UNIVERSAL POSTAL UNION

Definitions of nine classes of dangerous goods

The following definitions are relevant to Article 19.3 of the UPU Convention. They are part of the International Air Transport Association's (IATA) Dangerous Goods Regulations.

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Class 1
Explosives

Class 1 comprises:

a) explosive substances (a substance which is not itself an explosive but which can form an explosive atmosphere of gas, vapour or dust is not included in Class 1), except those that are too dangerous to transport or those where the predominant hazard is appropriate to another class;
b) explosive articles, except devices containing explosive substances in such quantity or of such a character that their inadvertent or accidental ignition or initiation, during transport, will not cause any effect external to the device either by projection, fire, smoke, heat or loud noise; and
c) articles and substances not mentioned under (a) and (b) above which are manufactured with a view to producing a practical, explosive or pyrotechnic effect.

Division 1.1

Articles and substances having a mass explosion hazard (a mass explosion is one which affects almost the entire load virtually instantaneously.

Division 1.2

Articles and substances having a projection hazard but not a mass explosion hazard.

Division 1.3

Articles and substances having a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard. This division comprises articles and substances that:

a) give rise to considerable radiant heat; or
b) bum one after another, producing minor blast and/or projection effects.

Division 1.4

Articles and substances that present no significant hazard. This division comprises articles and substances which present only a small hazard in the event of ignition or initiation during transport. The effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of the package.

Division 1.5

Very insensitive substances, having a mass explosion hazard, which are so insensitive that there is very little probability of initiation or of transition from burning to detonation under normal conditions of transport.

Division 1.6

Extremely insensitive articles which do not have a mass explosion hazard. This division comprises articles which contain only extremely insensitive detonating substances and which demonstrate a negligible probability of accidental initiation or propagation.

Note: the risk from articles of division 1.6 is limited to the explosion of a single article.

Class 2
Gases

A gas is a substance which:

a) at 50°C (122°F) has a vapour pressure greater than 300 kPa (3.0 bar, 43.5 lb/in^2); or
b) is completely gaseous at 20°C (68°F) at a standard pressure of 101.3 kPa (1.01 bar, 14.7 lb/in^2).

Division 2.1 Flammable gas

Gases which at 20°C (68°F) and a standard pressure of 101.3 kPa (1.01 bar, 14.7 lb/in^2):

a) are ignitable when in a mixture of 13% or less by volume with air; or
b) have a flammable range with air of at least 12 percentage points regardless of the lower flammable limit. Flammability must be determined by tests of by calculation in accordance with methods adopted by ISO (see ISO Standard 10156:2017). Where insufficient data are available to use these methods, tests by a comparable method recognized by the appropriate national authority must be used.

Division 2.2 Non-flammable, non-toxic gas

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; or
c) do not come under the other divisions.

Division 2.3 Toxic gas

Gases which:

a) are known to be so toxic or corrosive to humans as to pose a hazard to health; or
b) are presumed to be toxic or corrosive to humans because they have an LC_{50} value equal to or less than 5000 mL/m^3 (ppm) when tested in accordance with the criteria for Inhalation Toxicity.

Class 3
Flammable liquids

Class 3 comprises:

a) Flammable liquids; and
b) Liquid desensitized explosives.

This class has no subdivisions. It comprises liquids or mixtures of liquids or liquids containing solids in solution or in suspension (for example paints, varnishes, lacquers, etc., but not including substances otherwise classified on account of their dangerous characteristics) which give off a flammable vapour at temperatures of not more than 60°C (140°F) closed-cup test or not more than 65.6°C (150°F) open-cup test normally referred to as the flash point.

Liquids described above with a flash point of more than 35°C which do not sustain combustion need not be considered as flammable liquids if:

a) they have passed a suitable test for combustibility (see Sustained Combustibility Test prescribed in the UN Manual of Tests and Criteria, Part III, subsection 32.5.2); or
b) their fire point according to ISO 2592:2000 is greater than 100°C (212°F); or
c) they are miscible solutions with a water content of more than 90% by weight.

Liquids offered for transport at temperatures at or above their flash point are considered as flammable liquids.

Substances that are transported or offered for transport at elevated temperatures in a liquid state and which give off a flammable vapour at a temperature at or below the maximum transport temperature (that is, the maximum temperature likely to be encountered by the substance in transport) are also considered to be flammable liquids.

Liquid desensitized explosives: Explosive substances which are dissolved or suspended in water or other liquid substances, to form a homogeneous liquid mixture to suppress their explosive properties.

Class 4

Flammable solids; substances liable to spontaneous combustion; substances which, in contact with water, emit flammable gases

Division 4.1 Flammable solids; self-reactive and related substances; polymerizing substances; solid desensitized explosives

Solids which, under conditions encountered in transport, are readily combustible or may cause or contribute to fire through friction: self-reactive and related substances which are liable to undergo a strongly exothermic reaction; polymerizing substances are liable to undergo a strongly exothermic reaction if not stabilized; solid desensitized explosives which may explode if not diluted sufficiently. Division 4.1 contains:

– flammable solids;
– self-reactive and related substances;
– polymerizing substances;
– solid desensitized explosives.

Flammable solids are readily combustible solids and solids which may cause fire through friction. Readily combustible solids are powdered, granular or pasty substances which are dangerous if they can be easily ignited by brief contact with an ignition source, such as a burning match, and if the flame spreads rapidly. The danger may not only come 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.

Self-reactive substances: Thermally unstable substances liable to undergo a strongly exothermic decomposition even without the participation of oxygen (air). The following substances must not be considered to be self-reactive substances of division 4.1:

– explosives according to the criteria of Class 1;
– oxidizing substances according to the assignment procedure for Oxidizing Solids;
– organic peroxides according to the criteria of Division 5.2;
– substances where their heat of decomposition is less than 300 J/g; or
– substances where their self-accelerating decomposition temperature is greater than 75°C for 50 kg package.

Related substances are distinguished from self-reactive substances by having a self-accelerating decomposition temperature greater than 75°C. They are liable to undergo, as are self-reactive substances, a strongly exothermic decomposition. They are also liable, in certain packagings, to meet the criteria for substances of Class 1.

Polymerizing substances: Substances which, without stabilization, are liable to undergo a strongly exothermic reaction resulting in the formation of larger molecules or resulting in the formation of polymers under conditions normally encountered in transport.

Such substances including mixtures are considered to be polymerizing substances of Division 4.1 when:

a) their self-accelerating polymerization temperature (SAPT) is 75°C or less under the conditions (with or without chemical stabilization as offered for transport) and in the packaging in which the substance or mixture is to be transported;
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.

Solid desensitized explosives: Substances which are wetted with water or alcohols or diluted with other substances to suppress their explosive properties.

Division 4.2 Substances liable to spontaneous combustion

Substances which are liable to spontaneous heating under normal conditions encountered in transport, or to heating up in contact with air, and being then liable to catch fire.

The following types of substances are classified in Division 4.1:

- pyrophoric substances;
- self-heating substances.

Division 4.3 Substances which, in contact with water, emit flammable gases

Substances which, in contact with water, emit flammable gases (Dangerous when wet). Substances which, by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities.

These are described in the List of Dangerous Goods as “Water-reactive” substances.

Class 5
Oxidizing substances and organic peroxides

Division 5.1 Oxidizing substances

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

Division 5.2 Organic peroxides

Organic substances which contain the bivalent structure -O-O- and may be considered derivatives of hydrogen peroxide in which 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. 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 6
Toxic and infections substances

Division 6.1 Toxic substances

Substances which are liable to cause death or injury or to harm human health if swallowed, inhaled or contacted by the skin.

Division 6.2 Infections substances

Division 6.2 includes substances which are infections to humans and/or animals, genetically modified micro-organisms and organisms, biological products, diagnostic specimens and clinical and medical waste.

Pathogens are defined as micro-organisms (including bacteria, viruses, parasites, fungi) and other agents such as prions, which can cause disease in humans or animals. Infectious substances are not subject to the provisions of these Regulations for Division 6.2 if they are unlikely to cause human or animal disease. Infectious substances are, however, subject to the provisions of these Regulations for Division 6.2 if they are capable of spreading disease when exposure to them occurs.

Substances accepted in mail for air carriage include:

a) **Biological substance, Category B** (UN 3373) only, when packed in accordance with the requirements of Packing Instruction 650 and carbon dioxide, solid (dry ice) when used as a refrigerant for infectious substances (UN 3373).

b) **Patient specimens** being transported for purposes such as research, diagnosis, investigational activities, disease treatment and prevention, provided that they are classified, packed and marked as required by the regulations for “Exempt human specimen” or “Exempt animal specimen”.

Class 7
Radioactive material

Radioactive materials are articles or substances which spontaneously and continuously emit ionizing radiation which can be harmful to the health 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 or taste), but it can be detected and measured with suitable instruments.

Substances accepted in mail for air carriage include:

Radioactive material in an excepted package, UN 2910 and UN 2911 only, provided the activity does not exceed one tenth of that permitted for air transport and that does not meet the definitions and criteria of classes or divisions, other than Class 7. The package must be marked with;

a) the name and address of the shipper and the consignee;
b) be marked “radioactive material—quantities permitted for movement by post”; and
c) the radioactive material, excepted package label.

Class 8
Corrosives

Substances which, in the event of leakage, can cause irreversible damage by chemical action when in contact with living tissue or can materially damage, or even destroy other freight or the means of transport.

Class 9
Miscellaneous dangerous goods

Articles and substances which during air transport present a danger not covered by other classes. Included in this class are: Aviation regulated solids or liquids, magnetized material and miscellaneous articles and substances.

Aviation Regulated Solid or Liquid: Any material which has narcotic, noxious, irritating or other properties such that, in the event of spillage or leakage on an aircraft, could cause extreme annoyance or discomfort to crew members so as to prevent the correct performance of assigned duties. The materials included under this proper shipping name must not meet any of the definitions for Classes 1 through 8.

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 (see also Packing instruction 953, which includes methods of determining magnetic field strength).

Elevated temperatures substances: Substances that are transported or offered for transport in a liquid state at temperatures equal to or exceeding 100°C (212°F), or in a solid state at temperatures equal to or exceeding 240°C (464°F). These substances may only be carried under special government exemption.

Genetically Modified Micro-Organisms (GMMOs) or Genetically Modified Organisms (GMOs): Micro-organisms and organisms in which genetic material has been purposely altered through genetic engineering in a way that does not occur naturally.

Miscellaneous articles and substances: Examples included in this class:

- Lithium Batteries.
- Sodium Ion Batteries.
- Substances which, on Inhalation as Fine Dust, may Endanger Health.
- Capacitors.
- Substances Evolving Flammable Vapour.
- Life-Saving Appliances.
- Substances and Articles which, in the Event of Fire, may Form Dioxins.
- Other Substances or Articles - Presenting a Danger During Transport, but not Meeting the Definitions of Another Class.

Articles and substances accepted in mail for air carriage include:

c) Lithium-ion batteries contained in equipment (UN 3481) meeting the provisions of Section II of Packing Instruction 967; and
d) Lithium metal batteries contained in equipment (UN 3091) meeting the provisions of Section II of Packing Instruction 970.

Note: No more than four cells or two batteries may be mailed in any single package.

For further information, please consult the IATA Dangerous Goods Regulations at www.iata.org

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