFICATION

- **Class 5:**
  - ✓ **Division 5.1: <u>Oxidizing substances</u>**

ROX

- **They can be ‘’Solid’’ or ‘’Liquid’’ oxidizing substances**
- **On both, tests are performed to measure (solids) or determine (liquids) the potential for increasing the burning rate or burning intensity of a combustible substance**
- **Both Solids and Liquids are assigned Packing Group I, II or III**
  - ✓ **For Solids, see Part 2; 5.2.2.2**
  - ✓ **For Liquids, see Part 2; 5.2.3.2**

- **Class 5:**

✓ **Division 5.2: <u>Organic Peroxides</u>**

ROP

- **These are organic substances (solids or liquids) which contain the bivalent ''—O—O—'' structure and may be considered derivatives of the hydrogen peroxide ''H—O—O—H'', where one or both of the ''H'' hydrogen atoms have been replaced by organic radicals**
- **They are thermally unstable substances, which may undergo exothermic, self-accelerating decomposition**
- **In addition, they may have one or more of the following properties:**

✓ **be liable to explosive decomposition**

✓ **burn rapidly**

✓ **be sensitive to impact or friction**

✓ **react dangerously with other substances**

✓ **cause damage to the eyes**

- **Class 5:**
  - ✓ **Division 5.2: <u>Organic Peroxides</u>**

ROP

- **Their exothermic decomposition can be started by heat, contact with impurities (like acids, heavy metal compounds, amines), friction or impact**
- **Their rate of decomposition (burning) increases with temperature, depending of their formulation. Decomposition may result in the evolution of harmful or flammable gases or vapours**
- **For certain organic peroxides, the temperature must be controlled during transport**

PART 2 – UN CLASSIFICATION

- **Class 5:**
- ✓ **Division 5.2: <u>Organic Peroxides</u>**

ROP

- **Also, some organic peroxides decompose explosively, particularly if confined**
- **This characteristic may be modified by the addition of diluents (desensitization process) or by the use of appropriate packaging**

- **These substances are not assigned to Packing Groups**

→ Table 2-7 reproduces the list of currently assigned organic peroxides in packages

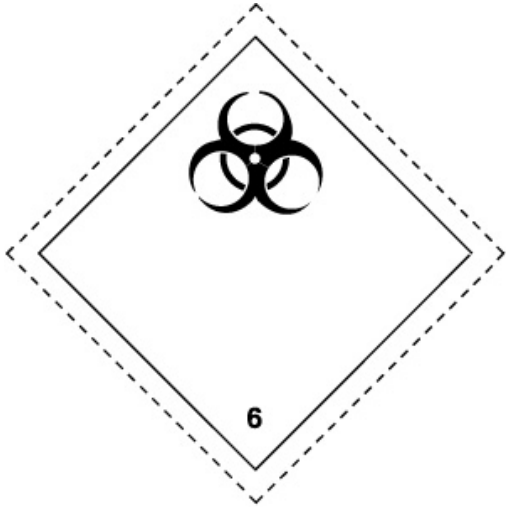
PART 2 – UN CLASSIFICATION

- **Class 6: Divided in 2 Divisions**

- ✓ **Division 6.1: Toxic substances**

RPB

- ✓ **Division 6.2: Infectious Substances**



RIS

PART 2 – UN CLASSIFICATION

- **Class 6:**
  - ✓ **Division 6.1: <u>Toxic substances</u> (including pesticides)**

RPB

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

→ **arsenic, nicotine, cyanide, phenol, pesticides, strychnine**

- **These substances are assigned to Packing Groups according to the degree of their toxic hazards … …**

✓ **Packing Group I — Substances and preparations presenting a very severe toxicity risk**

✓ **Packing Group II — Substances and preparations presenting a serious toxicity risk**

✓ **Packing Group III — Substances and preparations presenting a relatively low toxicity risk**

… … based on their Lethal Dose (LD_{50}), Lethal Concentration (LC_{50}) and saturated vapour concentration (V)

- **Class 6:**
  - ✓ **Division 6.1: <u>Toxic substances</u> (including pesticides)**

RPB

- **In the absence of human experience, the grouping must be based on the available data from animal experiments**
- **Three possible routes of administrations must be examined. These routes are exposure through:**
  - ✓ **oral ingestion (o)**
  - ✓ **dermal contact (d)**
  - ✓ **inhalation of dusts, mists, or vapors (i)**
- **Criteria for Oral and Dermal routes, as well as for Inhalation of dusts and mists, are as shown in Table 2-8**
- **Criteria for Inhalation of Liquids having toxic vapours are shown in Table 2-9**

PART 2 – UN CLASSIFICATION

- **Class 6:**
  - ✓ **Division 6.1: <u>Toxic substances</u> (including pesticides)**

RPB

- **Table 2-8: Grouping criteria for administration through oral ingestion, dermal contact and inhalation of dusts and mists**

Packing Group	Oral toxicity LD_{50} (mg/kg)	Dermal toxicity LD_{50} (mg/kg)	Inhalation toxicity by dusts and mists LC_{50} (mg/L)
I	≤5.0	≤50	≤0.2
II	>5.0 and ≤50	>50 and ≤200	>0.2 and ≤2.0
III*	>50 and ≤300	>200 and ≤1 000	>2.0 and ≤4.0
* Tear gas must be included in PG II even if their toxicity correspond to PG III			

PART 2 – UN CLASSIFICATION

- **Class 6:**
  - ✓ **Division 6.1: <u>Toxic substances</u> (including pesticides)**

RPB

- **Table 2-9: Criteria for inhalation**

Packing Group I	**V ≥10 LC_{50} and LC_{50} ≤1 000 mL/m3**
Packing Group II	**V ≥LC_{50} and LC_{50} ≤3 000 mL/m3 and not meeting the criteria for Packing Group I**
Packing Group III	**V ≥0.2 LC_{50} and LC_{50} ≤5 000 mL/m3 and not meeting the criteria for Packing Groups I and II**

PART 2 – UN CLASSIFICATION

- **Class 6:**
  - ✓ **Division 6.2: <u>Infectious substances</u>**

RIS

- **Substances known to contain, or reasonably expected to contain pathogens**

- **Pathogens are defined as micro-organisms (including bacteria, viruses, rickettsias, parasites, fungi) and other agents such as prions, which can cause disease in humans or animals**

→ Ebola, Rabies, VIH, Yellow Fever, Variola

→ Medical waste, clinical waste

But … →

PART 2 – UN CLASSIFICATION

- **Division 6.2: Infectious Substances**

✓ **Infectious Substances are divided in two Categories:**

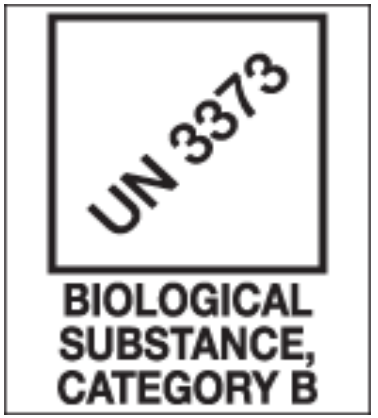
→ **Category "A": infectious substance capable of causing permanent disability, life-threatening or fatal disease to humans or animals**

– **assigned to UN2814: Infectious Substances affecting Humans**

– **assigned to UN2900: Infectious Substances affecting Animals only**

→ **Category "B": infectious substance which does not meet the criteria to be Category A**

– **assigned to UN3373: Biological Substances, Category B**



PART 2 – UN CLASSIFICATION

➢ **Division 6.2: Infectious Substances**

→ **Category "A": UN2814, UN2900**

✓ **Assignments to UN 2814 or UN 2900 must be based on the ''known medical history and symptoms'' of the source human or animal, endemic local conditions, or ''professional judgment'' concerning individual circumstances of the source human or animal**

✓ **Indicative examples of substances that meet these criteria are given in Table 2-10**

✓ **Table 2-10 is not exhaustive. Infectious substances, including new or emerging pathogens, which do not appear in Table 2-10 but which meet the same criteria must be assigned to Category A**

✓ **In addition, if there is doubt as to whether or not a substance meets the criteria it must be included in Category A**

PART 2 – UN CLASSIFICATION

➢ Division 6.2: Infectious Substances

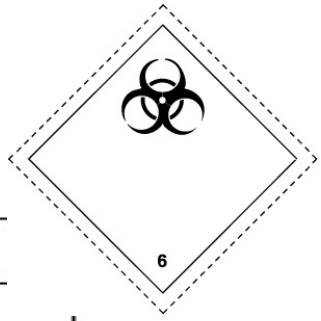
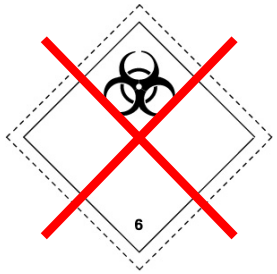


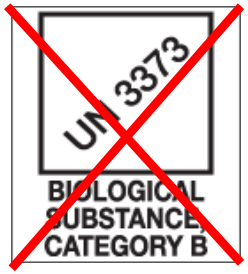
Table 2-10. Indicative examples of infectious substances included in Category A in any form unless otherwise indicated (6.3.2.2.1 a))

UN Number and Proper Shipping Name	Micro-organism
UN 2814 Infectious substances affecting humans	*Bacillus anthracis (cultures only)* *Brucella abortus (cultures only)* *Brucella melitensis (cultures only)* *Brucella suis (cultures only)* *Burkholderia mallei – Pseudomonas mallei* – Glanders *(cultures only)* *Burkholderia pseudomallei – Pseudomonas pseudomallei (cultures only)* *Chlamydia psittaci* – avian strains (cultures only) *Clostridium botulinum (cultures only)* *Coccidioides immitis (cultures only)* *Coxiella burnetii (cultures only)* Crimean-Congo hemorrhagic fever virus Dengue virus (cultures only) Eastern equine encephalitis virus (cultures only) *Escherichia coli*, verotoxigenic (cultures only) Ebola virus Flexal virus *Francisella tularensis (cultures only)* Guanarito virus Hantaan virus Hantaviruses causing haemorrhagic fever with renal syndrome Hendra virus Hepatitis B virus (cultures only) Herpes B virus (cultures only) Highly pathogenic avian influenza virus (cultures only) Human immunodeficiency virus (cultures only) Japanese Encephalitis virus (cultures only) Junin virus
UN 2900 Infectious substances affecting animals only	African swine fever virus (cultures only) Avian paramyxovirus Type 1 – Velogenic Newcastle disease virus (cultures only) Classical swine fever virus (cultures only) Foot and mouth disease virus (cultures only) Goatpox virus (cultures only) Lumpy skin disease virus (cultures only) *Mycoplasma mycoides* – Contagious bovine pleuropneumonia (cultures only) Peste des petits ruminants virus (cultures only) Rinderpest virus (cultures only) Sheep-pox virus (cultures only) Swine vesicular disease virus (cultures only) Vesicular stomatitis virus (cultures only)

PART 2 – UN CLASSIFICATION

➢ **Division 6.2: Infectious Substances**





✓ **Exceptions:**

– **Substances not containing infectious substances or substances which are unlikely to cause disease in humans or animals**

– **Micro-organisms which are non-pathogenic to humans or animals**

– **When pathogens have been neutralized or inactivated such that they no longer pose a health risk**

– **Environmental samples (including food and water samples) which are not considered to pose a significant risk of infection**

– **Dried blood spots (drop of blood onto absorbent material)**

– **Faecal occult blood screening sample**

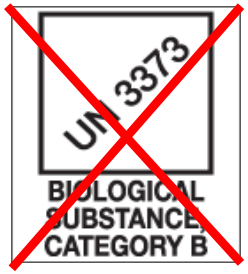
– **Dried blood spots that have been collected for the purposes of transfusion or for the preparation of blood products to be used for transfusion or transplantation and any tissues or organs intended for use in transplantation**

☞ **Genetically modified micro-organisms (GMO) not meeting the definition of infectious substances must be classified according to Chapter 9**

PART 2 – UN CLASSIFICATION

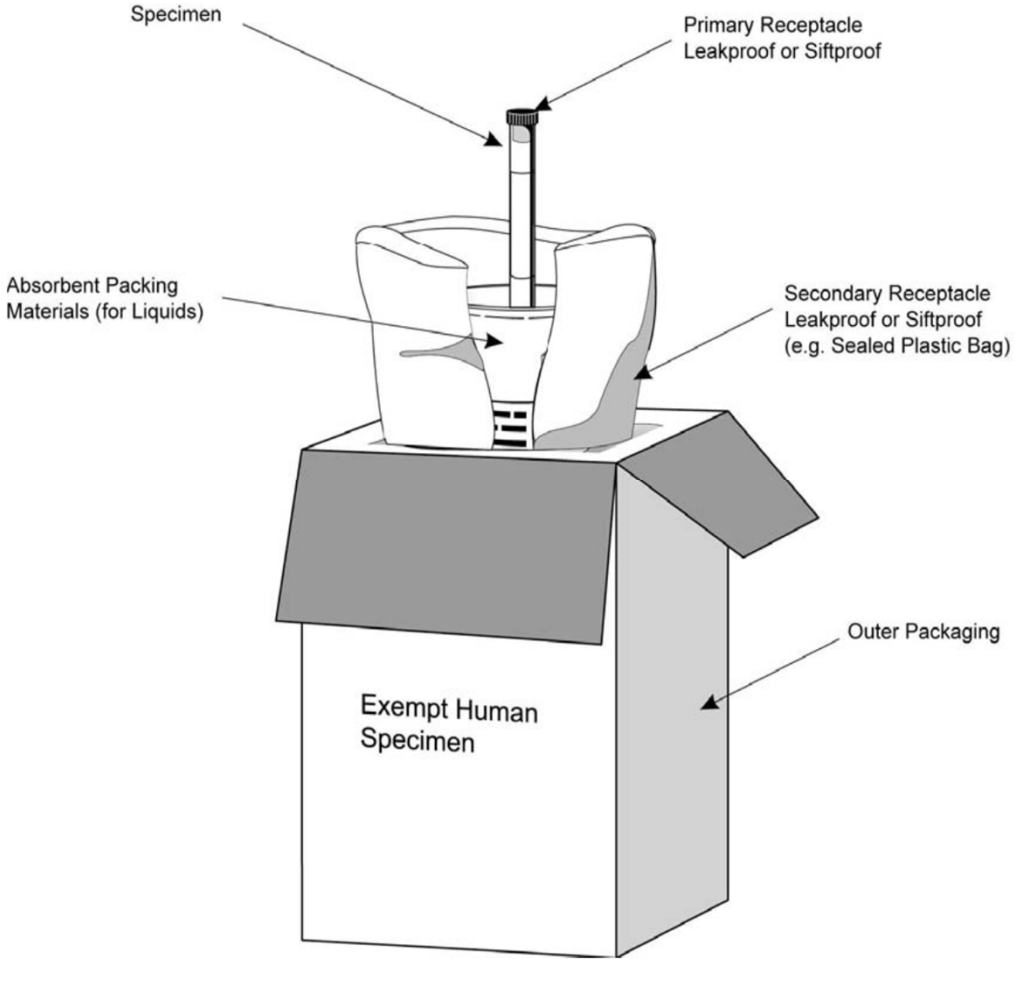
- **Division 6.2: <u>Infectious Substances</u>**

- ✓ **<u>Exceptions</u>: (continuous)**



– Patient specimens for which there is minimal likelihood that pathogens are present (professional judgment) if the specimen is transported in a packaging which will prevent any leakage and which is marked with the words "Exempt human specimen" or "Exempt animal specimen"

Packaging shall be design with leak-proof primary receptacle, leak-proof secondary packaging and adequate outer packaging + for liquids, absorbent material (see 6.3.2.3.8)



➢ **Division 6.2: <u>Infectious Substances</u>**

✓ **<u>Other cases</u>:**

→ **Medical or Clinical wastes:**

– **containing Category A, must be assign to UN 2814 or UN 2900**

– **containing Category B, must be assign to UN 3291**

– **which are reasonably believing to have a low probability of containing infectious substances, must be assigned to UN 3291**

– **decontaminated ones that previously contained infectious substances are exempted** (e.g. Ebola medical wastes cleaned with Hypochlorite solution)

→ **Infected <u>live</u> animal:**

– **if known to be infected, or suspected to contain an infectious substance, must not be transported by air → may only be transported under approval granted by appropriate national authority**

– **animal material affected by pathogens of Category A, must be assigned to UN 2814 or UN 2900**

PART 2 – UN CLASSIFICATION

➢ **Division 6.2: <u>Infectious Substances</u>**

✓ **<u>Other cases</u>:**

→ **Biological Products: (divided in two groups)**

– **a) Those which are manufactured and packaged in accordance with the requirements of appropriate national authorities and transported for the purposes of final packaging or distribution, and use for personal health care by medical professionals or individuals → are not subject to these Instructions**

– **b) Those which do not fall under paragraph a) and are known or reasonably believed to contain infectious substances and which meet the criteria for inclusion in Category A or Category B → must be assigned to UN 2814, UN 2900 or UN 3373, as appropriate.**

PART 2 – UN CLASSIFICATION

➢ Class 7: Radioactive Material

✓ **Class 7 includes 3 Categories (I – II – III)**

→ all radionuclides, uranium, iode

✓ **Packages and Overpacks of Radioactive Material must be assigned to either:**

Category I-WHITE

RRW

Category II-YELLOW

RRY

Category III-Yellow

RRY

PART 2 – UN CLASSIFICATION

➢ Class 7: Radioactive Material

✓ **Class 7 includes 3 Categories (I – II – III)**

✓ **Transport index (TI): dedicated to a package, overpack or freight container → This is a number used to provide the information on the radiation level:**

RRW

RRY

RRY

Transport Index	Maximum radiation level at any point on external surface	Category
0	≤ 0.005 mSv/h	I-White
> 0 - ≤ 1	> 0.005 mSv/h - ≤ 0.5 mSv/h	II-Yellow
> 1 - ≤ 10	> 0.5 mSv/h - ≤ 2 mSv/h	III-Yellow
> 10	> 2 mSv/h - ≤ 10 mSv/h	III-Yellow, under exclusive use and special arrangement

➢ Class 7: Radioactive Material

✓ **Class 7 includes 3 Categories (I – II – III)**

✓ **Transport index (TI): dedicated to a package, overpack or freight container → This is a number used to provide the information on the radiation level:**

TI = 0

TI > 0 to ≤ 1

TI > 1 to 10

PART 2 – UN CLASSIFICATION

➢ Class 7: Radioactive Material

➢ **Any material containing radionuclides where both the activity concentration and the total activity in the consignment exceed the values specified in the appropriate Tables 2-12 and 2-13 (with reference to A1 &/or A2 value)**

✓ **A1: The activity value of special form (not easily dispersible) radioactive material, listed in Table 2-12 and used to determine the activity limits for the requirements of these Instructions.**

✓ **A2: The activity value of radioactive material, other than special form (easily dispersible, liquid, gases, powder) radioactive material, listed in Table 2-12 is used to determine the activity limits for the requirements of these Instructions**

➢ **Radioactive materials are articles or substances, which spontaneously and continuously emit ionizing radiation, which can be harmful of humans and animals and can affect photographic or X-Ray film**

➢ **This radiation cannot be detected by any of the human senses (sight, smell, hearing, touch and taste), but it can be detected and measured with suitable instruments**

PART 2 – UN CLASSIFICATION

➢ Class 7: Radioactive Material

- ➢ **Radioactive material must be assigned to one of the UN numbers specified in Table 2-11 depending on:**
- ✓ **the activity level of the radionuclides contained in a package**
- ✓ **the fissile or non-fissile properties of these radionuclides**
- ✓ **the type of package to be presented for transport**
- ✓ **the nature or form of the contents of the package**
- ✓ **the nature of special arrangements governing the transport operation**

UN number	*Proper shipping name and description*[a]
Excepted packages (1;6.1.5)	
UN 2908	**Radioactive material, excepted package — empty packaging**
UN 2909	**Radioactive material, excepted package — articles manufactured from natural uranium** or **depleted uranium** or **natural thorium**
UN 2910	**Radioactive material, excepted package — limited quantity of material**
UN 2911	**Radioactive material, excepted package — instruments** or **articles**
UN 3507	**Uranium hexafluoride, radioactive material, excepted package**, less than 0.1 kg per package, non-fissile or fissile-excepted[b,c]
Low specific activity radioactive material (7.2.3.1)	
UN 2912	**Radioactive material, low specific activity (LSA-I)**, non-fissile or fissile excepted[b]
UN 3321	**Radioactive material, low specific activity (LSA-II)**, non-fissile or fissile excepted[b]
UN 3322	**Radioactive material, low specific activity (LSA-III)**, non-fissile or fissile excepted[b]

PART 2 – UN CLASSIFICATION

➢ Class 7: Radioactive Material

UN number	*Proper shipping name and description*[a]
UN 3324	**Radioactive material, low specific activity (LSA-II) fissile**
UN 3325	**Radioactive material, low specific activity (LSA-III) fissile**
Surface contaminated objects (7.2.3.2)	
UN 2913	**Radioactive material, surface contaminated objects (SCO-I or SCO-II), non-fissile or fissile excepted**[b]
UN 3326	**Radioactive material, surface contaminated objects (SCO-I or SCO-II), fissile**
Type A packages (7.2.4.4)	
UN 2915	**Radioactive material, Type A package, non-special form, non-fissile or fissile excepted**[b]
UN 3327	**Radioactive material, Type A package, fissile, non-special form**
UN 3332	**Radioactive material, Type A package, special form, non-fissile or fissile excepted**[b]
UN 3333	**Radioactive material, Type A package, special form, fissile**
Type B(U) package (7.2.4.6)	
UN 2916	**Radioactive material, Type B(U) package, non-fissile or fissile excepted**[b]
UN 3328	**Radioactive material, Type B(U) package, fissile**
Type B(M) package (7.2.4.6)	
UN 2917	**Radioactive material, Type B(M) package, non-fissile or fissile excepted**[b]
UN 3329	**Radioactive material, Type B(M) package, fissile**
Type C package (7.2.4.6)	
UN 3323	**Radioactive material, Type C package, non-fissile or fissile excepted**[b]
UN 3330	**Radioactive material, Type C package, fissile**
Special arrangement (7.2.5)	
UN 2919	**Radioactive material, transported under special arrangement, non-fissile or fissile excepted**[b]
UN 3331	**Radioactive material, transported under special arrangement, fissile**
Uranium hexafluoride (7.2.4.5)	
UN 2977	**Radioactive material, uranium hexafluoride, fissile**
UN 2978	**Radioactive material, uranium hexafluoride, non-fissile or fissile excepted**[b]
UN 3507	**Uranium hexafluoride, radioactive material, excepted package, less than 0.1 kg per package, non-fissile or fissile-excepted**[b,c]

PART 2 – UN CLASSIFICATION

➢ Class 7: Radioactive Material

➢ **Determination of basic Radionuclides Activity value is given in Table 2-12**

✓ **A1 & A2 in TBq**

✓ **activity concentration limits for exempt material in Bq/g**

✓ **activity limits for exempt consignments in Bq**

Table 2-12. Basic radionuclides values for individual radionuclides

Radionuclide (atomic number)	*Special form A_1 (TBq)*	*Other form A_2 (TBq)*	*Activity concentration for exempt material (Bq/g)*	*Activity limit for an exempt consignment (Bq)*
Actinium (89)				
Ac-225 (a)	8×10^{-1}	6×10^{-3}	1×10^{1}	1×10^{4}
Ac-227 (a)	9×10^{-1}	9×10^{-5}	1×10^{-1}	1×10^{3}
Ac-228	6×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{6}
Silver (47)				
Ag-105	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Ag-108m (a)	7×10^{-1}	7×10^{-1}	1×10^{1} (b)	1×10^{5} (b)
Ag-110m (a)	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{6}
Ag-111	2×10^{0}	6×10^{-1}	1×10^{3}	1×10^{6}
Aluminium (13)				
Al-26	1×10^{-1}	1×10^{-1}	1×10^{1}	1×10^{5}
Americium (95)				
Am-241	1×10^{1}	1×10^{-3}	1×10^{0}	1×10^{4}
Am-242m (a)	1×10^{1}	1×10^{-3}	1×10^{0} (b)	1×10^{4} (b)
Am-243 (a)	5×10^{0}	1×10^{-3}	1×10^{0} (b)	1×10^{3} (b)
Argon (18)				
Ar-37	4×10^{1}	4×10^{1}	1×10^{6}	1×10^{8}
Ar-39	4×10^{1}	2×10^{1}	1×10^{7}	1×10^{4}
Ar-41	3×10^{-1}	3×10^{-1}	1×10^{2}	1×10^{9}
Arsenic (33)				
As-72	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
As-73	4×10^{1}	4×10^{1}	1×10^{3}	1×10^{7}

PART 2 – UN CLASSIFICATION

➢ Class 7: Radioactive Material

→ **For Class 7, the type of packaging may have a decisive effect on classification:**

➢ **Special form radioactive material can be:**

✓ **an indispersible solid radioactive material, or**

✓ **a sealed capsule containing radioactive material**

➢ **Type A packages will be used when the radionuclide activity is not greater than the following:**

✓ **A1 - for special form radioactive material**

✓ **A2 - for all other radioactive material**

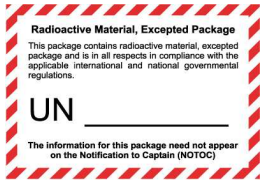
➢ **Other packages must be classified in Type B(U), Type B(M) or Type C packages**

☞ **Class 7 consignments which do not satisfy all the requirements of these Instructions may be transported under special arrangement (State approval)**

PART 2 – UN CLASSIFICATION

- **Class 7: Radioactive Material**

- **Excepted packages will be used depending of the radionuclide activity limit (in reference A1 and A2 values in Table 2-12) and if the activity is not more than 5 µSv/h (= 0.5 mrem/h)**
- ✓ **Values are given in Table 2-14**



	Instruments or article		*Materials*
Physical state of contents	*Item limits**	*Package limits**	*Package limits**
Solids			
Special form	10^{-2} A_1	A_1	10^{-3} A_1
Other form	10^{-2} A_2	A_2	10^{-3} A_2
Liquids	10^{-3} A_2	10^{-1} A_2	10^{-4} A_2
Gases			
Tritium	2×10^{-2} A_2	2×10^{-1} A_2	2×10^{-2} A_2
Special form	10^{-3} A_1	10^{-2} A_1	10^{-3} A_1
Other forms	10^{-3} A_2	10^{-2} A_2	10^{-3} A_2

* For mixtures of radionuclides, see 7.2.2.4 to 7.2.2.6.

Mass activity (Bq/g)

EXEMPTED MATERIAL

EXCEPTED PACKAGE

TYPE A

TYPE B

TYPE C

INDUSTRIAL (IP-1, IP-2, IP-3)

x A_2/g

Exemption value

EXEMPTED MATERIAL

Exemption value

10^{-n} A_1 or A_2

A_1 or A_2

3000 A_1 or 3000 A_2

Total activity (Bq)

PART 2 – UN CLASSIFICATION

- **Class 8: Corrosives Substances**

- ✓ **Class 8 does not have Divisions**

RCM

✓ **Any substances which, by chemical action, will cause severe damage when in contact with living tissue or, in the case of leakage, will materially damage, or even destroy, other goods or the means of transport**

→ **wet batteries filled with acid or alkali, hydrochloric/sulphuric acids …**

→ **cesium/potassium/sodium hydroxide …**

→ **mercury**

- **Class 8: Corrosives Substances**

RCM

- **These substances and preparations are assigned to packing groups**

- **Packing group assignment can be based on:**

✓ **for packing group I or II, the effect to cause a full thickness destruction of intact skin tissue, within an observation period and an exposure time**

✓ **for packing group III, the same process than above, or if not, on the corrosion rate on steel or aluminium surfaces**

- **Values are given in Table 2-15**

- **Class 8: Corrosives Substances**

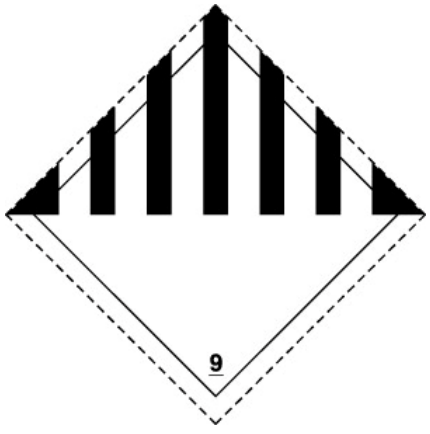
RCM

Table 2-15: Criteria for assigning packing groups to corrosive substances

Packing Group	Exposure Time	Observation Period	Effect
I	≤3 min	≤60 min	Full thickness destruction of intact skin
II	> 3 min but ≤1 h	≤14 days	Full thickness destruction of intact skin
III	> 1 h but ≤4 h	≤14 days	Full thickness destruction of intact skin
III	–	–	Corrosion rate on either steel or aluminium surfaces exceeding 6.25 mm (¼ in) a year at a test T° of 55°C when tested on both materials

PART 2 – UN CLASSIFICATION

- **Class 9: Miscellaneous Dangerous Substances and Articles, including Environmentally Hazardous Substances**



RMD, RSB, ICE, MAG

- **Any substances and articles (miscellaneous dangerous substances and articles) which, during air transport, present a danger not covered by other classes, and**

- **Genetically modified micro-organisms (GMMOs) and genetically modified organisms (GMOs) in which genetic material has been purposely altered through genetic engineering in a way that does not occur naturally (→ assigned to UN3845 if not meeting 6.1 or 6.2 definition)**

→ **Internal combustion engines, vehicles, battery powered equipment**

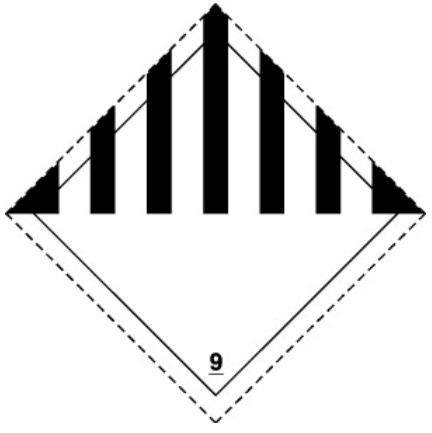
→ **Life-saving appliances self-inflating**

→ **Blue, brown or white asbestos, Zinc dithionite**

→ **Carbon dioxide solid (dry ice), Polymeric beads expandable**

PART 2 – UN CLASSIFICATION

- **Class 9: Miscellaneous Dangerous Substances and Articles, including Environmentally Hazardous Substances**



RMD, RSB, ICE, MAG

- **Class 9 also includes:**

✓ **Environmentally hazardous substances : any substances or mixtures dangerous to the aquatic environment not otherwise classified under the Instructions**

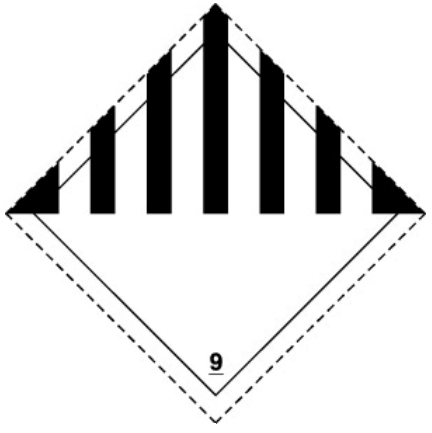
→ **They must be assigned to Packing Group III and designated:**

– **UN 3077 Environmentally hazardous substance, solid, n.o.s.; or**

– **UN 3082 Environmentally hazardous substance, liquid, n.o.s.**

PART 2 – UN CLASSIFICATION

- **Class 9: Miscellaneous Dangerous Substances and Articles, including Environmentally Hazardous Substances**



RMD, RSB, ICE, MAG

- **Class 9 also includes:**

✓ **Magnetized material: Any material which, when packed for air transport, has a maximum magnetic field strength (0.418 A/m or 0.00525 Gauss) sufficient to cause a compass deflection of more than 2 degrees at a distance of 2.1 m from any point on the surface of the assembled package**

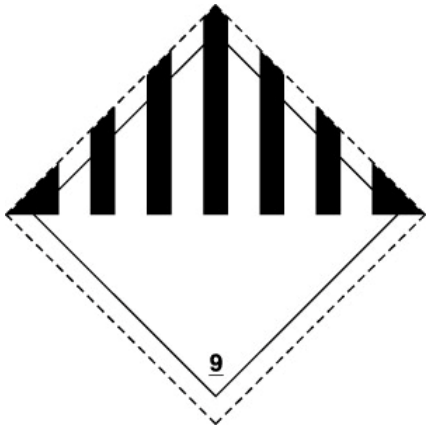
→ **They are assigned to:**

– **UN 2807 Magnetized material**

(see Packing Instruction 953)

PART 2 – UN CLASSIFICATION

- **Class 9: Miscellaneous Dangerous Substances and Articles, including Environmentally Hazardous Substances**



RMD, RSB, ICE, MAG

- **Class 9 also includes:**

✓ **Elevated temperatures substances: substances that are transported or offered for transport at:**

– **T° ≥ 100° C for liquid substances**

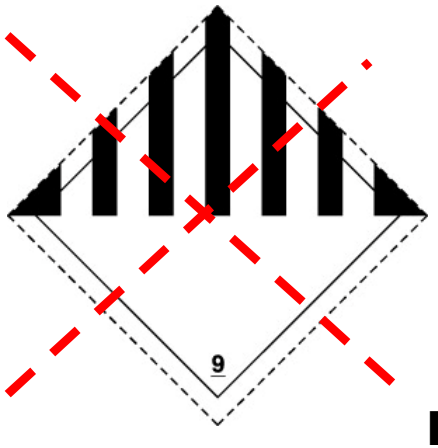
– **T° ≥ 240° C for solid substances**

→ **these substances may only be carried under exemption**

- **Aviation regulated solid or liquid: Any material which has narcotic, noxious or other properties such that, in the event of spillage or leakage on an aircraft, extreme annoyance or discomfort could be caused to crew members so as to prevent the correct performance of assigned duties**

PART 2 – UN CLASSIFICATION

- **Class 9: Miscellaneous Dangerous Substances and Articles, including Environmentally Hazardous Substances**



RMD, RSB, ICE, MAG

RLI, RLM, ELI, ELM

- **Class 9 also includes:**

✓ **Lithium batteries: cells and batteries, packed alone, or contained in equipment, or packed with equipment, which contain lithium in any form**

→ **they must be assigned to UN 3090, 3091, 3480 or 3481 as appropriate**

✓ **To be classified under this Class 9, these material have to:**

– **meet the requirements of each test of the UN Manual of tests and criteria**

– **incorporate a safety venting device, or be designed to preclude a violent rupture under conditions normally incident to transport**

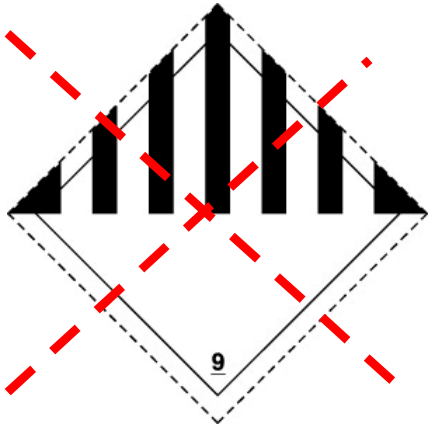
– **be equipped with an effective means of preventing external short circuits**

– **be equipped (for batteries) with effective means as necessary to prevent dangerous reverse current flow (e.g. diodes, fuses, etc.)**

– **be manufactured under a quality management programme**

PART 2 – UN CLASSIFICATION

- **Class 9: Miscellaneous Dangerous Substances and Articles, including Environmentally Hazardous Substances**



~~RMD, RSB, ICE, MAG~~

✓ **For all Lithium cells/batteries: packed alone, or contained in equipment, or packed with equipment, which contain lithium in any form**

→ **New label**

→ *The old label is not permitted to be used till 1st of January 2019*

PART 2 – UN CLASSIFICATION

➢ **For goods having more than one risk and not named in the Technical Instructions (Table 3-1), the precedence of hazard table (Table 2-1) must be used, depending of their Class/Division and Packing Group, and for some, depending of their state (l = liquid, s = solid) or their criteria (o = oral, d = dermal, i = inhalation)**

➢ **The primary characteristics of these goods always take precedence:**

- ✓ **Substances and Articles of Class 1**
- ✓ **Gases of Class 2**
- ✓ **Liquid desensitized explosives of Class 3**
- ✓ **Self-reactive substances & solid desensitized explosives of Division 4.1**
- ✓ **Pyrophoric substances of Division 4.2**
- ✓ **Substances of Division 5.2**
- ✓ **Substances of Division 6.1 with a Packing Group I inhalation toxicity**
- ✓ **Substances of division 6.2**
- ✓ **Substances of Class 7**

PART 2 – UN CLASSIFICATION

Table 2-1. Precedence of hazards and packing groups for Classes 3, 4 and 8 and for Divisions 5.1 and 6.1

Class or division and packing group	*Class or division and packing group*																	
	4.2 II	4.2 III	4.3 I	4.3 II	4.3 III	5.1 I	5.1 II	5.1 III	6.1 I (d)	6.1 I (o)	6.1 II	6.1 III	8 I (l)	8 I (s)	8 II (l)	8 II (s)	8 III (l)	8 III (s)
3 I*			4.3,I	4.3,I	4.3,I	—	—	—	3,I	3,I	3,I	3,I	3,I	—	3,I	—	3,I	—
3 II*			4.3,I	4.3,II	4.3,II	—	—	—	3,I	3,I	3,II	3,II	8,I	—	3,II	—	3,II	—
3 III*			4.3,I	4.3,II	4.3,III	—	—	—	6.1,I	6.1,I	6.1,II	3,III**	8,I	—	8,II	—	3,III	—
4.1 II*	4.2,II	4.2,II	4.3,I	4.3,II	4.3,II	5.1,I	4.1,II	4.1,II	6.1,I	6.1,I	4.1,II	4.1,II	—	8,I	—	4.1,II	—	4.1,II
4.1 III*	4.2,II	4.2,III	4.3,I	4.3,II	4.3,III	5.1,I	4.1,II	4.1,III	6.1,I	6.1,I	6.1,II	4.1,III	—	8,I	—	8,II	—	4.1,III
4.2 II			4.3,I	4.3,II	4.3,II	5.1,I	4.2,II	4.2,II	6.1,I	6.1,I	4.2,II	4.2,II	8,I	8,I	4.2,II	4.2,II	4.2,II	4.2,II
4.2 III			4.3,I	4.3,II	4.3,III	5.1,I	5.1,II	4.2,III	6.1,I	6.1,I	6.1,II	4.2,III	8,I	8,I	8,II	8,II	4.2,III	4.2,III
4.3 I						5.1,I	4.3,I	4.3,I	6.1,I	4.3,I	4.3,I	4.3,I	4.3,I	4.3,I	4.3,I	4.3,I	4.3,I	4.3,I
4.3 II						5.1,I	4.3,II	4.3,II	6.1,I	4.3,I	4.3,II	4.3,II	8,I	8,I	4.3,II	4.3,II	4.3,II	4.3,II
4.3 III						5.1,I	5.1,II	4.3,III	6.1,I	6.1,I	6.1,II	4.3,III	8,I	8,I	8,II	8,II	4.3,III	4.3,III
5.1 I									5.1,I	5.1,I	5.1,I	5.1,I	5.1,I	5.1,I	5.1,I	5.1,I	5.1,I	5.1,I
5.1 II									6.1,I	5.1,I	5.1,II	5.1,II	8,I	8,I	5.1,II	5.1,II	5.1,II	5.1,II
5.1 III									6.1,I	6.1,I	6.1,II	5.1,III	8,I	8,I	8,II	8,II	5.1,III	5.1,III
6.1 I (d)													8,I	6.1,I	6.1,I	6.1,I	6.1,I	6.1,I
6.1 I (o)													8,I	6.1,I	6.1,I	6.1,I	6.1,I	6.1,I
6.1 II (l)													8,I	6.1,I	6.1,II	6.1,II	6.1,II	6.1,II
6.1 II (d)													8,I	6.1,I	8,II	6.1,II	6.1,II	6.1,II
6.1 II (o)													8,I	8,I	8,II	6.1,II	6.1,II	6.1,II
6.1 III													8,I	8,I	8,II	8,II	8,III	8,III

(l) = liquid; (s) = solid; (i) = inhalation; (d) = dermal; (o) = oral; — = an impossible combination

* Substances of Division 4.1 other than self-reactive substances, and solid desensitized explosives and substances of Class 3 other than liquid desensitized explosives.

** For pesticides only, the primary risk must be Division 6.1.

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