

## I. Introduction

Shipping hazardous materials (also known as dangerous goods) regulated by numerous governmental and non-governmental organizations, including, but not limited to International Air Transport Association (IATA), U.S. Department of Transportation (DOT), Nevada Highway Patrol (NHP), U.S. Department of State, Directorate of Defense Trade Controls (DDTC), U.S. Department of Commerce, Bureau of Industry and Security (BIS), U.S. Department of the Treasury, Office of Foreign Assets Control (OFAC) and U.S. Customs & Border Protection (CBP). In addition, shipping companies may have implemented additional procedures that are more restrictive.

Penalties for non-compliance can be significant. In addition to potential public safety implications, each violation of the regulations may result in a civil penalty of up to \$30,000. A violation can result in five years imprisonment and penalties of \$250,000. Persons who willfully violate the regulations may be subject to criminal prosecution with penalties of up to \$500,000 and/or five years imprisonment.

## II. What activities constitute hazardous materials/dangerous goods shipping? (Note: The balance of this document is restricted to compliance with DOT and IATA regulations as they related to the shipment of hazardous materials. Export controls, import requirements and TSCA compliance are discussed in separate sections of the DRI shipping pages.)

Activities that clearly fit the definition of shipping dangerous goods are those you would expect:

- Mailing an item off campus, out of state, or out of the U.S.
- Shipping an item off campus, out of state, or out of the U.S. via a carrier such as Federal Express, United Parcel Service, Express Mail, etc.
- Carrying an item with you when you travel, for example on an airplane.

In addition, any time you move or send a hazardous material or dangerous goods from one location to another you are potentially shipping a material. When in doubt, contact NNSC Receiving & Shipping (7331) or EH&S (7329) for advice.

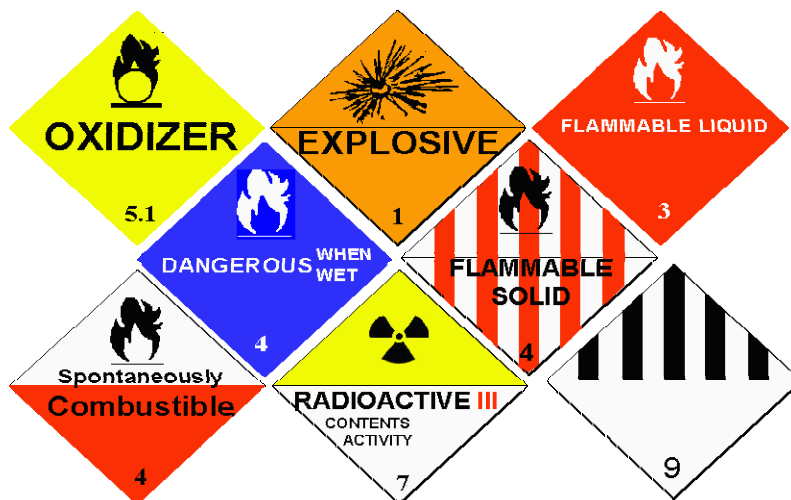
## III. What is a hazardous material/dangerous good?

Hazardous material (HM) is generally defined as any substance that could adversely affect the safety of the public, handlers or carriers during transportation. The terms hazardous materials and dangerous goods are often used interchangeably when discussing shipping. HM regulations may apply to commercial products, chemical mixtures, items containing or contaminated with hazardous substances, and newly synthesized compounds. Various types of batteries, fuel containers and cleaning products are examples of materials that are regulated for shipment.

There are nine different hazard classes under DOT classification scheme as identified in table on the following page. See attachment A for DOT hazard class definitions.

Hazard class	Division	Label	Description
Class 1	1.1-1.6	Orange	Explosives
Class 2	2.1	red	Flammable Gases
	2.2	green	Non-Flammable Gases
	2.3	white	Poison Gases
Class 3	N/A	red	Flammable Liquids
Class 4	4.1	red striped	Flammable Solids
	4.2	red top white bottom	Spontaneously Combustible Materials
	4.3	Blue	Dangerous When Wet Materials
Class 5	5.1	yellow	Oxidizers
	5.2	yellow	organic peroxides
Class 6	6.1	white	Poisons
	6.1	white	Keep away form Foodstuffs
	6.2	White	Infectious Substances
Class 7	N/A	Yellow-top White-bottom	Radioactive
Class 8	N/A	White-top Black-bottom	Corrosive
Class 9	N/A	Blackstriped-top White-bottom	Miscellaneous

Each hazard class is associated with specific labels or placards that convey hazard information for containers or shipments of hazardous materials. Each label has a characteristic color pattern, pictogram, and hazard class number.



#### IV. Definitions

Both the IATA and DOT regulations contain a long list of definitions related to shipping hazardous materials. In particular the list below includes those you may need to reference when determining how to ship your chemicals, biologicals or radioactives. In most cases, each has a multi paragraph description. Rather than repeat the details here, please go to the on line version of the DOT regulations located at <http://www.myregs.com/dotrspa/>. The definitions are found in 49 CFR 171.8. To get there from the link, Click on Subchapter C ‘Hazardous Materials Regulations’ then click on Part 171: General Information, Regulations and Definitions, then click on 171.8 Definitions and Abbreviations.

- *Aerosol*
- *Asphyxiant gas*
- *Atmospheric gases*
- *Biological product*
- *Combustible liquid*
- *Corrosive material*
- *Cryogenic liquid*
- *Cultures and stocks*
- *Dangerous when wet material*
- *Diagnostic specimen*
- *Etiologic agent*
- *Excepted quantity*
- *Flammable gas*
- *Flammable liquid*
- *Flammable solid*
- *Hazardous Material*
- *Hazardous Substance*
- *Infectious substance (etiologic agent)*
- *Irritating material*
- *Limited quantity.*
- *Nonflammable gas*
- *N.O.S. means not otherwise specified.*
- *Organic peroxide*
- *ORM means other regulated material*
- *Oxidizer*
- *Packing Group*
- *Poisonous gas*
- *Poisonous materials*
- *Pyrophoric liquid*
- *Radioactive materials*
- *Toxin*
- *Water reactive material*

- Other frequently used definitions
  - *Compatibility*
  - *Performance Or Packaging (POP)*
  - *Package*
  - *Inner Packaging*
  - *Intermediate Packaging*
  - *Labeling*
  - *Marking*
  - *Outer Packaging*
  - *Combination Packaging*
  - *Overpack*
  - *Segregation*

## V. Useful Links

The following links should be useful for obtaining additional information on shipping hazardous materials. Please contact Shipping and Receiving (add Karen link) directly if you have questions or require additional information.

- Emergency Response Guidebook - 2004  
<http://hazmat.dot.gov/pubs/erg2004/guidebook.htm>
- Hazardous Materials Transportation Training Modules - DOT  
<http://hazmat.dot.gov/training/mods/mod.htm>
- The Hazmat Table 49 CFR Subpart B,172.101 <http://www.myregs.com/dotrspa/>
- The U.S. Department of Transportation <http://www.dot.gov/>
- US DOT Office of Hazardous Material Safety <http://hazmat.dot.gov/>
- UPS Guide to Shipping Ground and Air Hazardous Materials  
<http://www.ups.com/content/us/en/resources/prepare/hazardous/>
- Federal Express  
<http://www.fedex.com/us/services/options/ground/hazmat/index.html>
- IATA <https://www.iataonline.com/Store/default.htm?cookie%5Ftest=1>
- US Postal Services Hazardous, Restricted and Perishable Mail  
<http://www.usps.com/cpim/ftp/pubs/pub52.pdf>

**§173.50 Class 1—Definitions.**

- (a) Explosive. For the purposes of this subchapter, an explosive means any substance or article, including a device, which is designed to function by explosion ( i.e. , an extremely rapid release of gas and heat) or which, by chemical reaction within itself, is able to function in a similar manner even if not designed to function by explosion, unless the substance or article is otherwise classed under the provisions of this subchapter. The term includes a pyrotechnic substance or article, unless the substance or article is otherwise classed under the provisions of this subchapter.
- (b) Explosives in Class 1 are divided into six divisions as follows:
- (1) Division 1.1 consists of explosives that have a mass explosion hazard. A mass explosion is one which affects almost the entire load instantaneously.
  - (2) Division 1.2 consists of explosives that have a projection hazard but not a mass explosion hazard.
  - (3) Division 1.3 consists of explosives that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard.
  - (4) Division 1.4 consists of explosives that present a minor explosion hazard. The explosive 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.
  - 5) Division 1.5<sup>1</sup> consists of very insensitive explosives. This division is comprised of substances which have a mass explosion hazard but are so insensitive that there is very little probability of initiation or of transition from burning to detonation under normal conditions of transport.
  - (6) Division 1.6<sup>2</sup> consists of extremely insensitive articles which do not have a mass explosive hazard. This division is comprised of articles which contain only extremely insensitive detonating substances and which demonstrate a negligible probability of accidental initiation or propagation.

[Amdt. 173-224, 55 FR 52617 Dec. 21, 1990, as amended at 56 FR 66267, Dec. 20, 1991; 66 FR 45177, August 28, 2001; 68 FR 48562, August 14, 2003]

**§173.115 Class 2, Divisions 2.1, 2.2, and 2.3—Definitions.**

- (a) Division 2.1 (Flammable gas). For the purpose of this subchapter, a flammable gas (Division 2.1) means any material which is a gas at 20°C (68°F) or less and 101.3 kPa (14.7 psia) of pressure (a material which has a boiling point of 20°C (68°F) or less at 101.3 kPa (14.7 psia)) which-

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- (1) Is ignitable at 101.3 kPa (14.7 psia) when in a mixture of 13 percent or less by volume with air; or
  - (2) Has a flammable range at 101.3 kPa (14.7 psia) with air of at least 12 percent regardless of the lower limit. Except for aerosols, the limits specified in paragraphs (a)(1) and (a)(2) of this section shall be determined at 101.3 kPa (14.7 psia) of pressure and a temperature of 20°C (68°F) in accordance with ASTM E681-85, Standard Test Method for Concentration Limits of Flammability of Chemicals or other equivalent method approved by the Associate Administrator. The flammability of aerosols is determined by the tests specified in § 173.306(i) of this part.
- (b) Division 2.2 (non-flammable, nonpoisonous compressed gas-including compressed gas, liquefied gas, pressurized cryogenic gas, compressed gas in solution, asphyxiant gas and oxidizing gas). For the purpose of this subchapter, a non-flammable, nonpoisonous compressed gas (Division 2.2) means any material (or mixture) which-
- (1) Exerts in the packaging an absolute pressure of 280 kPa (40.6 psia) or greater at 20 °C (68 °F), and
  - (2) Does not meet the definition of Division 2.1 or 2.3.
- (c) Division 2.3 (Gas poisonous by inhalation). For the purpose of this subchapter, a gas poisonous by inhalation (Division 2.3) means a material which is a gas at 20°C (68°F) or less and a pressure of 101.3 kPa (14.7 psia) (a material which has a boiling point of 20°C (68°F) or less at 101.3 kPa (14.7 psia)) and which-
- (1) Is known to be so toxic to humans as to pose a hazard to health during transportation, or
  - (2) In the absence of adequate data on human toxicity, is presumed to be toxic to humans because when tested on laboratory animals it has an LC50 value of not more than 5000 mL m3 (see § 173.116(a) of this subpart for assignment of Hazard Zones A, B, C or D). LC50 values for mixtures may be determined using the formula in § 173.133(b)(1)(i) or CGA Pamphlet P-20 (IBR, see § 171.7 of this subchapter).
- (d) Non-liquefied compressed gas. A gas, which when packaged under pressure for transportation is entirely gaseous at -50° C (-58° F) with a critical temperature less than or equal to -50° C (-58° F), is considered to be a non-liquefied compressed gas.
- (e) Liquefied compressed gas. A gas, which when packaged under pressure for transportation is partially liquid at temperatures above -50° C (-58° F), is considered to be a liquefied compressed gas. A liquefied compressed gas is further categorized as follows:
- (1) High pressure liquefied gas which is a gas with a critical temperature between -50 °C (-58° F) and + 65° C (149° F), and

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- (2) Low pressure liquefied gas which is a gas with a critical temperature above + 65° C (149° F).
- (f) Compressed gas in solution. A compressed gas in solution is a non-liquefied compressed gas which is dissolved in a solvent.
- (g) Cryogenic liquid. A cryogenic liquid means a refrigerated liquefied gas having a boiling point colder than -90 °C (-130 °F) at 101.3 kPa (14.7 psia). A material meeting this definition is subject to requirements of this subchapter without regard to whether it meets the definition of a non-flammable, non-poisonous compressed gas in paragraph (b) of this section.
- (h) Flammable range. The term flammable range means the difference between the minimum and maximum volume percentages of the material in air that forms a flammable mixture.
- (i) Service pressure. The term service pressure means the authorized pressure marking on the packaging. For example, for a cylinder marked "DOT 3A1800", the service pressure is 12410 kPa (1800 psig).
- (j) Refrigerant gas or Dispersant gas. The terms Refrigerant gas and Dispersant gas apply to all nonpoisonous refrigerant gases; dispersant gases (fluorocarbons) listed in § 172.101 of this subchapter and §§ 173.304 , 173.314(c) , 173.315(a) , and 173.315(h) and mixtures thereof; and any other compressed gas having a vapor pressure not exceeding 260 psia at 54° C(130° F), used only as a refrigerant, dispersant, or blowing agent.
- (k) The following applies to aerosols (see § 171.8 of this subchapter):
- (1) An aerosol must be assigned to Division 2.1 if the contents include 85% by mass or more flammable components and the chemical heat of combustion is 30 kJ/g or more;
  - (2) An aerosol must be assigned to Division 2.2 if the contents contain 1% by mass or less flammable components and the heat of combustion is less than 20 kJ/g.
  - (3) Aerosols not meeting the provisions of paragraphs (a) or (b) of this section must be classed in accordance with the appropriate tests of the UN Manual of Tests and Criteria (IBR, see § 171.7 of this subchapter).
  - (4) Division 2.3 gases may not be transported in an aerosol container.
  - (5) When the contents are classified as Division 6.1 or Class 8, PG III, the aerosol must be assigned a subsidiary hazard of Division 6.1 or Class 8.
  - (6) Substances of Division 6.1, PG I or II, and substances of Class 8, PG I are forbidden from transportation in an aerosol container.

- (7) Flammable components are Class 3 flammable liquids, Class 4.1 flammable solids, or Division 2.1 flammable gases. The chemical heat of combustion must be determined in accordance with the UN Manual of Tests and Criteria (IBR, see § 171.7 of this subchapter).

[Amdt. 173-224, 55 FR 52634, Dec. 21, 1990, as amended at 56 FR 66268, Dec. 20, 1991; 57 FR 45461, Oct. 1, 1992; Amdt. 173-236, 58 FR 50236, Sept. 24, 1993; Amdt. 173-234, 58 FR 51532, Oct. 1, 1993; Amdt. 173-241, 59 FR 67506, Dec. 29, 1994; Amdt. 173-255, 61 FR 50625, Sept. 26, 1996; 66 FR 45376, August 28, 2001; 67 FR 51626, August 08, 2002; 67 FR 61006, September 27, 2002; 68 FR 44992, July 31, 2003; 68 FR 75734, December 31, 2003; 69 FR 76044, December 20, 2004.]

### **§173.120 Class 3-Definitions.**

- (a) Flammable liquid. For the purpose of this subchapter, a flammable liquid (Class 3) means a liquid having a flash point of not more than 60.5°C (141°F), or any material in a liquid phase with a flash point at or above 37.8°C (100°F) that is intentionally heated and offered for transportation or transported at or above its flash point in a bulk packaging,

- (1) Any liquid meeting one of the definitions specified in § 173.115.
- (2) Any mixture having one or more components with a flash point of 60.5°C (141°F) or higher, that make up at least 99 percent of the total volume of the mixture, if the mixture is not offered for transportation or transported at or above its flash point.
- (3) Any liquid with a flash point greater than 35 ° C (95 ° F) that does not sustain combustion according to ASTM D 4206 (IBR, see § 171.7 of this subchapter) or the procedure in appendix H of this part.
- (4) Any liquid with a flash point greater than 35 ° C (95 ° F) and with a fire point greater than 100 ° C (212 ° F) according to ISO 2592 (IBR, see § 171.7 of this subchapter).
- (5) Any liquid with a flash point greater than 35°C (95°F) which is in a water-miscible solution with a water content of more than 90 percent by mass.

- (b) Combustible liquid

- (1) For the purpose of this subchapter, a combustible liquid means any liquid that does not meet the definition of any other hazard class specified in this subchapter and has a flash point above 60.5°C (141°F) and below 93 °C (200 °F).
- (2) A flammable liquid with a flash point at or above 38°C (100°F) that does not meet the definition of any other hazard class may be reclassified as a combustible liquid. This provision does not apply to transportation by vessel or aircraft, except where

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other means of transportation is impracticable. An elevated temperature material that meets the definition of a Class 3 material because it is intentionally heated and offered for transportation or transported at or above its flash point may not be reclassified as a combustible liquid.

- (3) A combustible liquid that does not sustain combustion is not subject to the requirements of this subchapter as a combustible liquid. Either the test method specified in ASTM D 4206 or the procedure in appendix H of this part may be used to determine if a material sustains combustion when heated under test conditions and exposed to an external source of flame.

(c) Flash point

- (1) Flash point means the minimum temperature at which a liquid gives off vapor within a test vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid. It shall be determined as follows:
  - (i) For a homogeneous, single-phase, liquid having a viscosity less than 45 S.U.S. at 38 °C (100 °F) that does not form a surface film while under test, one of the following test procedures shall be used:
    - (A) Standard Method of Test for Flash Point by Tag Closed Tester, (ASTM D 56);
    - (B) Standard Methods of Test for Flash Point of Liquids by Setaflash Closed Tester, (ASTM D 3278); or
    - (C) Standard Test Methods for Flash Point by Small Scale Closed Tester, (ASTM D 3828).
  - (ii) For a liquid other than one meeting all of the criteria of paragraph (c)(1)(i) of this section, one of the following test procedures shall be used:
    - (A) Standard Method of Test for Flash Point by Pensky-Martens Closed Tester, (ASTM D 93). For cutback asphalt, use Method B of ASTM D 93 or alternate tests authorized in this standard; or
    - (B) Standard Methods of Test for Flash Point of Liquids by Setaflash Closed Tester (ASTM D 3278).
- (2) For a liquid that is a mixture of compounds that have different volatility and flash points, its flash point shall be determined as specified in paragraph (c)(1) of this section, on the material in the form in which it is to be shipped. If it is determined by this test that the flash point is higher than -7 °C (20 °F) a second test shall be made as follows: a portion of the mixture shall be placed in an open beaker (or similar container) of such dimensions that the height of the liquid can be adjusted so that the ratio of the volume of the liquid to the exposed surface area is 6 to one. The liquid shall be allowed to evaporate under ambient pressure and temperature

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(20 to 25 °C (68 to 77 °F)) for a period of 4 hours or until 10 percent by volume has evaporated, whichever comes first. A flash point is then run on a portion of the liquid remaining in the evaporation container and the lower of the two flash points shall be the flash point of the material.

- (3) For flash point determinations by Setaflash closed tester, the glass syringe specified need not be used as the method of measurement of the test sample if a minimum quantity of 2 mL (0.1 ounce) is assured in the test cup.
- (d) If experience or other data indicate that the hazard of a material is greater or less than indicated by the criteria specified in paragraphs (a) and (b) of this section, the Associate Administrator may revise the classification or make the material subject or not subject to the requirements of parts 170-189 of this subchapter.

[Amdt. 173-224, 55 FR 52634 Dec. 21, 1990, as amended by Amdt. 173-227, 56 FR 49989, Oct. 2, 1991; 56 FR 66268, Dec. 20, 1991; 57 FR 45461, Oct. 1, 1992; Amdt. 173-241, 59 FR 67506, 67507, Dec. 29, 1994; Amdt. 173-255, 61 FR 50625, Sept. 26, 1996; 62 FR 24690, May 06, 1997; 66 FR]

**§173.124 Class 4, Divisions 4.1, 4.2 and 4.3-Definitions.**

(a) Division 4.1 (Flammable Solid) . For the purposes of this subchapter, flammable solid (Division 4.1) means any of the following three types of materials:

(1) Desensitized explosives that-

- (i) When dry are Explosives of Class 1 other than those of compatibility group A, which are wetted with sufficient water, alcohol, or plasticizer to suppress explosive properties; and
- (ii) Are specifically authorized by name either in the § 172.101 Table or have been assigned a shipping name and hazard class by the Associate Administrator under the provisions of-

(A) An exemption issued under subchapter A of this chapter; or

(B) An approval issued under § 173.56(i) of this part.

(2) –

- (i) Self-reactive materials are materials that are thermally unstable and that can undergo a strongly exothermic decomposition even without participation of oxygen (air). A material is excluded from this definition if any of the following applies:

(A) The material meets the definition of an explosive as prescribed in subpart C of this part, in which case it must be classed as an explosive;

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- (B) The material is forbidden from being offered for transportation according to § 172.101 of this subchapter or § 173.21 ;
  - (C) The material meets the definition of an oxidizer or organic peroxide as prescribed in subpart D of this part, in which case it must be so classed;
  - (D) The material meets one of the following conditions:
    - (1) Its heat of decomposition is less than 300 J/g; or
    - (2) Its self-accelerating decomposition temperature (SADT) is greater than 75°C (167°F) for a 50 kg package; or
  - (E) The Associate Administrator has determined that the material does not present a hazard which is associated with a Division 4.1 material.
- (ii) Generic types. Division 4.1 self-reactive materials are assigned to a generic system consisting of seven types. A self-reactive substance identified by technical name in the Self-Reactive Materials Table in § 173.224 is assigned to a generic type in accordance with that Table. Self-reactive materials not identified in the Self-Reactive Materials Table in § 173.224 are assigned to generic types under the procedures of paragraph (a)(2)(iii) of this section.
- A) Type A. Self-reactive material type A is a self-reactive material which, as packaged for transportation, can detonate or deflagrate rapidly. Transportation of type A self-reactive material is forbidden.
  - (B) Type B. Self-reactive material type B is a self-reactive material which, as packaged for transportation, neither detonates nor deflagrates rapidly, but is liable to undergo a thermal explosion in a package.
  - (C) Type C. Self-reactive material type C is a self-reactive material which, as packaged for transportation, neither detonates nor deflagrates rapidly and cannot undergo a thermal explosion.
  - (D) Type D. Self-reactive material type D is a self-reactive material which-
    - (1) Detonates partially, does not deflagrate rapidly and shows no violent effect when heated under confinement;
    - (2) Does not detonate at all, deflagrates slowly and shows no violent effect when heated under confinement; or
    - (3) Does not detonate or deflagrate at all and shows a medium effect when heated under confinement.

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- (E) Type E. Self-reactive material type E is a self-reactive material which, in laboratory testing, neither detonates nor deflagrates at all and shows only a low or no effect when heated under confinement.
  - (F) Type F. Self-reactive material type F is a self-reactive material which, in laboratory testing, neither detonates in the cavitated state nor deflagrates at all and shows only a low or no effect when heated under confinement as well as low or no explosive power.
  - (G) Type G. Self-reactive material type G is a self-reactive material which, in laboratory testing, does not detonate in the cavitated state, will not deflagrate at all, shows no effect when heated under confinement, nor shows any explosive power. A type G self-reactive material is not subject to the requirements of this subchapter for self-reactive material of Division 4.1 provided that it is thermally stable (self-accelerating decomposition temperature is 50 °C (122 °F) or higher for a 50 kg (110 pounds) package). A self-reactive material meeting all characteristics of type G except thermal stability is classed as a type F self-reactive, temperature control material.
- (iii) Procedures for assigning a self-reactive material to a generic type. A self-reactive material must be assigned to a generic type based on-
- (A) Its physical state (i.e. liquid or solid), in accordance with the definition of liquid and solid in § 171.8 of this subchapter;
  - (B) A determination as to its control temperature and emergency temperature, if any, under the provisions of § 173.21(f) ;
  - (C) Performance of the self-reactive material under the test procedures specified in the UN Manual of Tests and Criteria (IBR, see § 171.7 of this subchapter) and the provisions of paragraph (a)(2)(iii) of this section; and
  - (D) Except for a self-reactive material which is identified by technical name in the Self-Reactive Materials Table in § 173.224(b) or a self-reactive material which may be shipped as a sample under the provisions of §173.224 , the self-reactive material is approved in writing by the Associate Administrator. The person requesting approval shall submit to the Associate Administrator the tentative shipping description and generic type and-
    - (1) All relevant data concerning physical state, temperature controls, and tests results; or
    - (2) An approval issued for the self-reactive material by the competent authority of a foreign government

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(iv) Tests. The generic type for a self-reactive material must be determined using the testing protocol from Figure 14.2 (Flow Chart for Assigning Self-Reactive Substances to Division 4.1) from the UN Manual of Tests and Criteria.

(3) Readily combustible solids are materials that-

- (i) Are solids which may cause a fire through friction, such as matches;
- (ii) Show a burning rate faster than 2.2 mm (0.087 inches) per second when tested in accordance with the UN Manual of Tests and Criteria (IBR, see § 171.7 of this subchapter); or
- (iii) Any metal powders that can be ignited and react over the whole length of a sample in 10 minutes or less, when tested in accordance with the UN Manual of Tests and Criteria.

(b) Division 4.2 (Spontaneously Combustible Material) . For the purposes of this subchapter, spontaneously combustible material (Division 4.2) means-

- (1) A pyrophoric material. A pyrophoric material is a liquid or solid that, even in small quantities and without an external ignition source, can ignite within five (5) minutes after coming in contact with air when tested according to the UN Manual of Tests and Criteria.
- (2) A self-heating material. A self-heating material is a material that, when in contact with air and without an energy supply, is liable to self-heat. A material of this type which exhibits spontaneous ignition or if the temperature of the sample exceeds 200 °C (392 °F) during the 24-hour test period when tested in accordance with UN Manual of Tests and C(c) Division 4.3 (Dangerous when wet material) . For the purposes of this chapter, dangerous when wet material (Division 4.3) means a material that, by contact with water, is liable to become spontaneously flammable or to give off flammable or toxic gas at a rate greater than 1 L per kilogram of the material, per hour, when tested in accordance with UN Manual of Tests and Criteria.

[Amdt. 173-224, 55 FR 52634, Dec. 21, 1990, as amended at 56 FR 66268, Dec. 20, 1991; 57 FR 45461, Oct. 1, 1992; Amdt. 173-233, 58 FR 33305, June 16, 1993; Amdt. 173-234, 58 FR 51532, Oct. 1, 1993; Amdt. 173-241, 59 FR 67507, Dec. 29, 1994; 62 FR 24690, May 06, 1997; 66 FR 8644, February 01, 2001; 66 FR 45376, August 28, 2001; 68 FR 75734, December 31, 2003]

**§173.128 Class 5, Division 5.2-Definitions and types.**

(a) Definitions. For the purposes of this subchapter, organic peroxide (Division 5.2) means any organic compound containing oxygen (O) in the bivalent -O-O- structure and which may be considered a derivative of hydrogen peroxide, where one or more of the hydrogen atoms have been replaced by organic radicals, unless any of the following paragraphs applies:

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- (1) The material meets the definition of an explosive as prescribed in subpart C of this part, in which case it must be classed as an explosive;
- (2) The material is forbidden from being offered for transportation according to § 172.101 of this subchapter or § 173.21 ;
- (3) The Associate Administrator has determined that the material does not present a hazard which is associated with a Division 5.2 material; or
- (4) The material meets one of the following conditions:
  - (i) For materials containing no more than 1.0 percent hydrogen peroxide, the available oxygen, as calculated using the equation in paragraph (a)(4)(ii) of this section, is not more than 1.0 percent, or

- (ii) For materials containing more than 1.0 percent but not more than 7.0 percent hydrogen peroxide, the available oxygen, content ( $O_a$ ) is not more than 0.5

$$O_a = 16 \times \sum_{i=1}^k \frac{n_i c_i}{m_i} \text{ where, for a}$$

percent, when determined using the equation:

material containing k species of organic peroxides:

$n_i$  = number of -O-O- groups per molecule of the i th species

$c_i$  = concentration (mass percent) of the i th species

$m_i$  = molecular mass of the i th species

- (b) Generic types. Division 5.2 organic peroxides are assigned to a generic system which consists of seven types. An organic peroxide identified by technical name in the Organic Peroxides Table in § 173.225 is assigned to a generic type in accordance with that Table. Organic peroxides not identified in the Organic Peroxides Table are assigned to generic types under the procedures of paragraph (c) of this section.

- (1) Type A. Organic peroxide type A is an organic peroxide which can detonate or deflagrate rapidly as packaged for transport. Transportation of type A organic peroxides is forbidden.
- (2) Type B. Organic peroxide type B is an organic peroxide which, as packaged for transport, neither detonates nor deflagrates rapidly, but can undergo a thermal explosion.
- (3) Type C. Organic peroxide type C is an organic peroxide which, as packaged for transport, neither detonates nor deflagrates rapidly and cannot undergo a thermal explosion.
- (4) Type D. Organic peroxide type D is an organic peroxide which-
  - (i) Detonates only partially, but does not deflagrate rapidly and is not affected by heat when confined;

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- (ii) Does not detonate, deflagrates slowly, and shows no violent effect if heated when confined; or
  - (iii) Does not detonate or deflagrate, and shows a medium effect when heated under confinement.
- (5) Type E. Organic peroxide type E is an organic peroxide which neither detonates nor deflagrates and shows low, or no, effect when heated under confinement.
- (6) Type F. Organic peroxide type F is an organic peroxide which will not detonate in a cavitated state, does not deflagrate, shows only a low, or no, effect if heated when confined, and has low, or no, explosive power.
- (7) Type G. Organic peroxide type G is an organic peroxide which will not detonate in a cavitated state, will not deflagrate at all, shows no effect when heated under confinement, and shows no explosive power. A type G organic peroxide is not subject to the requirements of this subchapter for organic peroxides of Division 5.2 provided that it is thermally stable (self-accelerating decomposition temperature is 50 °C (122 °F) or higher for a 50 kg (110 pounds) package). An organic peroxide meeting all characteristics of type G except thermal stability and requiring temperature control is classed as a type F, temperature control organic peroxide.
- (c) Procedure for assigning an organic peroxide to a generic type. An organic peroxide shall be assigned to a generic type based on-
- (1) Its physical state (i.e., liquid or solid), in accordance with the definitions for liquid and solid in § 171.8 of this subchapter;
  - (2) A determination as to its control temperature and emergency temperature, if any, under the provisions of § 173.21(f) ; and
  - (3) Performance of the organic peroxide under the test procedures specified in the UN Manual of Tests and Criteria (IBR, see § 171.7 of this subchapter), and the provisions of paragraph (d) of this section.
- (d) Approvals
- (1) An organic peroxide must be approved, in writing, by the Associate Administrator, before being offered for transportation or transported, including assignment of a generic type and shipping description, except for -
    - (i) An organic peroxide which is identified by technical name in the Organic Peroxides Table in § 173.225(c) ;
    - (ii) A mixture of organic peroxides prepared according to § 173.225(b) ; or

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- (iii) An organic peroxide which may be shipped as a sample under the provisions of § 173.225(b) .
- (2) A person applying for an approval must submit all relevant data concerning physical state, temperature controls, and tests results or an approval issued for the organic peroxide by the competent authority of a foreign government.
- (e) Tests. The generic type for an organic peroxide shall be determined using the testing protocol from Figure 20.1(a) (Classification and Flow Chart Scheme for Organic Peroxides) from the UN Manual of Tests and Criteria (IBR, see § 171.7 of this subchapter).

[Amdt. 173-224, 55 FR 52634, Dec. 21, 1990, as amended at 56 FR 66268, Dec. 20, 1991; Amdt. 173-234, 58 FR 51532, Oct. 1, 1993; Amdt. 173-241, 59 FR 67508, Dec. 29, 1994; 62 FR 24690, May 06, 1997; 65 FR 58614, September 29, 2000; 66 FR 8644, February 01, 2001; 66 FR 45376, August 28, 2001; 68 FR 75734, December 31, 2003; 69 FR 76044, December 20, 2004]

**§173.132 Class 6, Division 6.1-Definitions.**

- (a) For the purpose of this subchapter, poisonous material (Division 6.1) means a material, other than a gas, which is known to be so toxic to humans as to afford a hazard to health during transportation, or which, in the absence of adequate data on human toxicity:
  - (1) Is presumed to be toxic to humans because it falls within any one of the following categories when tested on laboratory animals (whenever possible, animal test data that has been reported in the chemical literature should be used):
    - (i) Oral Toxicity. A liquid with an LD<sub>50</sub> for acute oral toxicity of not more than 500 mg/kg or a solid with an LD<sub>50</sub> for acute oral toxicity of not more than 200 mg/kg.
    - (ii) Dermal Toxicity. A material with an LD<sub>50</sub> for acute dermal toxicity of not more than 1000 mg/kg.
    - (iii) Inhalation Toxicity
      - (A) A dust or mist with an LC<sub>50</sub> for acute toxicity on inhalation of not more than 10 mg/L; or
      - (B) A material with a saturated vapor concentration in air at 20 °C (68 °F) greater than or equal to one-fifth of the LC<sub>50</sub> for acute toxicity on inhalation of vapors and with an LC<sub>50</sub> for acute toxicity on inhalation of vapors of not more than 5000 mL/m<sup>3</sup> ; or

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- (2) Is an irritating material, with properties similar to tear gas, which causes extreme irritation, especially in confined spaces.

(b) For the purposes of this subchapter-

- (1) LD<sub>50</sub> (median lethal dose) for acute oral toxicity is the statistically derived single dose of a substance that can be expected to cause death within 14 days in 50% of young adult albino rats when administered by the oral route. The LD<sub>50</sub> value is expressed in terms of mass of test substance per mass of test animal (mg/kg).
- (2) LD<sub>50</sub> for acute dermal toxicity means that dose of the material which, administered by continuous contact for 24 hours with the shaved intact skin (avoiding abrading) of an albino rabbit, causes death within 14 days in half of the animals tested. The number of animals tested must be sufficient to give statistically valid results and be in conformity with good pharmacological practices. The result is expressed in mg/kg body mass.
- (3) LC<sub>50</sub> for acute toxicity on inhalation means that concentration of vapor, mist, or dust which, administered by continuous inhalation for one hour to both male and female young adult albino rats, causes death within 14 days in half of the animals tested. If the material is administered to the animals as a dust or mist, more than 90 percent of the particles available for inhalation in the test must have a diameter of 10 microns or less if it is reasonably foreseeable that such concentrations could be encountered by a human during transport. The result is expressed in mg/L of air for dusts and mists or in mL/m<sup>3</sup> of air (parts per million) for vapors. See § 173.133(b) for LC<sub>50</sub> determination for mixtures and for limit tests
  - (i) When provisions of this subchapter require the use of the LC<sub>50</sub> for acute toxicity on inhalation of dusts and mists based on a one-hour exposure and such data is not available, the LC<sub>50</sub> for acute toxicity on inhalation based on a four-hour exposure may be multiplied by four and the product substituted for the one-hour LC<sub>50</sub> for acute toxicity on inhalation.
  - (ii) When the provisions of this subchapter require the use of the LC<sub>50</sub> for acute toxicity on inhalation of vapors based on a one-hour exposure and such data is not available, the LC<sub>50</sub> for acute toxicity on inhalation based on a four-hour exposure may be multiplied by two and the product substituted for the one-hour LC<sub>50</sub> for acute toxicity on inhalation.
  - (iii) A solid substance should be tested if at least 10 percent of its total mass is likely to be dust in a respirable range, e.g. the aerodynamic diameter of that particle-fraction is 10 microns or less. A liquid substance should be tested if a mist is likely to be generated in a leakage of the transport containment. In carrying out the test both for solid and liquid substances, more than 90% (by mass) of a specimen prepared for inhalation toxicity testing must be in the respirable range as defined in this paragraph (b)(3)(iii).

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(c) For purposes of classifying and assigning packing groups to mixtures possessing oral or dermal toxicity hazards according to the criteria in § 173.133(a)(1) , it is necessary to determine the acute LD50 of the mixture. If a mixture contains more than one active constituent, one of the following methods may be used to determine the oral or dermal LD50 of the mixture:

- (1) Obtain reliable acute oral and dermal toxicity data on the actual mixture to be transported;
- (2) If reliable, accurate data is not available, classify the formulation according to the most hazardous constituent of the mixture as if that constituent were present in the same concentration as the total concentration of all active constituents; or
- (3) If reliable, accurate data is not available, apply the formula:

$$\frac{C_{A+}}{T_A} + \frac{C_B}{T_B} + \frac{C_Z}{T_Z} = \frac{100}{T_M}$$

where: C = the % concentration of constituent A, B ... Z in the mixture;  
T = the oral LD50 values of constituent A, B ... Z;  
TM = the oral LD50 value of the mixture.

Note to formula in paragraph (c)(3): This formula also may be used for dermal toxicities provided that this information is available on the same species for all constituents. The use of this formula does not take into account any potentiation or protective phenomena.

(d) The foregoing categories shall not apply if the Associate Administrator has determined that the physical characteristics of the material or its probable hazards to humans as shown by documented experience indicate that the material will not cause serious sickness or death.

[Amdt. 173-224, 55 FR 52634, Dec. 21, 1990, as amended at 56 FR 66268, Dec. 20, 1991; Amdt. 173-234, 58 FR 51532, Oct. 1, 1993; 62 FR 24690, May 06, 1997; 62 FR 45702, August 28, 1997; 65 FR 58614, September 29, 2000; 66 FR 45376, August 28, 2001; 69 FR 76044, December 20, 2004]

**§173.134 Class 6, Division 6.2 - Definitions and exceptions.**

The requirements for shipping biological products, cultures and stocks, diagnostic substances and infectious materials will be discussed in a special shipping guideline that just addresses these shipping requirements for these kinds of materials.

**§173.403 (Class 7) Definitions.**

For purposes of this subpart-

*A<sub>1</sub>* means the maximum activity of special form Class 7 (radioactive) material permitted in a Type A package. This value is either listed in § 173.435 or may be derived in accordance with the procedures prescribed in § 173.433 .

*A<sub>2</sub>* means the maximum activity of Class 7 (radioactive) material, other than special form material, LSA material, and SCO, permitted in a Type A package. This value is either listed in § 173.435 or may be derived in accordance with the procedures prescribed in §173.433 .

*Class 7 (radioactive) material* See the definition of Radioactive material in this section.

*Closed transport vehicle* means a transport vehicle or conveyance equipped with a securely attached exterior enclosure that during normal transportation restricts the access of unauthorized persons to the cargo space containing the Class 7 (radioactive) materials. The enclosure may be either temporary or permanent, and in the case of packaged materials may be of the "see-through" type, and must limit access from top, sides, and bottom.

*Consignment* means a package or group of packages or load of radioactive material offered by a person for transport in the same shipment.

*Containment system* means the assembly of components of the packaging intended to retain the Class 7 (radioactive) material during transport. Contamination means the presence of a radioactive substance on a surface in quantities in excess of 0.4 Bq/cm<sup>2</sup> for beta and gamma emitters and low toxicity alpha emitters or 0.04 Bq/cm<sup>2</sup> for all other alpha emitters. Contamination exists in two phases.

- (1) Fixed radioactive contamination means radioactive contamination that cannot be removed from a surface during normal conditions of transport.
- (2) Non-fixed radioactive contamination means radioactive contamination that can be removed from a surface during normal conditions of transport.

*Conveyance* means:

- (1) For transport by public highway or rail: any transport vehicle or large freight container;
- (2) For transport by water: any vessel, or any hold, compartment, or defined deck area of a vessel including any transport vehicle on board the vessel; and
- (3) For transport by aircraft, any aircraft.

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*Criticality Safety Index (CSI)* means a number (rounded up to the next tenth) which is used to provide control over the accumulation of packages, overpacks or freight containers containing fissile material. The CSI for packages containing fissile material is determined in accordance with the instructions provided in 10 CFR 71.22, 71.23, and 71.59. The CSI for an overpack, freight container, or consignment containing fissile material packages is the arithmetic sum of the criticality safety indices of all the fissile material packages contained within the overpack, freight container, or consignment.

*Design* means the description of a special form Class 7 (radioactive) material, a package, packaging, or LSA-III, that enables those items to be fully identified. The description may include specifications, engineering drawings, reports showing compliance with regulatory requirements, and other relevant documentation.

*Deuterium* means, for the purposes of § 173.453 , deuterium and any deuterium compound, including heavy water, in which the ratio of deuterium atoms to hydrogen atoms exceeds 1:5000.

*Exclusive use* means sole use by a single consignor of a conveyance for which all initial, intermediate, and final loading and unloading are carried out in accordance with the direction of the consignor or consignee. The consignor and the carrier must ensure that any loading or unloading is performed by personnel having radiological training and resources appropriate for safe handling of the consignment. The consignor must provide to the initial carrier specific written instructions for maintenance of exclusive use shipment controls, including the vehicle survey requirement of § 173.443(c) as applicable, and include these instructions with the shipping paper information provided to the carrier by the consignor.

*Exemption value* means either an exempt material activity concentration or an exempt consignment activity limit listed in the table in § 173.436 , or determined according to the procedures described in § 173.433 , and used to determine whether a given physically radioactive material is sufficiently radioactive to be subject to the HMR (see definition of radioactive material). An exemption value is different from an exemption, as defined in § 171.8 of this subchapter.

*Fissile material* means plutonium<sup>239</sup>, plutonium<sup>241</sup>, uranium<sup>233</sup>, uranium<sup>235</sup>, or any combination of these radionuclides. This term does not apply to material containing fissile nuclides, unirradiated natural uranium and unirradiated depleted uranium, or to natural uranium or depleted uranium that has been irradiated in thermal reactors only.

*Freight container* means a reusable container having a volume of 1.81 cubic meters (64 cubic feet) or more, designed and constructed to permit it being lifted with its contents intact and intended primarily for containment of packages in unit form during transportation. A "small freight container" is one which has either one outer dimension less than 1.5 m (4.9 feet) or an internal volume of not more than 3.0 cubic meters (106 cubic feet). All other freight containers are designated as "large freight containers."

*Graphite* means, for the purposes of § 173.453 , graphite with a boron equivalent content less than 5 parts per million and density greater than 1.5 grams per cubic centimeter.

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*Highway route controlled quantity* means a quantity within a single package which exceeds:

- (1) 3,000 times the A 1 value of the radionuclides as specified in § 173.435 for special form Class 7 (radioactive) material;
- (2) 3,000 times the A 2 value of the radionuclides as specified in § 173.435 for normal form Class 7 (radioactive) material; or
- (3) 1,000 TBq (27,000 Ci), whichever is least.

*Limited quantity of Class 7 (radioactive)* material means a quantity of Class 7 (radioactive) material not exceeding the material's package limits specified in § 173.425 and conforming with requirements specified in § 173.421 .

*Low Specific Activity (LSA) material* means Class 7 (radioactive) material with limited specific activity which satisfies the descriptions and limits set forth below. Shielding material surrounding the LSA material may not be considered in determining the estimated average specific activity of the package contents. LSA material must be in one of three groups:

(1) LSA-I:

- (i) Uranium and thorium ores, concentrates of uranium and thorium ores, and other ores containing naturally occurring radionuclides which are intended to be processed for the use of these radionuclides; or
- (ii) Solid unirradiated natural uranium or depleted uranium or natural thorium or their solid or liquid compounds or mixtures; or
- (iii) Radioactive material other than fissile material, for which the A 2 value is unlimited; or
- (iv) Other radioactive material, excluding fissile material in quantities not excepted under § 173.453 , in which the activity is distributed throughout and the estimated average specific activity does not exceed 30 times the values for activity concentration specified in § 173.436 , or 30 times the default values listed in Table 8 of § 173.433 .

(2) LSA-II:

- (i) Water with tritium concentration up to 0.8 TBq/L (20.0 Ci/L); or
- (ii) Other radioactive material in which the activity is distributed throughout and the average specific activity does not exceed  $10^{-4} A 2 /g$  for solids and gases, and  $10^{-5} A 2 /g$  for liquids.

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- (3) LSA-III. Solids ( e.g., consolidated wastes, activated materials), excluding powders, that meet the requirements of § 173.468 and in which:
- (i) The radioactive material is distributed in a solid compact binding agent (such as concrete, bitumen, ceramic, etc.):
  - (ii) The radioactive material is relatively insoluble, or it is intrinsically contained in a relatively insoluble material, so that, even under loss of packaging, the loss of Class 7 (radioactive) material per package by leaching when placed in water for seven days would not exceed  $0.1 A 2$  ; and
  - (iii) The estimated average specific activity of the solid, excluding any shielding material, does not exceed  $2 \times 10^{-3} A 2 /g$ .

*Low toxicity alpha emitters* means natural uranium; depleted uranium; natural thorium; uranium-235 or uranium-238; thorium-232; thorium-228 and thorium-230 when contained in ores or physical and chemical concentrates; and alpha emitters with a half-life of less than 10 days.

*Maximum normal operating pressure* means the maximum gauge pressure that would develop in a containment system during a period of one year, in the absence of venting or cooling, under the heat conditions specified in 10 CFR 71.71(c)(1).

*Multilateral approval* means approval of a package design or shipment by the relevant Competent Authority of the country of origin and of each country through or into which the package or shipment is to be transported. This definition does not include approval from a country over which Class 7 (radioactive) materials are carried in aircraft, if there is no scheduled stop in that country.

*Natural thorium* means thorium with the naturally occurring distribution of thorium isotopes (essentially 100 percent by weight of thorium-232).

*Normal form Class 7 (radioactive) material* means Class 7 (radioactive) which has not been demonstrated to qualify as "special form Class 7 (radioactive) material."

*Package* means the packaging together with its radioactive contents as presented for transport.

- (1) "Excepted package" means a packaging together with its excepted Class 7 (radioactive) materials as specified in § 173.421 -173.426 and 173.428 .
- (2) "Industrial package" means a packaging that, together with its low specific activity (LSA) material or surface contaminated object (SCO) contents, meets the requirements of § 173.410 and 173.411 . Industrial packages are categorized in § 173.411 as either:
  - (i) "Industrial package Type 1 (IP-1)";

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- (ii) "Industrial package Type 2 (IP-2)"; or
  - (iii) "Industrial package Type 3 (IP-3)".
- (3) "Type A package" means a packaging that, together with its radioactive contents limited to A<sub>1</sub> or A<sub>2</sub> as appropriate, meets the requirements of § 173.410 and 173.412 and is designed to retain the integrity of containment and shielding required by this part under normal conditions of transport as demonstrated by the tests set forth in § 173.465 or § 173.466, as appropriate. A Type A package does not require Competent Authority approval.
- (4) "Type B package" means a packaging designed to transport greater than an A<sub>1</sub> or A<sub>2</sub> quantity of radioactive material that, together with its radioactive contents, is designed to retain the integrity of containment and shielding required by this part when subjected to the normal conditions of transport and hypothetical accident test conditions set forth in 10 CFR part 71.
- (i) "Type B(U) package" means a Type B packaging that, together with its radioactive contents, for international shipments requires unilateral approval only of the package design and of any stowage provisions that may be necessary for heat dissipation.
  - (ii) "Type B(M) package" means a Type B packaging, together with its radioactive contents, that for international shipments requires multilateral approval of the package design, and may require approval of the conditions of shipment. Type B(M) packages are those Type B package designs which have a maximum normal operating pressure of more than 700 kPa/cm<sup>2</sup> (100 lb/in<sup>2</sup>) gauge or a relief device which would allow the release of Class 7 (radioactive) material to the environment under the hypothetical accident conditions specified in 10 CFR part 71.
- (5) "Fissile material package" means a packaging, together with its fissile material contents, which meets the requirements for fissile material packages described in subpart E of 10 CFR 71. A fissile material package may be a Type AF package, a Type B(U)F package, or a Type B(M)F package.

*Packaging* means, for Class 7 (radioactive) materials, the assembly of components necessary to ensure compliance with the packaging requirements of this subpart. It may consist of one or more receptacles, absorbent materials, spacing structures, thermal insulation, radiation shielding, service equipment for filling, emptying, venting and pressure relief, and devices for cooling or absorbing mechanical shocks. The conveyance, tie-down system, and auxiliary equipment may sometimes be designated as part of the packaging.

*Quality assurance* means a systematic program of controls and inspections applied by each person involved in the transport of radioactive material which provides confidence that a standard of safety prescribed in this subchapter is achieved in practice.

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*Radiation level* means the radiation dose-equivalent rate expressed in millisieverts per hour or mSv/h (millirems per hour or mrem/h). Neutron flux densities may be converted into radiation levels according to Table 1:

<b>Table 1.--Neutron Fluence Rates To Be Regarded as Equivalent to a Radiation Level of 0.01 MSV/H (1 MREM/H) <sup>1</sup></b>	
<b>Energy of neutron</b>	<b>Flux density equivalent to 0.01 mSv/h (1 mrem/h) neutrons per square centimeter per second (n/cm<sup>2</sup>/s)</b>
Thermal (2.510E-8)MeV	272.0
1 keV	272.0
10 keV	281.0
100 keV	47.0
500 keV	11.0
1 MeV	7.5
5 MeV	6.4
10 MeV	6.7

(1) Flux densities equivalent for energies between those listed in this table may be obtained by linear interpolation.

*Radioactive contents* means a Class 7 (radioactive) material, together with any contaminated or activated solids, liquids and gases within the packaging.

*Radioactive instrument or article* means any manufactured instrument or article such as an instrument such as an instrument, clock, electronic tube or apparatus, or similar instrument or article having Class 7 (radioactive) material in gaseous or non-dispersible solid form as a component part.

*Radioactive material* means any material containing radionuclides where both the activity concentration and the total activity in the consignment exceed the values specified in the table in § 173.436 or values derived according to the instructions in § 173.433 .

*Special form Class 7 (radioactive) material* means either an indispensible solid radioactive material or a sealed capsule containing radioactive material which satisfies the following conditions:

- (1) It is either a single solid piece or a sealed capsule containing radioactive material that can be opened only by destroying the capsule;
- (2) The piece or capsule has at least one dimension not less than 5 mm (0.2 in); and
- (3) It satisfies the test requirements of § 173.469 . Special form encapsulations designed in accordance with the requirements of § 173.389(g) in effect on June 30, 1983 (see 49 CFR part 173 , revised as of October 1, 1982), and constructed prior to July 1, 1985 and special form encapsulations designed in accordance with

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the requirements of § 173.403 in effect on March 31, 1996 (see 49 CFR part 173, revised as of October 1, 1995), and constructed prior to April 1, 1997, may continue to be used. Any other special form encapsulation must meet the requirements of this paragraph (3).

*Specific activity of a radionuclide* means the activity of the radionuclide per unit mass of that nuclide. The specific activity of a material in which the radionuclide is essentially uniformly distributed is the activity per unit mass of the material.

*Surface Contaminated Object (SCO)* means a solid object which is not itself radioactive but which has radioactive material distributed on its surface. SCO exists in two phases:

(1) SCO-I: A solid object on which:

- (i) The non-fixed contamination on the accessible surface averaged over  $300 \text{ cm}^2$  (or the area of the surface if less than  $300 \text{ cm}^2$ ) does not exceed  $4 \text{ Bq/cm}^2$  ( $10^{-4}$  microcurie/ $\text{cm}^2$ ) for beta and gamma and low toxicity alpha emitters, or  $0.4 \text{ Bq/cm}^2$  ( $10^{-5}$  microcurie/ $\text{cm}^2$ ) for all other alpha emitters;
- (ii) The fixed contamination on the accessible surface averaged over  $300 \text{ cm}^2$  (or the area of the surface if less than  $300 \text{ cm}^2$ ) does not exceed  $4 \times 10^4 \text{ Bq/cm}^2$  ( $1.0$  microcurie/ $\text{cm}^2$ ) for beta and gamma and low toxicity alpha emitters, or  $4 \times 10^3 \text{ Bq/cm}^2$  ( $0.1$  microcurie/ $\text{cm}^2$ ) for all other alpha emitters; and
- (iii) The non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over  $300 \text{ cm}^2$  (or the area of the surface if less than  $300 \text{ cm}^2$ ) does not exceed  $4 \times 10^4 \text{ Bq/cm}^2$  ( $1$  microcurie/ $\text{cm}^2$ ) for beta and gamma and low toxicity alpha emitters, or  $4 \times 10^3 \text{ Bq/cm}^2$  ( $0.1$  microcurie/ $\text{cm}^2$ ) for all other alpha emitters.

(2) SCO-II: A solid object on which the limits for SCO-I are exceeded and on which:

- (i) The non-fixed contamination on the accessible surface averaged over  $300 \text{ cm}^2$  (or the area of the surface if less than  $300 \text{ cm}^2$ ) does not exceed  $400 \text{ Bq/cm}^2$  ( $10^{-2}$  microcurie/ $\text{cm}^2$ ) for beta and gamma and low toxicity alpha emitters, or  $40 \text{ Bq/cm}^2$  ( $10^{-3}$  microcurie/ $\text{cm}^2$ ) for all other alpha emitters;
- (ii) The fixed contamination on the accessible surface averaged over  $300 \text{ cm}^2$  (or the area of the surface if less than  $300 \text{ cm}^2$ ) does not exceed  $8 \times 10^5 \text{ Bq/cm}^2$  ( $20$  microcurie/ $\text{cm}^2$ ) for beta and gamma and low toxicity alpha emitters, or  $8 \times 10^4 \text{ Bq/cm}^2$  ( $2$  microcuries/ $\text{cm}^2$ ) for all other alpha emitters; and
- (iii) The non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over  $300 \text{ cm}^2$  (or the area of the surface if less than  $300 \text{ cm}^2$ ) does not exceed  $8 \times 10^5 \text{ Bq/cm}^2$  ( $20$  microcuries/ $\text{cm}^2$ ) for beta and gamma and low toxicity alpha emitters, or  $8 \times 10^4 \text{ Bq/cm}^2$  ( $2$  microcuries/ $\text{cm}^2$ ) for all other alpha emitters.

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*Transport index (TI)* means the dimensionless number (rounded up to the next tenth) placed on the label of a package, to designate the degree of control to be exercised by the carrier during transportation. The transport index is determined by multiplying the maximum radiation level in millisieverts (mSv) per hour at 1 m (3.3 ft) from the external surface of the package by 100 (equivalent to the maximum radiation level in millirem per hour at 1 m (3.3 ft)).

*Type A quantity* means a quantity of Class 7 (radioactive) material, the aggregate radioactivity which does not exceed  $A_1$  for special form Class 7 (radioactive) material of  $A_2$  for normal form Class 7 (radioactive) material, where  $A_1$  and  $A_2$  values are given in Sec.173.435 or are determined in accordance with § 173.433 .

**Type B quantity** means a quantity of material greater than a Type A quantity.

**Unilateral approval** means approval of a package design solely by the Competent Authority of the country of origin of the design.

*Unirradiated thorium* means thorium containing not more than  $10^{-7}$  grams uranium-233 per gram of thorium-232.

*Unirradiated uranium* means uranium containing not more than  $2 \times 10^3$  Bq of plutonium per gram of uranium-235, not more than  $9 \times 10^6$  Bq of fission products per gram of uranium-235 and not more than  $5 \times 10^{-3}$  g of uranium-236 per gram of uranium-235.

*Uranium--natural, depleted or enriched* means the following:

(1) –

- (i) "Natural uranium" means chemically separated uranium containing the naturally occurring distribution of uranium isotopes (approximately 99.28% uranium-238 and 0.72% uranium-235 by mass).
- (ii) "Depleted uranium" means uranium containing a lesser mass percentage of uranium-235 than in natural uranium.
- (iii) "Enriched uranium" means uranium containing a greater mass percentage of uranium-235 than 0.72%.

(2) In all cases listed in this definition, a very small mass percentage of uranium-234 is present

[Amdt. 173-244, 60 FR 50307, Sept. 28, 1995, as amended by Amdt. 173-244, 61 FR 20750, May 8, 1996; 63 FR 52844, October 01, 1998; 65 FR 58614, September 29, 2000; 66 FR 45177, August 28, 2001; 66 FR 45376, August 28, 2001; 69 FR 3632, January 26, 2004; 69 FR 55113; 69 FR 58841]

**§173.136 Class 8-Definitions.**

- (a) For the purpose of this subchapter, "corrosive material" (Class 8) means a liquid or solid that causes full thickness destruction of human skin at the site of contact within a specified period of time. A liquid that has a severe corrosion rate on steel or aluminum based on the criteria in § 173.137(c)(2) is also a corrosive material.
- (b) If human experience or other data indicate that the hazard of a material is greater or less than indicated by the results of the tests specified in paragraph (a) of this section, RSPA may revise its classification or make the determination that the material is not subject to the requirements of this subchapter.
- (c) Skin corrosion test data produced no later than September 30, 1995, using the procedures of Part 173, Appendix A, in effect on September 30, 1995 (see 49 CFR Part 173 , Appendix A, revised as of October 1, 1994) for appropriate exposure times may be used for classification and assignment of packing group for Class 8 materials corrosive to skin.
- (d) Steel or aluminum corrosion test data produced no later than September 30, 2005, using the procedures of § 173.137(c)(2) , in effect on September 30, 2004 (see 49 CFR 173.137 revised as of October 1, 2003), for appropriate steel or aluminum types may be used for classification and assignment of packing group for Class 8 materials corrosive to steel or aluminum.

[Amdt. 173-224, 55 FR 52634, Dec. 21, 1990, as amended at 56 FR 66270, Dec. 20, 1991; Amdt. 173-234, 58 FR 51532, Oct. 1, 1993; Amdt. 173-241, 59 FR 67508, Dec. 29, 1994; 62 FR 24690, May 06, 1997; 69 FR 76044, December 20, 2004]

**§173.140 Class 9-Definitions.**

For the purposes of this subchapter, miscellaneous hazardous material (Class 9) means a material which presents a hazard during transportation but which does not meet the definition of any other hazard class. This class includes

- (a) Any material which has an anesthetic, noxious or other similar property which could cause extreme annoyance or discomfort to a flight crew member so as to prevent the correct performance of assigned duties; or
- (b) Any material that meets the definition in § 171.8 of this subchapter for an elevated temperature material, a hazardous substance, a hazardous waste, or a marine pollutant.

[Amdt. 173-224, 57 FR 45463]