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**COMMITTEE OF EXPERTS ON THE TRANSPORT OF  
DANGEROUS GOODS AND ON THE GLOBALLY  
HARMONIZED SYSTEM OF CLASSIFICATION  
AND LABELLING OF CHEMICALS**

Sub-Committee of Experts on the  
Transport of Dangerous Goods

Twenty-seventh session, 4-8 July 2005  
Item 8 of the provisional agenda

**HARMONIZATION WITH THE INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA)  
REGULATIONS FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIAL**

Transmitted by the expert from the United Kingdom

**Introduction**

1. The Sub-Committee will recall the earlier papers, ST/SG/AC.10/C.3/2004/57 and ST/SG/AC.10/C.3/2004/103, which the expert from the United Kingdom produced for the 25<sup>th</sup> and 26<sup>th</sup> sessions of the Sub-Committee of Experts of the Transport of Dangerous Goods. In them we stated that as the IAEA had moved to a biennial review of their regulations and since the UN Sub-Committee was regularly invited to comment on proposals for amendment, it would be sensible now to review the differences between the two sets of regulations to harmonise wherever possible.

2. The Sub-Committee will note that the process was begun during the December 2004 session, albeit in a small way, when an amendment to the text in 1.1.2.4.1 concerning special arrangements was agreed and the Sub-Committee requested the secretariat to review the definitions in 1.2.1. The expert from the United Kingdom firmly believes that the momentum for harmonisation should be accelerated during this biennium. The United Kingdom recognises that harmonisation of both these texts may take some time and will not always be straightforward but nevertheless a start must be made now. The Sub-Committee will recall the discussions that took place during the last session on the World Convention where the majority of experts acknowledged the need to harmonise the various modal regulations even if they were less certain about the means to do so. The expert from the United Kingdom is convinced that harmonising both the UN Model Regulations and those produced by the IAEA can contribute to this process.

3. Of course it would be incumbent upon the Sub-Committee to inform the IAEA of any change it proposes to make to text in the Model Regulations concerning Class 7 in order that the IAEA may make its views on the changes known to the Sub-Committee. It is also incumbent on the Sub-Committee to

inform the IAEA of any change it believes needs to be made to the IAEA Regulations in order that the IAEA can adopt it or explain why it disagrees with the Sub-Committee's views.

4. The expert from the United Kingdom has carried out a preliminary review of the provisions of the Model Regulations and the IAEA Regulations on the basis of the table of correspondence at the end of the Model regulations (taking into account revised paragraph numbering in the IAEA regulations and errors in the table of correspondence). (At the time of submission of this paper this process had got as far as ST-1 paragraph 582 see Annex 4. A further INF paper may be submitted for the July session if further progress is made. From this review a number of proposals flow. Attached are suggested amendments to Chapters 2.7 and 3.4 and a new Chapter 1.5. Chapter 1.5 contains all the general requirements and definitions that apply exclusively to Class7 substances.

5. Some explanation is required to explain the rationale behind these proposed changes. The expert from the United Kingdom is of the firm opinion that all the definitions exclusively relating to Class 7 should be placed on a new Chapter 1.5. This has resulted in the removal of a number of sections from the current Chapter 2.7 in the Model Regulations. Furthermore the expert from the United Kingdom believes that Chapter 3.4 in the Model Regulations which deals with the limited quantity provisions should have a new section covering the excepted packages regulations for Class 7. Therefore the United Kingdom proposes a new section 3.4.2 which would include the text currently in section 2.7.9 in the Model Regulations.

6. The following annexes (in ENGLISH ONLY) are attached to this paper:

Annex 1: a proposed new Chapter 1.5 that includes the general requirements concerning Class 7

Annex 2: a consolidated revised Chapter 2.7

Annex 3: proposed amendments to Chapter 3.4 to include provisions for Class7 Excepted packages

Annex 4: a table of correspondence between ST-1 and the Model Regulations showing proposed changes and text not requiring change

Annex 5: samples of Class 7 packing requirements converted into Packing Instructions

Annex 6: consequential changes to other Parts of the Model Regulations

7. The expert from the United Kingdom recognises that the Sub-Committee will not necessarily be in a position to agree amendments in July. He would welcome a discussion in the Sub-Committee on its proposed changes with the intention of submitting a further paper at December 2005. The input of other Experts would be most welcome. It is also proposed that the Secretariat inform IAEA of the work being undertaken by the Sub-Committee and invite its comments.

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## Annex 1 (English only)

### Chapter 1.5 General requirements concerning Class 7

#### 1.45.21 Transport of radioactive material

##### **1.45.2.1 General**

1.45.2.1.1 These Regulations establish standards of safety which provide an acceptable level of control of the radiation, criticality and thermal hazards to persons, property and the environment that are associated with the transport of radioactive material. These regulations are based on the IAEA Regulations for the Safe Transport of Radioactive Material, as revised and amended in 2003. Explanatory material on TS-R-1 can be found in "Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material (1996 Edition)", Safety Standard Series No. TS-G-1.1 (ST-2), IAEA, Vienna.

1.45.2.1.2 The objective of these Regulations is to protect persons, property and the environment from the effects of radiation during the transport of radioactive material. This protection is achieved by requiring:

- (a) Containment of the radioactive contents;
- (b) Control of external radiation levels;
- (c) Prevention of criticality; and
- (d) Prevention of damage caused by heat.

These requirements are satisfied firstly by applying a graded approach to contents limits for packages and conveyances and to performance standards applied to package designs depending upon the hazard of the radioactive contents. Secondly, they are satisfied by imposing requirements on the design and operation of packages and on the maintenance of packagings, including a consideration of the nature of the radioactive contents. Finally, they are satisfied by requiring administrative controls including, where appropriate, approval by competent authorities.

1.45.2.1.3 These Regulations apply to the transport of radioactive material by all modes on land, water or in the air, including transport which is incidental to the use of the radioactive material. Transport comprises all operations and conditions associated with and involved in the movement of radioactive material; these include the design, manufacture, maintenance and repair of packaging, and the preparation, consigning, loading, transport including in-transit storage, unloading and receipt at the final destination of loads of radioactive material and packages. A graded approach is applied to the performance standards in these Regulations that is characterized by three general severity levels:

- (a) Routine conditions of transport (incident free);
- (b) Normal conditions of transport (minor mishaps);
- (c) Accident conditions of transport.

### **1.45.2.2      *Radiation protection programme***

1.45.2.2.1      The transport of radioactive material shall be subject to a radiation protection programme which shall consist of systematic arrangements aimed at providing adequate consideration of radiation protection measures.

1.45.2.2.2      The nature and extent of the measures to be employed in the programme shall be related to the magnitude and likelihood of radiation exposures. The programme shall incorporate the requirements in 1.45.2.2.3 to 1.45.2.2.5, 7.1.7.1.1, 7.1.7.1.3 and applicable emergency response procedures. Programme documents shall be available, on request, for inspection by the relevant competent authority.

1.45.2.2.3      Protection and safety shall be optimized in order that the magnitude of individual doses, the number of persons exposed, and the likelihood of incurring exposure shall be kept as low as reasonably achievable, economic and social factors being taken into account, and doses to persons shall be below the relevant dose limits. A structured and systematic approach shall be adopted and shall include consideration of the interfaces between transport and other activities.

1.45.2.2.4      Workers shall receive appropriate training concerning the radiation hazards involved and the precautions to be observed in order to ensure restriction of their exposure and that of other persons who might be affected by their actions.

1.45.2.2.5      For occupational exposures arising from transport activities, where it is assessed that the effective dose:

- (a) Is most unlikely to exceed 1 mSv in a year, no special work patterns, detailed monitoring, dose assessment programmes or individual record keeping shall be required;
- (b) Is likely to be between 1 and 6 mSv in a year, a dose assessment programme via workplace monitoring or individual monitoring shall be conducted;
- (c) Is likely to exceed 6 mSv in a year, individual monitoring shall be conducted.

When individual monitoring or workplace monitoring is conducted, appropriate records shall be kept.

### **1.45.2.3      *Quality assurance***

1.45.2.3.1      Quality assurance programmes based on international, national or other standards acceptable to the competent authority shall be established and implemented for the design, manufacture, testing, documentation, use, maintenance and inspection of all special form radioactive material, low dispersible radioactive material and packages and for transport and in-transit storage operations to ensure compliance with the relevant provisions of these Regulations. Certification that the design specification has been fully implemented shall be available to the competent authority. The manufacturer, consignor or user shall be prepared to provide facilities for competent authority inspection during manufacture and use and to demonstrate to any cognizant competent authority that:

- (a) The manufacturing methods and materials used are in accordance with the approved design specifications; and

- (b) All packagings are periodically inspected and, as necessary, repaired and maintained in good condition so that they continue to comply with all relevant requirements and specifications, even after repeated use.

Where competent authority approval is required, such approval shall take into account and be contingent upon the adequacy of the quality assurance programme.

#### **1.45.2.4**      *Special arrangement*

1.45.2.4.1      Special arrangement shall mean those provisions, approved by the competent authority, under which consignments which do not satisfy all the requirements of these Regulations applicable to radioactive material may be transported.

1.45.2.4.2      Consignments for which conformity with any provision applicable to Class 7 is impracticable shall not be transported except under special arrangement. Provided the competent authority is satisfied that conformity with the Class 7 provisions of these Regulations is impracticable and that the requisite standards of safety established by these Regulations have been demonstrated through alternative means the competent authority may approve special arrangement transport operations for single or a planned series of multiple consignments. The overall level of safety in transport shall be at least equivalent to that which would be provided if all the applicable requirements had been met. For international consignments of this type, multilateral approval shall be required.

#### **1.45.2.5**      *Radioactive material possessing other dangerous properties*

1.45.2.5.1      In addition to the radioactive and fissile properties, any subsidiary risk of the contents of a package, such as explosiveness, flammability, pyrophoricity, chemical toxicity and corrosiveness, shall also be taken into account in the documentation, packing, labelling, marking, placarding, stowage, segregation and transport, in order to be in compliance with all relevant provisions for dangerous goods of these regulations.

#### **1.45.2.6**      *Non-compliance*

1.45.2.6.1      In the event of a non-compliance with any limit in these Regulations applicable to radiation level or contamination,

- (a) the consignor shall be informed of the non-compliance
  - (i) by the carrier if the non-compliance is identified during transport; or
  - (ii) by the consignee if the non-compliance is identified at receipt;
- (b) the carrier, consignor or consignee, as appropriate, shall:
  - (i) take immediate steps to mitigate the consequences of the non-compliance;
  - (ii) investigate the non-compliance and its causes, circumstances and consequences;
  - (iii) take appropriate action to remedy the causes and circumstances that led to the non-compliance and to prevent a recurrence of similar circumstances that led to the non-compliance; and

(iv) communicate to the relevant competent authority(ies) on the causes of the non-compliance and on corrective or preventive actions taken or to be taken; and

(c) ~~(e)~~—the communication of the non-compliance to the consignor and relevant competent authority(ies), respectively, shall be made as soon as practicable and it shall be immediate whenever an emergency exposure situation has developed or is developing.

### 2.7.21.5.3      **Definitions**

A<sub>1</sub> and A<sub>2</sub>

A<sub>1</sub> means the activity value of special form radioactive material which is listed in the Table in 2.7.76.2.1 or derived in 2.7.76.2 and is used to determine the activity limits for the requirements of these Regulations.

A<sub>2</sub> means the activity value of radioactive material, other than special form radioactive material, which is listed in the Table in 2.7.76.2.1 or derived in 2.7.76.2 and is used to determine the activity limits for the requirements of these Regulations.

#### *Approval*

*Unilateral approval* means an 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* means 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* means the assembly of components of the packaging specified by the designer as intended to retain the radioactive material during transport.

#### *Contamination:*

*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.

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

*Fixed contamination* means contamination other than non-fixed contamination.

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

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

*Exclusive use* means the sole use, by a single consignor, of a conveyance 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* means uranium-233, uranium-235, plutonium-239, plutonium-241, or any combination of these radionuclides. Excepted from this definition is:

- (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* means an article of transport equipment designed to facilitate the transport of goods, either packaged or unpackaged, by one or more modes of transport without intermediate reloading. It shall be of a permanent enclosed character, rigid and strong enough for repeated use, and shall be fitted with devices facilitating its handling, particularly in transfer between conveyances and from one mode of transport to another. A small freight container is that which has either any overall outer dimension less than 1.5 m, or an internal volume of not more than 3 m<sup>3</sup>. Any other freight container is considered to be a large freight container.

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

*Low specific activity (LSA) material*, see 2.7.32.

*Low toxicity alpha emitters* are: 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.

*Maximum normal operating pressure* means 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.

*Package in the case of radioactive material* means the packaging with its radioactive contents as presented for transport. The types of packages covered by these Regulations, which are subject to the activity limits and material restrictions of 2.7.7-6 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 definitions under 1.2.1.*

*Packaging in the case of radioactive material* means 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, tank or intermediate bulk container.

*NOTE: For "packagings" for other dangerous goods see definitions under 1.2.1.*

*Radiation level* means the corresponding dose rate expressed in millisieverts per hour.

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

*Special form radioactive material*, see 2.7.4.1.

*Specific activity of a radionuclide* means the activity per unit mass of that nuclide. The specific activity of a material shall mean the activity per unit mass or volume of the material in which the radionuclides are essentially uniformly distributed.

| *Surface contaminated object (SCO)*, see 2.7.54.

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

*Unirradiated thorium* means thorium containing not more than  $10^{-7}$  g of 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, enriched* means the following:

*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).

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

*Enriched uranium* means uranium containing a greater mass percentage of uranium-235 than 0.72%. In all cases, a very small mass percentage of uranium-234 is present.

| **2.7.31.5.4 Low specific activity (LSA) material, determination of groups**

| **2.7.3.1.5.4.1** 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 shall not be considered in determining the estimated average specific activity.

| 1.5.34.2 LSA Material shall 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) solid unirradiated natural uranium or depleted uranium or natural thorium or their solid or liquid compounds or mixtures;
  - (iii) radioactive material for which the  $A_2$  value is unlimited, excluding fissile material in quantities not excepted under 6.4.11.2; 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 2.7.7.2.1 to 2.7.7.2.6, excluding fissile material in quantities not excepted under 6.4.11.2.
- (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 –
- (i) solids (e.g. consolidated wastes, activated materials), excluding powders, in which:
    - 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  $2 \times 10^{-3} A_2/g$ .

2.7.3.31.5.34.3 LSA-III material shall be a solid of such a nature that if the entire contents of a package were subjected to the test specified in 2.7.3.4 the activity in the water would not exceed  $0.1 A_2$ .

2.7.3.41.5.34.4 LSA-III material shall be tested as follows:

A solid material sample representing the entire contents of the package shall be immersed for 7 days in water at ambient temperature. The volume of water to be used in the test shall be sufficient to ensure that at the end of the 7 day test period the free volume of the unabsorbed and unreacted water remaining shall be at least 10% of the volume of the solid test sample itself. The water shall 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 shall be measured following the 7 day immersion of the test sample.

2.7.3.51.5.34.5 Demonstration of compliance with the performance standards in 2.7.3.4 shall be in accordance with 6.4.12.1 and 6.4.12.2.

Renumber in Chapter 1.1 Existing provisions in 1.1.3 becomes new 1.1.2

1.1.32 Dangerous goods forbidden from transport

1.1.32.1 Unless provided ~~otherwise by these Regulations, the following are forbidden from transport:.....~~

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**Annex 2 (English only)****CHAPTER 2.7****2.7.1 CLASS 7 - RADIOACTIVE MATERIAL****Definition of Class 7**

2.7.1.1 *Radioactive material* means any material containing radionuclides where both the activity concentration and the total activity in the consignment exceed the values specified in 2.7.76.2.1 to 2.7.76.2.6.

2.7.1.2 The following radioactive materials are not included in Class 7 for the purposes of these Regulations:

- (a) Radioactive material that is an integral part of the means of transport;
- (b) Radioactive material moved within an establishment which is subject to appropriate safety regulations in force in the establishment and where the movement does not involve public roads or railways;
- (c) Radioactive material implanted or incorporated into a person or live animal for diagnosis or treatment;
- (d) Radioactive material in consumer products which have received regulatory approval, following their sale to the end user;
- (f) Non-radioactive solid objects with radioactive substances present on any surfaces in quantities not in excess of the limit defined in 2.7.2.1.5.2

**2.7.32 Low specific activity (LSA) material, determination of groups**

2.7.32.1 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 shall not be considered in determining the estimated average specific activity.

2.7.32.2 LSA material shall 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) solid unirradiated natural uranium or depleted uranium or natural thorium or their solid or liquid compounds or mixtures;
  - (iii) radioactive material for which the  $A_2$  value is unlimited, excluding fissile material in quantities not excepted under 6.4.11.2; 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 2.7.76.2.1 to 2.7.76.2.6, excluding fissile

material in quantities not excepted under 6.4.11.2.

(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<sub>2</sub>/g for solids and gases, and  $10^{-5}$  A<sub>2</sub>/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<sub>2</sub>; and
- (iii) the estimated average specific activity of the solid, excluding any shielding material, does not exceed  $2 \times 10^{-3}$  A<sub>2</sub>/g.

| 2.7.32.3 LSA-III material shall be a solid of such a nature that if the entire contents of a package were subjected to the test specified in 2.7.3.4 the activity in the water would not exceed 0.1 A<sub>2</sub>.

| 2.7.32.4 LSA-III material shall be tested as follows:

A solid material sample representing the entire contents of the package shall be immersed for 7 days in water at ambient temperature. The volume of water to be used in the test shall be sufficient to ensure that at the end of the 7 day test period the free volume of the unabsorbed and unreacted water remaining shall be at least 10% of the volume of the solid test sample itself. The water shall 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 shall be measured following the 7 day immersion of the test sample.

| 2.7.32.5 Demonstration of compliance with the performance standards in 2.7.32.4 shall be in accordance with 6.4.12.1 and 6.4.12.2.

| **2.7.43 Requirements for special form radioactive material**

| 2.7.43.1 Special form radioactive material means either:

- (a) An indispersible solid radioactive material; or
- (b) A sealed capsule containing radioactive material that shall be so manufactured that it can be opened only by destroying the capsule.

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

2.7.43.2 Special form radioactive material shall be of such a nature or shall be so designed that if it is subjected to the tests specified in 2.7.43.4 to 2.7.43.8, it shall meet the following requirements:

- (a) It would not break or shatter under the impact, percussion and bending tests 2.7.43.5 (a) (b) (c), 2.7.43.6 (a) as applicable;
- (b) It would not melt or disperse in the applicable heat test 2.7.43.5 (d) or 2.7.43.6 (b) as applicable; and
- (c) The activity in the water from the leaching tests specified in 2.7.43.7 and 2.7.43.8 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.

2.7.43.3 Demonstration of compliance with the performance standards in 2.7.43.2 shall be in accordance with 6.4.12.1 and 6.4.12.2.

2.7.43.4 Specimens that comprise or simulate special form radioactive material shall be subjected to the impact test, the percussion test, the bending test, and the heat test specified in 2.7.43.5 or alternative tests as authorized in 2.7.43.6. A different specimen may be used for each of the tests. Following each test, a leaching assessment or volumetric leakage test shall be performed on the specimen by a method no less sensitive than the methods given in 2.7.43.7 for indispersible solid material or 2.7.43.8 for encapsulated material.

2.7.43.5 The relevant test methods are:

- (a) Impact test: The specimen shall drop onto the target from a height of 9 m. The target shall be as defined in 6.4.14;
- (b) Percussion test: The specimen shall 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 shall be 25 mm in diameter with the edges rounded off to a radius of  $(3.0 \pm 0.3)$  mm. The lead, of hardness number 3.5 to 4.5 on the Vickers scale and not more than 25 mm thick, shall cover an area greater than that covered by the specimen. A fresh surface of lead shall be used for each impact. The bar shall strike the specimen so as to cause maximum damage;
- (c) Bending test: The test shall 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 shall 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 shall 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 shall 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 shall be 25 mm in diameter with the edges rounded off to a radius of  $(3.0 \pm 0.3)$  mm;
- (d) Heat test: The specimen shall be heated in air to a temperature of 800 °C and held at that temperature for a period of 10 minutes and shall then be allowed to cool.

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

- (a) The tests prescribed in 2.7.43.5(a) and 2.7.43.5(b) provided the mass of the special form radioactive material is less than 200 g and they are alternatively subjected to the Class 4 impact test prescribed in ISO 2919:1990 "Radiation protection - Sealed radioactive sources - General requirements and classification"; and
- (b) The test prescribed in 2.7.43.5(d) provided they are alternatively subjected to the Class 6 temperature test specified in ISO 2919:1990 "Radiation protection - Sealed radioactive sources - General requirements and classification".

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

- (a) The specimen shall be immersed for 7 days in water at ambient temperature. The volume of water to be used in the test shall be sufficient to ensure that at the end of the 7 day test period the free volume of the unabsorbed and unreacted water remaining shall be at least 10% of the volume of the solid test sample itself. The water shall have an initial pH of 6-8 and a maximum conductivity of 1 mS/m at 20 °C;
- (b) The water with specimen shall then be heated to a temperature of  $(50 \pm 5)$  °C and maintained at this temperature for 4 hours;
- (c) The activity of the water shall then be determined;
- (d) The specimen shall then be kept for at least 7 days in still air at not less than 30 °C and relative humidity not less than 90%;
- (e) The specimen shall then be immersed in water of the same specification as in (a) above and the water with the specimen heated to  $(50 \pm 5)$  °C and maintained at this temperature for 4 hours;
- (f) The activity of the water shall then be determined.

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

- (a) The leaching assessment shall consist of the following steps:
  - (i) the specimen shall be immersed in water at ambient temperature. The water shall have an initial pH of 6-8 with a maximum conductivity of 1 mS/m at 20 °C;
  - (ii) the water and specimen shall be heated to a temperature of  $(50 \pm 5)$  °C and maintained at this temperature for 4 hours;
  - (iii) the activity of the water shall then be determined;
  - (iv) the specimen shall 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%;

- (v) the process in (i), (ii) and (iii) shall be repeated;
- (b) The alternative volumetric leakage assessment shall 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.

## 2.7.54 **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<sup>2</sup> (or the area of the surface if less than 300 cm<sup>2</sup>) does not exceed 4 Bq/cm<sup>2</sup> for beta and gamma emitters and low toxicity alpha emitters, or 0.4 Bq/cm<sup>2</sup> for all other alpha emitters; and
  - (ii) the fixed contamination on the accessible surface averaged over 300 cm<sup>2</sup> (or the area of the surface if less than 300 cm<sup>2</sup>) does not exceed 4 x 10<sup>4</sup> Bq/cm<sup>2</sup> for beta and gamma emitters and low toxicity alpha emitters, or 4 x 10<sup>3</sup> Bq/cm<sup>2</sup> for all other alpha emitters; and
  - (iii) the non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm<sup>2</sup> (or the area of the surface if less than 300 cm<sup>2</sup>) does not exceed 4 x 10<sup>4</sup> Bq/cm<sup>2</sup> for beta and gamma emitters and low toxicity alpha emitters, or 4 x 10<sup>3</sup> Bq/cm<sup>2</sup> 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<sup>2</sup> (or the area of the surface if less than 300 cm<sup>2</sup>) does not exceed 400 Bq/cm<sup>2</sup> for beta and gamma emitters and low toxicity alpha emitters, or 40 Bq/cm<sup>2</sup> for all other alpha emitters; and
  - (ii) the fixed contamination on the accessible surface, averaged over 300 cm<sup>2</sup> (or the area of the surface if less than 300 cm<sup>2</sup>) does not exceed 8 x 10<sup>5</sup> Bq/cm<sup>2</sup> for beta and gamma emitters and low toxicity alpha emitters, or 8 x 10<sup>4</sup> Bq/cm<sup>2</sup> for all other alpha emitters; and
  - (iii) the non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm<sup>2</sup> (or the area of the surface if less than 300 cm<sup>2</sup>) does not exceed 8 x 10<sup>5</sup> Bq/cm<sup>2</sup> for beta and gamma emitters and low toxicity alpha emitters, or 8 x 10<sup>4</sup> Bq/cm<sup>2</sup> for all other alpha emitters.

## 2.7.65 **Determination of transport index and criticality safety index (CSI)**

### 2.7.65.1 **Determination of transport index**

2.7.65.1.1 The transport index (TI) for a package, overpack or freight container, or for unpackaged LSA-I or SCO-I, shall 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, freight container, or unpackaged LSA-I and SCO-I. The value determined shall 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 tanks, freight containers and unpackaged LSA-I and SCO-I, the value determined in step (a) above shall be multiplied by the appropriate factor from Table 2.7.65.1.1;
- (c) The value obtained in steps (a) and (b) above shall 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.

Table 2.7.65.1.1: Multiplication factors for tanks, freight containers and unpackaged LSA-I and SCO-I

Size of load <sup>a</sup>	Multiplication factor
size of load < 1 m <sup>2</sup>	1
1 m <sup>2</sup> < size of load < 5 m <sup>2</sup>	2
5 m <sup>2</sup> < size of load < 20 m <sup>2</sup>	3
20 m <sup>2</sup> < size of load	10

<sup>a</sup> Largest cross-sectional area of the load being measured.

2.7.65.1.2 The transport index for each overpack, freight container or conveyance shall be determined as either the sum of the TIs 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 shall be determined only as the sum of the TIs of all the packages.

### 2.7.66.2 Determination of criticality safety index (CSI)

2.7.65.2.1 The criticality safety index (CSI) for packages containing fissile material shall be obtained by dividing the number 50 by the smaller of the two values of N derived in 6.4.11.11 and 6.4.11.12 (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).

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

### 2.7.76 Activity limits and material restrictions

#### 2.7.76.1 Contents limits for packages

##### 2.7.76.1.1 General

The quantity of radioactive material in a package shall not exceed the relevant limits for the package type as specified [below in either Chapter 3.4.2 for excepted packagings or Packing Instructions](#)

701 -706.

**2.7.76.2**      *Activity levels*

2.7.76.2.1      The following basic values for individual radionuclides are given in Table 2.7.7.2.1:

- (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.

Table 2.7.76.2.1: Basic radionuclides values for individual radionuclides

**The table shown on pages 128-142 of the Model Regulations to be included/ no change**

- (a)  $A_1$  and/or  $A_2$  values include contributions from daughter nuclides with half-lives less than 10 days;
- (b) Parent nuclides and their progeny included in secular equilibrium are listed in the following;

**THE DATA- on pages 142-143AS to be included NO CHANGE**

- (c) The quantity may be determined from a measurement of the rate of decay or a measurement of the radiation level at a prescribed distance from the source;
- (d) These values apply only to compounds of uranium that take the chemical form of  $UF_6$ ,  $UO_2F_2$  and  $UO_2(NO_3)_2$  in both normal and accident conditions of transport;
- (e) These values apply only to compounds of uranium that take the chemical form of  $UO_3$ ,  $UF_4$ ,  $UCl_4$  and hexavalent compounds in both normal and accident conditions of transport;
- (f) These values apply to all compounds of uranium other than those specified in (d) and (e) above;
- (g) These values apply to unirradiated uranium only.

2.7.76.2.2 For individual radionuclides which are not listed in Table 2.7.76.2.1 the determination of the basic radionuclide values referred to in 2.7.76.2.1 shall require competent authority approval or, for international transport, multilateral approval. Where the chemical form of each radionuclide is known, it is permissible to use the  $A_2$  value related to its solubility class as recommended by the International Commission on Radiological Protection, if the chemical forms under both normal and accident conditions of transport are taken into consideration. Alternatively, the radionuclide values in Table 2.7.76.2.2 may be used without obtaining competent authority approval.

Table 2.7.76.2.2

**Basic radionuclide values for unknown radionuclides or mixtures**

<b>Radioactive contents</b>	A <sub>1</sub>	A <sub>2</sub>	Activity concentration for exempt material	Activity limit for exempt consignments
	(TBq)	(TBq)	(Bq/g)	(Bq)
Only beta or gamma emitting nuclides are known to be present	0.1	0.02	1 x 10 <sup>-1</sup>	1 x 10 <sup>4</sup>
Only alpha emitting nuclides are known to be present	0.2	9 x 10 <sup>-5</sup>	1 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>
No relevant data are available	0.001	9 x 10 <sup>-5</sup>	1 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>

2.7.76.2.3 In the calculations of A<sub>1</sub> and A<sub>2</sub> for a radionuclide not in Table 2.7.76.2.1, 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, shall be considered as a single radionuclide; and the activity to be taken into account and the A<sub>1</sub> or A<sub>2</sub> value to be applied shall be those 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 shall be considered as mixtures of different nuclides.

2.7.76.2.4 For mixtures of radionuclides, the determination of the basic radionuclide values referred to in 2.7.76.2.1 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<sub>1</sub> or A<sub>2</sub>, or the activity concentration for exempt material or the activity limit for an exempt consignment as appropriate for the radionuclide i; and

X<sub>m</sub> is the derived value of A<sub>1</sub> or A<sub>2</sub>, or the activity concentration for exempt material or the activity limit for an exempt consignment in the case of a mixture.

2.7.76.2.5 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 2.7.76.2.4 and 2.7.76.1.4.2. 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.

2.7.7.6.2.6 For individual radionuclides or for mixtures of radionuclides for which relevant data are not available, the values shown in Table 2.7.7.6.2.2 shall be used.

**2.7.87 Limits on transport index (TI), criticality safety index (CSI), radiation levels for packages and overpacks**

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

2.7.87.2 Except for packages or overpacks transported under exclusive use by rail or by road under the conditions specified in 7.2.3.1.2(a), or under exclusive use and special arrangement by vessel or by air under the conditions specified in 7.2.3.2.1 or 7.2.3.3.3 respectively, the maximum radiation level at any point on any external surface of a package or overpack shall not exceed 2 mSv/h.

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

2.7.87.4 Packages and overpacks shall be assigned to either category I-WHITE, II-YELLOW or III-YELLOW in accordance with the conditions specified in Table 2.7.8.4 and with the following requirements:

- (a) For a package or overpack, both the transport index and the surface radiation level conditions shall 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 shall be assigned to the higher category. For this purpose, category I-WHITE shall be regarded as the lowest category;

- (b) The transport index shall be determined following the procedures specified in 2.7.67.1.1 and 2.7.67.1.2;
- (c) If the surface radiation level is greater than 2 mSv/h, the package or overpack shall be transported under exclusive use and under the provisions of 7.2.3.1.3, 7.2.3.2.1, or 7.2.3.3.3, as appropriate;
- (d) A package transported under a special arrangement shall be assigned to category III-YELLOW;
- (e) An overpack which contains packages transported under special arrangement shall be assigned to category III-YELLOW.

Table 2.7.87.4: Categories of packages and overpacks

Conditions		
Transport index	Maximum radiation level at any point on external surface	Category
0 <sup>a</sup>	Not more than 0.005 mSv/h	I-WHITE
More than 0 but not more than 1 <sup>a</sup>	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 <sup>b</sup>

<sup>a</sup> If the measured TI is not greater than 0.05, the value quoted may be zero in accordance with 2.7.67.1.1(c).

<sup>b</sup> Shall also be transported under exclusive use.

2. 87.7 5 Add a new 2. 87.7 5 to read:

"2. 87.7.5 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 2.7 7.4 shall be in accordance with the certificate of the country of origin of design."

## **2.7.408 Requirements for low dispersible material**

2.7.408.1 Low dispersible radioactive material shall be such that the total amount of this radioactive material in a package shall 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 6.4.20.3 and 6.4.20.4, the airborne release in gaseous and particulate forms of up to 100 µm aerodynamic equivalent diameter would not exceed 100 A<sub>2</sub>. A separate specimen may be used for each test; and
- (c) If subjected to the test specified in 2.7.32.4 the activity in the water would not exceed 100 A<sub>2</sub>. In the application of this test, the damaging effects of the tests specified in (b) above shall be taken into account.

2.7.408.2 Low dispersible material shall be tested as follows:

A specimen that comprises or simulates low dispersible radioactive material shall be subjected to the enhanced thermal test specified in 6.4.20.3 and the impact test specified in 6.4.20.4. A different specimen may be used for each of the tests. Following each test, the specimen shall be subjected to the leach test specified in 2.7.32.4. After each test it shall be determined if the applicable requirements of 2.7.408.1 have been met.

2.7.40-83 Demonstration of compliance with the performance standards in 2.7.408.1 and 2.7.408.2 shall be in accordance with 6.4.12.1 and 6.4.12.2.

\* \* \*

**Annex 3 (English only)****Amendments to Chapter 3.4**

New title

Dangerous Goods Packed in Limited Quantities and Requirements for Excepted packages of Radioactive material

Renumber

3.4.1 Limited Quantities  
and number paragraphs 3.4.1.1, 3.4.1.2 etc

**2.7.93.4.2 Requirements and controls for transport of excepted packages of radioactive material**

2.7.9.3.4.2.14 Excepted packages which may contain radioactive material in limited quantities, instruments, manufactured articles as specified in follows:

3.4.2.1.1. For radioactive material other than articles manufactured of natural uranium, depleted uranium or natural thorium, an excepted package shall 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 2.7.6.1.2.1 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 2.7.6.1.2.1.

**Table 3.4.2.1.1 Activity limits for excepted packages**

<b>Physical state of contents</b>	<b>Instruments or article</b>		<b>Materials</b>
	<b>Item limits<sup>a</sup></b>	<b>Package limits<sup>a</sup></b>	<b>Package limits<sup>a</sup></b>
<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>
<b>Solids</b>	$10^{-2} A_1$	$A_1$	$10^{-3} A_1$
<u>special form</u>			
<u>other form</u>	$10^{-2} A_2$	$A_2$	$10^{-3} A_2$
<b>Liquids</b>	$10^{-3} A_2$	$10^{-1} A_2$	$10^{-4} A_2$
<b>Gases</b>	$2 \times 10^{-2} A_2$	$2 \times 10^{-1} A_2$	$2 \times 10^{-2} A_2$
<u>tritium</u>			
<u>special form</u>	$10^{-3} A_1$	$10^{-2} A_1$	$10^{-3} A_1$
<u>other forms</u>	$10^{-3} A_2$	$10^{-2} A_2$	$10^{-3} A_2$

<sup>a</sup> For mixtures of radionuclides, see 2.7.6.2.4 to 2.7.6.2.6.

3.4.2.1.2 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.

~~2.7.7.1.2 and e~~ Empty packagings as specified in 2.7.9.63.4.2.6 may be transported under the following conditions:

- (a) The applicable requirements specified in 2.0.3.2, 2.7.9.23.4.2.2, 2.7.9.33.4.2.3 to 2.7.9.63.4.2.6 (as applicable), 2.7.9.63.4.2.6 (d), 4.1.9.1.2, 5.2.1.1, 5.2.1.2, 5.2.1.5.1 to 5.2.1.5.3, 5.4.1.4.1 (a), 7.1.7.5.2;
- (b) The requirements for excepted packages specified in 6.4.4;
- (c) If the excepted package contains fissile material, one of the fissile exceptions provided by 6.4.11.2 shall apply and the requirement of 6.4.7.2 shall be met; and
- (d) The requirements in 1.1.1.6 if transported by post.

2.7.9.23.4.2.2 The radiation level at any point on the external surface of an excepted package shall not exceed 5  $\mu$ Sv/h.

(i) (ii)

3.4.2.3 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 2.7.~~76~~.1.2.1, 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: radioluminescent time-pieces or devices;

consumer products that either have received regulatory approval according to 2.7.1.2 (d) or do not individually exceed the activity limit for an exempt consignment in Table 2.7.~~76~~.2.1 (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 shall not be considered to be an instrument or manufactured article).

2.7.9.43.4.2.4 Radioactive material in forms other than as specified in 2.7.9.33.4.2.3, with an activity not exceeding the limit specified in column 4 of Table 2.7.~~76~~.1.2.1, 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.

~~2.7.9.5~~3.4.2.5 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.

~~2.7.9.6~~3.4.2.6 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 4.1.9.1.2; and
- (d) Any labels which may have been displayed on it in conformity with 5.2.2.1.11.1 are no longer visible.

3.4.2.7 Each package of gross mass exceeding 50kg shall have its permissible gross mass legibly and durably marked on the outside of the package

~~2.7.9.7~~3.4.2.8 The following provisions do not apply to excepted packages and the controls for transport of excepted packages: 2.7.~~43~~.1, 2.7.~~43~~.2, 4.1.9.1.3, 4.1.9.1.4, 5.1.3.2, 5.1.5.1.1, 5.1.5.1.2, 5.2.2.1.12.1, 5.4.1.5.7.1, 5.4.1.5.7.2, 5.4.1.6, 6.4.6.1, 7.1.6.5.1, 7.1.6.5.3 to 7.1.6.5.5, 7.1.7.1.1, 7.1.7.1.3, 7.1.7.3.1, 7.1.7.6.1.

3.4.2.9 Radioactive material in consumer products which have received regulatory approval following their sale to the end user are not included in Class 7 for the purposes of these Regulations:

\* \* \*

**Annex 4 (English only)**

**CHAPTER AND SECTION LINKS BETWEEN THE IAEA REGULATIONS AND THE UN MODEL REGULATIONS  
 BASED ON THE TABLE OF CORRESPONDENCE IN THE 13<sup>TH</sup> EDITION OF THE MODEL REGULATIONS**

<b>TS-R-1</b>	<b>UN</b>	<b>Move to</b>	<b>Comment</b>	<b>Proposed change to UN text</b>	<b>Proposed change to IAEA text</b>
101	1.1.2.1.1	1.5	General Provisions should be applicable to all classes. This and other paragraphs are specific additional requirements for class 7 and should be clearly identified		
102	X				
103	1.1.1.3	No change			
104	1.1.2.1.2	1.5	See 101		
105	1.1.1.4	No change			
106	1.1.2.1.3	1.5	See 101		
107	2.7.1.2	No change	But compare 107(d) and 3.4.9		
108	X	No change			
109	4.1.9.1.5	No change			
110	X	No change			
201	2.7.2	No change			
202	1.2.1	No change			
203	1.2.1	No change			
	2.7.2	1.5	204 and 205 should be kept together. This definition is used in packaging standards and in material standards, so is appropriate for 1.5	May need to be repeated in 6.1?	
205	2.7.2	1.5			
206	1.2.1	No change			

<b>TS-R-1</b>	<b>UN</b>	<b>Move to</b>	<b>Comment</b>	<b>Proposed change to UN text</b>	<b>Proposed change to IAEA text</b>
207	1.2.1	No change	Text not harmonised. IAEA permits international bodies to be competent authorities, UN does not.		IAEA to consider adopting UN definition.
208	1.2.1	?	This definition is a class 7 definition, but is it suitable for use in other classes?		
209	2.7.2	1.5			
210	1.2.1	No change	IAEA definition and UN definition are different, but are two parts of a whole. Propose adopting a common definition that covers both IAEA and UN concepts.		
211	1.2.1	No change			
212	1.2.1	No change			
213	2.7.2	1.5			
214	2.7.2	1.5	Contamination is used both in material classification and in operational control, so moving to 1.5 is appropriate.		
215	2.7.2	1.5			
216	2.7.2	1.5			
217	1.2.1	?	Conveyance an outmoded term		Align with definition of 'transport'
218	2.7.2	1.5			
219	1.2.1	No change	IAEA currently amending text to match UN		
220	2.7.2	To 1.5	All class 7 definitions should be in 1.5		
221	2.7.2	To 1.5			

<b>TS-R-1</b>	<b>UN</b>	<b>Move to</b>	<b>Comment</b>	<b>Proposed change to UN text</b>	<b>Proposed change to IAEA text</b>
222	2.7.2	No change	This is classification, and is in the correct location - however reformatting of IAEA text to be compatible with UN philosophy may be required.		
223	1.2.1	To 1.5			
224	1.2.1	No change	UN definition incorporates IAEA definition. IAEA text is in process of being modified to reflect UN text.		
225	2.7.2	No change	This is classification, and is in the correct location - however reformatting of IAEA text to be compatible with UN philosophy may be required.		
226	2.7.3 (x2.7.2)	No change	This is classification, and is in the correct location - however reformatting of IAEA text to be compatible with UN philosophy may be required.		
227	2.7.2	1.5	This is primarily used in operational control		
228	2.7.2	1.5	This is a term related to design, not to material classification		
229	1.2.1	No change	This definition needs discussing. The term enclosure and the examples do not seem to be in agreement. IAEA, in principle, is in agreement with adoption of UN text, but examples cause a problem.	Remove examples from the definition (?place as a footnote?).	Adopt UN text, excluding examples.

<b>TS-R-1</b>	<b>UN</b>	<b>Move to</b>	<b>Comment</b>	<b>Proposed change to UN text</b>	<b>Proposed change to IAEA text</b>
230	2.7.2 (x1.2.1)	Delete 2.7.2 text - use 1.2.1	IAEA definition and UN definition are aligned (examples from class 7 text are superfluous)		
231	2.7.2 (x1.2.1)	1.5	Needs further consideration and possible alignment with UN definition		
232	1.2.1	No change			
233	2.7.2	1.5			
234	1.1.2.2.1	No change			
235	2.7.2	New definition in 1.2.1?	The term “radioactive contents” is used in Class7 and “contents” for other dangerous goods (see definition of package). It is proposed a common definition is adopted for all dangerous goods.		
236	2.7.1.1	No change			
237	1.2.1	?	Shipment is used 64 times. Is this necessary?		
238	1.1.2.4.1	1.5	See 101		

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
239	2.7.2 (x2.7.4.1)	1.5	Definitions apply not only to chapter 2.7 but most other parts of the Class 7 text. As these are specific definitions for class 7 it is proposed to incorporate them into Chapter 1.5		
240	2.7.2	1.5	See 239		
241	2.7.5 (x2.7.2)	No change	This is material classification		
242	1.2.1	No change			IAEA should adopt UN text
243	2.7.2	1.5	See 218		
244	2.7.2	No change	This is material classification		
245	2.7.2	No change	This is material classification		
246	2.7.2	No change	This is material classification		
247	1.2.1	No change	These definitions are not special to Class 7. IAEA text is currently being amended to match UN text.		
248	1.2.1	No change			
301-305	1.1 etc	1.5	Move class 7 text from 1.1 to 1.5		
306-309	1.1 etc	no change			
310	1.1 etc	1.5			
311	1.1 etc	no change			
312	1.1 etc	4.1.5			
313	1.1 etc	1.5			
314-316	1.1 etc		Training needs amalgamation with Chapter 1.3		
401	2.7.7.2.1	No change			
402	2.7.7.2.2	No change			
403	2.7.7.2.3	No change			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
404	2.7.7.2.4	No change			
405	2.7.7.2.5	No change			
406	2.7.7.2.6	No change			
407	2.7.7.2.5	No change	This may not be required in UN or IAEA text	Remove	Remove
408	2.7.7.1.2.1	3.4	Excepted quantities are the class 7 version of limited quantities and at the Ottawa working group on limited quantities it was agreed by the IAEA representative this was a sensible change		
409	2.7.7.1.2.2	3.4			
410	1.1.1.6 b)	No change			
411	2.7.7.1.3	4.1.4.1	New P I required P 700 onward		
412	2.7.7.1.3	4.1.4.1	New P I required P 700 onward		
413	2.7.7.1.4.1	4.1.4.1	New P I required P 700 onward		
414	2.7.7.1.4.2	4.1.4.1	New P I required P 700 onward		
415	2.7.7.1.5.1	4.1.4.1	New P I required P 700 onward		
416	2.7.7.1.5.2	4.1.4.1	New P I required P 700 onward		
417	2.7.7.1.6	4.1.4.1	New P I required P 700 onward		
418	2.7.7.1.7	4.1.4.1	New P I required P 700 onward		
419	2.7.7.1.8	4.1.4.1	New P I required P 700 onward		
501	5.1.5.1.1	4.1.9			
502	5.1.5.1.2	4.1.9			
503	4.1.9.1.3	No change			
504	5.1.3.2	7.1.5			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
505	X	?			
506	X	?			
507	2.0.3, 2.0.3.2	No change			
508	4.1.9.1.2	No change			
509	4.1.9.1.4	No change			
510	7.1.7.5.1	7.1.1.9	This provision is suitable for merging with UN provisions to relate to all classes.		
511	7.1.7.5.2	7.1.1.10			
512	7.1.7.5.3	No change			
513	7.1.7.5.4	No change			
514	7.1.7.5.5	No change			
515	2.7.9.1, 2.7.9.7	3.4			
516	2.7.9.2	3.4			
517	2.7.9.3	3.4			
518	2.7.9.4	3.4			
519	2.7.9.5	3.4			
520	2.7.9.6	3.4 or new 4.1.1.1 (i)			
521	4.1.9.2.1	Merge with 4.1.9			
522	4.1.9.2.2	No change			
523	4.1.9.2.3	No change			
524	4.1.9.2.4	4.1.4.1	Addressed in P701		.
525	7.1.7.2	No change			

<b>TS-R-1</b>	<b>UN</b>	<b>Move to</b>	<b>Comment</b>	<b>Proposed change to UN text</b>	<b>Proposed change to IAEA text</b>
526	2.7.6.1.1	No change			
527	2.7.6.1.2	No change			
528	2.7.6.2.1	No change			
529	2.7.6.2.2	No change			
530	2.7.8.1	7.1.7			
531	2.7.8.2	7.1.7			
532	2.7.8.3	7.1.7			
533	2.7.8.4	5.2?			
534	NEW	Merge with 2.0.0	N.B. This is a new paragraph in the 2005 edition of IAEA - the following paragraph numbers are adjusted.  This paragraph seeks to make a clearer definition of "appropriate" in 2.0.0	Consider amending 2.0.0 to specify which country the "appropriate" competent authority is in.	
535	5.2.1.5.1				
536	5.2.1.1, 5.2.1.2, 5.2.1.5.2	5.2.1.1, 5.2.1.2, 3.4.8	Should UN 5.2.1.1 call up both 3.1.2 and 3.1.3?  By moving excepted packages to 3.4 the text at 3.4.8 duplicates 5.2.1.5.2 - text is then common to all classes		
537	5.2.1.5.3		Needs to be duplicated in 3.4.3	Add new requirement in 3.4.3	
538	5.2.1.5.4	6.4.1			
539	5.2.1.5.5	6.4.1			
540	5.2.1.5.6	6.4.1			
541	5.2.1.5.7	No change			

TS-R-1	UN	Move to	Comment	Proposed change to UN text	Proposed change to IAEA text
542	5.2.2.1.12.1	No change			
543	5.2.2.1.12.1	No change			
544	5.2.2.1.12.2	No change			
545	5.2.2.1.12.3	No change			
546	5.2.2.1.12.4	No change			
547	5.3.1.1.5.1	No change			IAEA to consider adopting UN principles for number and position of placards.
548	5.3.2.1.1 and 5.3.2.1.2	No change			
549	5.1.1.2	No change			
550	5.4.1.5.7.1		Needs reviewing - should be merged with general requirements to make information provision clear (e.g. 5.4.1.5.7.1 (a) to (c) should clearly be a means of expressing the information in 5.4.1.5.1)		
551	5.4.1.6	Needs reviewing			
552	X	No change			IAEA to consider the continued validity of this paragraph
553	5.4.1.6	No change			

<b>TS-R-1</b>	<b>UN</b>	<b>Move to</b>	<b>Comment</b>	<b>Proposed change to UN text</b>	<b>Proposed change to IAEA text</b>
554	5.4.1.6	No change			
555	2.7.9.6 d)	No change			
556	5.4.1.5.7.2	No change?	See comparable text at 5.4.3 on emergency arrangements. It may be sensible to split this paragraph.		
557	5.4.1.5.7.3	No change			
558	5.1.5.2.4 a)	No change			
559	5.1.5.2.4 b)	No change			
560	5.1.5.2.4 d)	No change			
561	5.1.5.2.4 c)	No change			
562	5.1.5.3.2		This provision needs to be split Certificate possession should be in 5.4 and loading instructions should go to part 7		
563	7.1.7.1.1 and 7.1.7.1.3	No change			
564	7.1.7.1.2	No change	.		
565	7.1.7.3.1	Remove	7.1.1.3 is equivalent		IAEA to consider adopting text of 7.1.1.3
566	7.1.7.3.2	No change			
567	7.1.7.3.3	No change			
568	7.1.7.3.4	No change			

<b>TS-R-1</b>	<b>UN</b>	<b>Move to</b>	<b>Comment</b>	<b>Proposed change to UN text</b>	<b>Proposed change to IAEA text</b>
569	7.1.7.4.1	No change			
570	7.1.7.4.2	No change			
571	5.3.1.1.5.2 and 7.2.3.1.1	No change			
572	5.3.2.1.1 and 5.3.2.1.2	No change			
573	7.2.3.1.2	No change			
574	7.2.3.1.3	No change			
575	7.2.3.2.1	No change			
576	7.2.3.2.2	No change			
577	7.2.3.3.1	No change			
578	7.2.3.3.2	No change			
579	7.2.3.3.3	No change			
580	1.1.1.6	No change			
581	1.1.1.6	No change			
582	X				
582	7.1.7.6.1	No change			

**Annex 5 (English only)****Class 7 Packing instructions**

Add to 4.1.4.1

<b>P 701</b>	<b>P701</b>	
This instruction applies to: LSA material and SCO		
Packagings are authorised provided the provisions of 4.1.9 are met.		
<p>The radioactive contents in a single package of LSA material or in a single package of SCO shall be so restricted that the radiation level specified in 4.1.9.2.1 shall not be exceeded, and the activity in a single package shall also be so restricted that the activity limits for a conveyance specified in 7.1.7.2 shall not be exceeded. A single package of non-combustible solid LSA-II or LSA-III material, if carried by air, shall not contain an activity greater than 3000 A<sub>2</sub>.</p> <p>The quantity of LSA material or SCO in a single Type IP-1 package, Type IP-2 package, Type IP-3 package, or object or collection of objects, whichever is appropriate, shall be so restricted that the external radiation level at 3 m from the unshielded material or object or collection of objects does not exceed 10 mSv/h.</p>		
LSA material and SCO, except as otherwise specified in 4.1.9.2.3, shall be packaged in accordance with the table below		
<i>Industrial package requirements for LSA material and SCO</i>		
Radioactive contents	Industrial package type	
	Exclusive use	Not under exclusive use
LSA-I Solid <sup>a</sup> Liquid	Type IP-1 Type IP-1	Type IP-1 Type IP-2
LSA-II Solid Liquid and gas	Type IP-2 Type IP-2	Type IP-2 Type IP-3
LSA-III	Type IP-2	Type IP-3
SCO-I <sup>a</sup>	Type IP-1	Type IP-1
SCO-II	Type IP-2	Type IP-2
<sup>a</sup> <i>Under the conditions specified in 4.1.9.2.3, LSA-I material and SCO-I may be transported unpackaged.</i>		

<b>P 702</b>	<b>P702</b>
This instruction applies to: Type A Packagings	
Packagings are authorised provided the provisions of 4.1.9 are met.	
<p>Type A packages shall not contain activities greater than the following:</p> <p>(a) For special form radioactive material - A<sub>1</sub>; or</p> <p>(b) For all other radioactive material - A<sub>2</sub>.</p> <p>For mixtures of radionuclides whose identities and respective activities are known, the following condition shall apply to the radioactive contents of a Type A package:</p> $\sum_i \frac{B(i)}{A_1(i)} + \sum_j \frac{C(j)}{A_2(j)} \leq 1$ <p>where B(i) is the activity of radionuclide i as special form radioactive material and A<sub>1</sub>(i) is the A<sub>1</sub> value for radionuclide i; and</p> <p>C(j) is the activity of radionuclide j as other than special form radioactive material and</p> <p>A<sub>2</sub>(j) is the A<sub>2</sub> value for radionuclide</p>	

<b>P 703</b>	<b>P703</b>
This instruction applies to: Type B(U) and Type B(M) packages	
Packagings are authorised provided the provisions of 4.1.9 are met.	
<p>Type B(U) and Type B(M) packages shall not contain:</p> <p>(a) Activities greater than those authorized for the package design;</p> <p>(b) Radionuclides different from those authorized for the package design; or</p> <p>(c) Contents in a form, or a physical or chemical state different from those authorized for the package design</p> <p>as specified in their certificates of approval.</p> <p>Type B(U) and Type B(M) packages, if transported by air, shall in addition not contain activities greater than the following:</p> <p>(a) For low dispersible radioactive material - as authorized for the package design as specified in the certificate of approval;</p> <p>(b) For special form radioactive material - 3000 A<sub>1</sub> or 100 000 A<sub>2</sub>, whichever is the lower; or</p> <p>(c) For all other radioactive material - 3000 A<sub>2</sub>.</p>	

<b>P 704</b>	<b>P704</b>
This instruction applies to Type C packages	
Packagings are authorised provided the provisions of 4.1.9 are met.	
<p style="text-align: center;">Type C packages shall not contain:</p> <ul style="list-style-type: none"> <li>(a) Activities greater than those authorized for the package design;</li> <li>(b) Radionuclides different from those authorized for the package design; or</li> <li>(c) Contents in a form, or physical or chemical state different from those authorized for the package design;</li> </ul> <p>as specified in their certificates of approval</p>	

<b>P 705</b>	<b>P705</b>
This instruction applies to packages for fissile material	
Packagings are authorised provided the provisions of 4.1.9 are met.	
<p style="text-align: center;">Packages containing fissile material shall not contain:</p> <ul style="list-style-type: none"> <li>(a) A mass of fissile material different from that authorized for the package design;</li> <li>(b) Any radionuclide or fissile material different from those authorized for the package design; or</li> <li>(c) Contents in a form or physical or chemical state, or in a spatial arrangement, different from those authorized for the package design;</li> </ul> <p>as specified in their certificates of approval where appropriate.</p>	

<b>P 706</b>	<b>P706</b>
This instruction applies to packages containing uranium hexafluoride	
Packagings are authorised provided the provisions of 4.1.9 are met.	
<p>The mass of uranium hexafluoride in a package shall not exceed a value that would lead to an ullage smaller than 5% at the maximum temperature of the package as specified for the plant systems where the package shall be used. The uranium hexafluoride shall be in solid form and the internal pressure of the package shall be below atmospheric pressure when presented for transport.</p>	

Amend 4.1.9 as follows:

**4.1.9 Special packing provisions for Class 7**

**4.1.9.1 General**

4.1.9.1.1 **Unchanged**

**4.1.9.2 Requirements and controls for transport of LSA material and SCO**

4.1.9.2.1 LSA material and SCO which is or contains fissile material shall meet the applicable requirements of 6.4.11.1, 7.1.7.4.1 and 7.1.7.4.2.

4.1.9.2.2 LSA material and SCO in groups LSA-I and SCO-I may be transported unpackaged under the following conditions:

- (a) All unpackaged material other than ores containing only naturally occurring radionuclides shall be transported in such a manner that under routine conditions of transport there will be no escape of the radioactive contents from the conveyance nor will there be any loss of shielding;
- (b) Each conveyance shall be under exclusive use, except when only transporting SCO-I on which the contamination on the accessible and the inaccessible surfaces is not greater than ten times the applicable level specified in 2.7.2; and
- (c) For SCO-I where it is suspected that non-fixed contamination exists on inaccessible surfaces in excess of the values specified in 2.7.5(a)(i), measures shall be taken to ensure that the radioactive material is not released into the conveyance.

Remainder of text now in P701

\* \* \*

**Annex 6 (English only)**

**Consequential changes that need to be checked**

**Part 1**

Chapter 1.1 1.1.1.6 (b) “2.7.9.1 becomes 3.4.2.1”, “Table 2.7.7.1.2.1 becomes 2.7.6.1.2.1”

Chapter 1.2 Consider  
*Radioactive materials* see chapter 1.5 for definitions

Chapter 1.3 Consider 1.3.2.4 from ADR

**Part 2**

Chapter 2.7 see amendments in attached Annex xxx

**Part 3**

Chapter 3.4 see amendments in Attached Annex yyy

**Part 4**

Chapter 4.1 4.1.9 reference to 2.7.71 becomes 3.4.2  
4.1.9.2.3(b) reference to 2.7.2 becomes 1.5.3  
4.1.9.2.3(c) reference to 2.7.5 (a)(i) becomes 2.7.4.(a) (i)

**Part 5**

Chapter 5.1 5.1.5.2.3 reference to 1.1.2.4 becomes 1.5.2.4

**Part 6**

Chapter 6.4 6.4.4 references to 6.4.2 and 6.4.3 becomes 3.4  
6.4.10.3(ii) references to 2.7.7.2.4 to 2.7.7.2.6 become 2.7.6.2.4 to 2.7.6.2.6  
6.4.14 reference to 2.7.4.5 becomes 2.7.3.5  
6.4.24.1 reference to 2.7.7 becomes 2.7.6.1  
6.4.24.2 reference to 2.7.7 becomes 2.7.6.1

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