International Civil Aviation Organization

DGP/21-WP/6
29/8/07

WORKING PAPER

DANGEROUS GOODS PANEL (DGP)

TWENTY-FIRST MEETING

Montréal, 5 to 16 November 2007

Agenda Item 2: Development of recommendations for amendments to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284) for incorporation in the 2009-2010 Edition

DRAFT AMENDMENTS OF THE TECHNICAL INSTRUCTIONS TO ALIGN TO THE UN RECOMMENDATIONS — PART 2

(Presented by the Secretary)

SUMMARY

Below are the draft amendments to Part 2, Chapters 2, 4, 5, 6, 7 and 8 to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals at its third session (Geneva, 15 December 2006) and as modified by the decisions of WG/06 and WG/07.

The DGP is invited to agree to the draft amendments in this working paper..

Reference for amendments to Part 2: DGP-WG/07-WP/3, unless otherwise indicated.

Part 2

CLASSIFICATION OF DANGEROUS GOODS

Chapter 2

CLASS 2 — GASES

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2.1 DEFINITIONS AND GENERAL PROVISIONS

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DGP-WG/07-WP/51:

2.1.3 This class comprises compressed gases; liquefied gases; dissolved gases; refrigerated liquefied gases; mixtures of one or more gases with one or more vapours of substances of other classes; articles charged with a gas; and aerosols. (For aerosols, see 1;3.1).

Note 1.— Carbonated beverages and inflated balls used for sports are not subject to these Instructions.

Note 2.—"Cryogenic liquid" means the same as "refrigerated liquefied gas".

DGP-WG/07-WP/3:

2.2 DIVISIONS

2.2.1 Substances of Class 2 are assigned to one of three divisions based on the primary hazard of the gas during transport.

Note.— UN 1950 ***Aerosols,*** *UN 2037* ***Receptacles, small, containing gas*** *and UN 2037* ***Gas cartridges*** *must be regarded as being in Division 2.1 when the criteria in 2.5.1 a) are met.*

a) Division 2.1 — Flammable gases.

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b) Division 2.2 — Non-flammable, non-toxic gases.

Gases which:

i) are asphyxiant — gases which dilute or replace the oxygen normally in the atmosphere; or

ii) are oxidizing — gases which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does. The oxidizing ability must be determined by tests or by calculation in accordance with methods adopted by ISO (see ISO 10156:1996 and ISO 10156-2:2005); or

. . .

2.2.2 Gases of Division 2.2~~, other than refrigerated liquefied gases,~~ are not subject to these Instructions if they are transported at a pressure less than ~~280~~ 200 kPa at 20°C and are not liquefied or refrigerated liquefied gases.

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2.4 MIXTURES OF GASES

For the classification of gas mixtures into one of the three divisions (including vapours of substance from other classes), the following principles must be used:

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d) Oxidizing ability is determined either by tests or by calculation methods adopted by the International Standards Organization (see ISO 10156:1996 and ISO 10156-2:2005).

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Chapter 4

CLASS 4 — FLAMMABLE SOLIDS; SUBSTANCES LIABLE TO SPONTANEOUS COMBUSTION; SUBSTANCES WHICH, IN CONTACT WITH WATER, EMIT FLAMMABLE GASES

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4.2.4 Division 4.1 — Solid desensitized explosives

4.2.4.1 *Definition*

Solid desensitized explosives are explosive substances which are wetted with water or alcohols or are diluted with other substances to form a homogeneous solid mixture to suppress their explosive properties. Entries in the Dangerous Goods List for solid desensitized explosives are UN 1310, 1320, 1321, 1322, 1336, 1337, 1344, 1347, 1348, 1349, 1354, 1355, 1356, 1357, 1517, 1571, 2555, 2556, 2557, 2852, 2907, 3317, 3319, 3344, 3364, 3365, 3366, 3367, 3368, 3369, 3370, 3376, ~~and~~ UN 3380 and UN 3474.

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Chapter 5

CLASS 5 — OXIDIZING SUBSTANCES; ORGANIC PEROXIDES

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Table 2-7. List of currently assigned organic peroxides in packages

Note.— Peroxides to be transported must fulfil the classification and the control and emergency temperatures (derived from the self-accelerating decomposition temperature (SADT)) as listed.

Organic peroxide	Concentration (per cent)	Diluent type A (per cent)	Diluent type B (per cent) (Note 1)	Inert solid (per cent)	Water (per cent)	Control tempera-ture (°C)	Emergency tempera-ture (°C)	UN generic entry	Notes
. . .									
tert-Amyl peroxyneodecanoate	≤47	≥53				0	+10	3119	
. . .									
tert-Butyl peroxy-3,5,5- trimethylhexanoate	≤42			≥58				3106	
. . .									
Cumyl peroxyneodecanoate	≤87	≥13				–10	0	3115	
. . .									
2,2-Di-(tert-amylperoxy)-butane	≤57	≥43						3105	
1,1-Di-(tert-butylperoxy)cyclohexane	≤72		≥28					3103	30)
. . .									

Organic peroxide	Concentration (per cent)	Diluent type A (per cent)	Diluent type B (per cent) (Note 1)	Inert solid (per cent)	Water (per cent)	Control tempera-ture (°C)	Emergency tempera-ture (°C)	UN generic entry	Notes
1,1-Di-(tert-butylperoxy)cyclohexane + tert-butyl peroxy-2-ethylhexanoate	≤43+≤16	≥41						3105	
. . .									
1,1-Di-(tert-butylperoxy)-3,3,5-trimethylcyclohexane	≤90		≥10					3103	30)
. . .									
Dicumyl peroxide	>52-100			~~≤57~~				3110	12
. . .									
Di-2,4-dichlorobenzoyl peroxide	≤52 as a paste					+20	+25	3118	
. . .									
Di-(2-ethylhexyl)peroxydicarbonate	≤62 as a stable dispersion in water					–15	–5	~~3117~~3119	
~~Di (2 ethylhexyl)peroxydicarbonate~~	~~≤52 as a stable dispersion in water~~					~~–15~~	~~–5~~	~~3119~~	
. . .									
3-Hydroxy-1,1-dimethylbutyl peroxyneodecanoate	≤77	≥23				–5	+5	3115	
3-Hydroxy-1,1-dimethylbutyl peroxyneodecanoate	≤52 as a stable dispersion in water					–5	+5	3119	
3-Hydroxy-1,1-dimethylbutyl peroxyneodecanoate	≤52	≥48				–5	+5	3117	
. . .									
Methyl isopropyl ketone peroxide(s)	see remark 31)	≥70						3109	31
. . .									
3,3,5,7,7-pentamethyl-1,2,4-trioxepane	≤100							3107	
. . .									

Notes:

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30) Diluent type B with boiling point > 130°C.
31) Active oxygen ≤ 6.7 per cent.

Chapter 6

CLASS 6 — TOXIC AND INFECTIOUS SUBSTANCES

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6.3.2 Classification of infectious substances

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6.3.2.3 *Exceptions*

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6.3.2.3.6 Patient specimens for which there is minimal likelihood that pathogens are present are not subject to these Instructions 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", as appropriate. The packaging must meet the following conditions:

. . .

c) When multiple fragile primary receptacles are placed in a single secondary packaging, they must be either individually wrapped or separated to prevent contact between them.

Note.— In determining whether a patient specimen has a minimum likelihood that pathogens are present, an element of professional judgement is required to determine if a substance is exempt under this paragraph. That judgement should be based on the known medical history, symptoms and individual circumstances of the source, human or animal, and endemic local conditions. Examples of specimens which may be transported under this paragraph include blood or urine tests to monitor cholesterol levels, blood glucose levels, hormone levels, or prostate specific antibodies (PSA); tests required to monitor organ function such as heart, liver or kidney function for humans or animals with non-infectious diseases, or therapeutic drug monitoring; tests conducted for insurance or employment purposes and are intended to determine the presence of drugs or alcohol; pregnancy tests; biopsies to detect cancer; and antibody detection in humans or animals in the absence of any concern for infection (e.g. evaluation of vaccine induced immunity, diagnosis of autoimmune disease, etc.).

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6.3.5 Medical or clinical wastes

6.3.5.1 Medical or clinical wastes containing Category A infectious substances must be assigned to UN 2814 or UN 2900 as appropriate. Medical or clinical wastes containing infectious substances in Category B must be assigned to UN 3291.

6.3.5.2 Medical or clinical wastes that are reasonably believed to have a low probability of containing infectious substances must be assigned to UN 3291. For the assignment, international, regional or national waste catalogues may be taken into account.

. . .

6.3.6.3 Animal ~~carcasses~~ material affected by pathogens of Category A or which would be assigned to Category A in cultures only, must be assigned to UN 2814 or UN 2900 as appropriate. ~~Other animal carcasses affected by pathogens included in Category B must be transported in accordance with provisions determined by the competent authority.~~

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Chapter 7

CLASS 7 — RADIOACTIVE MATERIAL

Parts of this Chapter are affected by State Variations BE 4, CA 1, CA 3, CA 4, CH 4 DE 3, DK 1, DQ 1, JM 1, JP 2, JP 3, JP 26, RU 1, US 10; see Table A-1

Note.— For Class 7, the type of packaging may have a decisive effect on classification.

7.1 DEFINITIONS ~~OF CLASS 7~~

7.1.1 *Radioactive material*. ~~means a~~Any material containing radionuclides where both the activity concentration and the total activity in the consignment exceed the values specified in ~~7.7.2.1~~ 7.2.2.1 to ~~7.7.2.6~~ 7.2.2.6.

Editorial Note.— The following contamination definitions are moved from current paragraph 7.2:

7.1.2 *Contamination*

Contamination. The presence of a radioactive substance on a surface in quantities in excess of 0.4 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 0.04 Bq/cm^2 for all other alpha emitters.

Non-fixed contamination. Contamination that can be removed from a surface during routine conditions of transport.

Fixed contamination. Contamination other than non-fixed contamination.

Editorial Note.— The following paragraphs are moved to new Chapter 1;6:

~~7.1.2 The following radioactive materials are not included in Class 7 for the purposes of these Instructions:~~

~~a) radioactive material implanted or incorporated into a person or live animal for diagnosis or treatment;~~

~~b) radioactive material in consumer products which have received regulatory approval, following their sale to the end user;~~

~~c) natural material and ores containing naturally occurring radionuclides which are either in their natural state or have only been processed for purposes other than for extraction of the radionuclides, and are not intended to be processed for use of these radionuclides, provided the activity concentration of the material does not exceed 10 times the values specified in 7.7.2.1 b) or calculated in accordance with 7.7.2.2 to 7.7.2.6;~~

~~d) non-radioactive solid objects with radioactive substances present on any surfaces in quantities not in excess of the limit specified in the definition of contamination in 7.2.~~

~~7.2~~7.1.3 Definitions of specific terms

A_1 and *A_2*:

A_1. The activity value of special form radioactive material, which is listed in Table 2-~~13~~12 or derived in ~~2;7.7.2~~7.2.2.2 and is used to determine the activity limits for the requirements of these Instructions.

A_2. The activity value of radioactive material, other than special form radioactive material, which is listed in Table 2-~~13~~12 or derived in 2;~~7.7.2~~7.2.2.2 and is used to determine the activity limits for the requirements of these Instructions.

Editorial Note.— Definitions for approval, confinement system and containment system below are moved to 1;3.1:

~~*Approval:*~~

~~*Multilateral approval*. The approval by the relevant competent authority of the country of origin of the design or shipment, as applicable, and also, where the consignment is to be transported through or into any other country, approval by the~~

~~competent authority of that country. The term "through or into" specifically excludes "over", i.e. the approval and notification requirements must not apply to a country over which radioactive material is carried in an aircraft, provided that there is no scheduled stop in that country.~~

~~*Unilateral approval*. The approval of a design which is required to be given by the competent authority of the country of origin of the design only.~~

~~*Confinement system*. The assembly of fissile material and packaging components specified by the designer and agreed to by the competent authority as intended to preserve criticality safety.~~

~~*Containment system*. The assembly of components of the packaging specified by the designer as intended to retain the radioactive material during transport.~~

Editorial Note.— The following Contamination definitions are moved to 7.1.3:

~~*Contamination*:~~

~~*Contamination*. The presence of a radioactive substance on a surface in quantities in excess of 0.4 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 0.04 Bq/cm^2 for all other alpha emitters.~~

~~*Non-fixed contamination*. Contamination that can be removed from a surface during routine conditions of transport.~~

~~*Fixed contamination*. Contamination other than non-fixed contamination.~~

Editorial Note.— The following 3 definitions are moved to 1;3.1:

~~*Criticality safety index (CSI) assigned to a package, overpack or freight container containing fissile material*. A number which is used to provide control over the accumulation of packages, overpacks or freight containers containing fissile material.~~

~~*Design*. The description of special form radioactive material, low dispersible radioactive material, package or packaging which enables such items to be fully identified. The description may include specifications, engineering drawings, reports demonstrating compliance with regulatory requirements, and other relevant documentation.~~

~~*Exclusive use*. The sole use, by a single consignor, of an aircraft or of a large freight container, in respect of which all initial, intermediate and final loading and unloading is carried out in accordance with the directions of the consignor or consignee.~~

Fissile material. Uranium-233, uranium-235, plutonium-239, plutonium-241, or any combination of these radionuclides. Excepted from this definition are:

a) natural uranium or depleted uranium which is unirradiated; and

b) natural uranium or depleted uranium which has been irradiated in thermal reactors only.

[*Freight container in the case of radioactive material transport*. An article of transport equipment designed to facilitate the transport of packaged goods by one or more modes of transport without intermediate reloading, which is of a permanent enclosed character, rigid and strong enough for repeated use, and must be fitted with devices facilitating its handling, particularly in transfer between aircraft and from one mode of transport to another. A small freight container is that which has either an overall outer dimension less than 1.5 m, or an internal volume of not more than 3 m^3. Any other freight container is considered to be a large freight container. For the transport of Class 7 material, a freight container may be used as a packaging.]

Low dispersible radioactive material. A solid radioactive material or a solid radioactive material in a sealed capsule, that has limited dispersibility and is not in powder form.

Editorial Note.— The definition below is from current paragraph 7.3.1:

Low specific activity (LSA) material. ~~See 7.3.~~ Radioactive material which by its nature has a limited specific activity, or radioactive material for which limits of estimated average specific activity apply. External shielding materials surrounding the LSA material must not be considered in determining the estimated average specific activity.

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

Editorial Note.— The following definition is moved to 1;3.1:

~~*Maximum normal operating pressure*. The maximum pressure above atmospheric pressure at mean sea level that would develop in the containment system in a period of one year under the conditions of temperature and solar radiation corresponding to environmental conditions in the absence of venting, external cooling by an ancillary system, or operational controls during transport.~~

Editorial Note.— The following definition is moved to 4;9.1.1:

~~*[Package in the case of radioactive material*. The packaging with its radioactive contents as presented for transport. The types of packages covered by these Instructions, which are subject to the activity limits and material restrictions of 7.7 and meet the corresponding requirements, are:~~

~~a) Excepted package;~~

~~b) Industrial package Type 1 (Type IP-1 package);~~

~~c) Industrial package Type 2 (Type IP-2 package);~~

~~d) Industrial package Type 3 (Type IP-3 package);~~

~~e) Type A package;~~

~~f) Type B(U) package;~~

~~g) Type B(M) package;~~

~~h) Type C package.~~

~~Packages containing fissile material or uranium hexafluoride are subject to additional requirements.~~

~~*Note.— For packages for other dangerous goods, see the definitions under 1;3.1.1.]*~~

[Packaging in the case of radioactive material. The assembly of components necessary to enclose the radioactive contents completely. It may, in particular, consist of one or more receptacles, absorbent materials, spacing structures, radiation shielding and service equipment for filling, emptying, venting and pressure relief; devices for cooling, absorbing mechanical shocks, handling and tie-down, thermal insulation; and service devices integral to the package. The packaging may be a box, drum or similar receptacle, or may also be a freight container.

Note.— For packagings for other dangerous goods, see definitions under 1;3.1.1.]

Editorial Note.— The following definition is moved to 1;3.1 (radiation level and radioactive contents):

~~*Radiation level*. The corresponding dose rate expressed in millisieverts per hour.~~

~~*Radioactive contents*. The radioactive material together with any contaminated or activated solids, liquids, and gases within the packaging.~~

Editorial Note.— The following definition is moved from current 7.4:

Special form radioactive material. ~~See 7.4.1.~~Either:

a) an indispersible solid radioactive material; or

b) a sealed capsule containing radioactive material.

[Specific activity of a radionuclide. The activity per unit mass of that nuclide. The specific activity of a material must mean the activity per unit mass of the material in which the radionuclides are essentially uniformly distributed.]

Editorial Note.— The following definition is from current 7.5:

Surface contaminated object (SCO). ~~See 7.5.~~A solid object which is not itself radioactive but which has radioactive material distributed on its surfaces.

Transport index (TI) assigned to a package, overpack or freight container, or to unpackaged LSA-I or SCO-I. A number which is used to provide control over radiation exposure.

Unirradiated thorium. Thorium containing not more than 10^{-7} g of uranium-233 per gram of thorium-232.

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

Uranium — natural, depleted, enriched:

Natural uranium. Uranium (which may be chemically separated) containing the naturally occurring distribution ofuranium isotopes (approximately 99.28 per cent uranium-238, and 0.72 per cent uranium-235 by mass).

Depleted uranium. Uranium containing a lesser mass percentage of uranium-235 than in natural uranium.

Enriched uranium. Uranium containing a greater mass percentage of uranium-235 than 0.72 per cent. In all cases, a very small mass percentage of uranium-234 is present.

7.2 CLASSIFICATION

7.2.1 General provisions

7.2.1.1 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 and the nature or form of the contents of the package, or special arrangements governing the transport operation, in accordance with the provisions laid down in 7.2.2 to 7.2.5.

Table 2-11. Assignment of UN numbers

UN Number	*Name*
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**
Low specific activity radioactive material (7.2.3.1)	
UN 2912	**Radioactive material, low specific activity (LSA-I)**, non-fissile or fissile excepted
UN 3321	**Radioactive material, low specific activity (LSA-II)**, non-fissile or fissile excepted
UN 3322	**Radioactive material, low specific activity (LSA-III)**, non-fissile or fissile excepted
UN 3324	**Radioactive material, low specific activity (LSA-II) fissile**
UN 3325	**Radioactive material, low specific activity (LSA-III) fissile**

UN Number	*Name*
Surface contaminated objects (7.2.3.2)	
UN 2913	**Radioactive material, surface contaminated objects (SCO-I** or **SCO-II)**, non-fissile or fissile excepted
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
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
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
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
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
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
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

Editorial Note.— Paragraph 7.3 below is moved to 7.2.3 (paragraph 7.3.1 is moved to 7.1.3):

~~**7.3 LOW SPECIFIC ACTIVITY (LSA) MATERIAL, DETERMINATION OF GROUPS**~~

~~7.3.1 Radioactive material which by its nature has a limited specific activity, or radioactive material for which limits of estimated average specific activity apply, is termed low specific activity or LSA material. External shielding materials surrounding the LSA material must not be considered in determining the estimated average specific activity.~~

~~7.3.2 LSA material must be in one of three groups:~~

~~a) LSA-I~~

~~i) uranium and thorium ores and concentrates of such ores, and other ores containing naturally occurring radionuclides which are intended to be processed for the use of these radionuclides;~~

ii) natural uranium, depleted uranium, natural thorium, or their compounds or mixtures, providing they are unirradiated and in solid or liquid form;

iii) radioactive material for which the A_2 value is unlimited, excluding fissile material in quantities not excepted under 6;7.10.2; or

iv) other radioactive material in which the activity is distributed throughout and the estimated average specific activity does not exceed 30 times the values for activity concentration specified in 7.7.2.1 to 7.7.2.6, excluding fissile material in quantities not excepted under 6;7.10.2.

b) LSA II

i) water with tritium concentration up to 0.8 TBq/L; or

ii) other material in which the activity is distributed throughout and the estimated average specific activity does not exceed 10^{-4} A_2/g for solids and gases, and 10^{-5} A_2/g for liquids.

c) LSA III — solids (e.g. consolidated wastes, activated materials), excluding powders, in which:

i) the radioactive material is distributed throughout a solid or a collection of solid objects, or is essentially uniformly distributed in a solid compact binding agent (such as concrete, bitumen, ceramic, etc.);

ii) the radioactive material is relatively insoluble, or it is intrinsically contained in a relatively insoluble matrix, so that, even under loss of packaging, the loss of 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 2×10^{-3} A_2/g.

7.3.3 LSA-III material must be a solid of such a nature that if the entire contents of a package were subjected to the test specified in 7.3.4, the activity in the water would not exceed 0.1 A_2.

7.3.4 LSA-III material must be tested as follows:

A solid material sample representing the entire contents of the package must be immersed for 7 days in water at ambient temperature. The volume of water to be used in the test must be sufficient to ensure that at the end of the 7-day test period, the free volume of the unabsorbed and unreacted water remaining must be at least 10 per cent of the volume of the solid test sample itself. The water must have an initial pH of 6-8 and a maximum conductivity of 1 mS/m at 20°C. The total activity of the free volume of water must be measured following the 7-day immersion of the test sample.

7.3.5 Demonstration of compliance with the performance standards in 7.3.4 must be in accordance with 6;7.11.1 and 6;7.11.2.

Editorial Note.— Paragraph 7.4 below is moved to 7.2.3.3 (paragraph 7.4.1 is moved to 7.1.3):

7.4 REQUIREMENTS FOR SPECIAL FORM RADIOACTIVE MATERIAL

7.4.1 *Special form radioactive material* means either:

a) an indispersible solid radioactive material; or

b) a sealed capsule containing radioactive material that must be so manufactured that it can be opened only by destroying the capsule.

Special form radioactive material must have at least one dimension not less than 5 mm.

7.4.2 Special form radioactive material must be of such a nature or must be so designed that if it is subjected to the tests specified in 7.4.4 to 7.4.8, it must meet the following requirements:

a) it would not break or shatter under the impact, percussion and bending tests specified in 7.4.5 a), b), c) or 7.4.6 a), as applicable;

b) it would not melt or disperse in the applicable heat test specified in 7.4.5 d) or 7.4.6 b), as applicable; and

c) the activity in the water from the leaching tests specified in 7.4.7 and 7.4.8 would not exceed 2 kBq; or alternatively for sealed sources, the leakage rate for the volumetric leakage assessment test specified in ISO 9978:1992 "Radiation Protection — Sealed Radioactive Sources — Leakage Test Methods", would not exceed the applicable acceptance threshold acceptable to the competent authority.

7.4.3 Demonstration of compliance with the performance standards in 7.4.2 must be in accordance with 6;7.11.1 and 6;7.11.2.

7.4.4 Specimens that comprise or simulate special form radioactive material must be subjected to the impact test, the percussion test, the bending test, and the heat test specified in 7.4.5 or alternative tests as authorized in 7.4.6. A different specimen may be used for each of the tests. Following each test, a leaching assessment or volumetric leakage test must be performed on the specimen by a method no less sensitive than the methods given in 7.4.7 for indispersible solid material or 7.4.8 for encapsulated material.

7.4.5 The relevant test methods are:

a) Impact test: The specimen must drop onto the target from a height of 9 m. The target must be as defined in 6;7.13;

b) Percussion test: The specimen must be placed on a sheet of lead which is supported by a smooth, solid surface and struck by the flat face of a mild steel bar so as to cause an impact equivalent to that resulting from a free drop of 1.4 kg through 1 m. The lower part of the bar must be 25 mm in diameter with the edges rounded off to a radius of 3.0 ± 0.3 mm. The lead, of hardness number 3.5 to 4.5 on the Vickers scale and not more than 25 mm thick, must cover an area greater than that covered by the specimen. A fresh surface of lead must be used for each impact. The bar must strike the specimen so as to cause maximum damage.

c) Bending test: The test must apply only to long, slender sources with both a minimum length of 10 cm and a length to minimum width ratio of not less than 10. The specimen must be rigidly clamped in a horizontal position so that one-half of its length protrudes from the face of the clamp. The orientation of the specimen must be such that the specimen will suffer maximum damage when its free end is struck by the flat face of a steel bar. The bar must strike the specimen so as to cause an impact equivalent to that resulting from a free vertical drop of 1.4 kg through 1 m. The lower part of the bar must be 25 mm in diameter with the edges rounded off to a radius of (3.0 ± 0.3) mm.

d) Heat test: The specimen must be heated in air to a temperature of 800°C and held at that temperature for a period of 10 minutes and must then be allowed to cool.

7.4.6 Specimens that comprise or simulate radioactive material enclosed in a sealed capsule may be excepted from:

a) the tests prescribed in 7.4.5 a) and b) provided the mass of the special form radioactive material is:
   i) less than 200 g and the specimens are alternatively subjected to the Class 4 impact test prescribed in ISO 2919:1990 "Radiation protection — Sealed radioactive sources — General requirements and classification"; or

   ii) less than 500 g and the specimens are alternatively subjected to the Class 5 impact test prescribed in ISO 2919:1990: "Sealed radioactive sources — classification; and

b) the test prescribed in 7.4.5 d) provided the specimens are alternatively subjected to the Class 6 temperature test specified in ISO 2919:1990 "Radiation protection — Sealed radioactive sources — General requirements and classification".

7.4.7 For specimens which comprise or simulate indispersible solid material, a leaching assessment must be performed as follows:

a) The specimen must be immersed for 7 days in water at ambient temperature. The volume of water to be used in the test must be sufficient to ensure that at the end of the 7 day test period, the free volume of the unabsorbed and unreacted water remaining must be at least 10 per cent of the volume of the solid test sample itself. The water must have an initial pH of 6-8 and a maximum conductivity of 1 mS/m at 20°C;

b) The water with the specimen must then be heated to a temperature of (50 ± 5)°C and maintained at this temperature for 4 hours;

c) The activity of the water must then be determined;

d) The specimen must then be kept for at least 7 days in still air at not less than 30°C and relative humidity not less than 90 per cent;

e) The specimen must then be immersed in water of the same specification as in a) above and the water with the specimen heated to (50 ± 5)°C and maintained at this temperature for 4 hours;

f) The activity of the water must then be determined.

~~7.4.8 For specimens which comprise or simulate radioactive material enclosed in a sealed capsule, either a leaching assessment or a volumetric leakage assessment must be performed as follows:~~

~~a) The leaching assessment must consist of the following steps:~~

~~i) the specimen must be immersed in water at ambient temperature. The water must have an initial pH of 6-8 with a maximum conductivity of 1 mS/m at 20°C;~~

~~ii) the water and specimen must be heated to a temperature of (50 ± 5)°C and maintained at this temperature for 4 hours;~~

~~iii) the activity of the water must then be determined;~~

~~iv) the specimen must then be kept for at least 7 days in still air at not less than 30°C and relative humidity of not less than 90 per cent;~~

~~v) the process in i), ii) and iii) must be repeated;~~

~~b) The alternative volumetric leakage assessment must comprise any of the tests prescribed in ISO 9978:1992 "Radiation protection — Sealed radioactive sources — Leakage test methods", which are acceptable to the competent authority.~~

Editorial Note.— Paragraph 7.5 below is moved to 7.2.3.2 (definition moved to 7.1.3):

~~7.5 SURFACE CONTAMINATED OBJECT (SCO), DETERMINATION OF GROUPS~~

~~*Surface contaminated object (SCO)* means a solid object which is not itself radioactive but which has radioactive material distributed on its surfaces. SCO is classified in one of two groups:~~

~~a) SCO I: A solid object on which:~~

~~i) the non-fixed contamination on the accessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 4 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 0.4 Bq/cm^2 for all other alpha emitters; and~~

~~ii) the fixed contamination on the accessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 4×10^4 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 4×10^3 Bq/cm^2 for all other alpha emitters; and~~

~~iii) the non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 4×10^4 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 4×10^3 Bq/cm^2 for all other alpha emitters;~~

~~b) SCO II: A solid object on which either the fixed or non fixed contamination on the surface exceeds the applicable limits specified for SCO I in a) above and on which:~~

~~i) the non-fixed contamination on the accessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 400 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 40 Bq/cm^2 for all other alpha emitters; and~~

~~ii) the fixed contamination on the accessible surface, averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 8×10^5 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 8×10^4 Bq/cm^2 for all other alpha emitters; and~~

~~iii) the non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 8×10^5 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 8×10^4 Bq/cm^2 for all other alpha emitters.~~

Editorial Note.— Paragraph 7.6 below is moved to 5;1.2.4:

7.6 DETERMINATION OF TRANSPORT INDEX AND CRITICALITY SAFETY INDEX (CSI)

7.6.1 Determination of transport index

7.6.1.1 The transport index (TI) for a package, overpack or freight container, must be the number derived in accordance with the following procedure:

a) Determine the maximum radiation level in units of millisieverts per hour (mSv/h) at a distance of 1 m from the external surfaces of the package, overpack, or freight container. The value determined must be multiplied by 100 and the resulting number is the transport index. For uranium and thorium ores and their concentrates, the maximum radiation level at any point 1 m from the external surface of the load may be taken as:

0.4 mSv/h for ores and physical concentrates of uranium and thorium;

0.3 mSv/h for chemical concentrates of thorium;

0.02 mSv/h for chemical concentrates of uranium, other than uranium hexafluoride;

b) For freight containers, the value determined in step a) above must be multiplied by the appropriate factor from Table 2-11;

c) The value obtained in steps a) and b) above must be rounded up to the first decimal place (e.g. 1.13 becomes 1.2), except that a value of 0.05 or less may be considered as zero.

7.6.1.2 The transport index for each overpack or freight container must be determined as either the sum of the transport indices of all the packages contained, or by direct measurement of radiation level, except in the case of non-rigid overpacks for which the transport index must be determined only as the sum of the transport indices of all the packages.

7.6.2 Determination of criticality safety index (CSI)

7.6.2.1 The criticality safety index (CSI) for packages containing fissile material must be obtained by dividing the number 50 by the smaller of the two values of N derived in 6;7.10.11 and 6;7.10.12 (i.e. CSI = 50/N). The value of the criticality safety index may be zero, provided that an unlimited number of packages is subcritical (i.e. N is effectively equal to infinity in both cases).

Table 2-11. Multiplication factors for freight containers

*Size of load**	*Multiplication factor*
size of load ≤ 1 m^2	1
1 m^2 < size of load ≤ 5 m^2	2
5 m^2 < size of load ≤ 20 m^2	3
20 m^2 < size of load	10
* Largest cross-sectional area of the load being measured.	

7.6.2.2 The criticality safety index for each overpack or freight container must be determined as the sum of the CSIs of all the packages contained. The same procedure must be followed for determining the total sum of CSIs in a consignment or aboard an aircraft.

Editorial Note.— Paragraph 7.7.1 below is moved to 7.2.4:

~~**7.7 ACTIVITY LIMITS AND MATERIAL RESTRICTIONS**~~

~~**7.7.1 Contents limits for packages**~~

~~7.7.1.1 *General*~~

~~The quantity of radioactive material in a package must not exceed the relevant limits for the package type as specified below.~~

~~7.7.1.2 *Excepted packages*~~

~~7.7.1.2.1 For radioactive material other than articles manufactured from natural uranium, depleted uranium or natural thorium, an excepted package must not contain activities greater than the following:~~

~~a) Where the radioactive material is enclosed in or is included as a component part of an instrument or other manufactured article, such as a clock or electronic apparatus, the limits specified in columns 2 and 3 of Table 2-12 for each individual item and each package, respectively; and~~

~~b) Where the radioactive material is not so enclosed in or is not included as a component of an instrument or other manufactured article, the package limits specified in column 4 of Table 2-12.~~

~~7.7.1.2.2 For articles manufactured of natural uranium, depleted uranium or natural thorium, an excepted package may contain any quantity of such material provided that the outer surface of the uranium or thorium is enclosed in an inactive sheath made of metal or some other substantial material.~~

~~7.7.1.3 *Industrial packages*~~

~~The radioactive contents in a single package of LSA material or in a single package of SCO must be so restricted that the radiation level specified in 4;9.2.1 must not be exceeded, and the activity in a single package must also be so restricted that the activity limits for an aircraft specified in 7;2.9.2 must not be exceeded. A single package of non-combustible solid LSA-II or LSA-III material must not contain an activity greater than 3000 A_2.~~

Editorial Note.— Current Table 2-12 below is renumbered as Table 2-15 and moved following paragraph 7.2.4.1.6:

~~**Table 2-12. Activity limits for excepted packages**~~

~~*Physical state of contents*~~	~~*Instruments or article*~~		~~*Materials*~~
	~~*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 7.7.2.4 to 7.7.2.6.~~

~~7.7.1.4 *Type A packages*~~

~~7.7.1.4.1 Type A packages must not contain activities greater than the following:~~

~~a) for special form radioactive material — A_1; or~~

~~b) for all other radioactive material — A_2.~~

~~7.7.1.4.2 For mixtures of radionuclides whose identities and respective activities are known, the following condition must apply to the radioactive contents of a Type A package:~~

$$\sum_i \frac{B(i)}{A_1(i)} + \sum_j \frac{C(j)}{A_2(j)} \leq 1$$

~~where~~

~~B(i) is the activity of radionuclide i as special form radioactive material and $A_1(i)$ is the A_1 value for radionuclide i; and~~

~~C(j) is the activity of radionuclide j as other than special form radioactive material and $A_2(j)$ is the A_2 value for radionuclide j.~~

~~7.7.1.5 *Type B(U) and Type B(M) packages*~~

~~7.7.1.5.1 Type B(U) and Type B(M) packages must not contain:~~

~~a) activities greater than those authorized for the package design;~~

~~b) radionuclides different from those authorized for the package design; or~~

~~c) contents in a form or a physical or chemical state different from those authorized for the package design;~~

~~as specified in their certificates of approval.~~

~~7.7.1.5.2 Type B(U) and Type B(M) packages must, in addition, not contain activities greater than the following:~~

~~a) for low dispersible radioactive material — as authorized for the package design as specified in the certificate of approval;~~

~~b) for special form radioactive material — 3000 A_1 or 100 000 A_2, whichever is the lower; or~~

~~c) for all other radioactive material — 3000 A_2.~~

~~7.7.1.6 *Type C packages*~~

~~Type C packages must not contain:~~

~~a) activities greater than those authorized for the package design;~~

~~b) radionuclides different from those authorized for the package design; or~~

~~c) contents in a form or physical or chemical state different from those authorized for the package design;~~

~~as specified in their certificates of approval.~~

~~7.7.1.7 *Packages containing fissile material*~~

~~Unless excepted by 6;7.10.2, packages containing fissile material must not contain:~~

~~a) a mass of fissile material different from that authorized for the package design;~~

~~b) any radionuclide or fissile material different from those authorized for the package design; or~~

~~c) contents in a form or physical or chemical state, or in a spatial arrangement, different from those authorized for the package design;~~

~~as specified in their certificates of approval, where appropriate.~~

~~7.7.1.8 *Packages containing uranium hexafluoride*~~

~~Packages containing uranium hexafluoride must not contain:~~

~~a) a mass of uranium hexafluoride different from that authorized for the package design;~~

~~b) a mass of uranium hexafluoride greater than a value that would lead to an ullage smaller than 5 per cent at the maximum temperature of the package as specified for the plant systems where the package will be used; or~~

~~c) uranium hexafluoride other than in solid form or at an internal pressure above atmospheric pressure when presented for transport.~~

~~7.7.2~~7.2.2 Determination of ~~A~~activity level~~s~~

~~7.7.2.1~~7.2.2.1 The following basic values for individual radionuclides are given in Table 2-~~13~~12:

a) A_1 and A_2 in TBq;

b) activity concentration for exempt material in Bq/g; and

c) activity limits for exempt consignments in Bq.

~~7.7.2.2~~7.2.2.2 For individual radionuclides which are not listed in Table 2-~~13~~12, determination of the basic radionuclide values referred to in ~~7.7.2.1~~7.2.2.1 requires multilateral approval. It is permissible to use the A_2 value calculated using a dose coefficient for the appropriate lung absorption type as recommended by the International Commission on Radiological Protection, if the chemical forms of each radionuclide under both normal and accident conditions of transport are taken into consideration. Alternatively, the radionuclide values in Table 2-~~14~~13 may be used without obtaining competent authority approval.

~~7.7.2.3~~7.2.2.3 In the calculations of A_1 and A_2 for a radionuclide not in Table 2-~~13~~12, a single radioactive decay chain in which the radionuclides are present in their naturally occurring proportions, and in which no daughter nuclide has a half-life either longer than 10 days or longer than that of the parent nuclide, must be considered as a single radionuclide; and the activity to be taken into account and the A_1 or A_2 value to be applied must be that corresponding to the parent nuclide of that chain. In the case of radioactive decay chains in which any daughter nuclide has a half-life either longer than 10 days or greater than that of the parent nuclide, the parent and such daughter nuclides must be considered as mixtures of different nuclides.

~~7.7.2.4~~7.2.2.4 For mixtures of radionuclides, the determination of the basic radionuclide values referred to in ~~7.7.2.1~~7.2.2.1 may be determined as follows:

$$X_m = \frac{1}{\sum_i \frac{f(i)}{X(i)}}$$

where,

f(i) is the fraction of activity or activity concentration of radionuclide i in the mixture;

X(i) is the appropriate value of A_1 or A_2 or the activity concentration for exempt material or the activity limit for an exempt consignment as appropriate for the radionuclide i; and

X_m is the derived value of A_1 or A_2 or the activity concentration for exempt material or the activity limit for an exempt consignment in the case of a mixture.

~~7.7.2.5~~7.2.2.5 When the identity of each radionuclide is known but the individual activities of some of the radionuclides are not known, the radionuclides may be grouped and the lowest radionuclide value, as appropriate, for the radionuclides in each group may be used in applying the formulas in ~~7.7.1.4.2~~ 7.2.2.4 and ~~7.7.2.4~~7.2.4.4. Groups may be based on the total alpha activity and the total beta/gamma activity when these are known, using the lowest radionuclide values for the alpha emitters or beta/gamma emitters, respectively.

~~7.7.2.6~~7.2.2.6 For individual radionuclides or for mixtures of radionuclides for which relevant data are not available, the values shown in Table 2-~~14~~13 must be used.

Table 2-~~13~~12. Basic radionuclides values for individual radionuclides

Radionuclide (atomic number)	*A_1 (TBq)*	*A_2 (TBq)*	*Activity concentration for exempt material (Bq/g)*	*Activity limit for an exempt consignment (Bq)*
Actinium (89)				
. . .				

Editorial Note.— There are no changes to Table 2-13 (now Table 2-12).

Table ~~2-14~~2-13. Basic radionuclide values for unknown radionuclides or mixtures

Radioactive contents	*A_1 (Tbq)*	*A_2 (Tbq)*	*Activity concentration for exempt material (Bq/g)*	*Activity limit for an exempt consignment (Bq)*
Only beta- or gamma-emitting nuclides are known to be present	0.1	0.02	1×10^{1}	1×10^{4}
Alpha-emitting nuclides but no neutron emitters are known to be present	0.2	9×10^{-5}	1×10^{-1}	1×10^{3}
Neutron-emitting nuclides are known to be present or no relevant data are available	0.001	9×10^{-5}	1×10^{-1}	1×10^{3}

Editorial Note.— Paragraph 7.2.3 below is moved from 7.3 (paragraph 7.3.1 is moved to 7.1.3):

7.2.3 Determination of other material characteristics
~~.7.3 LOW SPECIFIC ACTIVITY (LSA) MATERIAL, DETERMINATION OF GROUPS~~

~~7.3.1 Radioactive material which by its nature has a limited specific activity, or radioactive material for which limits of estimated average specific activity apply, is termed low specific activity or LSA material. External shielding materials surrounding the LSA material must not be considered in determining the estimated average specific activity.~~

7.2.3.1 *Low specific activity (LSA) material*

7.2.3.1.1 (Reserved)

~~7.3.2~~7.2.3.1.2 LSA material must be in one of three groups:

a) LSA-I

i) uranium and thorium ores and concentrates of such ores, and other ores containing naturally occurring radionuclides which are intended to be processed for the use of these radionuclides;

ii) natural uranium, depleted uranium, natural thorium, or their compounds or mixtures, providing they are unirradiated and in solid or liquid form;

iii) radioactive material for which the A_2 value is unlimited, excluding material classified as fissile ~~material in quantities not excepted under~~ according to ~~6;7.10.2~~ 7.2.3.5; or

iv) other radioactive material in which the activity is distributed throughout and the estimated average specific activity does not exceed 30 times the values for activity concentration specified in ~~7.7.2.1~~ 7.2.2.1 to ~~7.7.2.6~~

7.2.2.6, excluding material classified as fissile ~~material in quantities not excepted under~~ according to ~~6;7.10.2~~ 7.2.3.5.

b) LSA-II

i) water with tritium concentration up to 0.8 TBq/L; or

ii) other material in which the activity is distributed throughout and the estimated average specific activity does not exceed 10^{-4} A_2/g for solids and gases, and 10^{-5} A_2/g for liquids.

c) LSA-III — solids (e.g. consolidated wastes, activated materials), excluding powders, in which:

i) the radioactive material is distributed throughout a solid or a collection of solid objects, or is essentially uniformly distributed in a solid compact binding agent (such as concrete, bitumen, ceramic, etc.);

ii) the radioactive material is relatively insoluble, or it is intrinsically contained in a relatively insoluble matrix, so that, even under loss of packaging, the loss of 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 2×10^{-3} A_2/g.

~~7.3.3~~7.2.3.1.3 LSA-III material must be a solid of such a nature that if the entire contents of a package were subjected to the test specified in ~~7.3.4~~ 7.2.3.1.4, the activity in the water would not exceed 0.1 A_2.

~~7.3.4~~7.2.3.1.4 LSA-III material must be tested as follows:

A solid material sample representing the entire contents of the package must be immersed for 7 days in water at ambient temperature. The volume of water to be used in the test must be sufficient to ensure that at the end of the 7-day test period, the free volume of the unabsorbed and unreacted water remaining must be at least 10 per cent of the volume of the solid test sample itself. The water must have an initial pH of 6-8 and a maximum conductivity of 1 mS/m at 20°C. The total activity of the free volume of water must be measured following the 7-day immersion of the test sample.

~~7.3.5~~7.2.3.1.5 Demonstration of compliance with the performance standards in ~~7.3.4~~ 7.2.3.1.4 must be in accordance with 6;7.11.1 and 6;7.11.2.

Editorial Note.— Paragraph 7.2.3.2 below is moved from 7.5:

7.2.3.2~~7.5~~ S*urface contaminated object (SCO)~~, determination of groups~~*

Editorial Note.— Text in 7.2.3.2.1 below moved to 2;7.1.3, definition for Surface contaminated object:

7.2.3.2.1 ~~*Surface contaminated object (SCO)* means a solid object which is not itself radioactive but which has radioactive material distributed on its surfaces.~~ SCO is classified in one of two groups:

a) SCO-I: A solid object on which:

i) the non-fixed contamination on the accessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 4 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 0.4 Bq/cm^2 for all other alpha emitters; and

ii) the fixed contamination on the accessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 4×10^4 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 4×10^3 Bq/cm^2 for all other alpha emitters; and

iii) the non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 4×10^4 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 4×10^3 Bq/cm^2 for all other alpha emitters;

b) SCO-II: A solid object on which either the fixed or non-fixed contamination on the surface exceeds the applicable limits specified for SCO-I in a) above and on which:

i) the non-fixed contamination on the accessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 400 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 40 Bq/cm^2 for all other alpha emitters; and

ii) the fixed contamination on the accessible surface, averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 8×10^5 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 8×10^4 Bq/cm^2 for all other alpha emitters; and

iii) the non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 8×10^5 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 8×10^4 Bq/cm^2 for all other alpha emitters.

Editorial Note.— Paragraph 7.2.3.3 is below moved from 7.4 and paragraph 7.4.1 is moved to 7.1.3:

7.2.3.3 ~~7.4 **REQUIREMENTS FOR** *Special form radioactive material*~~

~~7.4.1 *Special form radioactive material* means either:~~

~~a) an indispersible solid radioactive material; or~~

~~b) a sealed capsule containing radioactive material that must be so manufactured that it can be opened only by destroying the capsule.~~

7.2.3.3.1 Special form radioactive material must have at least one dimension not less than 5 mm. When a sealed capsule constitutes part of the special form radioactive material, the capsule must be so manufactured that it can be opened only by destroying it. The design for special form radioactive material requires unilateral approval.

~~7.4.2~~7.2.3.3.2 Special form radioactive material must be of such a nature or must be so designed that if it is subjected to the tests specified in ~~7.4.4~~ 7.2.3.3.4 to ~~7.4.8~~ 7.2.3.3.8, it must meet the following requirements:

a) it would not break or shatter under the impact, percussion and bending tests specified in ~~7.4.5~~ 7.2.3.3.5 a), b), c) or ~~7.4.6~~ 7.2.3.3.6 a), as applicable;

b) it would not melt or disperse in the applicable heat test specified in ~~7.4.5~~7.2.3.3.5 d) or ~~7.4.6~~7.2.3.3.6 b), as applicable; and

c) the activity in the water from the leaching tests specified in ~~7.4.7~~ 7.2.3.3.7 and ~~7.4.8~~ 7.2.3.3.8 would not exceed 2 kBq; or alternatively for sealed sources, the leakage rate for the volumetric leakage assessment test specified in ISO 9978:1992 “Radiation Protection — Sealed Radioactive Sources — Leakage Test Methods”, would not exceed the applicable acceptance threshold acceptable to the competent authority.

~~7.4.3~~7.2.3.3.3 Demonstration of compliance with the performance standards in ~~7.4.2~~ 7.2.3.3.2 must be in accordance with 6;7.11.1 and 6;7.11.2.

~~7.4.4~~7.2.3.3.4 Specimens that comprise or simulate special form radioactive material must be subjected to the impact test, the percussion test, the bending test, and the heat test specified in ~~7.4.5~~ 7.2.3.3.5 or alternative tests as authorized in ~~7.4.6~~ 7.2.3.3.6. A different specimen may be used for each of the tests. Following each test, a leaching assessment or volumetric leakage test must be performed on the specimen by a method no less sensitive than the methods given in ~~7.4.7~~ 7.2.3.3.7 for indispersible solid material or ~~7.4.8~~ 7.2.3.3.8 for encapsulated material.

~~7.4.5~~7.2.3.3.5 The relevant test methods are:

a) Impact test: The specimen must drop onto the target from a height of 9 m. The target must be as defined in 6;7.13;

b) Percussion test: The specimen must be placed on a sheet of lead which is supported by a smooth, solid surface and struck by the flat face of a mild steel bar so as to cause an impact equivalent to that resulting from a free drop of 1.4 kg through 1 m. The lower part of the bar must be 25 mm in diameter with the edges rounded off to a radius of (3.0 ± 0.3) mm. The lead, of hardness number 3.5 to 4.5 on the Vickers scale and not more than 25 mm thick, must cover an area greater than that covered by the specimen. A fresh surface of lead must be used for each impact. The bar must strike the specimen so as to cause maximum damage.

c) Bending test: The test must apply only to long, slender sources with both a minimum length of 10 cm and a length to minimum width ratio of not less than 10. The specimen must be rigidly clamped in a horizontal position so that one-half of its length protrudes from the face of the clamp. The orientation of the specimen must be such that the

specimen will suffer maximum damage when its free end is struck by the flat face of a steel bar. The bar must strike the specimen so as to cause an impact equivalent to that resulting from a free vertical drop of 1.4 kg through 1 m. The lower part of the bar must be 25 mm in diameter with the edges rounded off to a radius of (3.0 ± 0.3) mm.

d) Heat test: The specimen must be heated in air to a temperature of 800°C and held at that temperature for a period of 10 minutes and must then be allowed to cool.

~~7.4.6~~7.2.3.3.6 Specimens that comprise or simulate radioactive material enclosed in a sealed capsule may be excepted from:

a) the tests prescribed in ~~7.4.5~~ 7.2.3.3.5 a) and b) provided the mass of the special form radioactive material is:

i) less than 200 g and the specimens are alternatively subjected to the Class 4 impact test prescribed in ISO 2919:1999 “Radiation protection — Sealed radioactive sources — General requirements and classification”; or

ii) less than 500 g and the specimens are alternatively subjected to the Class 5 impact test prescribed in ISO 2919:1999~~:~~ “Radiation protection — Sealed radioactive sources — General requirements and classification; and

b) the test prescribed in ~~7.4.5~~ 7.2.3.3.5 d) provided the specimens are alternatively subjected to the Class 6 temperature test specified in ISO 2919:1999 “Radiation protection — Sealed radioactive sources — General requirements and classification”.

~~7.4.7~~7.2.3.3.7 For specimens which comprise or simulate indispersible solid material, a leaching assessment must be performed as follows:

a) The specimen must be immersed for 7 days in water at ambient temperature. The volume of water to be used in the test must be sufficient to ensure that at the end of the 7-day test period, the free volume of the unabsorbed and unreacted water remaining must be at least 10 per cent of the volume of the solid test sample itself. The water must have an initial pH of 6-8 and a maximum conductivity of 1 mS/m at 20°C;

b) The water with the specimen must then be heated to a temperature of (50 ± 5)°C and maintained at this temperature for 4 hours;

c) The activity of the water must then be determined;

d) The specimen must then be kept for at least 7 days in still air at not less than 30°C and relative humidity not less than 90 per cent;

e) The specimen must then be immersed in water of the same specification as in a) above and the water with the specimen heated to (50 ± 5)°C and maintained at this temperature for 4 hours;

f) The activity of the water must then be determined.

~~7.4.8~~7.2.3.3.8 For specimens which comprise or simulate radioactive material enclosed in a sealed capsule, either a leaching assessment or a volumetric leakage assessment must be performed as follows:

a) The leaching assessment must consist of the following steps:

i) the specimen must be immersed in water at ambient temperature. The water must have an initial pH of 6-8 with a maximum conductivity of 1 mS/m at 20°C;

ii) the water and specimen must be heated to a temperature of (50 ± 5)°C and maintained at this temperature for 4 hours;

iii) the activity of the water must then be determined;

iv) the specimen must then be kept for at least 7 days in still air at not less than 30°C and relative humidity of not less than 90 per cent;

v) the process in i), ii) and iii) must be repeated;

b) The alternative volumetric leakage assessment must comprise any of the tests prescribed in ISO 9978:1992 “Radiation protection — Sealed radioactive sources — Leakage test methods”, which are acceptable to the competent authority.

Editorial Note.— Paragraph 7.2.3.4 below is moved from 7.10:

~~**7.10**~~ ~~7.2.3.4~~ ~~*Requirements for l*~~*Low dispersible radioactive material*

Editorial Note.— New text below is moved from 6;7.21.5:

~~7.10.1~~7.2.3.4.1 The design for low dispersible radioactive material requires multilateral approval. Low dispersible radioactive material must be such that the total amount of this radioactive material in a package must meet the following requirements:

a) The radiation level at 3 m from the unshielded radioactive material does not exceed 10 mSv/h;

b) If subjected to the tests specified in 6;7.19.3 and 6;7.19.4, the airborne release in gaseous and particulate forms of up to 100 μm aerodynamic equivalent diameter would not exceed 100 A_2. A separate specimen may be used for each test; and

c) If subjected to the test specified in ~~7.3.4~~ 7.2.3.1.4, the activity in the water would not exceed 100 A_2. In the application of this test, the damaging effects of the tests specified in b) above must be taken into account.

~~7.10.2~~7.2.3.4.2 Low dispersible material must be tested as follows:

A specimen that comprises or simulates low dispersible radioactive material must be subjected to the enhanced thermal test specified in 6;7.19.3 and the impact test specified in 6;7.19.4. A different specimen may be used for each of the tests. Following each test, the specimen must be subjected to the leach test specified in ~~7.3.4~~ 7.2.3.1.4. After each test, it must be determined if the applicable requirements of ~~7.10.1~~ 7.2.3.4.1 have been met.

~~7.10.3~~7.2.3.4.3 Demonstration of compliance with the performance standards in ~~7.10.1~~ 7.2.3.4.1 and ~~7.10.2~~ 7.2.3.4.2 must be in accordance with 6;7.11.1 and 6;7.11.2.

7.2.3.5 *Fissile material*

7.2.3.5.1 Packages containing fissile radionuclides must be classified under the relevant entry of Table 2-11 for fissile material unless one of the conditions a) to d) of this paragraph is met. Only one type of exception is allowed per consignment.

Editorial Note.— Remaining paragraph 7.2.3.5 is moved from 6;7.10.2 and Table 2-14 moved from current Table 6-5.

a) A mass limit per consignment such that:

$$\frac{\text{mass of uranium - 235(g)}}{X} + \frac{\text{mass of other fissile material (g)}}{Y} < 1$$

where X and Y are the mass limits defined in Table ~~6-5~~ 2-14, provided that the smallest external dimension of each package is not less than 10 cm and that either:

i) each individual package contains not more than 15 g of fissile material; for unpackaged material, this quantity limitation must apply to the consignment being carried in or on the conveyance;

ii) the fissile material is a homogeneous hydrogenous solution or mixture where the ratio of fissile nuclides to hydrogen is less than 5 per cent by mass; or

iii) there are not more than 5 g of fissile material in any 10 L volume of material.

Neither beryllium nor deuterium ~~in hydrogeneous material enriched in deuterium~~ must be present in quantities exceeding 1 per cent of the applicable consignment mass limits provided in Table ~~6-5~~ 2-14, except for deuterium in natural concentration in hydrogen.

b) Uranium enriched in uranium-235 to a maximum of 1 per cent by mass, and with a total plutonium and uranium-233 content not exceeding 1 per cent of the mass of uranium-235, provided that the fissile material is distributed essentially homogeneously throughout the material. In addition, if uranium-235 is present in metallic, oxide or carbide forms, it must not form a lattice arrangement;

c) Liquid solutions of uranyl nitrate enriched in uranium-235 to a maximum of 2 per cent by mass, with a total plutonium and uranium-233 content not exceeding 0.002 per cent of the mass of uranium, and with a minimum nitrogen to uranium atomic ratio (N/U) of 2;

d) Packages containing, individually, a total plutonium mass not more than 1 kg, of which not more than 20 per cent by mass may consist of plutonium-239, plutonium-241 or any combination of those radionuclides.

Table ~~6-5~~2-14. Consignment mass limits for exceptions from the requirements for packages containing fissile material

Fissile material	*Fissile material mass (g) mixed with substances having an average hydrogen density less than or equal to water*	*Fissile material mass (g) mixed with substances having an average hydrogen density greater than water*
Uranium 235 (X) Other fissile material (Y)	400 250	290 180

Editorial Note.— New paragraph 7.2.4 below is comprised of current 7.7.1 and 7.9.2 to 7.9.6:

7.2.4 Classification of packages

~~7.7.1.1 *General*~~

7.2.4.1 The quantity of radioactive material in a package must not exceed the relevant limits for the package type as specified below.

~~7.7.1.2~~7.2.4.1.2 *Classification as ~~E~~excepted packages*

~~7.7.1.2.1 For radioactive material other than articles manufactured from natural uranium, depleted uranium or natural thorium, an excepted package must not contain activities greater than the following:~~

~~a) Where the radioactive material is enclosed in or is included as a component part of an instrument or other manufactured article, such as a clock or electronic apparatus, the limits specified in columns 2 and 3 of Table 2-12 for each individual item and each package, respectively; and~~

~~b) Where the radioactive material is not so enclosed in or is not included as a component of an instrument or other manufactured article, the package limits specified in column 4 of Table 2-12.~~

Editorial Note.— Paragraph 7.2.4.1.2.1 below is modified from 7.9.1:

7.2.4.1.2.1 Packages may be classified as excepted packages if:

a) they are empty packagings having contained radioactive material;

b) they contain instruments or articles in limited quantities;

c) they contain articles manufactured of natural uranium, depleted uranium or natural thorium; or

d) they contain radioactive material in limited quantities.

Editorial Note.— Paragraph 7.2.4.1.2.2 and 7.2.4.1.2.3 are moved from 7.9.2 to 7.9.6:

~~7.9.2~~7.2.4.1.2.2 A package containing radioactive material may be classified as an excepted package provided that t~~T~~he radiation level at any point on ~~the~~ its external surface ~~of an excepted package must~~ does not exceed 5 μSv/h.

~~7.9.3~~7.2.4.1.2.3 Radioactive material which is enclosed in or is included as a component part of an instrument or other manufactured article~~, with activity not exceeding the item and package limits specified in columns 2 and 3 respectively of Table 2-12, may be transported in an excepted package provided~~ may be classified under UN 2911, **Radioactive material, excepted package — instruments** or **articles** provided that:

a) the radiation level at 10 cm from any point on the external surface of any unpackaged instrument or article is not greater than 0.1 mSv/h; and

b) each instrument or article bears the marking "RADIOACTIVE" except:

i) radioluminescent time-pieces or devices;

ii) consumer products that either have received regulatory approval ~~following their sale to the end user~~ according to 1;6.1.4 d) or do not individually exceed the activity limit for an exempt consignment in Table 2-~~13~~12 (column 5), provided such products are transported in a package that bears the marking "RADIOACTIVE" on an internal surface in such a manner that warning of the presence of radioactive material is visible on opening the package; ~~and~~

c) the active material is completely enclosed by non-active components (a device performing the sole function of containing radioactive material must not be considered to be an instrument or manufactured article)~~.~~; and

Editorial Note.— Paragraph d) below is modified from current 7.7.1.2.1.

d) The limits specified in columns 2 and 3 of Table 2-15 are met for each individual item and each package, respectively.

~~7.9.4~~7.2.4.1.2.4 Radioactive material ~~in forms other than as specified in 7.9.3,~~ with an activity not exceeding the limit specified in column 4 of Table 2-~~12~~15, may be ~~transported in an excepted package~~ classified under UN 2910 — **Radioactive material, excepted package — limited quantity of material** provided that:

a) the package retains its radioactive contents under routine conditions of transport; and

b) the package bears the marking "RADIOACTIVE" on an internal surface in such a manner that a warning of the presence of radioactive material is visible on opening the package.

~~7.9.5 A manufactured article in which the sole radioactive material is unirradiated natural uranium, unirradiated depleted uranium or unirradiated natural thorium may be transported as an excepted package, provided that the outer surface of the uranium or thorium is enclosed in an inactive sheath made of metal or some other substantial material.~~

~~7.9.6~~7.2.4.1.2.5 An empty packaging which had previously contained radioactive material ~~may be transported as an excepted package~~ with an activity not exceeding the limit specified in column 4 of Table 2-15 may be classified under UN 2908 — **Radioactive material, excepted package — empty packaging**, provided that:

a) it is in a well-maintained condition and securely closed;

b) the outer surface of any uranium or thorium in its structure is covered with an inactive sheath made of metal or some other substantial material;

c) the level of internal non-fixed contamination ~~does not exceed one hundred times the levels specified in 4;9.1.2; and~~, when averaged over any 300 cm^2, does not exceed:

(i) 400 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters; and

(ii) 40 Bq/cm^2 for all other alpha emitters; and

d) any labels which may have been displayed on it in conformity with 5;3.2.6 are no longer visible.

~~7.7.1.2.2~~7.2.4.1.6 ~~For a~~Articles manufactured of natural uranium, depleted uranium or natural thorium and articles in which the sole radioactive material is unirradiated natural uranium, unirradiated depleted uranium or unirradiated natural thorium may be classified under UN 2909, **Radioactive material, excepted package — articles manufactured from natural uranium** or **depleted uranium** or **natural thorium**, ~~an excepted package may contain any quantity of such material~~ provided that the outer surface of the uranium or thorium is enclosed in an inactive sheath made of metal or some other substantial material.

~~7.7.1.3 *Industrial packages*~~

~~The radioactive contents in a single package of LSA material or in a single package of SCO must be so restricted that the radiation level specified in 4;9.2.1 must not be exceeded, and the activity in a single package must also be so restricted that the activity limits for an aircraft specified in 7;2.9.2 must not be exceeded. A single package of non-combustible solid LSA-II or LSA-III material must not contain an activity greater than 3000 A_2.~~

Table ~~2-12~~ 2-15. Activity limits for excepted packages

Physical state of contents	*Instruments or article*		*Materials*
	*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 ~~7.7.2.4~~ 7.2.2.4 to ~~7.7.2.6~~ 7.2.2.6.

7.2.4.2 *Classification as low specific activity (LSA) material*

7.2.4.2.1 Radioactive material may only be classified as LSA material if the conditions of 7.2.3.1 and 4;9.2.1 are met.

7.2.4.3 *Classification as surface contaminated object (SCO)*

7.2.4.3.1 Radioactive material may be classified as SCO if the conditions of 7.2.3.2.1 and 4;9.2.1 are met.

~~7.7.1.4~~7.2.4.4 *Classification of Type A packages*

~~7.7.1.4.1~~7.2.4.4.1 Packages containing radioactive material may be classified as Type A packages provided that the following conditions are met:

7.2.4.4.1.1 Type A packages must not contain activities greater than the following:

a) for special form radioactive material — A_1; or

b) for all other radioactive material — A_2.

~~7.7.1.4.2~~7.2.4.4.1.2 For mixtures of radionuclides whose identities and respective activities are known, the following condition must apply to the radioactive contents of a Type A package:

$$\sum_i \frac{B(i)}{A_1(i)} + \sum_j \frac{C(j)}{A_2(j)} \leq 1$$

where

B(i) is the activity of radionuclide i as special form radioactive material; ~~and~~

$A_1(i)$ is the A_1 value for radionuclide i; ~~and~~

C(j) is the activity of radionuclide j as other than special form radioactive material; ~~and~~

$A_2(j)$ is the A_2 value for radio-nuclide j.

Editorial Note.— Current paragraph 7.7.1.5 below is moved to 7.2.4.6:

~~7.7.1.5 *Type B(U) and Type B(M) packages*~~

~~7.7.1.5.1 Type B(U) and Type B(M) packages must not contain:~~

~~a) activities greater than those authorized for the package design;~~

~~b) radionuclides different from those authorized for the package design; or~~

~~c) contents in a form or a physical or chemical state different from those authorized for the package design;~~

~~as specified in their certificates of approval.~~

~~7.7.1.5.2 Type B(U) and Type B(M) packages must, in addition, not contain activities greater than the following:~~

~~a) for low dispersible radioactive material — as authorized for the package design as specified in the certificate of approval;~~

~~b) for special form radioactive material — 3000 A_1 or 100 000 A_2, whichever is the lower; or~~

~~c) for all other radioactive material — 3000 A_2.~~

Editorial Note.— Current paragraph 7.7.1.6 below is moved to 7.2.4.6.4:

~~7.7.1.6 *Type C packages*~~

~~Type C packages must not contain:~~

~~a) activities greater than those authorized for the package design;~~

~~b) radionuclides different from those authorized for the package design; or~~

~~c) contents in a form or physical or chemical state different from those authorized for the package design;~~

~~as specified in their certificates of approval.~~

~~7.7.1.7 *Packages containing fissile material*~~

~~Unless excepted by 6;7.10.2, packages containing fissile material must not contain:~~

~~a) a mass of fissile material different from that authorized for the package design;~~

~~b) any radionuclide or fissile material different from those authorized for the package design; or~~

~~c) contents in a form or physical or chemical state, or in a spatial arrangement, different from those authorized for the package design;~~

~~as specified in their certificates of approval, where appropriate.~~

~~7.7.1.8~~7.2.4.5 ~~*Packages containing*~~*Classification of uranium hexafluoride*

7.2.4.5.1 Uranium hexafluoride must only be assigned to UN Nos. 2977 — **Radioactive material, uranium hexafluoride, fissile** or 2978 — **Radioactive material, uranium hexafluoride**, non-fissile or fissile excepted.

7.2.4.5.2 Packages containing uranium hexafluoride must not contain:

a) a mass of uranium hexafluoride different from that authorized for the package design;

b) a mass of uranium hexafluoride greater than a value that would lead to an ullage smaller than 5 per cent at the maximum temperature of the package as specified for the plant systems where the package will be used; or

c) uranium hexafluoride other than in solid form or at an internal pressure above atmospheric pressure when presented for transport.

Editorial Note.— Current paragraph 7.2.4.6 below is moved from current 7.7.1.5:

~~7.7.1.5~~7.2.4.6 *Classification as Type B(U), ~~and~~ Type B(M) or Type C packages*

7.2.4.6.1 Packages not otherwise classified in 7.2.4 (7.2.4.1.2 to 7.2.4.5) must be classified in accordance with the competent authority approval certificate for the package issued by the country of origin of design.

~~7.7.1.5.1~~7.2.4.6.2 A package may only be classified as a Type B(U) ~~and Type B(M)~~ package~~s~~ if it ~~must~~ does not contain:

a) activities greater than those authorized for the package design;

b) radionuclides different from those authorized for the package design; or

c) contents in a form or a physical or chemical state different from those authorized for the package design;

as specified in their certificates of approval.

Editorial Note.— Paragraph 7.2.4.6.3 below is the same text as for B(U) above:

7.2.4.6.3 A package may only be classified as a Type B(M) package if it does not contain:

a) activities greater than those authorized for the package design;

b) radionuclides different from those authorized for the package design; or

c) contents in a form or a physical or chemical state different from those authorized for the package design;

as specified in their certificates of approval.

~~7.7.1.5.2 Type B(U) and Type B(M) packages must, in addition, not contain activities greater than the following:~~

~~a) for low dispersible radioactive material — as authorized for the package design as specified in the certificate of approval;~~

~~b) for special form radioactive material — 3000 A_1 or 100 000 A_2, whichever is the lower; or~~

~~c) for all other radioactive material — 3000 A_2.~~

Editorial Note.— Paragraph 7.2.4.6.4 below is moved from current 7.7.1.6:

~~7.7.1.6 *Type C packages*~~

7.2.4.6.4 A package may only be classified as a Type C ~~packages must~~ if it does not contain:

a) activities greater than those authorized for the package design;

b) radionuclides different from those authorized for the package design; or

c) contents in a form or physical or chemical state different from those authorized for the package design;

as specified in their certificates of approval.

7.2.5 Special arrangements

Radioactive material must be classified as transported under special arrangement when it is intended to be transported in accordance with 1;6.4.

~~7.8 LIMITS ON TRANSPORT INDEX, CRITICALITY SAFETY INDEX, RADIATION LEVELS FOR PACKAGES AND OVERPACKS~~

Editorial Note.— Paragraphs 7.8.1 to 7.8.3 below are moved to 4;9.1.10 to 4;91.1.12*:*

~~7.8.1 Except for consignments under exclusive use, the transport index of any package or overpack must not exceed 10, nor must the criticality safety index of any package or overpack exceed 50.~~

7.8.2 Except for packages or overpacks transported under exclusive use and special arrangement under the conditions specified in 7;2.9.5.3, the maximum radiation level at any point on any external surface of a package or overpack must not exceed 2 mSv/h.

7.8.3 The maximum radiation level at any point on any external surface of a package or overpack under exclusive use must not exceed 10 mSv/h.

Editorial Note.— Paragraphs 7.8.4, 7.8.5 and Table 2-15 below are moved to 5;1.2.4.4:

7.8.4 Packages and overpacks must be assigned to either category I WHITE, II YELLOW or III YELLOW in accordance with the conditions specified in Table 2-15 and with the following requirements:

a) for a package or overpack, both the transport index and the surface radiation level conditions must be taken into account in determining which is the appropriate category. Where the transport index satisfies the condition for one category but the surface radiation level satisfies the condition for a different category, the package or overpack must be assigned to the higher category. For this purpose, category I-WHITE must be regarded as the lowest category;

b) the transport index must be determined following the procedures specified in 7.6.1.1 and 7.6.1.2;

c) if the surface radiation level is greater than 2 mSv/h, the package or overpack must be transported under exclusive use and under the provisions of 7;2.9.5.3, as appropriate;

d) a package transported under a special arrangement must be assigned to category III YELLOW except under the provisions of 7.8.5;

e) an overpack which contains packages transported under special arrangement must be assigned to category III-YELLOW except under the provisions of 7.8.5.

7.8.5 In case of international transport of packages requiring competent authority design or shipment approval, for which different approval types apply in the different countries concerned by the shipment, assignment to the category as required in 7.8.4 must be in accordance with the certificate of the country of origin of design.

7.9 REQUIREMENTS AND CONTROLS FOR TRANSPORT OF EXCEPTED PACKAGES

Editorial Note.— The following is moved to 1;6.1.4:

7.9.1 Excepted packages which may contain radioactive material in limited quantities, instruments, manufactured articles as specified in 7.7.1.2 and empty packagings as specified in 7.9.6 may be transported under the following conditions:

a) the applicable requirements specified in 2; Introductory Chapter, 4.2, 2;7.9.2, and, as applicable, 2;7.9.3 to 2;7.9.6, 4;9.1.2, 5;2.4.2, 5;2.4.5 a) and e); 5;3.2.11 e), 5;4.4, 7;3.2.2 and 7;4.4;

Editorial Note.— Table 2-15 moved to 5;1.2.4

Table 2-15. Categories of packages and overpacks

Conditions		
Transport index	*Maximum radiation level at any point on external surface*	*Category*
0*	Not more than 0.005 mSv/h	I WHITE
More than 0 but not more than 1*	More than 0.005 mSv/h but not more than 0.5 mSv/h	II YELLOW
More than 1 but not more than 10	More than 0.5 mSv/h but not more than 2 mSv/h	III YELLOW

More than 10	More than 2 mSv/h but not more than 10 mSv/h	III-YELLOW**
* If the measured transport index is not greater than 0.05, the value quoted may be zero in accordance with 7.6.1.1 c). ** Must be transported under exclusive use and special arrangement.		

b) the requirements for excepted packages specified in 6;7.3;

c) if the excepted package contains fissile material, one of the fissile exceptions provided by 6;7.10.2 must apply and the requirement of 6;7.6.2 must be met; and

d) the requirements in 1;2.3, if transported by post.

Editorial Note.— Paragraphs 7.9.2 to 7.9.6 below are moved to 7.2.4.1.2:

7.9.2 The radiation level at any point on the external surface of an excepted package must not exceed 5 μSv/h.

7.9.3 Radioactive material which is enclosed in or is included as a component part of an instrument or other manufactured article, with activity not exceeding the item and package limits specified in columns 2 and 3 respectively of Table 2-12, may be transported in an excepted package provided that:

a) the radiation level at 10 cm from any point on the external surface of any unpackaged instrument or article is not greater than 0.1 mSv/h; and

b) each instrument or article bears the marking "RADIOACTIVE" except:

i) radioluminescent time-pieces or devices;

ii) consumer products that either have received regulatory approval following their sale to the end user or do not individually exceed the activity limit for an exempt consignment in Table 2-13 (column 5), provided such products are transported in a package that bears the marking "RADIOACTIVE" on an internal surface in such a manner that warning of the presence of radioactive material is visible on opening the package; and

c) the active material is completely enclosed by non-active components (a device performing the sole function of containing radioactive material must not be considered to be an instrument or manufactured article).

7.9.4 Radioactive material in forms other than as specified in 7.9.3, with an activity not exceeding the limit specified in column 4 of Table 2-12, may be transported in an excepted package provided that:

a) the package retains its radioactive contents under routine conditions of transport; and

b) the package bears the marking "RADIOACTIVE" on an internal surface in such a manner that a warning of the presence of radioactive material is visible on opening the package.

7.9.5 A manufactured article in which the sole radioactive material is unirradiated natural uranium, unirradiated depleted uranium or unirradiated natural thorium may be transported as an excepted package, provided that the outer surface of the uranium or thorium is enclosed in an inactive sheath made of metal or some other substantial material.

7.9.6 An empty packaging which had previously contained radioactive material may be transported as an excepted package provided that:

a) it is in a well-maintained condition and securely closed;

b) the outer surface of any uranium or thorium in its structure is covered with an inactive sheath made of metal or some other substantial material;

c) the level of internal non-fixed contamination does not exceed one hundred times the levels specified in 4;9.1.2; and

d) any labels which may have been displayed on it in conformity with 5;3.2.6 are no longer visible.

Editorial Note.— Paragraph 7.10 below is moved to 7.2.3.4:

~~**7.10 REQUIREMENTS FOR LOW DISPERSIBLE RADIOACTIVE MATERIAL**~~

~~7.10.1 Low dispersible radioactive material must be such that the total amount of this radioactive material in a package must meet the following requirements:~~

~~a) The radiation level at 3 m from the unshielded radioactive material does not exceed 10 mSv/h;~~

~~b) If subjected to the tests specified in 6;7.19.3 and 6;7.19.4, the airborne release in gaseous and particulate forms of up to 100 µm aerodynamic equivalent diameter would not exceed 100 A_2. A separate specimen may be used for each test; and~~

~~c) If subjected to the test specified in 7.3.4, the activity in the water would not exceed 100 A_2. In the application of this test, the damaging effects of the tests specified in b) above must be taken into account.~~

~~7.10.2 Low dispersible material must be tested as follows:~~

~~A specimen that comprises or simulates low dispersible radioactive material must be subjected to the enhanced thermal test specified in 6;7.19.3 and the impact test specified in 6;7.19.4. A different specimen may be used for each of the tests. Following each test, the specimen must be subjected to the leach test specified in 7.3.4. After each test, it must be determined if the applicable requirements of 7.10.1 have been met.~~

~~7.10.3 Demonstration of compliance with the performance standards in 7.10.1 and 7.10.2 must be in accordance with 6;7.11.1 and 6;7.11.2.~~

Chapter 8

CLASS 8 — CORROSIVES

. . .

8.2 ASSIGNMENT OF PACKING GROUPS

. . .

8.2.5 Packing groups are assigned to corrosive substances in accordance with the following criteria:

a) *Packing Group I* is assigned to substances that cause full thickness destruction of intact skin tissue within an observation period of up to 60 minutes starting after an exposure time of 3 minutes or less.

b) *Packing Group II* is assigned to substances that cause full thickness destruction of intact skin tissue within an observation period of up to 14 days starting after an exposure time of more than 3 minutes but not more than 60 minutes.

c) *Packing Group III* is assigned to substances that:

i) cause full thickness destruction of intact skin tissue within an observation period of up to 14 days starting after an exposure time of more than 60 minutes but not more than 4 hours;

ii) are judged not to cause full thickness destruction of intact skin tissue but which exhibit a corrosion rate either on steel or aluminium surfaces exceeding 6.25 mm a year at a test temperature of 55°C when tested on both materials. For the purposes of testing steel, type S235JR+CR (1.0037 resp. St 37-2), S275J2G3+CR (1.0144 resp. St 44-3), ISO 3574, Unified Numbering System (UNS) G10200 or SAE 1020, and for testing aluminium, non-clad types 7075-T6 or AZ5GU-T6, must be used. An acceptable test is prescribed in the UN *Manual of Tests and Criteria*, Part III, Section 37.

Note.— Where an initial test on either steel or aluminium indicates the substance being tested is corrosive the follow up test on the other metal is not required.

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